TECHNICAL MEMORANDUM

TO: Terry Woehl, NDDOT
FROM: Kshitij Sharma, ATAC
Subject: Spot Speed Studies – US 85 @ ND 68
Date: November 18, 2014

This memorandum documents the Spot Speed Studies conducted on US 85 in the vicinity of ND 68 in McKenzie county, ND.

BACKGROUND
NDDOT had requested ATAC to conduct spot speed studies at two locations along US 85. The two locations are:

1. Site 1
   US 85 south of ND 68
   RP 158.722
   Posted Speed Limit 65mph

2. Site 2
   US 85 north of ND 68
   RP 159.635
   Posted Speed Limit 65mph

Two studies with minimum sample size of 250 vehicles were requested per location. Both northbound and southbound directions of travel were to be observed.

METHODOLOGY
For the purpose of these spot speed studies, Operating Speed Method, generally known as the 85th percentile speed method was used. In addition to the 85th percentile speed, the following parameters were calculated:

- Mean Speed
  Average speed of vehicles observed.
- Mode Speed
  Most frequently observed speed.
- Median Speed
  50th percentile speed.
- Pace
Window of 10mph range encompassing highest number of observed vehicles.

- Vehicles in pace
  Percent of observed vehicles driving at speeds within pace.
- Over 65mph
  Total percent of vehicles speeding.
- Over 70mph
  Percent of vehicles speeding over 70mph.
- Standard deviation
  Measure of spread or dispersion of observed speeds.

Also, based on the observed data, the following charts were created:

- Frequency Distribution Chart
  Normal frequency distribution chart plotted against speeds. This chart includes Pace.
- Cumulative Frequency Distribution Chart
  Cumulative frequency distribution chart plotted against speeds. This chart shows 85\textsuperscript{th} percentile speeds.

**METHODOLOGY**

For the purpose of these spot speed studies, Operating Speed Method, generally known as the 85\textsuperscript{th} percentile speed method was deployed. The dates and times of observation are listed in table 1.

Note that due to rapidly decreasing/increasing instantaneous speeds or otherwise non-free-flow conditions, some vehicles were intentionally left out from the observations including:

- Emergency vehicles in pursuit or responding to emergency situations
- Vehicles deliberately driving slower (indicated by actively flashing beacons)
- Turning vehicles including vehicles in two way turn lane
- Vehicles entering the roadway from a complete stop close to the study location
  - All vehicles turning right onto US-85 from the driveway of travel center located in the southeast corner of the intersection of US 85 and ND 68

Table 1. Observation dates and times for spot speed study sites.

<table>
<thead>
<tr>
<th>Location</th>
<th>Date</th>
<th>Direction</th>
<th>Time From</th>
<th>Time To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1</td>
<td>November 13, 2014</td>
<td>Northbound</td>
<td>10:00 am</td>
<td>1:30 pm</td>
</tr>
<tr>
<td></td>
<td>November 14, 2014</td>
<td>Southbound</td>
<td>10:00 am</td>
<td>12:30 pm</td>
</tr>
<tr>
<td></td>
<td>Northbound</td>
<td>2:00 pm</td>
<td>4:30 pm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Southbound</td>
<td>2:00 pm</td>
<td>4:45 pm</td>
<td></td>
</tr>
<tr>
<td>Site 2</td>
<td>November 13, 2014</td>
<td>Northbound</td>
<td>2:00 pm</td>
<td>5:00 pm</td>
</tr>
<tr>
<td></td>
<td>Southbound</td>
<td>2:00 pm</td>
<td>4:15 pm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>November 14, 2014</td>
<td>Northbound</td>
<td>10:00 am</td>
<td>1:00 pm</td>
</tr>
<tr>
<td></td>
<td>Southbound</td>
<td>10:00 am</td>
<td>1:30 pm</td>
<td></td>
</tr>
</tbody>
</table>
RESULTS
As aforementioned, various parameters were calculated from speed observations. A summary of the results is presented in table 2.

At all of the locations studied, the 85th percentile speed was found to be extremely close to the posted speed limit. This implies that most of the traffic is observing the posted speed limit, as expected.

Also, vehicles travelling southbound at site 1 were observed to be travelling at speeds varying more than other locations/directions. This can also be seen in results as the speeds observed have higher standard deviation and there are lesser number of vehicles travelling in pace.

Table 2. Summary of spot speed study results.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Site 1</th>
<th>Site 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NB</td>
<td>SB</td>
</tr>
<tr>
<td></td>
<td>13-Nov¹</td>
<td>14-Nov</td>
</tr>
<tr>
<td>85th Percentile (mph)</td>
<td>66</td>
<td>66</td>
</tr>
<tr>
<td>Mean (mph)</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>Standard Deviation (mph)</td>
<td>4.2</td>
<td>4.6</td>
</tr>
<tr>
<td>Mode (mph)</td>
<td>62</td>
<td>64</td>
</tr>
<tr>
<td>Median (mph)</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>Pace (mph)</td>
<td>57-67</td>
<td>57-67</td>
</tr>
<tr>
<td>In pace (%)</td>
<td>77</td>
<td>75</td>
</tr>
<tr>
<td>Over 65mph (%)</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
<td>Over 70mph (%)</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

¹ Sample size is 243.
APPENDICES
Appendix A: Frequency Distribution Charts.
Appendix B: Cumulative Frequency Distribution Charts.