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## MEMORANDUM

TO: Ryan Barney  
MnDOT District 8

FROM: Graham Johnson, PE

DATE: July 28, 2015

RE: Highway 23 North Gap - Crash History  
SEH No. MNT08 132980

Highway 23 (TH 23) extends across the state of Minnesota from Interstate 90, in the southwest corner of the state, to Interstate 35 in the City of Duluth. TH 23 is an interregional corridor that connects regional trade centers including the cities of Marshall, Willmar, St Cloud, and Duluth-Superior. The segment of TH 23 between Willmar and Interstate 94 (I-94) is approximately 53 miles. Of this total distance, approximately 38 miles of TH 23 is currently a 4-lane roadway, this leaves approximately 15 miles of TH 23 as a 2-lane roadway. There are two different 2-lane sections along TH 23 which are between the cities of New London and Paynesville and between the cities of Paynesville and Richmond.

MnDOT District 8 has already completed a study of the 2-lane section of TH 23 between the cities of New London and Paynesville. This project will address the 2-lane section of TH 23 between the cities of Paynesville and New Richmond; an approximate 8.9 mile section of TH 23.

As part of the project, a crash analysis was completed along the corridor using data obtained from the MnDOT Crash Mapping Analysis Tool (MnCMAT). A 10-year crash analysis was conducted for crashes occurring from January 1<sup>st</sup>, 2005 through December 31<sup>st</sup>, 2014.

Crash and severity rates were calculated for all intersections and segment sections along the corridor. The rates were compared to the MnDOT Statewide average rates for similar intersections and roadway sections. A critical crash and severity rate was also calculated for each intersection and segment. Critical rates are a statistical rate calculated for each individual intersection or segment based on amount of vehicle exposure. If an intersection or segment crash rate is at or above the critical rate, there is a sustained crash problem and these locations are considered to be unsafe.

### **Intersection Crashes**

Crashes were assigned to each intersection and the segments between the intersections based on the reference mile marker. With all the crashes assigned to either a specific intersection or segment, an assessment was completed on the minor intersections to determine if there were specific crash problems at the low-volume intersections.

Almost all minor street stop controlled intersections had at least one crash occur during the 10-year analysis. The highest number of crashes for a single intersection in the study area was 15 crashes. The majority of the minor intersections were below both the statewide average crash rates and all intersections were below the intersection critical crash rates; however the TH 23 intersections with 263<sup>rd</sup> Avenue, 210<sup>th</sup> Street and CR 43 were above the statewide averages.

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Within the 10-year crash analysis, six intersections that had more than 4 crashes; three intersections had more than 8 crashes. A total of 35 crashes occurred at the three worst intersections. Of the 61 total intersection crashes, 43% of the crashes were vehicles leaving the roadway, 59% of the crashes occurred during daylight conditions and only 54% occurred on dry pavement.

All intersections along this segment of TH 23 are minor street stop controlled. The table below represents the 10-year crash history for all intersections that had at least two crashes. TH 23 at both 263<sup>rd</sup> Avenue and CSAH 43 are the only intersections that have a crash and severity rate higher than the district average rates. The only critical rate surpassed is at the intersection of TH 23 and CR 43 where the critical severity rate is exceeded.

*Table 1 10-year Intersection Crash History*

TH 23 @	Fatal	A	B	C	N	Total	Crash Rate	Severity Rate	Critical Crash Rate	Critical Severity Rate
TH 23 at 263rd Avenue	0	0	0	6	6	12	0.44	0.66	0.55	0.81
TH 23 at County Road 123	0	0	1	2	0	3	0.11	0.26	0.55	0.81
TH 23 at 253rd Avenue	0	0	0	3	1	4	0.15	0.26	0.55	0.81
TH 23 at 205th Street	0	0	2	0	1	3	0.11	0.26	0.55	0.82
TH 23 at 210th Street	0	0	2	1	5	8	0.28	0.46	0.55	0.81
TH 23 at 190th Street	0	1	0	2	1	4	0.15	0.34	0.56	0.82
TH 23 at County Road 114	0	0	0	1	3	4	0.15	0.18	0.55	0.81
TH 23 at County Road 123	0	0	0	1	1	2	0.07	0.11	0.55	0.81
TH 23 at County Road 43	0	1	3	4	7	15	0.43	0.81	0.52	0.77
TH 23 at West Becker Lake Circle	0	0	1	2	0	3	0.09	0.21	0.52	0.77
TH 23 at East Becker Lake Circle	0	0	1	0	2	3	0.09	0.15	0.52	0.77
							Above Statewide Average Rate		Above Critical Rate	

Based on the above analysis, there is a high percentage of rear end (21%) and run-off-road (43%) crashes at the intersections. Contributing factors to these types of crashes can be attributed to the number of access points, left turning vehicles from the through lane, drivers following too closely, and distracted drivers. There is a high percentage of crashes that occur when the pavement is not dry (46%) and in poor weather conditions (38%).

See the attached Tables 3 and 4 for additional intersection crash data, including the Statewide Average crash rates.

**Segment Crashes**

All intersection crashes at the segment splits along TH 23 were removed from the segment crash data; this includes 263<sup>rd</sup> Avenue, 210<sup>th</sup> Street and CSAH 43. The table below represents the 10-year crash history for the 4 different segments in the crash analysis. All of the segments, between the three worst intersections, are at or above the statewide non-junction average crash and severity rates. The short segment between the existing 4-lane section and 263<sup>rd</sup> Avenue is above the critical severity rates; all other segments are below the calculated critical rates.

A total of 93 crashes occurred along TH 23 in the 10-year analysis period. Of the 93 segment crashes 54% of the crashes occurred during daylight conditions, 57% occurred on wet or icy pavement and 20% of the crashes occurring on Saturdays.

Table 2 10-Year Segment Crash History

From	To	Length (Miles)	Segment ADT	Fatal	A	B	C	N	Total	Crash Rate	Severity Rate	Critical Crash Rate	Critical Severity Rate
Ref. 177+00.057	263 <sup>rd</sup> Avenue	0.45	7,300	0	0	2	1	4	7	0.58	1.00	0.66	0.94
263 <sup>rd</sup> Avenue	210 <sup>th</sup> Street	2.42	7,300	0	0	6	8	11	25	0.39	0.70	0.47	0.71
210 <sup>th</sup> Street	CSAH 43	4.35	7,300	0	3	3	13	22	41	0.35	0.59	0.43	0.67
CSAH 43	Ref. 185+00.780	1.49	9,200	0	1	3	6	10	20	0.40	0.70	0.50	0.71
											Above Statewide Average Rate	Above Critical Rate	

Based on the above analysis, there is a high percentage of rear end (17%) and run-off-road (52%) crashes along each segment. These could be attributed to the high number of access points along TH 23 and all traffic turning from the through-lane on TH 23. Other contributing factors to these types of crashes can be attributed to drivers following too closely and distracted drivers.

See the attached Table 5 for additional segment crash data, including the Statewide Average crash rates.

**Conclusion**

A crash analysis along the 8.9 miles section of TH 23 was completed based on a 10-year crash history. Three intersections along TH 23, at 263<sup>rd</sup> Avenue, 210<sup>th</sup> Street and CSAH 43, are at or above the statewide average crash and severity rates for a rural through/stop intersection. The intersection of TH 23 and CR 43 is above the critical severity rate; however all other intersections along TH 23 are below the calculated critical rates.

The roadway was divided into 4 segments surrounding the three worst crash intersections. The entire 2-lane section of TH 23 is at or above the statewide average crash and severity rate for a rural 2-lane roadway. The short segment between the existing 4-lane section and 263<sup>rd</sup> Avenue is above the critical severity rates; all other segments are below the calculated critical rates.

The high percentage of rear end and run-off-road crashes along the corridor could be attributed to the high number of access onto TH 23 and lack of separate turning lanes for vehicles. All turning traffic along the corridor must turn from the TH 23 through-lane which is posted at 55 mph.

Attachments:

- Table 3 Intersection Crash Severity
- Table 4 Intersection Crash Type
- Table 5 Segment Crash Severity and Type

**Table 3**  
**TH 23 Intersection Crash Summary**  
**2005 to 2014 Crash Data**  
**MnDOT Crash Mapping Software Information**

TH 23 North Gap From	Crash Severity						Average Rates		Critical Rates*	
	Fatal	A	B	C	Property	Total	Crash Rate	Severity Rate	Critical Crash Rate	Critical Severity Rate
TH 23 at 263rd Avenue	0	0	0	6	6	12	0.44	0.66	0.55	0.81
TH 23 at County Road 123	0	0	1	2	0	3	0.11	0.26	0.55	0.81
TH 23 at 253rd Avenue	0	0	0	3	1	4	0.15	0.26	0.55	0.81
TH 23 at 205th Street	0	0	2	0	1	3	0.11	0.26	0.55	0.82
TH 23 at 210th Street	0	0	2	1	5	8	0.28	0.46	0.55	0.81
TH 23 at 190th Street	0	1	0	2	1	4	0.15	0.34	0.56	0.82
TH 23 at County Road 114	0	0	0	1	3	4	0.15	0.18	0.55	0.81
TH 23 at County Road 123	0	0	0	1	1	2	0.07	0.11	0.55	0.81
TH 23 at County Road 43	0	1	3	4	7	15	0.43	0.81	0.52	0.77
TH 23 at West Becker Lake Circle	0	0	1	2	0	3	0.09	0.21	0.52	0.77
TH 23 at East Becker Lake Circle	0	0	1	0	2	3	0.09	0.15	0.52	0.77
<b>TOTAL</b>	<b>0</b>	<b>2</b>	<b>10</b>	<b>22</b>	<b>27</b>	<b>61</b>				
	0%	3%	16%	36%	44%					

**Table 4**  
**TH 23 Intersection Crash Summary**  
**2005 to 2014 Crash Data**  
**MnDOT Crash Mapping Software Information**

TH 23 North Gap From	Diagram - Crash Type								Rates	
	Rear End	Left Turn	Right Angle	Side Swipe	Head On	Ran Off Road	Other	Total	Crash Rate	Severity Rate
TH 23 at 263rd Avenue	2	0	0	1	0	9	0	12	0.44	0.66
TH 23 at County Road 123	1	0	1	0	0	0	1	3	0.11	0.26
TH 23 at 253rd Avenue	0	0	0	0	0	4	0	4	0.15	0.26
TH 23 at 205th Street	0	0	1	1	0	1	0	3	0.11	0.26
TH 23 at 210th Street	2	1	0	2	0	2	1	8	0.28	0.46
TH 23 at 190th Street	0	0	0	2	1	0	1	4	0.15	0.34
TH 23 at County Road 114	0	0	0	1	0	3	0	4	0.15	0.18
TH 23 at County Road 123	0	0	0	0	0	2	0	2	0.07	0.11
TH 23 at County Road 43	7	0	4	0	0	2	2	15	0.43	0.81
TH 23 at West Becker Lake Circle	1	0	0	0	0	1	1	3	0.09	0.21
TH 23 at East Becker Lake Circle	0	0	1	0	0	2	0	3	0.09	0.15
<b>TOTAL</b>	<b>13</b>	<b>1</b>	<b>7</b>	<b>7</b>	<b>1</b>	<b>26</b>	<b>6</b>	<b>61</b>		
	21%	2%	11%	11%	2%	43%	10%			

\*Critical Rate based on 95% Confidence Level

MnDOT Statewide Average Rates (2013 Data: 10 Year Avg)		
Intersection Type	Crash Rate	Severity Rate
6 Rural Thru/Stop	0.28	0.47

**Table 5  
TH 23 Segment Crash Summary  
2005 to 2014 Crash Data  
MnDOT Crash Mapping Software Information**

TH 23 North Gap											Crash Severity		Average Rates		Critical Rates**	
From	To	Road Section Type	Length (Miles)	Segment ADT	Fatal	A	B	C	Property	Total	Crash Rate	Severity Rate	Critical Crash Rate	Critical Severity Rate		
177.057	263rd Avenue	Rural 2 Lane ADT [5000,8000)	0.45	7,300	0	0	2	1	4	7	0.58	1.00	0.66	0.94		
263rd Avenue	210th Street	Rural 2 Lane ADT [5000,8000)	2.42	7,300	0	0	6	8	11	25	0.39	0.70	0.47	0.71		
210th Street	CSAH 43	Rural 2 Lane ADT [5000,8000)	4.35	7,300	0	3	3	13	22	41	0.35	0.59	0.43	0.67		
CSAH 43	185.78	Rural 2 Lane ADT [8000,∞)	1.49	9,200	0	1	3	6	10	20	0.40	0.70	0.50	0.71		
<b>TOTALS</b>			<b>8.72</b>		<b>0</b>	<b>4</b>	<b>14</b>	<b>28</b>	<b>47</b>	<b>93</b>						
					<b>0%</b>	<b>4%</b>	<b>15%</b>	<b>30%</b>	<b>51%</b>							

\*Does not include crashes at the intersections of 263rd Avenue, 210th Street, and CSAH 43.

TH 23 North Gap											Diagram - Crash Type					
From	Total	Road Section Type	Rear End	Left Turn	Right Angle	Side Swipe	Head On	Ran Off Road	Other	Total						
177.057	263rd Avenue	Rural 2 Lane ADT [5000,8000)	2	0	0	0	0	5	0	7						
263rd Avenue	210th Street	Rural 2 Lane ADT [5000,8000)	4	0	4	6	0	10	1	25						
210th Street	CSAH 43	Rural 2 Lane ADT [5000,8000)	4	0	2	6	1	24	4	41						
CSAH 43	185.78	Rural 2 Lane ADT [8000,∞)	6	0	2	1	1	9	1	20						
<b>TOTALS</b>			<b>16</b>	<b>0</b>	<b>8</b>	<b>13</b>	<b>2</b>	<b>48</b>	<b>6</b>	<b>93</b>						
			<b>17%</b>	<b>0%</b>	<b>9%</b>	<b>14%</b>	<b>2%</b>	<b>52%</b>	<b>6%</b>							

\*Does not include crashes at the intersections of 263rd Avenue, 210th Street, and CSAH 43.

\*\*Critical Rate based on 95% Confidence Level

MnDOT Statewide Average Rates (2013 Data: Non-Junction 10 Year Avg)		
Section Type	Crash Rate	Severity Rate
1 Rural 2 Lane ADT [0,1500)	0.45	0.79
2 Rural 2 Lane ADT [1500,5000)	0.35	0.56
3 Rural 2 Lane ADT [5000,8000)	0.34	0.55
4 Rural 2 Lane ADT [8000,∞)	0.35	0.53

