HIGHWAY SAFETY IMPROVEMENT PROGRAM (HSIP)

Greater Minnesota Solicitation for Local Projects for 2017, 2018, 2019, and 2020

August 2015

HSIP

GUIDEBOOK & APPLICATION FORM

Table of Contents

Introduction.....5

Timeline for Greater MN Local Solicitation 6

Requirements 7

Eligibility 9

Criteria for Systemic Project Funding 9

Criteria for Reactive Project Funding.....10

Submittal Instructions 11

Contacts.....11

Appendix A: Sample HSIP Worksheet.....13

Appendix B: A Planners Guide to Sustained Crash Location Selection and Critical Crash Rates 15

Appendix C: Recommended Service Life 27

Appendix D: Delegated Contract Process.....29

Appendix E: HSIP and Signals.....31

Appendix F: Narrow Shoulder Paving Guidelines 33

INTRODUCTION

The Office of Traffic, Safety and Technology (OTST) in partnership with State Aid for Solicitation (SALT) is soliciting for a minimum of $25 million over four years of local projects for the Highway Safety Improvement Program (HSIP).

AVAILABLE	2017	2018	2019	2020	
ATP 1	$ 60,590	$ 616,340	$ 1,289,540	$ 1,289,539.69	
ATP 2			$ 833,497	$ 833,497.00	
ATP 3	$ 569,197	$ 1,363,819	$ 2,287,256	$ 2,566,256.27	
ATP 4			$ 34,039	$ 1,103,706.85	
ATP 6	$ 990,975	$ 2,137,725	$ 1,278,405	$ 2,137,725.15	
ATP 7	$ 45,510	$ 1,164,240	$ 1,251,240	$ 1,359,240.32	
ATP 8	$ 15,195	$ 516,232	$ 702,255	$ 1,099,323.76	
Subtotal	**$ 1,681,468**	**$ 5,798,356**	**$ 7,676,233**	**$ 10,389,289**	**$ 25,545,345**

OTST strongly encourages submitting more projects than the minimum targets listed above as more dollars may become available for quality projects. If 2017 and 2018 funds are left unallocated after this solicitation, then those funds will go to a project outside of this solicitation that can be delivered in the necessary timeframe.

TIMELINE

July-August

- Solicitation will be sent out to all eligible agencies

August-October

- Each eligible agency selects projects and compiles a application packet based on the criteria guidelines.

November 1

- Application packets should be submitted to MnDOT's office of Traffic, Safety and Technology no later than November 1, 2015.

November-January

- MnDOT Office of Traffic, Safety and Technology will review each application packet for compliance with HSIP criteria guidelines.
- A preliminary list of prioritized projects is developed.

January

- HSIP selection committee reviews and approves list of prioritized projects.

February

- Notification is sent to applicants announcing selected projects.

March-April

- Selected projects are placed in the STIP.

REQUIREMENTS

The Highway Safety Improvement Plan (HSIP) selection committee will evaluate each application, prioritize and determine the best funding source for each. **Independent of the source from which funding will be secured; certain requirements must be met to receive funding.**

1. Applications must be received on or before **November 1, 2015**.

2. **The County Road Safety Plan should be the starting point for selecting projects for this solicitation.**

3. Projects must focus on fatal and serious injury crashes. Plans can be a resource to help identify locations or methodology. Additional information on how to analyze locations is available in Appendix A and B.

   NOTE: For projects not listed in a road safety plan agencies should consult Julie Whitcher (651-234-7019).

4. Only stand-alone projects will be considered. It is recognized that portions of larger projects have elements that improve the safety of an intersection or section of roadway. Safety features, such as guardrail, that are routinely provided as part of a broader project should be funded from the same source as the broader project. Proposals should be limited to those that can be considered legitimate stand-alone safety projects. In some instances, narrow shoulder paving in conjunction with resurfacing projects may be allowed. See Appendix F for these exceptions.

5. Applicants submitting systemic lane departure or intersection projects identified in a County Road Safety Plan, need only fill out page 1 of the application and attach the appropriate pages from that **plan.** Reactive projects and projects not identified in the County Road Safety Plan need to attach additional documentation as indicated on the application. Page 4 of the application applies only to Reactive/Spot location projects.

6. Applicants are strongly encouraged to coordinate with other jurisdictions and agencies affected by the project. A letter from each of these agencies is required stating that they are aware of the project and have no objections. These letters do not imply participation in funding. Any projects proposed on or adjacent to state roads should be discussed with the MnDOT District Traffic Engineer before the project is submitted.

7. Projects must indicate the roadway and specify both a beginning and an ending reference point. This is to expedite the environmental review and historical site evaluation process.

8. Applicants must agree to maintain any selected projects for the life of the project. (See Appendix C for FHWA Recommended Service Life Criteria.)

9. Projects **NOT** eligible for funding:

   - overlays
   - guardrail updates
   - sign upgrades
   - "Force account" work -all projects must be done by a qualified contractor through the design-bid-build process
   - Maintenance

10. Edgeline restriping projects will be considered for 6" edgelines only. These projects will be selected based on risk as identified in the County Road Safety Plans.

11. New or reconstructed signals will be considered if they meet the criteria contained in Appendix E.

12. Maximum Federal Funding is 90% of eligible total project costs up to:
    - $350,000 for individual systemic projects.
    - $1,000,000 or as much as available by ATP for reactive projects.
    - Agencies are **encouraged** to submit multiple applications in the event that additional funding is available.

    NOTE: There is a minimum 10% local match required. The match must be made in non-federal "hard dollars". Soft matches (i.e. volunteer labor, donated materials, professional services) will not be included in the match.

13. Funds are not "capped." Additional funds may be approved based on bid prices or other unforeseen circumstances. The selection committee must approve any increases in funding.

14. Funding for the project will be eliminated from the program if it does not meet the deadlines described in Appendix D. **The deadline is April 15 of the year that it is programmed.**

15. **Before and after summaries and data collection forms must be completed prior to final payment.** (examples for both are available on State Aid for Local Transportation's (SALT) traffic safety page)
    http://www.dot.state.mn.us/stateaid/sa_traffic_safety.html

ELIGIBILITY

The Federal funds listed in the table on the first page of this solicitation are available to Tribal Governments, Greater Minnesota counties, and agencies within those counties with the ability to receive State Aid. Non-State Aid agencies must be sponsored by their county.

CRITERIA FOR SYSTEMIC PROJECT FUNDING

A **minimum** of 70% of the HSIP dollars that are awarded to each ATP will be systemic. The criteria that will be used to select these projects are detailed in this section of the document.

Proposed projects qualify for the **Systemic** Program by the following criteria:

- Agency agrees to maintain for the life of the project – see Appendix C
- Letter from other agencies involved in the project
    - E.g. Otter Tail County submits an application for County-wide lighting improvements at CSAH/TH intersections. They need to include a letter from MnDOT District 4, stating that the District is aware of the project and has no objections.

PRIORITIZATION

Projects will be prioritized using the following criteria:

- Part of a longer range plan (Road Safety Plan or Road Safety Audit Recommendations) – include an excerpt from the existing plan
    - **Higher priority projects from the Road Safety Plan will receive more points during the selection process than lower priority projects.**

- Cost/mile or Cost/intersection

CRITERIA FOR REACTIVE PROJECT FUNDING

A **maximum** of 30% of the projects awarded to each ATP will be reactive. Reactive projects must have a B/C greater than 1 to be considered for funding. The criteria that will be used to select these projects are detailed in this section of the document.

Proposed projects qualify for the **Reactive** Program by the following criteria:

- Locations must have a significant crash history that includes a fatal or serious injury crashes. Significant crash history can be determined in a number of ways, it is suggested that critical crash rates be used to assess significance. Details on calculating critical rates can be found in APPENDIX B. Contact OTST regarding the average crash rate by intersection type (see also Traffic Safety Fundamentals Handbook page B-8). Contact OTST if you are going to consider using another metric to address/quantify significant crash history

http://www.dot.state.mn.us/trafficeng/publ/fundamentals/MnDOT_Safety_Handbook_FINAL.pdf

- Must have a benefit/cost (B/C) ratio of 1.0 or greater.* (Note: The B/C ratio shall exclude right-of-way costs.)

  ***Only crashes contained within the Minnesota Department of Transportation database can be used to determine the B/C for project submittals. If it is found that crashes have been omitted from MnDOT's database, you will need to provide the crash report to have those crashes entered into the system.**

- Agency agrees to maintain for the life of the project – see Appendix C.

REQUIRED MATERIAL & SPECIAL INSTRUCTIONS FOR REACTIVE PROJECTS

Following, is a list of material required to submit a project. Failure to provide this information will exclude the submission from consideration:

- Project plan or preliminary layout/scope of work proposed
- Calculations demonstrating a significant crash history (see Appendix B)
- HSIP Worksheet – A sample worksheet is included in Appendix A. An Excel version of the HSIP Worksheet is available at: http://www.dot.state.mn.us/trafficeng/safety/index.html
- Crash data; include all crashes from the three most recent, complete calendar years (2012-2014). Only crashes contained within the Minnesota Department of Transportation's database can be shown. This is to insure that all project proposals can be equally compared. All crash data must be obtained from MnCMAT.

Each submission should also include the following:

- Cover Letter – include submitting agency, project manager, description of project, Federal funds requested, local match and source.
- Location map.
- Letter from other entities involved in the project stating their awareness of the project and that they have no objections.

SUBMITTAL INSTRUCTIONS

Applications should be submitted **electronically** to the OTST office. Applications must be received in the office no later than the specified deadline.

Applications for **all ATP's** are due in the OTST office on or before **November 1, 2015.**

An electronic version of this application can be found at:
http://www.dot.state.mn.us/trafficeng/safety/hsip.html

Electronic submittals must be in a pdf formatted document and be formatted to print no larger than 11x17. Each completed application and its supporting documents should be in **ONE** pdf file.

IE: If you are submitting three applications, you will have 3 pdf files.

Email electronic submittals to: Julie.Whitcher@state.mn.us

If electronic submittal is not possible, then applicants may submit a paper application:
Paper applications should be mailed or delivered to the following address on or before the application deadline:

Julie Whitcher
MnDOT
1500 West County Road B2, MS 725
Roseville, MN 55113

It is not necessary to submit both an electronic and printed version of the same application.

Contacts

Applicants having questions or requiring assistance with this application should contact:

Julie Whitcher, OTST
651-234-7019
Julie.Whitcher@state.mn.us

Brad Estochen, OTST
651-234-7011
Bradley.Estochen@state.mn.us

Mark Vizecky, State Aid
651-366-3839
Mark.Vizecky@state.mn.us

Sulmaan Khan, State Aid
651-366-3829
Sulmaan.Khan@state.mn.us

Appendix A – Sample HSIP Worksheet

HSIP worksheet	Control Section	T.H. / Roadway	Location	Beginning Ref. Pt.	Ending Ref. Pt.	State, County, City or Township	Study Period Begins	Study Period Ends
		I-494	Portland Ave to Nicollet Ave	3+00.848	4+00.357	Hennepin Co.	1/1/2012	12/31/2014
	Description of Proposed Work		Construct Westbound auxiliary lane between Portland and Nicollet					

Accident Diagram Codes			1 Rear End	2 Sideswipe Same Direction	3 Left Turn Main Line	5 Right Angle	4,7 Ran off Road	8, 9 Head On/ Sideswipe - Opposite Direction	Pedestrian	Other	Total
Study Period: Number of Crashes	Fatal	F									
	Personal Injury (PI)	A									
		B									
		C	5								5
	Property Damage	PD	7	3							10
% Change in Crashes *Use Desktop Reference for Crash Reduction Factors	Fatal	F									
	PI	A									
		B									
		C	-25%								
	Property Damage	PD	-25%	-25%							
Change in Crashes = No. of crashes X % change in crashes	Fatal	F									
	PI	A									
		B									
		C	-1.25								-1.25
	Property Damage	PD	-1.75	-0.75							-2.50

Year (Safety Improvement Construction)	2018						
Project Cost (exclude Right of Way)	$ 600,000	Type of Crash	Study Period: Change in Crashes	Annual Change in Crashes	Cost per Crash	Annual Benefit	
Right of Way Costs (optional)		F			$ 1,140,000		
Traffic Growth Factor	0.5%	A			$ 570,000		
Capital Recovery		B			$ 170,000		
1. Discount Rate	2%	C	-1.25	-0.42	$ 83,000	$ 34,583	
2. Project Service Life (n)	30	PD	-2.50	-0.83	$ 7,600	$ 6,333	
		Total				$ 40,917	

B/C= 1.66

Using present worth values,

B= $ 998,370

C= $ 600,000

See "Calculations" sheet for amortization.

Office of Traffic, Safety and Technology August 2015

Data for Calculating Benefit/Cost Ratio

The Recommended % Change in Crashes should be taken from the FHWA's Crash Reduction Factors Clearinghouse. The clearinghouse can be located at: http://www.cmfclearinghouse.org/

Include documentation on how the appropriate crash reduction factor was determined.

The proposal will have to demonstrate in logical fashion how each improvement will impact each type of crash. The MnDOT Selection Committee will review the documentation and estimates for accuracy. Some examples of acceptable estimates are listed below:

Example 1: A project is proposing closure of a median at an intersection. Logically, all left turning and cross street right angle crashes will be eliminated (100% reduction in these types of crashes).

Example 2: A project is proposing adding right turn lanes at a signal on two approaches. The clearinghouse http://www.cmfclearinghouse.org/ shows a 9% reduction (empirical Bayes analysis) in all crashes. 9% should be used.

The applicant can contact Julie Whitcher, 651-234-7019, to discuss crash reduction assumptions for each improvement project prior to submittal.

The most beneficial improvement included in the proposed project should be used to determine the crash reduction factor and the recommended service life (Appendix C).

In the interest of standardizing the calculation of an annual cost associated with a given type of highway safety improvement, the following inputs are used in all calculations for HSIP submissions:

- ✓ Discount = 2%
- ✓ Traffic Growth = 0.5% (The default value of 0.5% is a conservative statewide average. The use can input a different value with documentation.)
- ✓ Salvage Value of Right of Way and change in maintenance costs are negligible.

Type of Crash	Crash Severity	Cost per Crash
Fatal	K	$ 1,140,000
Personal Injury	A Incapacitating	$ 570,000
	B Non-Incapacitating	$ 170,000
	C Possible	$ 83,000
Property Damage	PDO or N	$ 7,600

Source: MnDOT Office of Transportation System Management (July 2015)

Appendix B - A Planners Guide to Sustained Crash Location Selection and Critical Crash Rates

Every year in Minnesota, there are around 75,000 crashes involving motor vehicles. The vast majorities of these crashes (98%) are minor injury or only result in property damage. When looking at all crashes, there is rarely a location or segment that has not had some kind of crash within a given window of time (typically 3, 5 or 10 years of data). Knowing this, it has been difficult to assign where an at-risk location is using solely crash data. Since nearly all segments and intersections have some crashes, it has been possible to establish average crash rates for a given type of intersection of segment. Due to the random nature of crashes, OTST has decided to use a statistical evaluation to determine which locations are below the average crash rate, performing near the average crash rate, those that are above the average crash rate, and those that are statistically significant (i.e. critical) above the crash rate. Using a critical crash helps to ensure that locations being selected are actually having something significant happening, and are not just a result of the random nature of crashes. The Critical Crash Rate helps to filter out areas with low Average Daily Traffic, or evaluated over a short time period.

Calculating the Critical Crash Rate

The Office of Traffic, Safety, and Technology (OTST) evaluates crash data on a routine basis to help monitor trends, track crashes, and establish average crash rates. This data is collected, organized and released in the yearly Toolkit. A new feature to the 2011 Toolkit is the use of the critical crash rate index.

This index is calculated by taking the existing crash rate, and dividing it by the critical crash rate. Any index with a number greater than 1.0 will be considered as having a critical crash rate.

Critical Rate Equation:

$$R_c = R_a + K * (R_a/m)^{1/2} + .5/m$$

R_a = Critical Crash Rate

R_a = System Wide Average Crash Rate

K = Confidence Interval; 99.5% K=2.756, 95% K= 1.645, 90% K= 1.282

OTST has established the following confidence intervals for each type of crash rate

Crash Rate will be 99.5% Confidence; K = 2.756

Fatal Rate will be 90% Confidence; K = 1.282

Fatal and Serious (A) Rate will be 90% Confidence; K = 1.282

m = Vehicle Exposure (for sections this is Vehicle Miles Traveled (VMT), for intersections this is Entering Vehicles)

To understand the toolkit, we have included two examples to understand the process OTST will use for location selection and project evaluation. These examples were developed using the 2011 Toolkit. The most current toolkit can be found at: http://ihub/trafficeng/crash_data.html

Example 1

Minnesota Trunk Highway 66 is a four lane expressway in rural Minnesota that has a need to be evaluated by the District Engineer. Here are the facts:

Segment Length = 10.5 miles

Average Daily Traffic = 33,711

Crash History (3 years) = 93 crashes total; 1 Fatal, 2 A Injury, 7 B Injury, 20 C Injury, and 63 Property Damage

Calculating the Rates

Crash Rate = (total crashes)* 1,000,000 / (Length * ADT * Years * 365 Days/ Year)

Crash Rate = 93*1,000,000 / 10.5 miles * 33,711, * 3 years * 365 Days / Year

Crash Rate = 0.24

Severity Rate is a weighted number, which gives more severe crashes a higher score.

K=5 points, A = 4 points, B = 3 points, C = 2 points, PDO = 1 point

Severity Rate = (5*K + 4*A + 3*B + 2*C + PDO) * 1,000,000 / (Length * ADT * Years * 365)

Severity Rate = (5*1+4*2+3*7+2*20+63)*1,000,000 / (10.5*33,371*3*365)

Severity Rate = 0.35

Fatal Rate looks only at fatal crashes.

Fatal Rate = K *100,000,000 / (Length * ADT * Years * 365)

Fatal Rate = 1*100,000,000 / (10.5*33,711*3*365)

Fatal Rate = 0.26

FA Rate is a rate looking only at Fatal and Serious (A) Injury Crashes. This is the current performance measure that OTST uses.

FA Rate = (K+A) * 100,000,000 / (Length * ADT * Years * 365)

FA Rate = (1+2)*100,000,000 / (10.5*33,711*3*365)

FA Rate = 0.77

We will need the average crash rates for each of the categories. This is available from the 2011 section toolkit.

For a 4-Lane Rural Expressway, the average rates are:

Crash Rate = 0.34

Severity Rate = 0.51

Fatal Rate = 0.33

FA Rate = 0.74

Looking at out calculated rates on Page 2, we can see that Crash Rate (0.25), Severity Rate (0.37), and Fatal (0.27) are all below the average rate. This segment of roadway is performing safely compared to similar types of segments.

The FA rate, however, is above the average and will need some evaluation.

Calculating the FA Rate

$$R_c = R_a + K * (R_a/m)^{1/2} + .5/m$$

R_c = Critical Crash Rate

R_a = System Wide Average Crash Rate (FA Rate = 0.74, from 2011 Toolkit)

K = Confidence Interval; 90% K = 1.282

Fatal and Serious (A) Rate will be 90% Confidence; K = 1.282

m = Vehicle Exposure (10.5 miles*33,711 ADT *3 years *365 days/year) = 387.6 Million Vehicle Miles

$R_c = 0.74 + 1.282 * (0.74/387.6)^{1/2} + .5/387.6$

R_c = 0.80 (critical) **>** 0.77 (actual)

FA Index = Actual / Critical = 0.77/0.80 = 0.96

This segment does not meet the critical crash rate criteria.

Example 2

An intersection on US TH 202 (a divided expressway) has need for review. Here are the facts:

Three Legged intersection with MN TH 93 - Unsignalized

Entering/Approach Volume = 12,300

Crash History (10 years) = 67 crashes total; 4 Fatal, 5 A Injury, 11 B Injury, 12 C Injury, and 35 Property Damage

Calculating the Rates

Crash Rate = (total crashes)* 1,000,000 / (Entering ADT * Years * 365 Days/ Year)

Crash Rate = 67*1,000,000 / 12,300 * 10 years * 365 Days / Year

Crash Rate = 1.49

Severity Rate is a weighted number, which gives more severe crashes a higher score.

K=5 points, A = 4 points, B = 3 points, C = 2 points, PDO = 1 point

Severity Rate = (5*K + 4*A + 3*B + 2*C + PDO) * 1,000,000 / (Entering ADT * Years * 365)

Severity Rate = (5*4+4*5+3*11+2*12+35)*1,000,000 / (12,300*10*365)

Severity Rate = 2.94

Fatal Rate looks only at fatal crashes.

Fatal Rate = K *100,000,000 / (Entering ADT * Years * 365)

Fatal Rate = 4*100,000,000 / (12,300*10*365)

Fatal Rate = 8.91

FA Rate is a rate looking only at Fatal and Serious (A) Injury Crashes.

FA Rate = (K+A) * 100,000,000 / (Entering ADT * Years * 365)

FA Rate = (4+5)*100,000,000 / (12,300*3*365)

FA Rate = 20.1

We will need the average crash rates for each of the categories. This is available from the 2011 section toolkit.

For an unsignalized rural thru-stop, the average rates are:

Crash Rate = 0.29

Severity Rate = 0.48

Fatal Rate = 0.50

FA Rate = 1.38

All of our calculated rates are above the average crash rate. We will use the critical crash equation to find if they are statistically significant.

$$R_c = R_a + K * (R_a/m)^{1/2} + .5/m$$

R_c = Critical Crash Rate

R_a = System Wide Average Crash Rate

K = Confidence Interval;

OTST has established the following confidence intervals for each type of crash rate

Crash Rate will be 99.5% Confidence; K = 2.756

Severity Rate will be 99.5% Confidence; K = 1.645

Fatal Rate will be 90% Confidence; K = 1.282

Fatal and Serious (A)Rate will be 90% Confidence; K = 1.282

m = Vehicle Exposure (12,300 ADT *10 years*365 days/year) = 44.90 Million Entering Vehicles (MEV)

Crash Rate

$$R_c = 0.29 + 2.756 * (0.29/44.90)^{1/2} + .5/44.90$$

$$R_c = 0.52 \text{ (critical)} > 1.49 \text{ (actual)}$$

Crash Rate Index = Actual / Critical = 1.49 / 0.52 =2.9

This segment meets the critical crash rate criteria.

Severity Rate

$R_c = 0.48 + 2.756 * (0.48/44.90)^{1/2} + .5/44.90$

$R_c = 0.78$ (critical) **>** 2.94 (actual)

Severity Index = 2.94 / 0.78 = 3.8

This segment meets the critical severity crash rate criteria.

Fatal Rate

$R_c = 0.50 + 1.282 * (0.50/44.90)^{1/2} + .5/44.90$

$R_c = 0.65$ (critical) **>** 8.91 (actual)

Fatal Index = 8.91 / 0.65 = 13.7

This segment meets the critical severity crash rate criteria.

Fatal and Serious Rate

$R_c = 1.38 + 1.282 * (1.38/44.90)^{1/2} + .5/44.90$

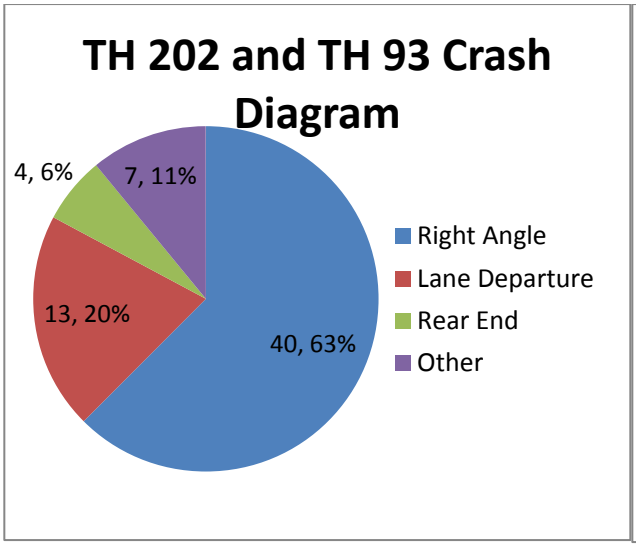
$R_c = 1.62$ (critical) **>** 20.1 (actual)

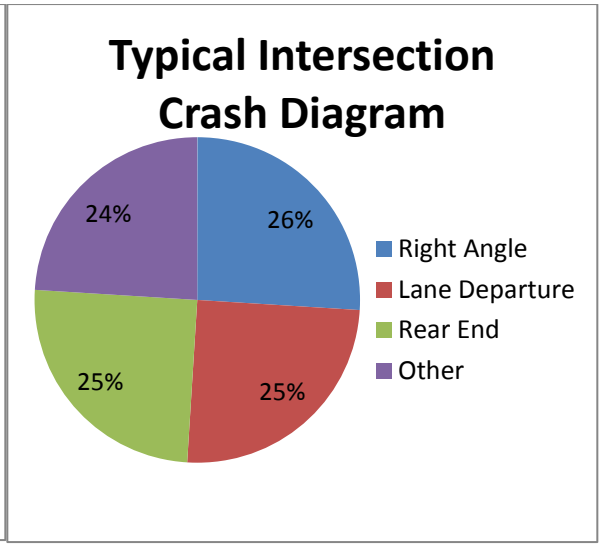
Fatal and Serious Index = 20.1 / 1.62 = 12.4

This segment meets the critical severity crash rate criteria.

Understanding the Crashes

After having run the critical rate calculations, we can see there is clearly a sustained crash problem at this location. There is also a problem with fatal and serious injury type crashes.





Comparing this intersection to other intersections in Minnesota, it appears that right angle crashes are over represented at TH 202 and TH 93. When possible, obtaining intersection collision diagrams can also be insightful into understanding the problem.

The collision diagram for this intersection shows a large number of crashes (and especially severe crashes) are occurring on the near side of the intersection. If the goal is to make this intersection safer, this crash type should be our target to eliminate.

Eliminating the Target Crash Type

The crash diagram is suggesting that people heading south are pulling out while attempting to turn left, and getting hit by vehicles on the US 202 mainline heading west. Basically, we need to make drivers aware of approaching vehicles, control the intersection and assign right of way, eliminate the ability for people to pull out, or separate the existing conflict points.

The projects that we could implement are the following:

1. Install a Traffic Signal (control the intersection)
2. Install a Reduced Conflict Intersection (RCI) (eliminate the ability to pull out)
3. Construct a grade separated interchange (separate existing conflict points)

Each of the options have pro's and con's. The table below shows a simple look at some of these concerns.

Description	**Time to implement**	**Cost**	**Safety Benefits**
Install a Traffic Signal	Medium	Medium	Signals tend to lower severe crashes moderately, but other crash types typically increase (ie Rear End)
Reduced Conflict Intersection	Short to Medium	Medium	Medium to High
Grade Separated Interchange	Long	Long	High

The crash costs that are currently used to establish a benefit/ cost ratio are:

Fatal = $840,000

A injury = $420,000

B Injury = $138,000

C Injury = $92,000

PDO = $12,000

Installing a Traffic Signal

Estimated Cost: $300,000

Project Life: 20 years

Typical Crash Reductions:

Fatal and Severe: -30%

Minor Injury: -30%

Property Damage: + 60%

Crash Severity	Number of Crashes	Crash Cost	Crash Reduction	Crash Cost Savings/ Year
Fatal and Serious	9	$5,460,000	-30%	$163,800
Minor Injury	23	$2,622,000	-30%	$78,660
Property Damage	35	$420,000	+60%	-$25,200
			Total Yearly Savings	$217,260

Crash Benefit = $217,260 * 20 years = $4,345,200

Projects Costs + Operations and Maintenance = $300,000 + 10% per year ($30,000*20 year)

Cost = $900,000

Benefit/ Cost = $4,345,200 / $900,000 = **4.8**

Installing a Reduced Conflict Intersection

Estimated Cost: $750,000

Project Life: 35 years

Typical Crash Reductions:

Fatal and Severe: -70%

Minor Injury: -40%

Property Damage: - 35%

Crash Severity	Number of Crashes	Crash Cost	Crash Reduction	Crash Cost Savings/ Year
Fatal and Serious	9	$5,460,000	-70%	$382,200
Minor Injury	23	$2,622,000	-40%	$104,880
Property Damage	35	$420,000	-35%	$14,700
			Total Yearly Savings	$501,780

Crash Benefit = $501,780 * 35 years = $17,562,300

Projects Costs + Operations and Maintenance = $750,000 + 5% per year ($37,500*35 year)

Cost = $2,062,500

Benefit/ Cost = $17,562,300/ $2,062,500= **8.5**

Constructing a Grade Separated Interchange

Estimated Cost: $5,000,000

Project Life: 50 years

Typical Crash Reductions:

Fatal and Severe: -75%

Minor Injury: -60%

Property Damage: - 35%

Crash Severity	Number of Crashes	Crash Cost	Crash Reduction	Crash Cost Savings/ Year
Fatal and Serious	9	$5,460,000	-90%	$491,400
Minor Injury	23	$2,622,000	-60%	$157,320
Property Damage	35	$420,000	-35%	$14,700
			Total Yearly Savings	$581,520

Crash Benefit = $663,420 * 50 years = $33,171,000

Projects Costs + Operations and Maintenance = $5,000,000 + 2% per year ($100,000*50 year)

Cost = $10,000,000

Benefit/ Cost = $33,171,000 / $10,000,000 = **3.3**

Benefit/ Cost Analysis

After reviewing the three alternatives, it appears that the reduced conflict intersection gives us the best return on investment, with a BC of 8.5. However, the interchange gives us the most crash savings over the life of the project, but at the highest level of investment.

It is important to remember that many factors go into selecting a project. Cost is one consideration, but one of several. Other factors to remember are mobility, capacity, right of way acquisition, current funds, access management, public feedback, political, social, demographic, and others.

For investments on intersections, an Intersection Control Evaluation (ICE) should be conducted, especially for larger projects.

Appendix C – Recommended Service Life

Description	Service Life (years)
Intersection & Traffic Control	
Construct Turning Lanes	20
Provide Traffic Channelization	20
Improve Sight Distance	20
Install Traffic Signs	10
Install Pavement Marking	2
Install Delineators	10
Install Illumination	20
Upgrade Traffic Signals	20
Install New Traffic Signals	20
Retime Coordinated System	5
Construct Roundabout	20
Pedestrian & Bicycle Safety	
Construct sidewalk	20
Construct Pedestrian & Bicycle Overpass/Underpass	30
Install Fencing & Pedestrian Barrier	10
Construct Bikeway	20
Structures	
Widen or Modify Bridge for Safety	20
Replace Bridge for Safety	30
Construct New Bridge for Safety	30
Replace/Improve Minor Structure for Safety	20
Upgrade Bridge Rail	20

Description	Service Life (years)
Roadway & Roadside	
Widen Traveled Way (no lanes added)	20
Add Lane(s) to Traveled Way	20
Construct Median for Traffic Separation	20
Wide or Improve Shoulder	20
Realign Roadway (except at railroads)	20
Overlay for Skid Treatment	10
Groove Pavement for Skid Treatment	10
Install Breakaway Sign Supports	10
Install Breakaway Utility Poles	10
Relocate Utility Poles	20
Install Guardrail End Treatment	10
Upgrade Guardrail	10
Upgrade or Install Concrete Median Barrier	20
Upgrade or Install Cable Median Barrier	10
Install Impact Attenuators	10
Flatten or Re-grade Side Slopes	20
Install Bridge Approach Guardrail Transition	10
Remove Obstacles	20
Install Edge Treatments	7
Install Centerline Rumble Strips	7

Source: Federal Highway Administration (FHWA)

Appendix D – Delegated Contract Process

A brief overview of the Delegated Contract Process (DCP) has been provided below. The outlined criteria must be completed to meet the April 15th deadline requirement for all selected projects:

1. Environmental document prepared by sponsoring agency and **approved** by DSAE and SALT.
2. Right of way certificate approved or condemnation proceedings have been formally initiated*.
3. District State Aid Engineer (DSAE) approval of plans and a satisfactory review by State Aid that project plans are complete and reflect the project that was selected.
4. Engineer's Estimate and working days estimate including how working days were computed*.
5. Special provision information*****.
6. Utility relocation certificate*****.
7. Request for Lab Services form*.
8. Permits received or NPDES permit application filled out by sponsoring agency*.
9. SALT requests DBE goal.
10. Plans reviewed and approved by SALT.
11. SALT requests authorization for HSIP or HRRRP projects.
12. Bid opening can be set after authorization by SALT and sponsoring agency.
13. Sponsoring agency prepares proposal, sells project documents and advertises per State Statute (required ad language provided by SALT).
14. Bid opening should be within 90 days of authorization.
15. DBE clearance must be given by MnDOT Office of Civil Rights before project is awarded by sponsoring agency (if applicable).
16. Submit above information for all projects that will be included in the construction contract. Above Federal requirements will apply to all work included in the construction contract.

*****These items are all submitted to SALT along with DSAE approved plan set.

Additional Resources:

For detailed information about the FEDERAL (DCP) process, please visit our website: www.dot.state.mn.us/stateaid/projectdelivery/pdp/dcp/dcp-checklist.pdf

If you have any questions about the Federal Aid process, please contact your DSAE or Merry Daher with SALT at Merry.Daher@state.mn.us or (651) 366-3821.

Appendix E: HSIP and Signals

(Revised 10/10/2012)

In most cases, traffic signals are not safety control devices. They assign right of way for vehicles and are necessary for operational purposes. However, in some cases they can improve safety. The objective of the Highway Safety Improvement Program (HSIP) is to "reduce the occurrence of and the potential for fatalities and serious injuries resulting from crashes on all public roads" (23 CRF 924.5). Signal projects will be considered for funding provided they meet the following criteria.

1. New Signals

   - Warrant 7, Crash Experience from the MMUTCD must be met. Specifically, "Five or more reported crashes, of the types susceptible to correction by a traffic control signal, have occurred within a 12-month period". Exceptions to meeting this warrant may be made if an adequate case is made on how the new signal will reduce the number of, or potential for, fatalities and serious injuries.

     Section 4 of the Minnesota Manual on Uniform Traffic Control Devices can be found at the link below:

     http://www.dot.state.mn.us/trafficeng/publ/mutcd/mnmutcd2014/mnmutcd-4.pdf

   - All new signals shall meet current MnDOT design standards. If exceptions to incorporating these standards are necessary due to site specific conditions, explanation should be included with the application.

   - Installation of red light running (enforcement) lights is strongly encouraged. Installation costs are low when installed with new signals and they provide the benefit of red light running enforcement to be accomplished by one law enforcement officer, instead of two.

   - Documentation should be provided confirming that other intersection types were considered but are not feasible. Those considered should include intersection types that reduce the probability of severe right-angle crashes. Roundabouts restricted crossing u-turn (RCUT) intersections, and some other alternative intersection types fall into this category.

2. Existing Signals

   - Rebuilding an existing signal system is only eligible for HSIP funding if it is necessary for implementation of a geometric improvement (constructing new lanes). The signal system is incidental to the primary safety improvement on these projects, which is geometric.

3. Retiming of signal systems

   - The development and implementation of new signal timing plans for a series of signals, a corridor or the entire system is eligible.

Appendix F – Narrow Shoulder Paving Guidelines

Guidelines for HSIP-funded narrow shoulder paving in conjunction with county resurfacing projects

Under certain circumstances it makes sense to pave narrow shoulders in conjunction with a resurfacing project, rather than as a separate, stand-alone project.

The County Road Safety Plans (CRSPs) have identified **6 miles per county per year** for narrow shoulder paving. This work involves the paving of existing aggregate or turf shoulders with 1 to 2 feet of pavement and the addition of a safety edge and a shoulder rumble strip or edge line rumble stripe. The following guidelines are proposed for the selection of future HSIP projects on the local system:

- Narrow shoulder paving can be done in conjunction with resurfacing if the project is along one of the segments specifically identified in the CRSP for this type of work.
- The project can be at a different location than those identified in the CRSP if it is along a higher-risk segment, as identified in the CRSP. The CRSP assigns a risk rating to highway segments based on the following criteria: traffic volume, rate and density of road departure crashes, curve density and edge assessment. The risk rating ranges from 0 (lower risk) to 5 (higher risk). **If the proposed project is along a highway segment with a rating of 4 or 5, then it can be done in conjunction with a resurfacing project.** This process ensures that narrow shoulder paving is being done at locations of higher risk rather than being driven by the schedule of pavement rehabilitation projects.
- The shoulder paving must include a safety edge and either shoulder or edge line rumble strips.
- The Applicant should use regular construction dollars to upgrade guardrail and other safety hardware as part of the resurfacing project.