

Crash Analysis (Task 3.1)



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1.0 Crash analysis methodology

At a meeting on August 13, 2010, at the NWMCOG offices, a methodology for performing the crash analysis for the TC-TALUS study area was discussed and agreed upon. The methodology utilizes Roadsoft version 7.1.0.0 and the associated crash data supplied for the Region 10 planning area (Northwest Michigan Council of Governments member counties).

The supplied crash data is for the 10 years from 2000 to 2009, inclusive. The data set for the Region 10 planning area was filtered for the analysis so only crashes along the 11 defined corridors of significance are included. Detailed descriptions of the 11 corridors can be found in the Task 3.5 report. The filtered data resulted in 431 total intersections with at least one crash reported over the 10-year period.

The data was examined using Roadsoft in three distinct ways: crashes attributable to curved segments of roadways, intersection weighting and ranking by year, and key intersection crash diagrams. Each of the methodologies and the results are discussed in the sections below.

This analysis is intended to provide a regional overview of specific areas that are experiencing safety-related issues. The results from this methodology may differ from other safety analyses performed by local road agencies due to the data set utilized and the specific methodology applied to the data.

1.1 Curve segment rankings

Using Roadsoft's curve analysis tool, the top crash concentration curve segments in the region were ranked in terms of number of "K" and "A" accidents attributable to roadway geometry. A "K" crash involves a fatality while an "A" crash involves serious injury. For the curve analysis, Roadsoft assigns all accidents along curved segments of roadway, regardless of the degree of curvature of the roadway alignment. The top five curves in terms of crashes are:

1. US-31N from the Traverse City limits to 5 Mile Rd.
2. US-31N from Traverse City State Park entrance to 4 Mile Rd.
3. US-31N from Avenue E to Traverse City State Park entrance
4. West Silver Lake Rd. from Allen Dr. to Secor Rd.
5. North Long Lake Rd. between Timbers Trail and Harty Hill

The first three curves listed are on the segment of US-31 (Corridor 1) along the East Arm of the Grand Traverse Bay. The alignment along these segments of roadway, although curved, is a series of very high radius curves with no sight-distance issues noted. The results of the analysis should be viewed with this in mind, as it is unlikely that mitigation in the form of roadway realignment would result in a safety improvement.

Details for these segments are included on the following pages. This information will be utilized to recommend mitigation measures in the *Transportation Gap Analysis and Refined Intersection Report (Task 3.6 / Task 4.2)*.

Curve Crashes Per Mile

PR No.	Segment Name	From Description	To Description	BMP	Length	Total Crashes				Greatest Injury Severity Per Mile				Occurrences Per Mile					County	
						All	Type K (Fatal)	Type A (Incap)	Type K+A	PDO	Killed	Incap	Non-Incap	No Injury	Total	Fatal	Type A	Type K+A		Peds
994002	Traverse City SP AccesN 4 Mile Rd			2.567	0.198	68	0	2	2	54	.00	10.10	10.10	272.73	343.43	.00	15.15	15.15	5.05	Grand Traver
994002	Avenue E	Traverse City SP Se		1.682	0.05	35	1	0	1	22	20.00	.00	20.00	440.00	700.00	20.00	.00	20.00	20.00	Grand Traver
994002	City/Twp Line	5 Mile Rd		4.447	0.013	3	0	1	1	2	.00	76.92	.00	153.85	230.77	.00	153.85	153.85	.00	Grand Traver
992309	Allen Dr	Secor Rd		3.513	0.067	9	0	1	1	6	.00	14.93	29.85	89.55	134.33	.00	44.78	44.78	.00	Grand Traver
998601	Timbers Trl	Harty Hill		6.959	0.144	7	0	1	1	6	.00	6.94	.00	41.67	48.61	.00	6.94	6.94	.00	Grand Traver
998601	Timbers Trl	Harty Hill		7.111	0.123	5	0	0	0	3	.00	.00	8.13	24.39	40.65	.00	.00	.00	.00	Grand Traver
998601	Timbers Trl	Harty Hill		7.266	0.074	3	0	0	0	3	.00	.00	.00	40.54	40.54	.00	.00	.00	.00	Grand Traver
Totals						Total	Fatal	Type A	Type K+A	PDO										
						130	1	5	6	96										

1.2 Intersection ranking by year

Using the Roadsoft safety analysis module, the top 5 percent of all intersections on the 11 corridors of significance were identified. The resulting intersection list was first generated for all 10 years of crash data from 2000 to 2009. To recognize that safety improvements have been made over the last 10 years, the same top 5 percent intersection ranking was performed for nine years of data (2001 to 2009), eight years of data (2002-2009), and so on through the three years of data from 2007 to 2009. By identifying and ranking the intersections year-by-year, changes in the intersections' relative ranking can be identified and correlated with safety improvements made during the course of the last decade.

This analysis method resulted in a list of 40 intersections (**Table 1**) that have been in the top 5 percent of all corridor intersections at some point in the last 10 years. These intersections are listed below in order of their average 10-year ranking in the top 5 percent. Intersections that should be considered for possible safety improvements are at the top of the list. Generalized crash analysis and recommended mitigation measures for the high crash locations which occur on the Corridors of Significance are included in the Task 3.6/4.2 report.

Table 1 2000-2009 Cumulative Yearly Intersection Ranking

Intersection	Average
Hammond & Garfield Rd	2
Garfield Rd & Potter	4
US-31 & Morgan Run Dr	4.25
S South Long Lake Rd / M-137 & US-31	8.375
S West Silver Lake Rd & US-31 (Grawn)	8.625
Hammond Rd & 3 Mile Rd	8.75
M-37 & Blair Townhall Rd	14.625
W 11th St & S Division St (US-31, M-37)	14.875
Park Dr & W South Airport Rd	15.75
E 8th St & Cass St	16.875
Woodmere Ave & E 8th St & Tart Trail	18
South Airport Rd & Garfield Rd	18.625
Silver Lake Rd & Franke Rd	18.875
E Potter Rd & 3 Mile Rd	19.25
N Division St (US-31, M-37) & Randolph St	21.625
S Division St (US-31, M-37) & 6th St	21.875
US-31S & S East Silver Lake Rd	25.5
US-31N & 4 Mile Rd	30.125
US-31S & Gonder Rd	31.125
W South Airport Rd & Division (US-31, M-37)	31.125
S Division St (US-31, M-37) & W 14th St (Silver Lake Road)	38.875
US-31S & Blair Valley Rd	43.75
Green Hill Ct & Silver Lake Rd*	47
E Front St (US-31, M-37, M-72) & Garfield Ave	47.75
Zimmerman Rd & Silver Lake Rd*	48.125
Manor Wood Dr & M-37	51.375
E 8th St & Munson Ave (US-31, M-37, M-72)	52.125
US-31S & Sawyer Rd / Curtis Rd	53.375
Black Bark Ln & S Garfield Rd	53.75
M-37 & Nimrod Rd	55.125
S Garfield Rd & E River Rd	56.625
Eastward Dr & W South Airport Rd	58.25
E Traverse Rd (M-72) & S Morgan Hill Rd	60.625
Hartman Rd & US-31, M-37	75.125
S Garfield Rd & Voice Rd	80.875
US-31, M-72 & 3 Mile Rd	93.75
M-37 & Vance Rd	123.875
US-31S & East Duck Lake Rd	128.75

* Green Hill Ct. and Zimmerman Rd intersect Silver Lake Rd within 100 feet of each other.

In addition to the average ranking, intersections were examined for upward (worsening) or downward (improving) trends in their relative Roadsoft safety rankings over the 10 year analysis period. Intersections exhibiting a movement of at least 20 ranking spots, either upward or downward are detailed below. A complete list of the year-by-year intersection rankings is included at the end of this section, in **Table 2**.

1.2.1 Intersections with worsening trends

The intersections noted in this section are trending toward more accidents, relative to all 431 of the intersections included in the corridor intersection safety analysis. These intersections should be monitored going forward to determine if their worsening trends continue. Short term increases in crashes at intersections can be caused by a number of non-correctable factors including: nearby construction detours, changing land use patterns and changing traffic control devices.

E. Traverse Rd. (M-72) & S. Morgan Hill Rd. – Increased ranking 216 spots over 10 years from 261st to 45th. This intersection's high ranking was 21st in the 2006 to 2009 data set. This increase may be due to the awkward angle of the intersection and the horizontal and vertical alignment of M-72 near the intersection.

US-31S & Blair Valley Rd. – Increased ranking 78 spots over 10 years from 121st in 2000 to 43rd in 2009. This intersection's high ranking was 20th in the 2006 to 2009 data set. The increase in this intersection's ranking may be attributable to ongoing development adjacent to US-31 in the Chum's Corners area.

Black Bark Lane & S Garfield Rd. – Increased ranking 57 spots over 10 years from 73rd to 16th. 2007 to 2009 represents this intersection's highest rank. This intersection may be increasing due to traffic volume increases. This intersection has some horizontal and vertical alignment issues on Garfield Rd. which may contribute to its crash history.

M-37 & Nimrod Rd. – Increased ranking 55 spots over 10 years from 72nd to 17th. This intersection's highest ranking was 15th in the 2006 to 2009 data set. The increase in this intersection's ranking may be attributable to ongoing development adjacent to US-31 in the Chum's Corners area.

S. Garfield Rd. & E. River Rd. – Increased ranking 51 spots from 70th to 19th. This intersection's highest ranking was 17th in the 2006 to 2009 data set. The increase in this intersection's ranking may be attributable to the increase in traffic on Garfield Rd., some of which coming from increase development in the Villages of Kingsley and Fife Lake.

US-31S & Sawyer Rd. / Curtis Rd. – Increased ranking 51 spots over 10 years from 66th to 15th. The increase in this intersection's ranking may be attributable to the increase in traffic on US-31S some of which coming from increased development in the Interlochen area.

Eastward Dr. & South Airport Rd. – Increased ranking 42 spots over 10 years from 55th to 13th. This intersection may be experiencing more traffic crashes as development pressure near the mall increases.

Potter Rd. & 3 Mile Rd. – Increased ranking 26 spots over 10 years from 33rd to 7th. The increase in this intersection's ranking may be attributable to the increase in traffic on 3 Mile Rd, some of which coming from increased development in the Villages of Kingsley and Fife Lake.

US-31S & S. East Silver Lake Rd. – Increased ranking 21 spots over 10 years from 35th to 14th. The increase in this intersection's ranking may be attributable to the increase in traffic on US-31S some of which coming from increased development in the Interlochen area.

Woodmere Ave. and E. 8th St. and Tart Trail – Increased ranking 28 spots over 10 years from 31st to 3rd. This increase may reflect changing travel patterns as a recent improvement projects have made the Woodmere Ave. corridor a more attractive north-south corridor.

1.2.2 Intersections with improving trends

These intersections have trended downward on the overall list of 431 intersections. Short-term decreases in crashes at intersections may be caused by a number of unintended factors including: construction detours, changing land use patterns and changing traffic control devices at other intersections in the vicinity.

M-37 & Vance Rd. – This intersection has moved down 367 spots over 10 years from 18th to 385th. A marked difference in this intersection occurred between 2005 and 2006 when its ranking changed from 23rd to 402nd. A flashing beacon was installed at this intersection during the timeframe analyzed; this may have contributed to the improving trend, as well as persons avoiding this intersection due to past crashes.

US-31S & East Duck Lake Rd. – This intersection has moved down 347 spots over 10 years from 36th to 383rd. A marked difference in this intersection occurred between 2005 and 2006 when its ranking changed from 50th to 400th. This odd angle intersection has seen a decrease in crashes potentially due to a decrease in traffic volume due to changes in travel patterns.

Hartman Rd. & US-31, M-37 – This intersection has moved down 307 spots over 10 years from 14th to 321st. A marked difference in this intersection occurred between 2006 and 2007 when its ranking changed from 47th to 321st. The intersection was improved with an additional lane on Hartman Rd. in 2006.

S. Garfield Rd. & Voice Rd. – This intersection has moved down 302 spots over 10 years from 38th to 340th. A marked difference in this intersection occurred between 2006 and 2007 when it changed from 58th to 340th. The decrease in crashes at this intersection may be due to land use changes in the vicinity of the intersection.

Zimmerman Rd. & Silver Lake Rd. – This intersection has moved down 273 spots over 10 years from 13th to 286th. A marked difference in this intersection occurred between 2006 and 2007 when it changed from 41st to 286th. The signal at this intersection has also recently been upgraded and modernized. The Green Hill Ct. / Silver Lake Rd. intersection is in close proximity to the Zimmerman Rd. / Silver Lake Rd. intersection and has moved down 272 spots over 10 years from 12th to 284th. A marked difference in this

intersection occurred between 2006 and 2007 when it changed from 40th to 284th. The close proximity of these intersections (less than 100 feet apart) could result in Roadsoft double-counting some accident data.

E. 8th St. & Munson Ave. (US-31, M-37, M-72) – This intersection has moved down 240 spots over 10 years from 10th to 250th. A marked difference in this intersection occurred between 2006 and 2007 when it dropped from 27th to 250th. This odd angle intersection has seen a decrease in crashes potentially due to changes in travel patterns and/or improvements to signal phasing/timing.

E. Front St. (US-31, M-37 M-72) & Garfield Ave. – This intersection has moved down 158 spots over 10 years from 26th to 184th. A marked difference in this intersection occurred between 2006 and 2007 when it dropped from 38th to 184th. The decrease in crash rate at this intersection may be attributable to changes in signal phasing/timing completed by MDOT.

S. Division (US-31, M-37) & 14th St. – This intersection has moved down 141 spots over 10 years from 1st to 142nd. A marked difference in this intersection occurred between 2005 and 2006 when it dropped from 6th to 154th. Even though the data shows this intersection is on an improving trend, proposed land use changes in the vicinity necessitate that this intersection be monitored often to keep abreast of any increase in crashes.

US-31, M-72 and 3 Mile Rd. – This intersection has improved 138 spots over 10 years from 9th to 147th. An improvement trend in this intersection began to occur between 2002 and 2003. The decrease in crash rate at this intersection may be attributable to changes in signal phasing/timing completed by MDOT.

US-31, M-72 and 4 Mile Rd. – This intersection has improved 33 spots over 10 years from 7th to 40th. A marked improvement in this intersection occurred between 2002 and 2003 when its ranking improved from 9th to 63rd. The decrease in crash rate at this intersection may be attributable to changes in signal phasing/timing completed by MDOT.

11th St. & S. Division (US-31, M-37) – This intersection has improved 25 spots over 10 years from 11th to 36th. A marked improvement occurred in this intersection between 2006 and 2007 when it improved from 10th to 36th. Even though this intersection is on an improving trend, proposed land use changes in the vicinity necessitate that this intersection be monitored often to keep abreast of any increase in crashes.

Hammond Rd. & Garfield Rd. – This intersection was improved with signal modernization and upgrades in 2007. These upgrades have likely contributed to the intersections improvement from rank one to rank six for the 2007-2009 analysis period.

Silver Lake Rd. & Franke Rd. – This intersection was improved with the addition of a traffic signal in 2008. This improvement has likely contributed to the intersections improved performance in the two most recent analysis periods from 2006-2009 and 2007-2009.

Table 2 – Intersection ranking detail – numbers indicate intersection rank for each analysis period

Intersection	2000-2009	2001-2009	2002-2009	2003-2009	2004-2009	2005-2009	2006-2009	2007-2009
M-37 & Vance Rd	18	18	28	51	66	23	402	385
US-31S & East Duck Lake Rd	36	20	27	50	64	50	400	383
Hartman Rd & US-31, M-37	14	29	24	22	80	64	47	321
S Garfield Rd & Voice Rd	38	22	29	32	71	57	58	340
Zimmerman Rd & Silver Lake Rd	13	10	11	10	9	5	41	286
Green Hill Ct & Silver Lake Rd	12	9	10	9	8	4	40	284
E 8th St & Munson Ave (US-31, M-37)	10	11	14	14	19	72	27	250
E Front St (US-31, M-37, M-72 & Garfield Ave	26	32	18	16	20	48	38	184
S Division St (US-31, M-37) & W 14th St (Silver Lake Road)	1	1	1	3	3	6	154	142
US-31, M-72 & 3 Mile Rd	9	15	13	91	232	84	159	147
US-31, M-72 & 4 Mile Rd	7	13	9	63	48	33	28	40
W 11th St & S Division St (US-31,M-37)	11	12	15	12	5	18	10	36
Park Dr & W South Airport Rd	6	27	21	20	12	8	7	25
M-37 & Blair Townhall Rd	4	4	3	5	7	56	18	20
N Division St (US-31, M-37) & Randolph St	20	16	17	15	21	15	36	33
S Division St (US-31, M-37) & 6th St	21	17	19	17	22	16	32	31
S South Long Lake Rd / M-137 & US-31S	3	3	4	7	15	14	11	10
Silver Lake Rd & Franke Rd	19	14	13	11	18	7	43	26
Hammond Rd & Garfield Rd	2	2	2	1	1	1	1	6
Garfield Rd & Potter Rd	5	5	5	2	2	2	3	8
South Airport Rd & Garfield Rd	28	27	22	19	11	9	6	27
US-31S & Gonder Rd	17	19	26	49	64	49	14	11
US-31 & Morgan Run Dr	8	6	6	4	4	3	2	1
S West Silver Lake Rd & US-31S (Grawn)	16	8	8	6	6	12	4	9
Hammond Rd & 3 Mile Rd	15	7	7	8	13	10	5	5
W South Airport Rd & (US-31, M-37) (Division)	31	28	23	21	10	63	52	21
Manor Wood Dr & M-37	35	107	60	53	68	54	16	18
E 8th St & Cass St	23	34	16	13	17	19	9	4
Woodmere Ave & E 8th St & Tart Trail	31	35	26	21	23	18	10	3
US-31S & S East Silver Lake Rd	35	23	31	24	16	11	50	14
E Potter Rd & 3 Mile Rd	33	21	30	23	14	13	13	7
Eastward Dr & W South Airport Rd	55	82	65	57	82	66	46	13
US-31S & Sawyer Rd / Curtis Rd	66	95	50	40	59	51	51	15
S Garfield Rd & E River Rd	70	108	61	54	69	55	17	19
M-37 & Nimrod Rd	72	106	59	52	67	53	15	17
Black Bark Ln & S Garfield Rd	73	109	53	43	65	52	19	16
US-31S & Blair Valley Rd	121	50	39	27	29	21	20	43
M-72 & S Morgan Hill Rd	261	36	38	31	31	22	21	45

2.0 Intersection diagrams

For each corridor, an intersection crash diagram was generated at the Key Intersections. Key Intersections have been defined by the TC-TALUS technical committee, a list can be found in the Task 3.6/4.2 report. At each Key Intersection, the radius of crashes searched is dependent on the intersection volume and geometry. Intersection searches were started with the search radius set to 0.03 miles and the number of crashes was noted. The search radius for each intersection was then increased in 0.02-mile increments until the total crashes found increased by 10 crashes or less (one crash per year, on average). The maximum search radius used is 0.19 miles, or approximately 1,000 feet from the center of the intersection. The crash diagrams developed for this section have been provided to TALUS, but are not included with this report.

The top key intersections in terms of total crashes are:

1. S. Airport Rd. and US-31	871
2. S. Airport Rd. and Garfield Rd.	584
3. E. Front (US-31, M-37, M-72) and Garfield Rd.	457
4. S. Airport Rd. and Barlow St.	452
5. S. Airport Rd. and Cass Rd.	444

Note that this intersection ranking differs from the intersections listed in **Tables 1 and 2**. The above list is based on total accidents over the 10-year analysis period. The list in **Table 2** is based on the intersection ranking based on total "K"- and "A"-type accidents. It was determined that listing the top five intersections in terms of total crashes best met the Grand Vision's Scope of Services.

This detailed crash information will be utilized for recommendation of mitigation measures in the *Transportation Gap Analysis and Refined Intersection Analysis Report (Task 3.6/Task 4.2)*.