

6. Safety Projects

One of the key objectives of Olmsted County's safety planning effort involved identifying low cost safety related projects that are focused on the County's documented safety emphasis areas. These safety emphasis areas contain the greatest number of severe crashes occurring along the County's system of highways and deploying mitigations for the factors contributing to these crashes represent the best opportunity to move Olmsted County Towards Zero Deaths. The need for low cost projects that can be widely deployed across the County's system of highways is based on the fact that Olmsted County averages 45 severe crashes (Fatal + A Injury) per year and these are spread across more than 300 miles of County highways and hundreds of intersections. As a result, the density of these severe crashes is very low and Minnesota's Strategic Highway Safety Plan has demonstrated that the most effective programmatic approach involves a wide application of relatively low cost safety projects.

The effort to develop low cost safety projects is based on the application of high priority strategies at the most at-risk locations that were identified as part of the detailed analysis of the County's system of highways. The high priority safety strategies were identified in Chapter 4, and basically consist of the following types of improvements:

- Improvements to the edges of rural highways and enhanced delineation of horizontal curves in rural areas.
- Upgrading the signs and pavement markings, installing street lights and providing dynamic warning signs at rural STOP controlled intersections.
- Adding technology at signalized intersections to support increased enforcement levels for red light running.
- Adding channelization and median islands to restrict/control turning maneuvers at urban STOP controlled intersections.

The at-risk locations were documented in Chapter 5, and include rural County highway segments, STOP controlled intersections in both rural and urban areas and signalized intersections. The low cost safety projects that are suggested for implementation are described in the following sections. It should be noted that the list of potential projects is greater than what can reasonably be undertaken in a single year based on funding limitations and that the actual schedule for implementation of individual projects will be a function of securing funding from the State's Highway Safety Improvement Program (HSIP). It should also be noted that the safety planning process that Olmsted County followed is consistent with the Minnesota's Strategic Highway Safety Plan and that the high priority safety strategies are among those recommended for local systems in the State's Strategic Plan. Both of these items put Olmsted County in a position to be successful at securing HSIP funding.

6.1 Infrastructure Based

6.1.1 Rural Highway Segments

The high priority strategies identified using edge line rumble stripEs and 6 inch wide edge lines (**Figure 6.1**) to better delineate the road edges and increased use of Chevron warning signs to define horizontal curves in order to help keep drivers on the roads. Three projects involving the deployment of these strategies are suggested.



Figure 6.1 Rumble StripEs and 6 Inch Wide Edge Line

The 324 miles of rural County Highway were divided into 52 distinct segments and these segments were then ranked based on a combination of crash and traffic volume characteristics. The first low cost safety project consists of adding edge line rumble stripEs to the thirty-eight highest priority segments (approximately 164 miles) described in **Figure 6.2**. This group of highway segments was designated as the highest priority for edge treatments because they fall in a range of daily traffic volumes (500 to 2,000 vehicles per day) that has the highest fraction and rate of road departure crashes. The estimated cost of deploying edge line rumble stripE's is \$2,400/mile and the estimated cost of the project is almost \$400,000.

Route	From	To	ADT	Length	RoR		Crashes	
					Crashes	K	A	Total
CSAH 36	US 52	CR 143	1050	3.4	12	2	1	25
CSAH 3	CSAH 6	CSAH 4	884	17.5	10	1	4	21
CSAH 3	CSAH 14	CSAH 13	1072	8.2	10		3	15
CSAH 14	Dodge County	CSAH 3 (west)	600	5.3	6		1	8
CSAH 13	Dodge County	Goodhue County	760	1.7	6		2	7
CR 112	CSAH 14	US 52	1070	4.4	6		1	17
CR 104	CR 117	CSAH 4	1100	6.6	6			8
CSAH 10	US 14	Wabasha County	1070	10.2	5		1	12
CSAH 15	TH 30	CSAH 25	552	6.6	4			6
CSAH 5	CSAH 25	US 14	680	5	4			8
CSAH 24	CSAH 2	Wabasha County	820	4.7	4			5
CSAH 6	CSAH 3	US 63	875	7.6	4			8
CSAH 10	Chatfield city limit	I-90	569	8.2	3		1	3
CR 142	CSAH 7	Sheek Street N	770	5	3	1		3
CR 117	CSAH 15	CSAH 8	980	3.4	3		1	4
CSAH 8	CSAH 6	CSAH 35	1150	1.8	3	1	1	4
CSAH 5	Dodge County CSAH 22	CSAH 3	1450	5	3			5
CR 133	55th Street NW	CSAH 14	1600	2.4	3			7
CR 114	CSAH 12	Wabasha County	600	2.1	2			4
CSAH 11	CSAH 2	TH 247	668	7.5	2	1	1	8
CSAH 3	CSAH 4	CSAH 14	800	0.25	2			2
CSAH 12	CSAH 3	US 52	810	3.5	2			3
CR 111	CSAH 1	US 52	820	2.6	2		1	3
CSAH 20	TH 30	CSAH 16	500	4.6	1	1		4
CSAH 7	US 52	I-90	790	2.3	1			4
CSAH 16	CSAH 8	CSAH 20	793	3.8	1		1	5
CSAH 16	CSAH 20	CSAH 1	800	1.4	1			1
CSAH 9	CSAH 10	Winona County	820	3	1			6
CSAH 14	US 63	CSAH 11	850	3.2	1		1	2
CSAH 20	CSAH 16 (west)	US 63	940	4.4	1			2
CR 143	CSAH 36	CSAH 11	1104	2.4	1			3
CSAH 14	CSAH 3	US 52	1450	2.9	1		1	11
CSAH 8	Mower County	CSAH 6	1500	0.5	1			2
CSAH 25	CSAH 3	CSAH 22	1720	5.5	1	1	1	10
CSAH 27	CSAH 12	Wabasha County	900	1.7	0			2
CSAH 19	CSAH 23	US 14	940	1.9	0		1	1
CSAH 10	I-90	US 14	1200	1.7	0			0
CSAH 18	CSAH 12	Wabasha County	1200	1.9	0			0
<i>Total</i>				164.2	116	8	23	239
<i>Countywide Rural Corridor Total</i>				323.5	275	15	40	539

Figure 6.2 Rumble StripEs and 6 Inch Wide Edge Line Projects

A second safety project involves adding a 6" wide edge line to an additional fourteen segments (approximately 84 miles) as described in **Figure 6.3**. These segments were designated as a second priority for edge treatments based on having the next highest fraction and rate of road departure crashes. The estimated cost of installing a 6" edge line is \$300/mile and the estimated cost of the project is \$25,000.

Route	From	To	ADT	Length	Crashes			
					RoR Crashes	K	A	Total
CSAH 1	Fillmore County	US 52	3395	10.3	16		1	25
CSAH 8	CSAH 35	Meadow Crossing Road	2190	8.7	14	1	2	21
CSAH 4	CSAH 5	CSAH 22	2695	6.8	13	1		28
CR 147	48th Street SW	CR 125	2210	3.3	11			16
CSAH 2	36th Avenue NE	TH 42	2557	8.5	11		3	17
CSAH 9	CSAH 22	CSAH 10	2146	13.9	9			19
CSAH 11	CSAH 36	CSAH 2	2195	6.6	9	1	1	16
CSAH 21	US 63	Wabasha County	2600	5	8		1	10
CSAH 34	CSAH 3	CSAH 22	2100	4.6	7			17
CSAH 12	US 52	US 63	2330	6.6	7		3	13
CSAH 5	Bryon city limits	Dodge County CSAH 17	2125	4	4	1		9
CR 154	US 52	CR 112	2800	1.6	3		1	10
CSAH 35	CSAH 8	US 63	3150	2	3	1		6
CSAH 34	US 14	CSAH 3	2100	1.7	1			2
<i>Total</i>				83.6	116	5	12	209
<i>Countywide Rural Corridor Total</i>				323.5	275	15	40	539

Figure 6.3 6 Inch Wide Edge Line Projects

A third safety project addressing road departure crashes involves adding Chevron warning signs (**Figure 6.4**) at the group of twenty-two high risk horizontal curves identified in **Figure 6.5**. The estimated cost of adding chevrons is \$1,000/curve and the estimated cost of the project is \$22,000.



Figure 6.4 Typical Chevron on Curves

Corridor	Segment	Description	Curve
7	CSAH 3	Mower Co - CSAH 6	1
9	CSAH 4	CSAH 5 - CSAH 22	6
11	CSAH 8	CSAH 6 - CSAH 35	3
18	CSAH 11	CSAH 36 - CSAH 2	2
20	CSAH 2	36th Ave NE - TH 42	4
21	CR 133	55th St NW - CSAH 14	6
22	CSAH 3	CSAH 14 - CSAH 13	9
24	CSAH 12	US 52 - US 63	2
26	CSAH 5	Byron City Limits - Dodge Co (CSAH 17)	5 6
41	CSAH 34	US 14 - CSAH 3	3
42	CSAH 3	CSAH 6 - CSAH 4	5 6
44	CSAH 6	CSAH 3 - US 63	1 2
52	CSAH 10	Chatfield City Limits - I-90	4
63	CSAH 25	CSAH 3 - CSAH 22	1 3
64	CSAH 23	CSAH 19 - TH 42	4 5
65	CR 143	CSAH 11 - CSAH 19	3
71	CSAH 16	CSAH 1 - US 52	3
75	CSAH 18	CSAH 12 - Wabasha Co	4

Figure 6.5 High Priority Curves

6.1.2 Urban STOP Controlled Intersections

The detailed crash analysis found that 82% of the severe crashes at urban STOP controlled intersections were in Rochester, that 63% of these involved right angle collisions and that the only highway with multiple intersections with severe crashes was CSAH 22 (Circle Drive). This information combined with the high priority safety strategy that involves restricting crossing/turning maneuvers by providing channelization or closing median openings points to a safety project at the STOP controlled intersections along CSAH 22. The suggested safety project would involve either building median islands or channelizing islands on the minor leg approaches at selected intersections along CSAH 22 (**Figure 6.6**) that would prevent the most hazardous movements at the intersections – the minor road crossing maneuvers. The estimated cost of these intersection modifications is \$75,000/intersection and the estimated cost for addressing the five intersections (**Figure 6.7**) identified as black spots (those with 5 or more crashes during the study period) is \$450,000.



Figure 6.6 Examples of Median Restrictions
Source: Google Maps

	Intersection	Ring
CSAH 22 and	6th Ave	NE
CSAH 22 and	Century Valley Road NE	NE
CSAH 22 and	1st Street NW	NW
CSAH 22 and	26th Street/Technology Drive	NW
CSAH 22 and	9th Street	NW

Figure 6.7 Intersections for Minor Leg Channelization

6.1.3 Rural STOP Controlled Intersections

The detailed crash analysis of rural STOP controlled intersections found that the most common crash type at the twenty-five high priority intersections was a right angle collision (57%) and that almost 65% of the severe crashes occurred during dark conditions. Combining this data with the high priority strategies results in three safety projects at rural STOP controlled intersections.

The six top ranked intersections (**Figure 6.8**) on the high priority list have the highest crash rates (five above the critical crash rate), account for 67% of total crashes and 75% of the severe crashes occurring at the twenty-five high priority intersections. The suggested project at these six intersections involves installing a mainline dynamic warning sign (**Figure 6.9**), street lighting (**Figure 6.10**) and upgraded signs and pavement markings (**Figure 6.11**). The estimated cost of adding these safety features is \$45,000/intersection and the estimated cost of the project is \$270,000.

Number	Intersection	Actual Crash Rate	Critical Crash Rate
1	CSAH 23 & CSAH 19 (East)	2.52	2.20
2	CSAH 3 & CSAH 34	1.57	0.92
3	CSAH 3 & CSAH 12	1.22	1.27
4	US 63 & CSAH 14	1.11	0.67
5	US 63 & CSAH 12/TH 247	1.02	0.73
6	TH 42 & CSAH 9	0.85	0.82

Figure 6.8 Top Six High Priority Rural STOP Controlled Intersections



Figure 6.9 Mainline Dynamic Warning Sign



Figure 6.10 Street Lighting

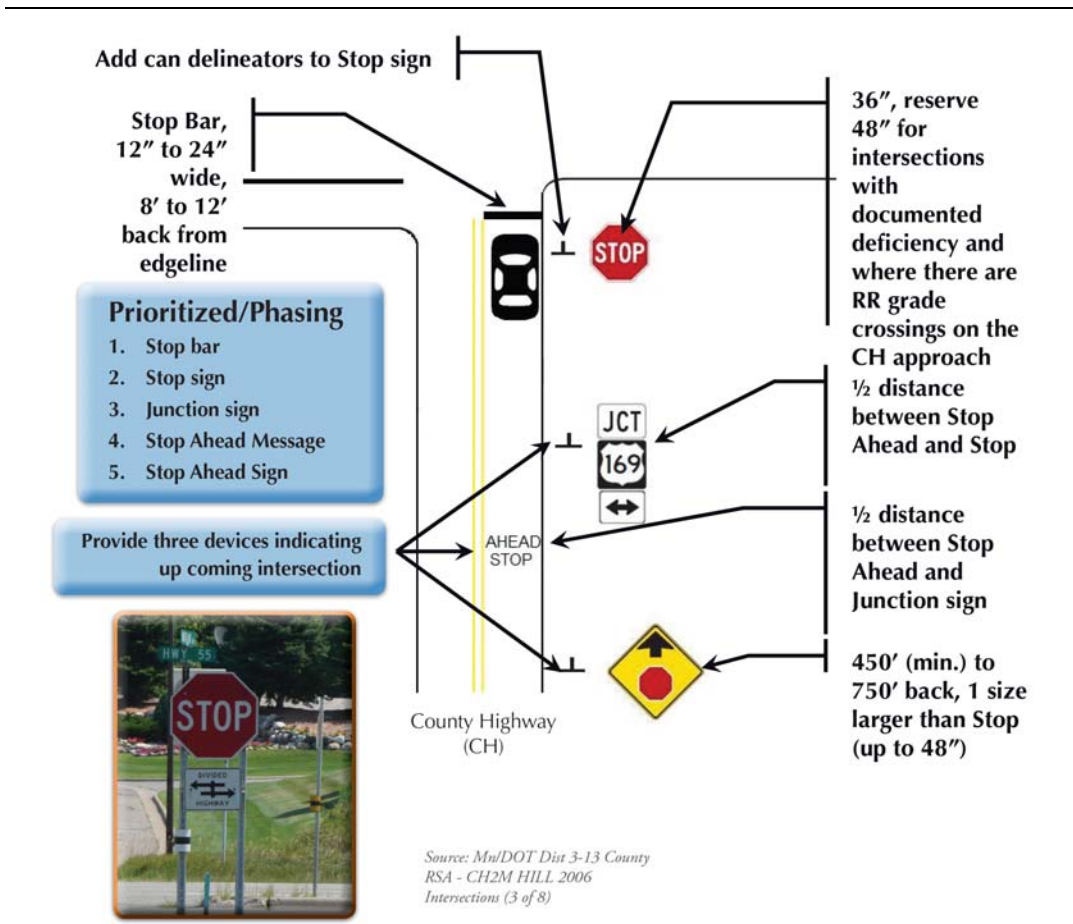


Figure 6.11 Upgraded Signs and Markings

The second project involves addressing the next six intersections on the list of high priority intersections (**Figure 6.12**). These intersections have crash rates above the countywide average and account for over 20% of total crashes occurring at the high priority intersections. The suggested project involves installing street lights and upgraded signs and pavement markings at an estimated cost of \$15,000/intersection and an estimated project cost of \$90,000.

Number	Intersection	Actual Crash Rate	Critical Crash Rate
7	CSAH 3 & CSAH 5	0.70	1.02
8	TH 30 & CSAH 1	0.56	0.94
9	TH 30 & CSAH 8	0.54	0.85
10	CSAH 11 & CSAH 14	0.50	1.38
11	CSAH 20 & CSAH 16	0.49	1.37
12	CSAH 11 & CSAH 9	0.47	0.81

Figure 6.12 High Priority Intersections 7 thru 12

The third project involves upgrading the signs and pavement markings at the remaining 13 locations (**Figure 6.13**) on the list of high priority intersections. The estimated cost of

upgrading the signs and pavement markings is \$7,000/intersection and the estimated project cost is \$91,000.

Number	Intersection	Actual Crash Rate	Critical Crash Rate
13	CSAH 16 & CSAH 20	0.40	1.26
14	CSAH 14 & CSAH 3 (west)	0.38	1.24
15	CSAH 6 & CSAH 8 (west)	0.37	1.22
16	CSAH 14 & CR 112	0.19	0.69
17	CSAH 34 & CR 104	0.19	0.94
18	CSAH 5 & CSAH 4	0.18	0.93
19	CSAH 4 & CSAH 3 (west)	0.18	0.93
20	CSAH 36 & CSAH 11	0.09	0.75
21	US 14 & CSAH 11	0.05	0.65
22	CSAH 8 & CSAH 35	0.00	0.97
23	CSAH 6 & CSAH 8 (east)	0.00	1.08
24	CSAH 25 & CSAH 5	0.00	1.47
25	CSAH 3 & CSAH 17	0.00	1.43

Figure 6.13 High Priority Intersections 13 thru 25

6.1.4 Urban Signalized Intersections

The detailed crash analysis of the signalized intersections documented that the most common type of crash is a right angle collision (41%). In order to have two vehicles in the intersection at the same time, it is clear that (at least) one of the vehicles had made an error and was in the intersection when the light was red. A review of the design guides for traffic signals suggests that implementation of a number of mitigation strategies to improve driver's compliance with signal change intervals, which includes, the use of overhead indications, 12-inch lenses and background shields. A review of the signalized intersections in Olmsted County found that the County, Mn/DOT and the City of Rochester all routinely provide these features. This suggests that signal design features are likely not a factor contributing to the red light running that is associated with the right angle collisions and points towards an enhanced enforcement effort. Conversations with law enforcement officials in Rochester found a recognition that red light running was an important issue, but they were not able to assign enough officers to this detail due to staff limitations and the fact that it requires a minimum of two officers to safely carry out the operation (one on the approach to witness the violation and a second on the far side to chase the violator).

In order to enhance the enforcement of red light running, a new technology has been developed involving the addition of a confirmation light (**Figure 6.14**) on the back of the signal mast arms. This light is wired into the red light circuit of the signal so that one officer on the far side of the intersection can observe the confirmation light (which comes on when the red light is illuminated) and be in a safe position to chase violators. The use of the red light confirmation light was one of the highest ranked safety strategies at the County's Safety Workshop.

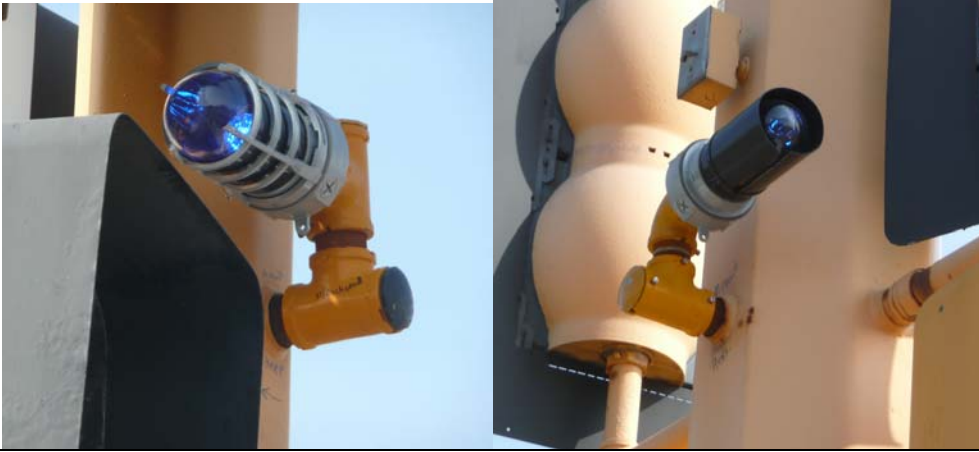


Figure 6.14 Confirmation Lights in Dakota County

The suggested safety project involves installing the confirmation light at twenty-eight signalized intersections (**Figure 6.15**) along the three corridors with the greatest concentration of both total crashes and angle crashes – CSAH 22 East, CSAH 22 West and TH 14 (the South Beltway). The estimated cost of adding the confirmation lights is \$1,000/approach and the estimated cost of the project is \$100,000.

6.2 Driver Behavior Based

In order to address the driver behavior related factors that contribute to severe crashes, the Olmsted County Public Works Department will continue to provide professional staff to participate with their safety partners in a variety of activities, including:

- Countywide Fatal Crash Review Committee
- Southeast Minnesota TZD
- Safe Community coalitions
- Coordination with the county health department in efforts to educate drivers about seat belt usage, impaired driving and speeding
- Coordination with the county sheriff's department and other law enforcement officials regarding snow and ice issues and enhanced efforts to reduce red light running.

6.3 Support Bicycle Safety

In support of addressing bicyclist safety concerns, Olmsted County Public Works Department will increase the level of coordination with ROCOG relative to their Long Range Thoroughfare Plan regarding future bike routes. When county highway projects are being developed on segments that are designated bike routes, consideration will be given to providing full width paved shoulders or an off-road trail, based on the availability of funding and where right-of-way widths are sufficient.

In addition, in order to strike a balance between motorist and bicyclist safety, Olmsted County has chosen to employ a bicycle friendly rumble strip design for use along rural highways. The bicycle friendly design has been adopted by a number of state departments

of transportation (including Minnesota). The design consists of providing a twelve-foot gap in the grooved pattern every sixty feet in order to provide bicyclists an opportunity to move between the traveled land and the shoulder without having to traverse the grooves.

US 14 from US 52 to CSAH 11

- US 14 and Memorial Pkwy SW (+)
- US 14 and 12th St SW (T)
- US 14 and TH 63 (+)
- *US 14 and CR 146 (3rd Ave SE) (+)*
- US 14 and 8th Ave SE (+)
- *US 14 and CSAH 1 (11th Ave SE) (+)*
- *US 14 and CSAH 36 (15th Ave SE) (+)*
- *US 14 and CSAH 22 (T)*
- US 14 and CSAH 11 (+)

CSAH 22 (West) from US 52 to US 52/14

- *CSAH 22 and West Frontage Rd (+)*
- *CSAH 22 and Chateau Rd NW (+)*
- *CSAH 22 and 55th St NW (+)*
- *CSAH 22 and 41st St. NW (T)*
- *CSAH 22 and CSAH 4 (Valley High Dr NW) (+)*
- *CSAH 22 and 19th St NW (+)*
- *CSAH 22 and 7th St NW (North) (+)*
- *CSAH 22 and 7th St NW (South) (+)*
- *CSAH 22 and CSAH 34 (Country Club Rd SW) (+)*
- *CSAH 22 and CSAH 8 (Bamber Valley Rd SW) (T)*
- *CSAH 22 and CSAH 25 (16th St SW) (T)*
- *CSAH 22 and Fox Valley Dr SW (+)*

CSAH 22 (East) from US 14 to US 52

- *CSAH 22 and CSAH 9 (Collegeview Rd E) (+)*
- *CSAH 22 and CSAH 2 (Viola Rd NE) (+)*
- *CSAH 22 and TH 63 (+)*
- *CSAH 22 and East River Rd NE (+)*
- *CSAH 22 and West River Pkwy NW (+)*
- *CSAH 22 and 18th Ave NW (+)*
- *CSAH 22 and 22nd Ave NW (+)*

Figure 6.15 Signalized Intersections in Rochester

6.4 Safety Project Summary

6.4.1 Infrastructure Based Projects

Applying the high priority safety strategies at the most at-risk locations along Olmsted County's system of highways results in the identification of eight types of safety projects with an implementation cost approaching \$1.5 million. These projects include:

• Edge line rumble stripE's	164 Miles	\$400,000
• Enhanced (6") edge lines	84 Miles	\$ 25,000
• Enhanced curve delineation	22 Curves	\$ 22,000
• Median/channelization	6 Intersections	\$450,000
• Signs, St. Lights & Dynamic Warning	6 Intersections	\$270,000
• Signs & Street Lights	6 Intersections	\$ 90,000
• Signs	13 Intersections	\$ 91,000
• Enhanced Red Light Enforcement	28 Intersections	\$100,000
Total		\$1,447,000

6.4.2 Driver Behavior Based Activities

- Continued participation safety partners in Fatal Crash Review Committee, Southwest MNTZD and Safe Community coalitions.
- Continued coordination with the county public health and sheriff's department in efforts to educate drivers and enhance enforcement efforts.

6.4.3 Support Bicyclist Safety

- Increased level of coordination with ROCOG relative to incorporating paved shoulders or off-road trails in reconstruction projects along designated bike routes.