3/29/2018

CONGESTION MANAGEMENT SAFETY PLAN (CMSP) | PHASE IV

Secondary Screening Technical Memorandum

MARCH 2018

Prepared by:
SRF Consulting Group, Inc. and Sambatek, Inc.

DEPARTMENT OF TRANSPORTATION

TABLE OF CONTENTS

BACKGROUND

The Congestion Management Safety Plan (CMSP) is a funding program that seeks to implement lower-cost/high-benefit improvements to address congestion and safety problems on Minnesota Department of Transportation's (MnDOT) Metro District trunk highway system. Identification of problem locations and selection of solutions is completed using a data driven process to maximize the return on investment in terms of benefits for highway users. Solutions are intended to address specific problems under existing conditions, and while they are not always intended to be 100 percent effective, they should make conditions noticeably better than they are today. Solutions are also typically lower-cost and smaller in scope that traditional highway investments, which is intended to allow them to be delivered more quickly and simply.

Several previous phases of CMSP have been undertaken over the past decade. The first phase, titled Congestion Management Planning Study, was completed in 2007 and identified 186 potential highway improvements on Metro District roadways. From these, 19 of the most promising solutions were recommended as demonstration projects, and 13 of these have been implemented since that time.

Phase 2 of the Congestion Management Safety Plan, undertaken in 2009-2010, addressed several policy considerations for adoption of the lower-cost/high-benefit investment approach for the region. Workshops were conducted to facilitate instruction and dialogue on flexible design and managed corridors, and to better define the range of solutions for the low-cost, high-benefit approach. In addition, the System Problem Statement was developed as part of this study to identify and characterize congestion and safety issues on the Metro highway system. The System Problem Statement utilized the annual Congestion Report produced by MnDOT's Regional Transportation Management Center (RTMC) to identify locations with recurring congestion on the freeway system. Each location was then characterized by a description of the problem's underlying causes such as entering traffic, lane drop, or weaving.

CMSP Phase 3 began with an extensive outreach effort in which the study team met with County and City representatives to confirm highway problem locations and gather feedback on the CMSP process. This phase then built on these results to screen the locations in the System Problem Statement and identify the most pressing issues. Lower-cost/high-benefit improvement concepts were developed for these locations in design charrettes, and their costs, benefits, and effectiveness were estimated. These factors were used to develop a return period, or anticipated length of time for the benefits to equal the cost, to prioritize the strongest solutions. From a list of 53 opportunities, several Phase 3 projects have also been constructed. In addition, 25 of these project opportunities are in the process of further design and study, and 11 are programmed for construction over the next four years.

Phase 4, the current phase of CMSP, repeats many of the key activities undertaken in Phases 2 and 3, by updating the System Problem Statement and developing a new list of opportunities that reflect changes to the Metro District highway system over recent years. Travel time reliability has also been added as an additional performance measure as part of the System Problem Statement. Reliability describes the variability in travel time experienced by highway users, due to factors such as weather, crashes, and changes in demand.

INTRODUCTION

Initial steps of the CMSP Phase 4 evaluation involved the System Problem Statement and Primary Screening process. These steps were necessary to prioritize problem locations on the Metro District highway system for solution development. Problem locations were evaluated with respect to problem magnitude, roadway type, and relationship to completed or ongoing studies. The Primary Screening process established a list of 104 high-priority problem locations to be carried forward. The Secondary Screening process was implemented to identify potential solutions and estimate the return on investment for each location. Results were combined with recommendations from other studies to arrive at the full list of CMSP candidate locations. These outcomes may be included in the Metropolitan Council update of the *Transportation Policy Plan* (TPP) and considered for future MnDOT construction.

Among the 104 problems that passed through Primary Screening, 36 are located within the study areas of various completed and ongoing highway corridor studies. These studies include:

- TH 10 Access Management Study
- I-494/TH 62 Congestion Relief Study
- TH 169 Mobility Study
- Rethinking I-94

Each of those projects includes a concept development component to recommend solutions addressing safety and congestion concerns, typically with access to more detailed background data than is available in the CMSP process. Thus, solutions for these locations are referenced from the corridor studies rather than undergoing development in the CMSP design charrette process. The solutions referenced from these other studies are considered alongside the other CMSP solutions for Secondary Screening evaluation.

This memorandum documents the secondary screening process for CMSP Phase 4. Key elements of this process include the design charrettes, cost and benefit estimation procedures, and return period calculations. The final list of recommended solutions is presented in maps and tables in the memorandum. A summary of the outcomes from the primary screening process is also provided.

1. DESIGN CHARRETTES

1.1 CHARRETTE EVENT DETAILS BY AREA

Four design charrettes were held in December of 2016. The workshops were hosted at SRF Consulting Group in Plymouth. There were over 20 participants representing MnDOT, Metropolitan Council, Federal Highway Administration (FHWA), and SRF. In total, 68 locations were reviewed in 15 hours.

Tables below summarize the dates, times, and participants for each of the design charrettes:

DATE AND TIME

Area	Date and Time
East	Tuesday, December 6, 2016. 8:30 to 11:30 a.m.
West	Thursday, December 15, 2016. 10:30 a.m. to 4:30 p.m.
North	Tuesday, December 20, 2016. 1:00 to 4:30p.m.
South	Monday, December 19, 2016. 1:00 to 4:30p.m.

PARTICIPANTS

<table>
<tr><th colspan="2"></th><th>East Area</th><th>West Area</th><th>North Area</th><th>South Area</th></tr>
<tr><td colspan="2">Functional Group</td><td colspan="4">Participants</td></tr>
<tr><td rowspan="14">MnDOT</td><td>Area Manager</td><td>Adam Josephson</td><td>April Crockett</td><td>Sheila Kauppi</td><td>Jon Solberg</td></tr>
<tr><td rowspan="3">Area Engineer</td><td rowspan="3">-</td><td>Ron Rauchle</td><td>Mark Lindberg</td><td rowspan="3">-</td></tr>
<tr><td>Andrew Lutaya</td><td>Dale Gade</td></tr>
<tr><td>Chris Hoberg</td><td>Paul Jung</td></tr>
<tr><td>District Traffic Area Contact</td><td>Kaare Festvog</td><td>Chad Erickson</td><td>Gayle Gedstad</td><td>Merlin Kent</td></tr>
<tr><td>Project Manager</td><td colspan="4">Michael Corbett</td></tr>
<tr><td rowspan="2">RTMC</td><td colspan="4">Brian Kary</td></tr>
<tr><td colspan="4">Garrett Schreiner</td></tr>
<tr><td>Traffic</td><td colspan="4">Jason Junge</td></tr>
<tr><td>Signals</td><td colspan="4">Kevin Schwartz</td></tr>
<tr><td rowspan="2">Cost Estimation</td><td colspan="4">John Isackson</td></tr>
<tr><td colspan="4">Eric Janssen</td></tr>
<tr><td rowspan="4">Geometric Design</td><td colspan="4">Chad Casey (Metro)</td></tr>
<tr><td colspan="4">Tim Donovan</td></tr>
<tr><td colspan="4">Jim Rosenow (C.O.)</td></tr>
<tr><td colspan="4">Almin Ramic</td></tr>
<tr><td>Met Council</td><td>Planning Manager</td><td colspan="4">Mark Filipi</td></tr>
<tr><td>FHWA</td><td>Safety</td><td colspan="4">Will Stein</td></tr>
</table>

	Traffic	Jim McCarthy
SRF	Moderator	Josh Maus
	Geometric Design	Aaron Vacek
	Timer	Paul Morris
	Traffic Data	Nick Semeja
	Map Control	Ryan Loos

The key objective of the design charrettes was to develop potential solutions to alleviate the traffic issues identified through the problem statement. Through collaboration amongst the panel of technical experts, one or more solutions were developed at each problem location to undergo a cost-effectiveness evaluation. Background data referenced during the design charrettes included:

- Problem magnitude
  - Delay
  - Safety
  - Reliability
- Traffic volumes
- Three-year crash data
- Current roadway and bridge designs
- Right-of-way limits

1.2 Design Charrette Outcomes

There were several common themes that arose during each of the four design charrettes. Listed below are some of the prominent items that were frequently encountered:

- Data-driven process yielded many severe congestion/safety problems; these problems are the toughest to fix and potential solutions often exceed the size and scope intended for the CMSP program.
- Technical discussion often burdened by policy challenges.
- Corridor vision required solutions to coincide with ultimate design, which is unknown in the absence of a more detailed corridor study.

This led to a few locations requiring additional investigation following the design charrettes. The project team reassessed some of these problem areas in a more time and effort-intensive evaluation. The locations that went through the additional analysis process included:

- TH 65 north of TH 10
- TH 55 (Hiawatha Avenue)
- TH 13 / CSAH 101
- TH 169 / TH 282

- TH 51 (Snelling Avenue) and County Road C

Lastly, there were two locations that were removed from project consideration. These locations, along with reasons for being omitted, are stated below:

- TH 169 and West River Rd – final intersection design for current corridor layout recently constructed
- TH 61 and CSAH 96 – current configuration is consistent with long-term local vision

A summary of the number of solutions recommended by project type and metro area is shown in Table 1.

Table 1: Number of Solutions by Area and Project Type

Area	Auxiliary Lane	Ramp Modification	Acceleration Lane	Capacity Expansion	Grade Seperation	Alternative Intersection	Turn Lane	Signal Improvements	Ped Improvements	Restripe	Upgrade/Update Signing	Total
East	0	0	0	0	0	2	3	5	1	0	1	**12**
North	2	0	0	6	4	7	3	1	2	3	1	**29**
South	2	0	0	6	1	7	6	2	1	1	2	**28**
West	7	5	3	5	0	6	4	0	2	0	0	**32**
Total	**11**	**5**	**3**	**17**	**5**	**22**	**16**	**8**	**6**	**4**	**4**	**101***

*Several locations either have more than one solution options or multiple design elements to address issues, so more solutions than locations are shown here.

2. SECONDARY SCREENING EVALUATION

The secondary screening process was completed to generate a planning-level cost effectiveness evaluation of solutions developed during the design charrettes. The primary elements that were used to determine project benefits were highway user savings associated with vehicle delay, travel time reliability, and crash costs. Solution cost estimates were also developed to provide an understanding of the capital costs realized to implement the solutions. Together these were used to estimate the return on project investment. Methodologies and assumptions associated with project benefits and cost estimates are described in more detail in the following sections.

2.1 TRAFFIC EVALUATION

Delay

Existing annual delay costs at each problem location were derived using MnDOT loop detector information and INRIX data where detector data was unavailable. A primary objective of the cost effectiveness evaluation was to determine the impact each solution had on the existing problem magnitude. To assess the vehicle delay reduction of each solution, existing traffic conditions were compared to traffic conditions under the assumed build configuration. The methods involved in performing the traffic analysis were selected based on the problem and facility types. Procedures aligned with both arterial and freeway locations are listed below:

Arterial

Synchro was used in the operational analysis for both existing and build conditions. Existing morning and afternoon peak conditions were replicated using turning movement data provided by MnDOT's Metro Intersection Traffic Counts Website[1]. Delay results from the existing conditions analysis were compared to delay output in the build analysis to determine delay reduction due to the improvement (reference **Appendix A**). The percent delay reduction from the a.m. and p.m. Synchro models were applied to the respective existing congestion costs to determine delay savings.

Freeway

A lane assignment procedure was used to evaluate the impact each freeway solution had at reducing the observed existing congestion. Lane assignments use existing and proposed lane configurations, along with observed lane volumes, to identify the locations and severity of bottlenecks on a study corridor.

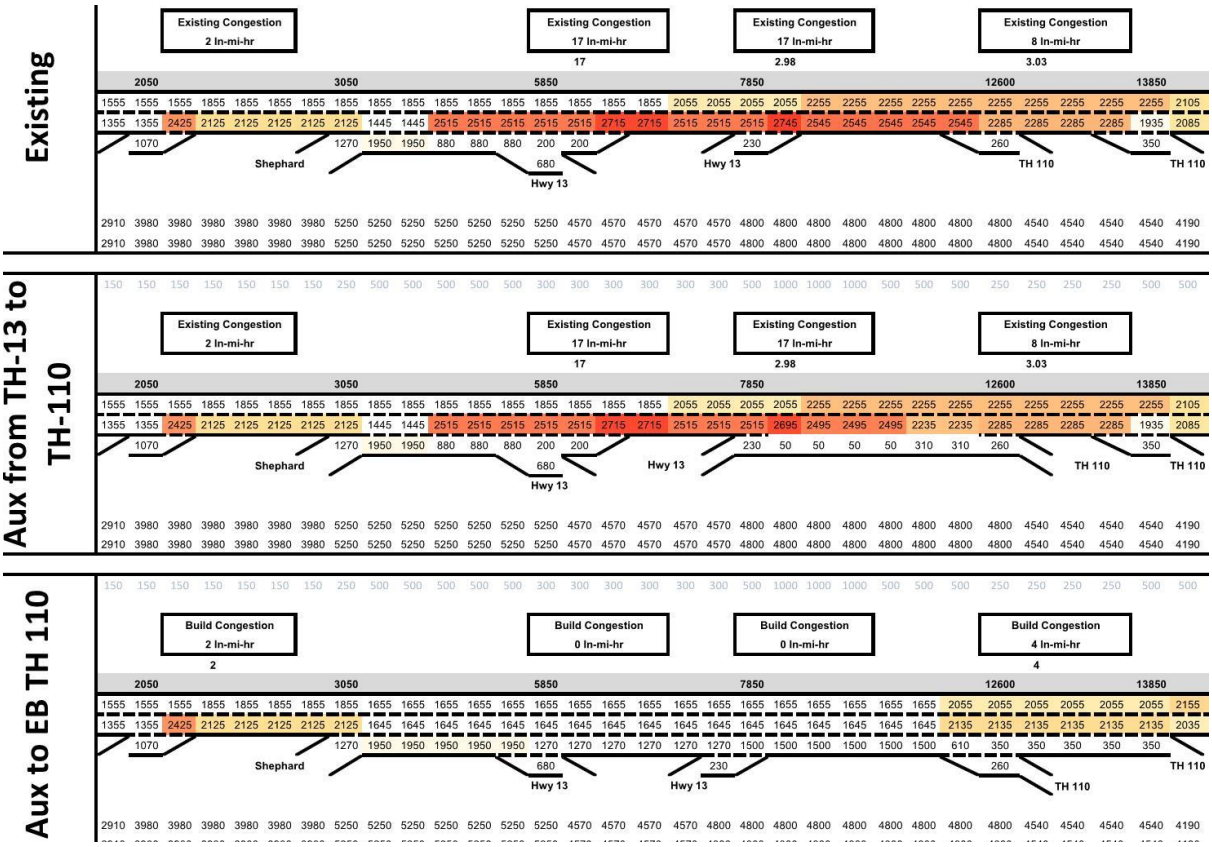
Lane configurations, which consisted of number of lanes, ramp locations and types, and other key geometric attributes of the facility were obtained for the existing scenario using Google Earth. Lane-by-lane traffic volumes from loop detectors were obtained using MnDOT's Data Extract tool, and were from October of 2016, unless construction or other traffic diversion causes were known to exist. The mainline and ramp detector volumes were then used to create a balanced volume set through the study corridor. To assess traffic conditions for the proposed

[1] http://www.dot.state.mn.us/metro/warrant/

build scenarios, lane configurations and traffic flows by lane were modified from the existing lane assessment to reflect the solution description and logical lane choices.

There was also an effort to capture upstream and downstream bottleneck locations within the lane assignment study extents. This allowed for the impacts solutions would have on other parts of corridor to be factored into the total corridor benefit calculation. An example of the lane assignment procedure is depicted in Figure 1.

Figure 1: Lane Assignment Example



Existing vehicle demands were developed by using congestion duration and queue lengths from the 2015 MnDOT Congestion Report, along with assessing peak period vehicle throughput prior to and after operational breakdowns. Since vehicle throughput is often depressed by congestion, demand is typically a better representation of potential bottlenecks. Thus, this method was used for producing vehicle input to the lane assignment evaluations. The locations and severity of bottlenecks were identified by recognizing the demand at the bottleneck and upstream of the bottleneck. The demand values were assumed to correlate to the duration and queue length of congestion based on empirically fit bottleneck and upstream demand volumes shown in Figure 2. As a result, a value of lane-mile-hours of congestion was determined for each alternative. The reduction of lane-mile-hours between existing and build alternatives was applied to the initial congestion cost during respective peak periods to determine an overall delay benefit (reference **Appendix A**).

Figure 2: Lane Assignment Congestion Table

Upstream Flow (veh/hr/ln) \ Severity of Congestion (ln-mi-hr)														
2900	9	11	12	14	16	17	19	21	23	26	28	30	33	35
2800	8	9	11	12	14	16	17	19	21	23	26	28	30	33
2700	7	8	9	11	12	14	16	17	19	21	23	26	28	30
2600	6	7	8	9	11	12	14	16	17	19	21	23	26	28
2500	5	6	7	8	9	11	12	14	16	17	19	21	23	26
2400	4	5	6	7	8	9	11	12	14	16	17	19	21	23
2300	3	4	5	6	7	8	9	11	12	14	16	17	19	21
2200	2	3	4	5	6	7	8	9	11	12	14	16	17	19
2100	2	2	3	4	5	6	7	8	9	11	12	14	16	17
2000	1	2	2	3	4	5	6	7	8	9	11	12	14	16
1900	1	1	2	2	3	4	5	6	7	8	9	11	12	14
1800	0	1	1	2	2	3	4	5	6	7	8	9	11	12
1700	0	0	1	1	2	2	3	4	5	6	7	8	9	11
1600	0	0	0	1	1	2	2	3	4	5	6	7	8	9
1500	0	0	0	0	1	1	2	2	3	4	5	6	7	8
	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100
	Bottleneck Conflict Demand (veh/hr/ln)													

Safety

The existing safety problem magnitude was computed from crash data for the three-year period from July 2012 to June 2015. Crashes were monetized in accordance with their severity, with the exception of fatal crashes, which were valued at twice the cost of an incapacitating injury crash. Crash frequencies were modified based on an aggregation of the geometric modifications and delay reduction of each solution to determine safety benefit. Crash modification factors, which were obtained from FHWA's Crash Modification Factors Clearinghouse[2], were used for solutions that included traffic or pedestrian safety features. Solutions that were targeted at reducing recurring vehicle delay, such as signal timing improvements or capacity expansions, applied the estimated reduction in delay to crash types that are highly correlated with congestion (e.g. rear-ends, sideswipes, etc.). The reduction of crashes from each solution were factored into the existing crash cost to determine safety savings (reference **Appendix A**).

Reliability

Travel time reliability savings was the final component in determining overall project benefit. The original user reliability cost derived from the deviation of observed travel times during peak periods. Since both a decrease in crashes and an increase in facility capacity are expected to produce more reliable travel times, results from the delay and safety evaluations were factored into the reliability analysis. The reliability module from SHRP2's *C11: Tools for Assessing Wider Economic Benefits of Transportation* incorporated both elements and was used for the reliability savings assessment.

The C11 reliability tool's key functions are to produce recurring and nonrecurring delay based on planning-level inputs. Required information includes basic segment geometry, vehicle demand, and crash frequencies. Scenarios were assessed for existing and proposed build conditions to determine the reduction in nonrecurring delay. The

[2] http://www.cmfclearinghouse.org/

observed reduction was applied to the existing reliability user cost to determine travel time reliability savings (reference **Appendix A**).

2.2 Cost Estimate Development

Along with project benefits, cost estimates were also necessary to estimate potential return on investment. The project cost development process was comprised of traditional estimation methods as well as an attempt to monetize several project risks and factors that are typically considered "unknowns". Primary elements that initiated the cost estimation process included:

- Project drawings
- Quantity calculations
- Unit cost factors
- Mobilization
- Traffic control
- Contractor mark-up

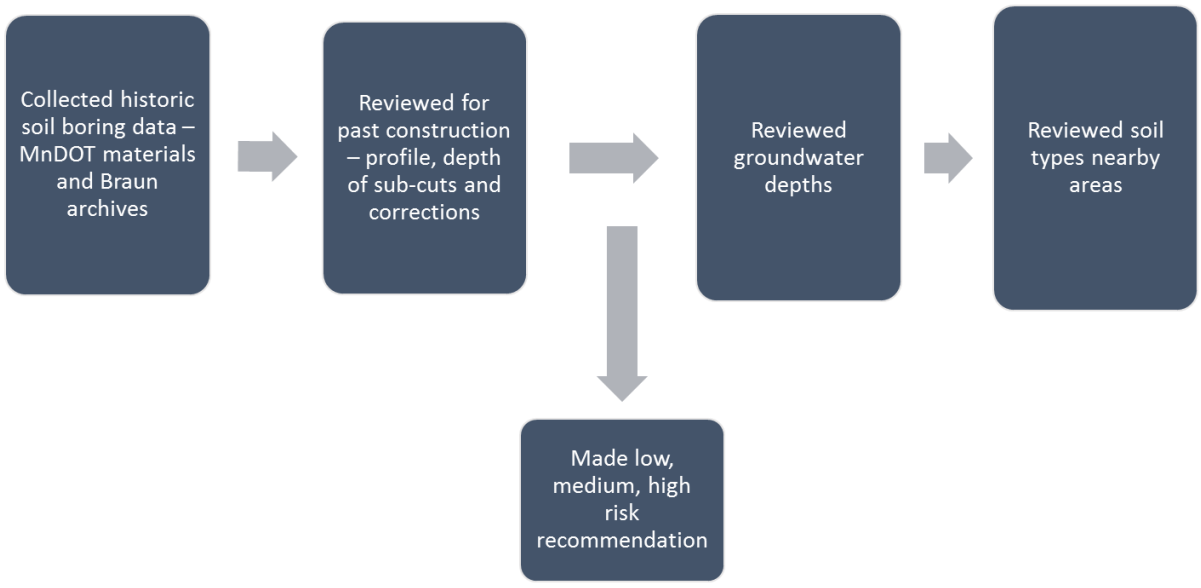
In addition to itemized unit costs and other flat-rate construction items, detail was placed on costs that would pivot off project type, size, and location. These elements included, but were not limited to:

- Subsurface assessment (soil conditions)
- Noise walls
- Construction duration
- Design delivery
- Overhead signage
- Impacts to drainage

Subsurface Assessment

The subsurface assessment was undertaken to identify any risks or irregularities with soil properties that would complicate the construction process prior to a project's scoping. Undesirable soil conditions have the potential to cause large cost increases and ultimately make the project investment not cost-effective. A goal of this process was to identify soil complexities during the secondary screening stage to more accurately estimate a project's return on investment, prior to project prioritization. Braun Intertec was consulted to perform the subsurface assessment, which is described in more detail in Figure 3.

Figure 3: Subsurface Assessment Process



Based on findings from the subsurface assessment, projects were categorized by risk as high, medium, or low. Costs were added if a medium or high risk of unsuitable soils were to be expected during construction. There were two locations where soil risk was contingent on project construction extents and the potential for remedying improper soil conditions prior to construction of the CMSP solution. As a conservative estimate, project costs incorporated the more severe soil risk category. A summary of the subsurface assessment is shown below:

Table 2: Subsurface Assessment Summary

Low Risk	
• 42 locations	
Medium Risk	
• TH 5 and TH 41	• TH 13 and Lynn Avenue
• TH 55 and Vicksburg Lane	• TH 61 between Frenchman Road and 140th Street
• TH 51 and County Road C	
High Risk	
• TH 65 and 109th Avenue	
Medium/Low Risk (contingent on unknown project factors)	
• TH 13 / CSAH 101	
High/Low Risk (contingent on unknown project factors)	
• TH 149 and TH 3	

Noise Wall Evaluation

Another cost element that played a significant role in the cost estimate process was the potential for noise walls. The Scope Work Group expressed interest in including a noise wall assessment, as this design element can have substantial costs and heavily impact a project's return on investment. Consultant noise expert reviewed each location to determine if the proposed solutions would prompt a noise wall analysis. Locations that had potential for noise wall, but no existing noise wall is present, were evaluated by the design team to estimate quantities. It was assumed that all noise walls would be of concrete design, as detailed in *Noise Requirements for MnDOT and other Type I Federal-aid Projects*[3], with a cost of $36 per square foot. In total, 21 solutions (17 locations) were determined to have potential for noise walls, which resulted in an average addition of $2.5M to the project cost. A list of locations with potential noise wall is provided in Table 3.

Table 3: Potential Noise Wall Locations

HWY	Location	Retaining Wall Cost	HWY	Location	Retaining Wall Cost
TH 65	TH 65 & 105th Ave	$468,000	**TH 169**	CSAH 9	$792,000
TH 65	TH 65 & 109th Ave	$1,008,000	**TH 100**	Brooklyn Blvd	$2,592,000
TH 10	Hanson Blvd	$6,912,000	**I-35W**	W Old Shakopee Rd	$936,000
TH 5	TH 212	$720,000	**TH 51**	Co Rd C	$2,664,000 - $4,536,000*
TH 5	TH 41	$1,224,000	**TH 36**	Snelling Ave	$3,024,000
I-35E	At TH 110	$5,616,000	**I-35E**	Shepard Rd	$5,760,000
TH 100	Cedar Lake Rd	$1,152,000	**TH 61**	Warner Rd	$1,224,000
I-494	I-394 EB exit	$720,000	**TH 61**	Lower Afton Rd	$1,080,000
I-94	Maple Grove Pkwy	$2,088,000			

*Noise wall cost varies by solution at this location.

Cost Estimation Summary

An aggregation of itemized unit costs and project risks was used to determine a project cost subtotal. In addition, a contractor mark-up of 15% and project delivery cost, which ranged from 5% to 20% based on project complexity, was produced based on the subtotal. In sum, the elements detailed above make up the total project cost estimates. A summary of cost ranges and averages, by project type, is shown in Table 4.

[3] http://www.dot.state.mn.us/environment/noise/pdf/2017-noise-requirements.pdf

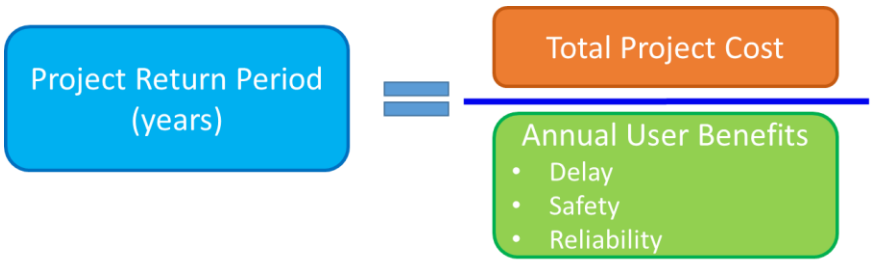
Table 4: Cost Summary by Solution Type

Project Type	Minimum	Maximum	Average
Auxiliary Lane	$710,000	$12,150,000	$5,905,000
Ramp Modification	$70,000	$1,940,000	$1,005,000
Acceleration Lane	$250,000	$250,000	$250,000
Capacity	$230,000	$16,660,000	$8,405,000
Grade Separation	$7,580,000	$17,610,000	$12,065,000
Alternative Intersection	$459,000	$15,380,000	$2,220,000
Turn Lane	$83,000	$2,110,000	$455,000
Signal Improvements	$13,000	$133,000	$50,000
Ped Improvements	$60,000	$970,000	$515,000
Restripe	$10,000	$33,000	$18,000
Upgrade/Update Signing	$10,000	$19,000	$15,000

Individual project costs for each project is provided in **Appendix A**.

2.3 Summary of Results

Once project benefits and cost estimates were established for each solution, the cost-effectiveness was calculated. Project return period, or the expected number of years that a return on investment will be realized, was the measure of effectiveness used in the project comparison process. The return period is calculated by dividing the total project cost by the annual user benefits, as shown below:



A desired characteristic of the CMSP program is to identify projects that are relatively quick to implement in the field and efficient at producing large benefits per unit cost. Therefore, solutions with lower return periods are more desirable during project prioritization. Project benefits, costs, and the resulting return period are detailed in the Solution Evaluation Summary, located in **Appendix A**.

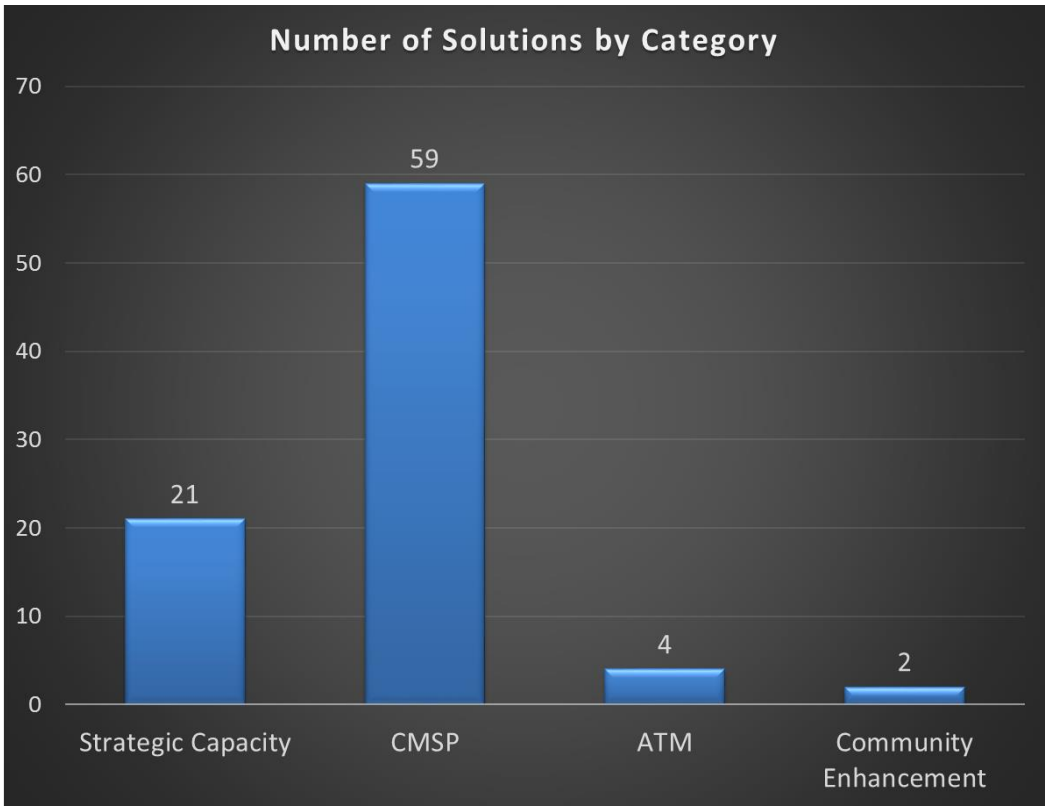
2.4 Policy Review

After initial review of the project evaluations, it was determined that solutions should be assessed based on their respective policy categories. This effort was made due to the wide variety of size and scope of solutions recommended through the CMSP process, and to better align solutions with the types of highway funding. The different policy categories are as follows:

- Strategic Capacity
- MnPASS
- CMSP
- Active Travel Management (ATM)
- Community Enhancement

Note that MnPASS solutions were not identified as part of the CMSP effort. This was largely because CMSP and MnPASS projects differ in terms of size and cost, and due to the ongoing MnPASS System Study during the time of the secondary screening process. The total number of solutions, broken down by the remaining four policy types, recommended across the 68 problem locations are illustrated in Figure 4.

Figure 4: Number of Solutions by Policy Category

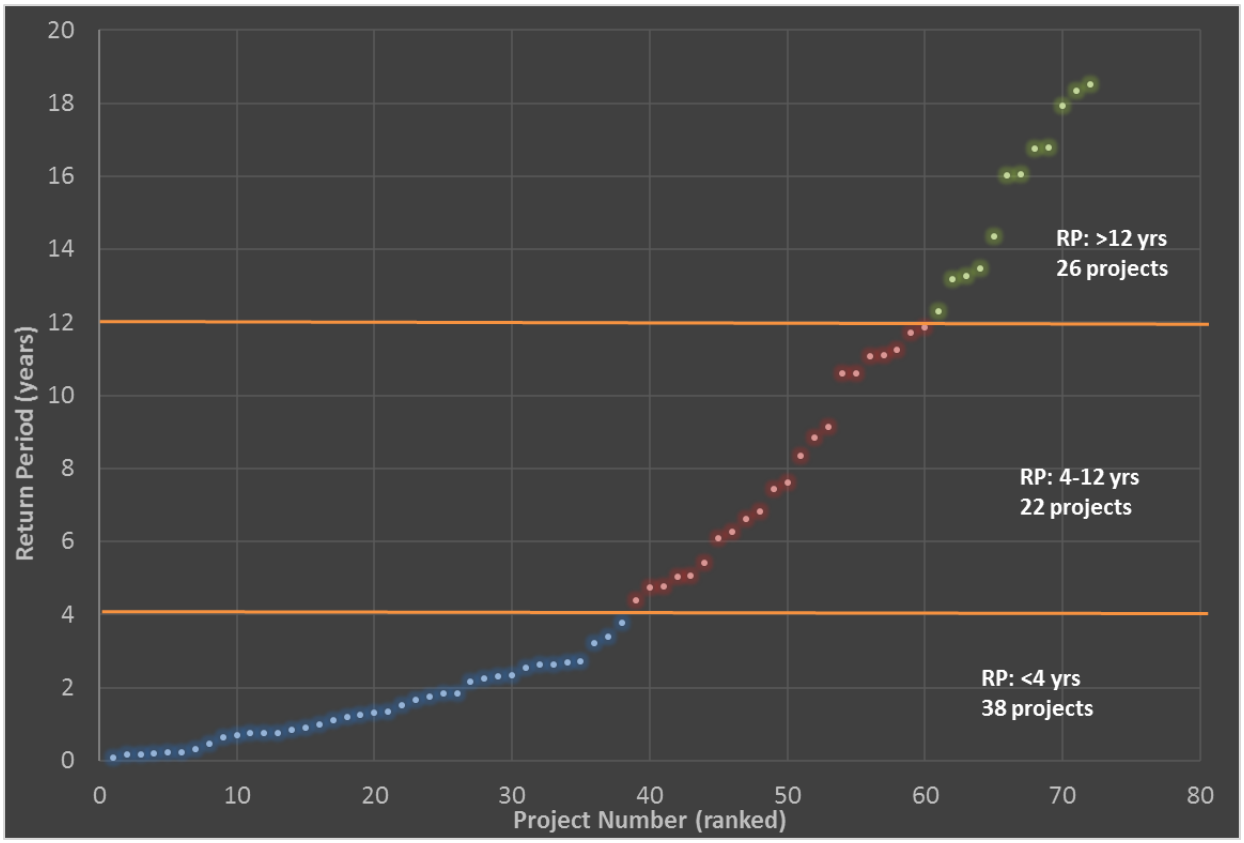


The large majority of solutions coincided with CMSP project criteria or fell under one of the lower-hierarchy policy types of ATM and Community Enhancement. The Strategic Capacity solutions exceeded the defined scope of CMSP, and thus, may not be eligible for CMSP funding. However, many of the Strategic Capacity solutions are expansions of CMSP alternatives at the same location. Therefore, it remains beneficial to consider implementation of CMSP improvements in these locations.

2.5 Return Period Criteria

Once return periods and policy categories were established for each solution, the next step was to develop project ranking criteria. The first element of project prioritization was to set return period thresholds to group projects into tiers. Thresholds were determined by assessing the distribution of return periods across all solutions. Divisions between tiers were then placed by identifying gaps in the distribution, while also creating roughly proportional solution tiers (see Figure 5).

Figure 5: Return Period Tiers



Return period tier thresholds can be summarized as follows:

- Top tier: less than four years – 38 solutions
    - Solutions are likely to deliver strong return on investment, even given some uncertainty in the cost and benefit estimates. These can be implemented as stand-alone projects and should be prioritized.
- Middle tier: between four and twelve years – 22 solutions
    - These solutions have a satisfactory return on investment that meets the goals of the CMSP program. However, these can be enhanced by implementation with other funded projects such as preservation activities.

- Bottom tier: greater than 12 years – 26 solutions
    - These solutions did not produce return on investment levels that are consistent with CMSP goals. As a result, they are not recommended at this time, but may warrant additional consideration in future study.

Bearing in mind that Strategic Capacity solutions exceed the desired scope of the CMSP program, final selection criteria based on return period and policy type was established:

Proposed criteria for recommended CMSP Solutions:

- Include at least one "CMSP" or "ATM" or "Community Enhancement" solution
- At least one solution produces a return period of less than twelve years

Recommended Solution Locations

Based on the above solutions developed during the design charrette process, the Secondary Screening traffic evaluation and cost estimates, and the criteria listed above, 52 of the 68 problem locations have solutions that are recommended. Note that there was a total of 60 solutions that fell into the top two return period tiers; this number exceeds the amount of locations with recommended solutions (52) because either: the cost-effective solutions did not meet the policy criteria (e.g. only Strategic Capacity solutions at that location), or there were multiple solutions at a location that met the return period threshold. Table 5, below, summarizes locations that meet the designated criteria, broken down by facility type and county.

Table 5: TPP Locations by Roadway Type and County

	2-Lane Rural	2-Lane Urban	4+ Lane Urban	4+ Lane Expressway	4-Lane Freeway	6+ Lane Freeway	Total
Anoka	0	0	3	3	1	0	**7**
Carver	5	0	0	0	0	0	**5**
Chisago	5	0	0	0	0	0	**5**
Dakota	0	1	0	0	2	0	**3**
Hennepin	1	0	5	3	6	5	**20**
Ramsey	0	1	3	1	0	0	**5**
Scott	1	0	0	2	0	0	**3**
Washington	3	0	0	1	0	0	**4**
Total	**15**	**2**	**11**	**10**	**9**	**5**	**52**

An additional consideration of the CMSP program was to distribute projects geographically and by facility type. Information provided in the table above displays that the CMSP process was largely successful in this regard, with multiple locations on each roadway type and in each county meeting the return period criteria.

A detailed list of solutions and their return periods is in **Appendix A**.

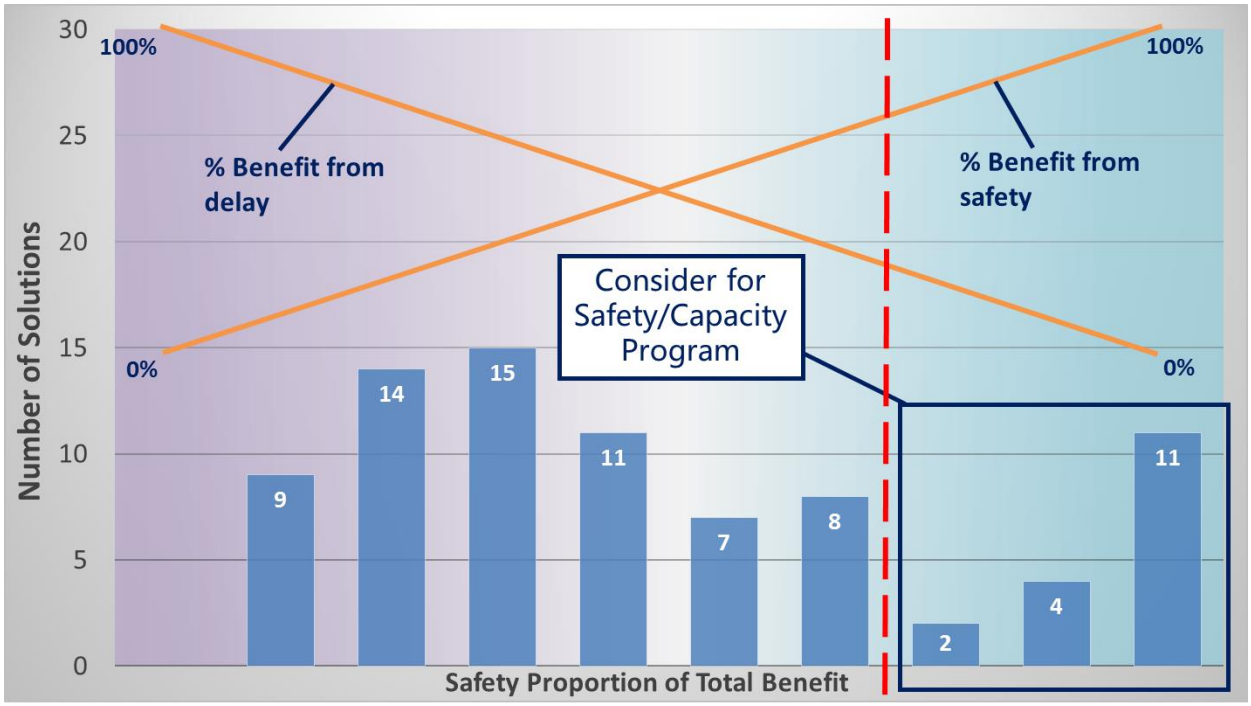
3. Refinement of CMSP Solution List

Before finalizing the list of recommended CMSP locations, additional refinement steps were considered. These included identifying and coordinating potential solutions for the Safety/Capacity Program, coordination with solutions developed as part of completed or ongoing studies, and assessing solutions recommended through previous CMSP phases.

3.1 Cooperative Refinement with Safety/Capacity

Through the CMSP cost-effectiveness evaluation, it was of interest to determine if any projects were a potential candidate for Safety/Capacity funding based on its estimated safety performance. A method used for this assessment was to identify which projects had a high proportion of benefit deriving from safety. An initial sample was taken of solutions with safety accounting for at least 70 percent of the sum of its delay and safety benefit (see Figure 6).

Figure 6: Potential Safety/Capacity Solutions



Once an initial sample of projects was drawn, a qualitative assessment was completed to refine the list of potential solutions. The resulting list is shown in Table 6.

Table 6: Potential Safety/Capacity Solutions

Project Location	Solution
TH 5 at Victoria Dr	Stripe out EBL turn lane at Quamoclit St & extend WBL turn bay at Victoria Dr, signal coordination
TH 5 at TH 41	Provide dual NBTs/SBTs thru intersection and taper down beyond signal, square up RTs, possible NW Quadrant intersection
TH 7 at County Rd 10	Increase length of WB median taper on west leg, enhance advanced RAB signing (also at TH 25)
TH 95 at Grand Ave	Remove WBRTL and pavement on SE taper to narrow east leg, provide median refuge on east leg, improve intersection lighting (overhead)
TH 8 at Greenway Ave	"Freeway Ends, Signal Ahead" sign, signal coordination, separate RT from thru traffic with median at access to the south
TH 169 at I-94	Extend EB I-94 to SB TH 169 accel lane and remove dirt mound between on-ramp and SB TH 169 mainline
TH 7 at Williston Rd	Extend WBL and WBR turn lanes, evaluate signing upgrades (slow speed signal ahead flashers, glare shields, advance queue length)
I-35W at W Old Shakopee Rd	SB Auxiliary lane from Old Shakopee Rd to 106th St
I-35W at I-94 CD Road	Close access from CD to SB TH 55 & restripe/reconfig lanes on CD, tie in NB TH 55 to WB I-94 first, then tie in SB I-35W, extend the 2-lane entrance to 11th St exit with escape lane, contra-flow ramp on 3rd St for stadium events
TH 61 at Lower Afton Rd	Continuous Green T, median transit station to accommodate peds
TH 61 at 140th St N & Frenchman Rd	TWLTL between 140th St and Frenchman Rd, add RTs to local access
TH 36 at Lake Elmo Ave N	Signalized RCI

Note that the solutions listed in the table above are simply listed as potential solutions for the Safety/Capacity Program. Nominating them as such does not suggest that they are inappropriate for CMSP. Additionally, several of the projects included in this list provide notable magnitudes of mobility benefit.

Coordination with MnDOT Traffic staff was also completed to determine any overlap between CMSP solutions and projects already identified through the Safety/Capacity Program. The findings are as follows:

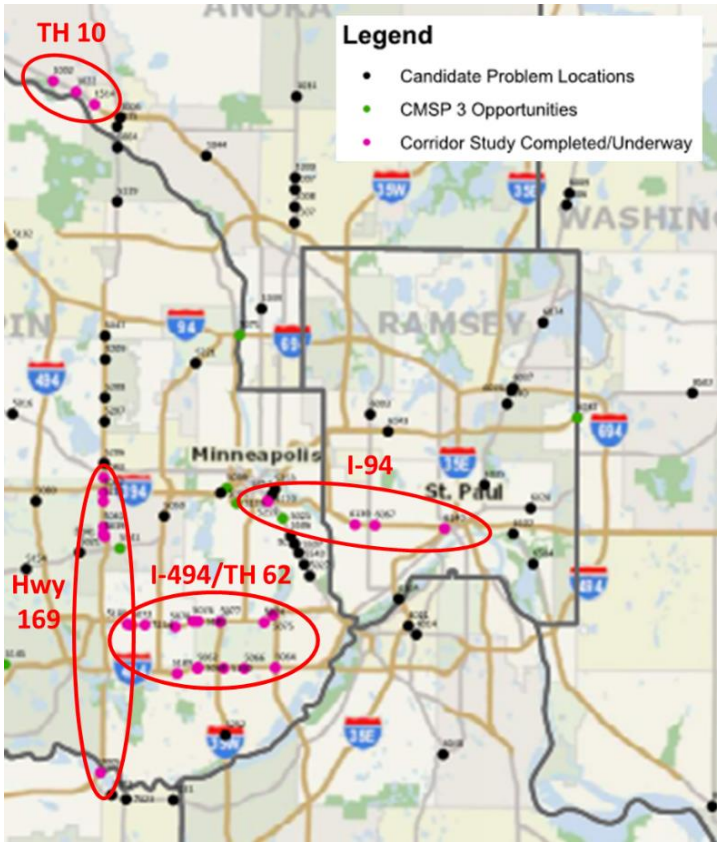
- TH 5 and TH 212 – there is Safety/Capacity funding for turn lane modifications and a local pedestrian crossing
- TH 8 and Sportsman Drive – there is potential for Safety/Capacity funding for conversion to a 3/4 access
    - This improvement was included as part of the TH 8 and Lofton Avenue / Old Towne Road solution identified in CMSP 4

3.2 Externally Evaluated Solutions

In addition to the 52 locations that met the return period and policy criteria from the original CMSP list, locations that were studied as part of previous CMSP phases or other completed or ongoing studies were evaluated for the TPP. The other highway studies mentioned include:

- TH 10 Access Management Study – Completed
- I-494/TH 62 Congestion Relief Study – Completed
- TH 169 Mobility Study – Ongoing
- Rethinking I-94 – Ongoing

Similar to CMSP, the scope of these studies involved some degree of problem identification and solution development. Therefore, solution effectiveness measures from the other study efforts were assessed for possible implementation into the TPP. The following sections summarize the priority problem locations, evaluation methods, and results of the additional analyses.



I-494/TH 62 Congestion Relief Study

The I-494/TH 62 Congestion Relief Study is currently an ongoing study that is primarily assessing MnPASS lanes and various spot-mobility improvements on these two facilities. Solutions that were determined to have a desirable return on investment were carried forward to the CMSP evaluation process. Each of these solutions underwent similar lane assessment and safety analyses as the other CMSP solutions to provide a comparable benefits methodology. Detailed project cost estimates developed as part of the I-494/TH 62 effort were used to develop estimated project return periods. Results from the evaluation are shown in Table 7, below.

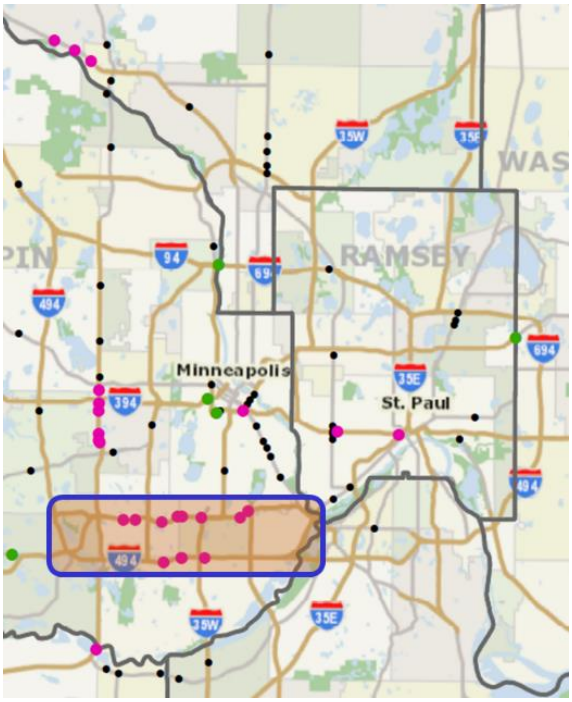


Table 7: I-494/TH 62 Solution Evaluation

Solution ID	HWY	Description	Problem Type	Detailed Solution	Project Cost	Return Period (Years)
5074	EB TH 62	I-35W to TH 77	Entering Traffic	Two-lane on-ramp from SB I-35W to EB TH 62 (right lane becomes option) with aux lane from I-35W on-ramp to SB TH 77 off-ramp, close Bloomington Ave ramps	$9,950,000	4.4
5078	WB TH 62	Valley View Rd	Entering Traffic	WB Aux lane from Valley View on-ramp to NB TH 100 off-ramp	$8,100,000	8.1
5072	EB TH 62	Gleason Rd	Lane Drop	Aux lane from Gleason Rd lane drop to SB TH 100 off-ramp	$9,050,000	3.1
5075	WB TH 62	TH 77 NB	Entering Traffic	Aux lane from NB TH 77 on-ramp to Portland Ave	$9,950,000	2.6
5062	EB I-494	France Ave	Entering Traffic	Aux lane from SB France Ave on-ramp to Penn Ave on-ramp	$12,900,000	3.4

The methodology for developing solutions differed for each of the other studies compared to the CMSP process. In the case of the I-494/TH 62 Congestion Relief Study, less emphasis was placed on meeting certain policy criteria when developing spot improvements. Thus, only the westbound TH 62 auxiliary lane from Valley View Road to northbound TH 100 met the CMSP policy criteria. Since the spot improvements recommended through the I-494/TH 62 effort considered all the listed solutions as potential projects for the TPP, they were carried forward to the potential spot mobility location list.

Several locations that were identified through the Primary Screening process had unsatisfactory project return periods, as determined through the I-494/TH 62 spot improvement evaluation. Additionally, there were numerous problems identified through the CMSP System Problem Statement that were not carried forward in the Primary Screening list. These locations are summarized in the table below:

Table 8: Additional I-494/TH 62 Problems

Primary Screening Problem Locations Not Meeting Return Period Thresholds					
ID	**HWY**	**Location**	**ID**	**HWY**	**Location**
5189	EB I494	France Ave lane drop	**5069**	WB I494	Penn Ave to France Ave
5190	EB I494	I-35W NB to Lyndale Ave	**5180**	EB TH62	TH 169 to TH 100
5064	WB I494	TH 77 entrance	**5181**	EB TH62	Xerxes Ave entrance
5195 5066	WB I494	Portland Ave to Nicollet Ave	**5077**	WB TH62	Lyndale Ave
Other Identified Problems					
ID	**HWY**	**Location**	**ID**	**HWY**	**Location**
5059	EB I494	TH 169 NB entrance	**5179**	EB TH62	CD road lane drop
5060	EB I494	East Bush Lake Rd	**5073**	EB TH62	TH 100 loop-to-loop
5061	EB I494	TH 100	**5265**	EB TH 62	France Ave
5191	EB I494	Lyndale Ave to Nicollet Ave	**5264**	EB TH 62	Portland Ave
5192	EB I494	Nicollet Ave to Portland Ave	**5261**	WB TH 62	Crosstown mainline and ramps
5063	WB I494	34th Ave	**5184**	WB TH62	Penn Ave to Xerxes Ave
5068 5196	WB I494	Lyndale Ave to I-35W NB	**5076**	WB TH62	Xerxes Ave
5070	WB I494	France Ave	**5079**	WB TH62	Valley View Rd to TH 100 NB exit
5198	WB I494	TH 212 exit	**5186**	WB TH62	TH 100 NB exit

Highway 169 Mobility Study

The purpose of the ongoing Highway 169 Mobility Study was to identify the preferred transit plan and evaluate MnPASS lanes on the corridor. As part of the project effort, spot mobility improvements were also developed at several problem locations. The solutions underwent similar lane assessment and safety analyses as the other CMSP solutions to provide a comparable benefits methodology. Detailed project cost estimates developed as part of the TH 169 Mobility Study were used to develop estimated project return periods. Results from the evaluation are shown in Table 9.

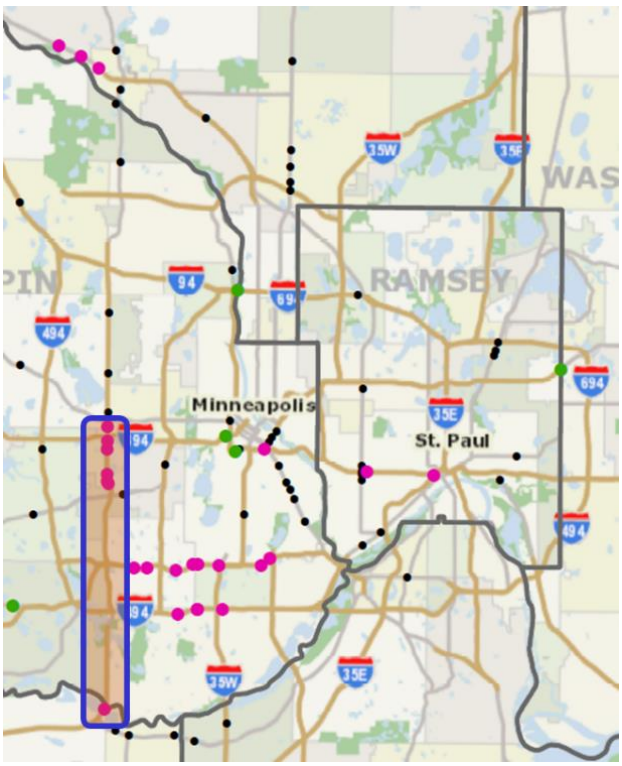


Table 9: Highway 169 Solution Evaluation

Solution ID	HWY	Description	Problem Type	Detailed Solution	Project Cost	Return Period (Years)
7005B	NB TH 169	From MN 13	Entering Traffic	Bridge braid with NB TH 169 to Old Shakopee Rd and WB TH 101 to NB TH 169 traffic	$30,000,000	7.2
7005A	NB TH 169	From MN 13	Entering Traffic	Restripe NB TH 169 - NB CR 21 on-ramp adds third lane, WB TH 101 adds fourth lane and drops at Old Shakopee Rd off-ramp, Old Shakopee Rd on-ramp becomes merge	$35,000	< 0.1
5039B	NB TH 169	36th St to Minnetonka Blvd	Ramp to Ramp Weaving	Tie aux lane from 36th St to Cedar Lake Rd (as third NB lane), Minnetonka Blvd ramps become diverge and merge	$2,300,000	3.5
5039A	NB TH 169	36th St to Minnetonka Blvd	Ramp to Ramp Weaving	Provide escape lane from Minnetonka Blvd off-ramp	$95,000	0.5
5040A	NB TH 169	Minnetonka Blvd	Entering Traffic	Restrict access from Minnetonka Blvd to NB TH 169, provide frontage road to Cedar Lake Rd ramps	$3,000,000	3.0
5040B	NB TH 169	Minnetonka Blvd	Entering Traffic	Provide CD road for Minnetonka Blvd on-ramp and Cedar Lake Rd ramps	$7,550,000	5.6
5041A	SB TH 169	Minnetonka Blvd	Entering Traffic	Tie aux lane from Cedar Lake Rd to TH 7 (as third SB lane), Minnetonka Blvd off-ramp becomes diverge, full aux between Minnetonka Blvd on-ramp and 36t St off-ramp	$2,300,000	1.6
5043	SB TH 169	I-394 to TH 55	Ramp to Ramp Weaving	Remove access from Betty Crocker and provide east frontage road from TH 55 to Betty Crocker, close S-E ramp, E-N ramp, N-W ramp and south loops at TH 55 and provide signalized ramp terminals	$7,000,000	1.1
5042	SB TH 169	I-394 EB entrance	Entering Traffic	Lengthen EB I-394 to SB TH 169 acceleration lane	$500,000	3.2

TH 10 Access Planning Study

The TH 10 Access Planning Study was completed in 2014. The three corridor locations identified through the CMSP screening process are:

- Thurston Avenue
- Sunfish Lake Boulevard
- Ramsey Boulevard

Key outcomes of the study stated that all three signalized intersections require some degree of grade separation. As part of the CMSP analysis, alternatives were assessed while incrementally providing additional capacity to the intersection until the optimal return on investment was established.

Operational and safety benefits were evaluated using similar methodologies described as part of the CMSP Secondary Screening process. Results from the assessment are shown in Table 10.

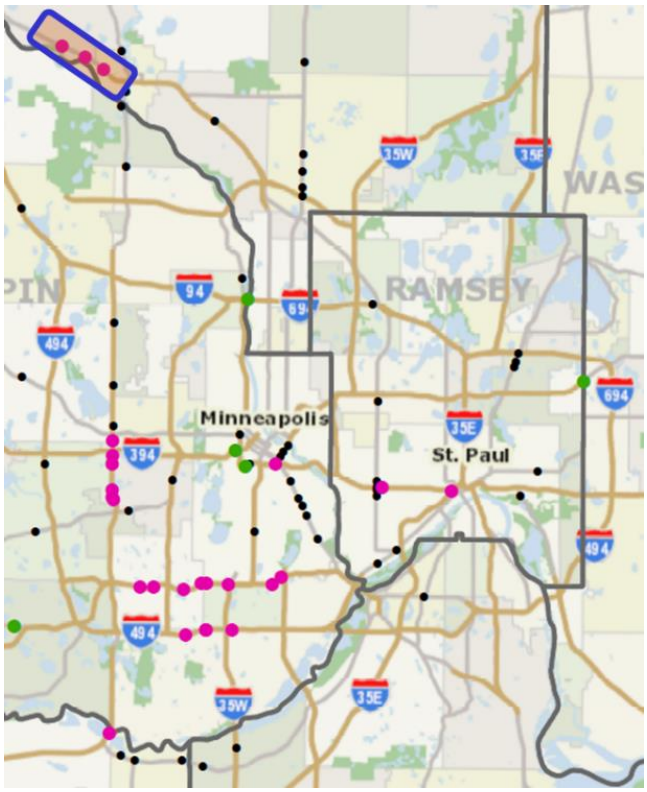


Table 10: TH 10 Solution Evaluation

Solution ID	HWY	Description	Problem Type	Detailed Solution	Project Cost	Return Period (Years)
1022A	TH10	TH 10 & SUNFISH LAKE BLVD	Intersection	Provide flyover for WBT vehicles, other movements remain signalized	$10,800,000	7.7
1022B				High T with RIRO access on south leg	$14,000,000	5.3
1514A		TH 10 & THURSTON AVE	Intersection	Provide flyover for WBT vehicles, other movements remain signalized	$16,000,000	14.7
1514B				High T with RIRO access on south leg	$17,500,000	10.2
1002A		TH 10 & RAMSEY BLVD	Intersection	Provide flyover for WBT vehicles, other movements remain signalized	$11,400,000	34.2
1002B				High T with RIRO access on south leg	$13,750,000	15.3

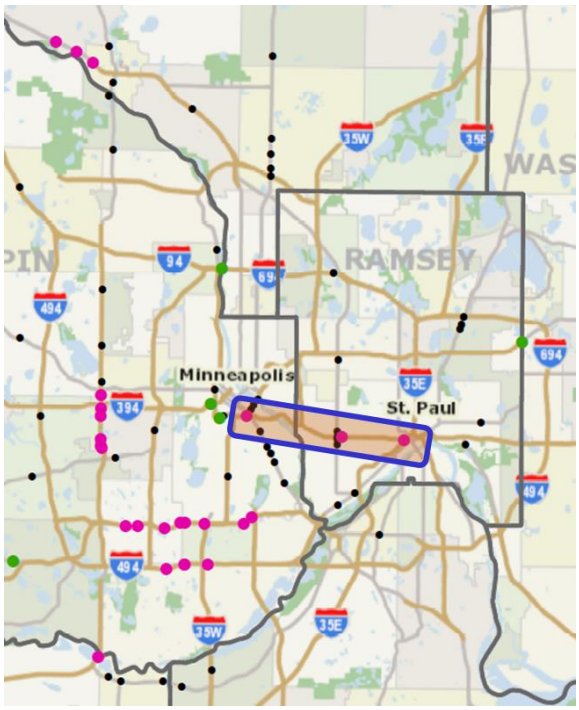
Note that a full-access grade separation option was also evaluated for Ramsey Boulevard and was not found to provide stronger return period relative to the other alternatives.

Rethinking I-94 Study

The Rethinking I-94 Study was not at the spot improvement development stage at the time of the CMSP Secondary Screening Report. The problem locations identified through the Primary Screening process include:

- WB I-94 at SB I-35W exit capacity
- WB I-94 at SB I-35W CD road entering traffic
- WB I-94 at Snelling Ave lane drop
- EB I-94 at Snelling Ave lane drop
- EB I-94 at NB I-35E commons section

In addition to the priority locations listed above, the I-94 project team has been informed of all problem locations identified in the CMSP Problem Statement and is including that list as spot improvement candidate locations.



MnPASS System Study Phase 3

There were several CMSP solutions located on corridors under consideration in the MnPASS System Study Phase 3. The CMSP locations overlapping potential MnPASS corridors are shown in the map to the right and listed below:

- Hwy 169 system 3C evaluation (5047, 5206, 5207, 5208, 5209)
- I-94 location 5102

It was also of interest to assess whether implementing the CMSP solutions would preclude any future MnPASS possibilities, either by right-of-way constraints or substantial cost increases. The results of this review are as follows:

- Hwy 169
  - Some cost increases to implement CMSP improvements prior to MnPASS
  - Return periods become slightly longer by implementing both CMSP and MnPASS
- I-94
  - CMSP does not preclude MnPASS

CMSP 3 Opportunities

There were several problem locations identified during CMSP Phase 3 that also passed through Phase 4 Primary Screening. Solution effectiveness derived during the previous program phase was applied to the problem cost developed during the CMSP 4 System Problem Statement to determine project benefit. The previously developed cost estimates were inflated to year 2017 dollars to represent current year project costs. The updated results of the CMSP 3 solutions are shown in Table 11.

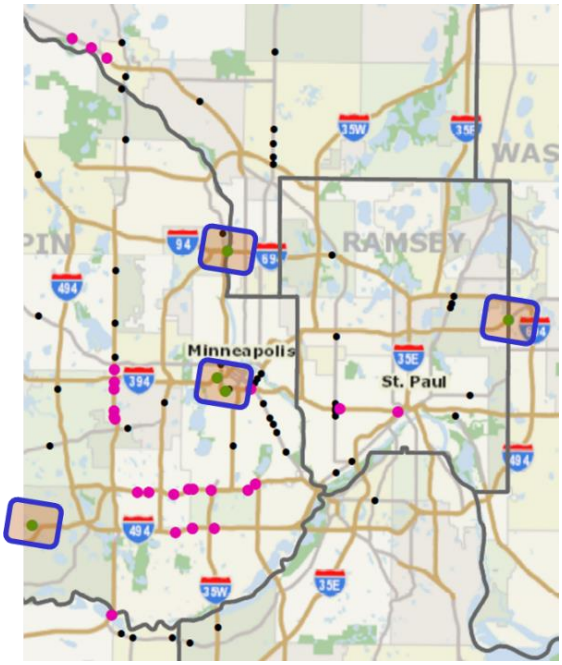


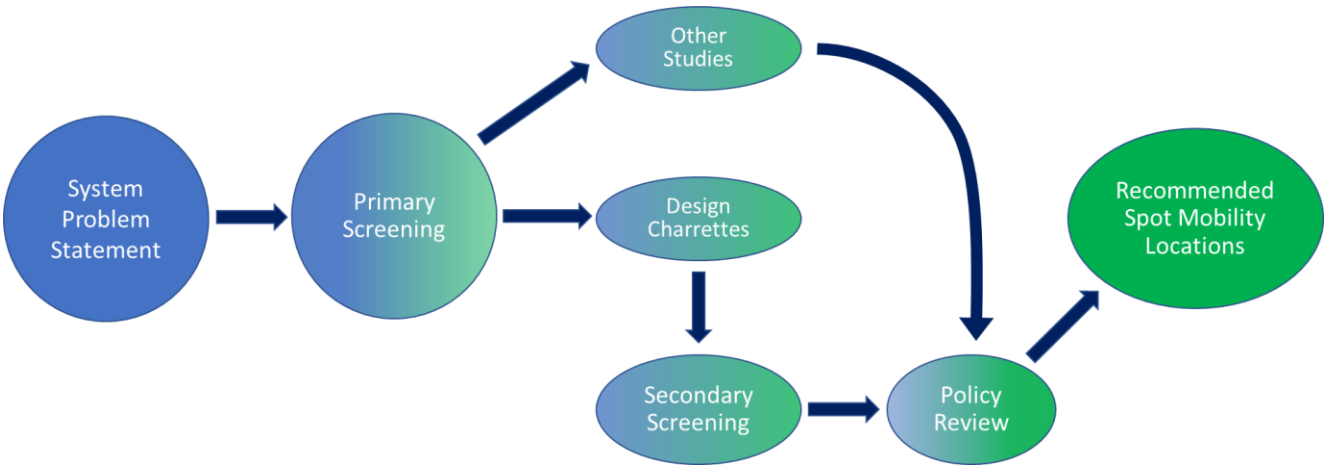
Table 11: CMSP 3 Solution Evaluation

Solution ID	HWY	Description	Problem Type	Detailed Solution	Project Cost	Return Period (Years)
5025	MN55	26th St	Intersection	Remove channelized right-turns	$200,000	3.1
5115	EB I-94	Hennepin/Lyndale to I-35W SB	Mainline Weaving	Provide buffer lane between Lyndale and SB I-35W with escape lane	$5,950,000	1.6
5071	WB I-694	I-94 EB exit	Exit Capacity	Provide two-lane exit for I-694 westbound to TH 252 southbound loop, provide additional lane on TH 252 southbound between I-694 and I-94, connect I-694 westbound auxiliary lane through East River Rd interchange	$2,400,000	0.9
5145	MN 5	CSAH 4	Intersection	Extend EBL and WBR storage bays	$250,000	6.3
5541	TH 7	TH 7 & BLAKE RD	Intersection	Provide three through lanes on TH 7 between Texas Ave and Minnehaha Creek bridge	$1,500,000	3.7
6032	TH 36	TH 36 & TH 120 (CENTURY AVE)	Intersection	Project completed in fall of 2015, implemented solution (extend EBL storage bay) differed from CMSP 3 concept (quadrant roadways in northeast and southwest quadrants)	$1,800,000	3.2

3.3 Recommended Spot Mobility Location List

The information below summarizes the CMSP process and the number of recommended spot mobilty locations.

Figure 7: CMSP Process Flow Chart



Recommended Spot Mobility Location List

- CMSP Solution Locations
  - 52 locations with solutions and desirable return period
- Corridor Study Locations
  - I-494/TH 62 = 6 locations (5 projects)
  - Hwy 169 = 6 locations
  - TH 10 = 2 locations
  - CMSP 3 = 6 locations
- Total Spot Mobility Locations = 72

The 72 recommended spot mobility locations are listed in Table 12.

Table 12: Recommended Spot Mobility Locations

ID	HWY	Location	ID	HWY	Location
1006	TH169	TH 10 South Ramps	**5253**	I35W	I-94 CD Road
1007	TH65	TH 65 & 105th Ave	**5506**	TH55	32nd St E & Hiawatha Ave
1008	TH65	TH 65 & 99th Ave	**5507**	TH55	35th St E & Hiawatha Ave
1015	TH169	Main St W	**5543**	TH55	42nd St E & Hiawatha Ave
1031	TH65	TH 65 & Bunker Lake Blvd	**6003**	TH51	Co Rd C
1039	TH47	Mississippi St	**6028**	TH5	White Bear Ave
1044	TH10	Hanson Blvd	**6037**	TH61	I-694 WB Ramps
2011	TH5	CSAH 13	**6040**	TH61	Beam Ave
2012	TH5	Victoria Dr	**6164**	I35E	Shepard Rd
2016	TH41	TH 212 Ramps	**7001**	TH13	160th St SE
2018	TH5	TH 41	**7007**	TH169	TH 282
2510	TH7	County Road 10	**7021**	TH13	Lynn Ave
3001	TH61	Wyoming Trl	**8003**	TH61	TH 61 & Manning Ave S
3010	TH8	Greenway Ave	**8006**	TH61	140th St N & Frenchman Rd
3011	TH8	Green Lake Trl	**8502**	TH36	Lake Elmo Ave N
3012	TH8	Lofton Ave/Old Towne Rd	**5074**	TH62	I-35W to TH 77
3013	TH8	Akerson St	**5078**	TH62	Valley View Rd
4014	TH110	TH 149	**5072**	TH62	Gleason Rd
4021	I35E	At TH 110	**5114**	TH62	Uphill Grade (west of TH 100)
5021	TH7	Hopkins Crossroad	**5075**	TH62	TH 77 NB
5024	TH55	38th St E & Hiawatha Ave	**5062**	I494	France Ave
5027	TH55	46th St E & Hiawatha Ave	**7005**	US169	From MN 13
5047	TH169	I-94	**5039**	US169	36th St to Minnetonka Blvd
5050	TH100	Cedar Lake Rd	**5040**	US169	Minnetonka Blvd
5080	I494	I-394 EB exit	**5041**	US169	Minnetonka Blvd
5102	I94	Maple Grove Pkwy	**5043**	US169	I-394 to TH 55
5119	TH169	109th Ave N	**5042**	US169	I-394 EB entrance
5144	TH12	CR 29 (Baker Park Rd)	**1022**	TH10	TH 10 & Sunfish Lake Blvd
5154	TH7	Williston Rd	**1514**	TH10	TH 10 & Thurston Ave
5206	TH169	TH 55	**5025**	MN55	26th St
5207	TH169	36th Ave	**5115**	I94	Hennepin/Lyndale to I-35W SB
5208	TH169	CSAH 9	**5071**	I694	I-94 EB exit
5209	TH169	CSAH 10 EB	**5145**	MN5	CSAH 4
5221	TH100	Brooklyn Blvd	**5541**	TH7	TH 7 & Blake Rd
5252	I35W	W Old Shakopee Rd	**6032**	TH36	TH 36 & TH 120 (Century Ave)

Reference **Appendix A** for detailed solution evaluation matrix and **Appendix B** for recommended spot mobility location map.

4. APPENDICES

A) Solution Effectiveness Summary (List)

Congestion Management Safety Plan 4 - Solution Effectiveness Summary

DRAFT

										Delay			Safety			Reliability			Total			
Loc ID	Solution ID	HWY	Location	Problem Type	County	Area	Solution Description	Policy Review	Project Cost	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Return Period (Years)
1006	1006A	TH169	TH 10 SOUTH RAMPS	Intersection	Anoka	North	Restripe stop bar further north	CMSP	$10,000	$492,800	7%	$33,000	$665,300	1%	$6,000	$129,700	3%	$4,000	$1,287,800	3%	$43,000	0.2
	1006B						Construct ped bridge on west side and add NBL and SBL turn lanes	CMSP	$1,177,000	$492,800	21%	$106,000	$665,300	37%	$244,000	$129,700	64%	$83,000	$1,287,800	34%	$433,000	2.7
1015	1015	TH169	MAIN ST W	Intersection	Anoka	North	Displaced left-turns on east and west approaches	CMSP	$4,721,000	$1,530,200	20%	$305,000	$397,300	17%	$66,000	$430,600	17%	$74,000	$2,358,100	19%	$445,000	10.6
1039	1039	TH47	Mississippi St	Intersection	Anoka	North	Extend SBL and SBR turn bays, FYA on minor approaches, consider removing frontage road in SE quadrant once City Hall moves	CMSP	$220,000	$251,500	8%	$21,000	$315,700	10%	$31,000	$150,500	11%	$16,000	$717,700	9%	$68,000	3.2
1044	1044A	TH10	Hanson Blvd	Lane Drop	Anoka	North	Aux from Hanson to Main	CMSP	$11,630,000	$1,247,700	2%	$24,000	$1,327,300	1%	$17,000	$848,900	20%	$170,000	$3,423,900	6%	$211,000	55.3
	1044B						Aux from Hanson to Main, aux from Main to Round Lake	CMSP	$12,150,000	$1,247,700	11%	$138,000	$1,327,300	7%	$97,000	$848,900	34%	$286,000	$3,423,900	15%	$521,000	23.3
	1044C						Capacity from Hanson lane-drop to Main	Strategic Capacity	$12,350,000	$1,247,700	27%	$340,000	$1,327,300	18%	$239,000	$848,900	42%	$356,000	$3,423,900	27%	$935,000	13.2
	1044D						Capacity from Hanson lane-drop to Main, aux from Main to Round Lake	Strategic Capacity	$12,860,000	$1,247,700	46%	$569,000	$1,327,300	30%	$400,000	$848,900	57%	$487,000	$3,423,900	43%	$1,456,000	8.8
	1044E						Capacity from Hanson lane-drop to Round Lake	Strategic Capacity	$16,660,000	$1,247,700	46%	$569,000	$1,327,300	30%	$400,000	$848,900	63%	$538,000	$3,423,900	44%	$1,507,000	11.1
2004	2004	TH5	TH 212	Intersection	Carver	South	Add SBR turn lane, extend EBL turn bay, close access to/from south at adjacent intersection of Morse St and provide grade-separated ped crossing (Carver Co awarded funding for bridge), close North to West ramp	CMSP	$2,110,000	$22,700	-6%	-$1,000	$48,300	4%	$2,000	$22,700	-123%	-$28,000	$93,700	-29%	-$27,000	0.0
2011	2011	TH5	CSAH 13	Intersection	Carver	South	Add EBT lane and provide dual SBLs, Modify WBRs to include separate turn bay for access east of CSAH 13	CMSP	$690,000	$183,700	31%	$56,000	$314,100	35%	$109,000	$232,000	41%	$96,000	$729,800	36%	$261,000	2.6
2012	2012	TH5	Victoria Dr	Intersection	Carver	South	Stripe out EBL turn-lane at Quamoclit St and extend WBL turn bay at Victoria Dr, signal coordination	CMSP	$33,000	$13,600	3%	$400	$71,200	3%	$1,800	$91,900	5%	$4,800	$176,700	4%	$7,000	4.7
2016	2016	TH41	TH 212 Ramps	Intersection	Carver	South	Add exclusive EBL turn lane, provide advanced signing for dual SBL turn bays (before taper north of westbound ramp terminal)	CMSP	$170,000	$95,200	15%	$15,000	$27,900	7%	$2,000	$36,300	29%	$11,000	$159,400	18%	$28,000	6.3
2018	2018	TH5	TH 41	Intersection	Carver	South	Provide dual NBTs and SBTs through intersection and taper down beyond signal, square up right-turns	CMSP	$3,880,000	$561,000	12%	$70,000	$625,900	50%	$315,000	$173,300	23%	$40,000	$1,360,200	31%	$425,000	9.1
2510	2510	TH7	COUNTY ROAD 10	Intersection	Carver	South	Increase length of westbound median taper on west leg, enhance advanced roundabout signing (also at TH 25)	CMSP	$10,000	$0		$0	$61,100	8%	$4,900	$5,200	11%	$600	$66,300	8%	$5,500	1.8
3001	3001	TH61	Wyoming Trl	Intersection	Chisago	East	Signal coordination	ATM	$13,000	$7,000	6%	$0	$89,700	15%	$14,000	$38,600	37%	$14,000	$135,300	21%	$28,000	0.5
3003	3003	TH95	Grand Ave	Intersection	Chisago	East	Remove WBR turn lane and pavement on SE taper to narrow East leg, provide median refuge on East leg, improve intersection lighting (overhead)	Community Enhancement	$60,000	$3,300	0%	$0	$17,700	5%	$1,000	$23,200	10%	$2,000	$44,200	7%	$3,000	18.3
3010	3010	TH8	Greenway Ave	Intersection	Chisago	East	"Freeway Ends, Signal Ahead" sign, signal coordination, separate RT from thru traffic with median at access to the south	CMSP	$83,000	$11,200	6%	$1,000	$383,600	26%	$102,000	$37,800	40%	$15,000	$432,600	27%	$118,000	0.7
3011	3011	TH8	Green Lake Trl	Intersection	Chisago	East	Signal coordination and FYA	ATM	$80,000	$9,300	12%	$1,000	$348,100	15%	$53,000	$30,800	29%	$9,000	$388,200	16%	$63,000	1.3
3012	3012	TH8	Lofton Ave/Old Towne Rd	Intersection	Chisago	East	3/4 access at Sportsmans Dr intersection to the east, signal coordination, FYA, possible access closure to marina on north leg	CMSP	$133,000	$31,100	23%	$7,000	$246,300	6%	$15,000	$55,600	31%	$17,000	$333,000	12%	$39,000	3.4
3013	3013	TH8	Akerson St	Intersection	Chisago	East	Signal coordination, recently reconstructed	ATM	$13,000	$16,600	6%	$1,000	$132,900	6%	$8,000	$20,400	40%	$8,000	$169,900	10%	$17,000	0.8
4014	4014A	TH110	TH 149	Intersection	Dakota	South	Partial Median U-Turn with three EBTs and WBTs at signal (use existing left-turn bays as decel lanes)	CMSP	$1,010,000	$370,300	18%	$65,000	$349,100	10%	$36,000	$149,700	23%	$35,000	$869,100	16%	$136,000	7.4
	4014B						Displaced left-turns on minor approaches	CMSP	$2,100,000	$370,300	28%	$105,000	$349,100	16%	$57,000	$149,700	17%	$26,000	$869,100	22%	$188,000	11.2
4021	4021A	I35E	At TH 110	Lane Drop	Dakota	South	NB Auxiliary lane from TH 110 on-ramp to TH 13 off-ramp	CMSP	$9,540,000	$1,030,700	5%	$49,000	$360,100	4%	$15,000	$1,342,600	4%	$52,000	$2,733,400	4%	$116,000	81.7
	4021B						Capacity from TH 110 on-ramp to TH 13 on-ramp	Strategic Capacity	$9,750,000	$1,030,700	24%	$244,000	$360,100	21%	$77,000	$1,342,600	37%	$501,000	$2,733,400	30%	$822,000	11.9
	4021C						Capacity from TH 110 off-ramp to TH 13 off-ramp	Strategic Capacity	$9,780,000	$1,030,700	16%	$161,000	$360,100	14%	$51,000	$1,342,600	30%	$400,000	$2,733,400	22%	$612,000	16.0
	4021D						Capacity from TH 110 off-ramp to TH 13 on-ramp	Strategic Capacity	$9,890,000	$1,030,700	70%	$724,000	$360,100	63%	$228,000	$1,342,600	76%	$1,017,000	$2,733,400	72%	$1,969,000	5.0

Solution Rankings
Top Tier
Mid Tier
Bottom Tier

Congestion Management Safety Plan 4 - Solution Effectiveness Summary

DRAFT

										Delay			Safety			Reliability			Total			
Loc ID	Solution ID	HWY	Location	Problem Type	County	Area	Solution Description	Policy Review	Project Cost	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Return Period (Years)
4040	4040A	TH149	TH 3 (Robert Trl)	Intersection	Dakota	South	Reconfigure alignments to make SB and EB free movements	CMSP	$1,070,000	$42,400	-91%	-$39,000	$101,700	-32%	-$32,000	$30,600	-45%	-$14,000	$174,700	-49%	-$85,000	0.0
	4040D						Roundabout	CMSP	$860,000	$42,400	71%	$30,000	$101,700	17%	$18,000	$30,600	55%	$17,000	$174,700	37%	$65,000	13.3
	4040C						Displaced SB left-turn	CMSP	$670,000	$42,400	10%	$4,000	$101,700	4%	$4,000	$30,600	3%	$1,000	$174,700	5%	$9,000	76.9
	4040B						Extend SBL turn bay	CMSP	$140,000	$42,400	0%	$200	$101,700	0%	$100	$30,600	0%	$0	$174,700	0%	$300	490.2
5016	5016	TH55	VICKSBURG LN	Intersection	Hennepin	West	Square up RTs from Vicksburg, ped bridge over west leg	Community Enhancement	$970,000	$615,800	3%	$20,000	$349,900	6%	$21,000	$256,600	7%	$17,000	$1,222,300	5%	$58,000	16.7
5021	5021	TH7	HOPKINS XRD	Intersection	Hennepin	West	Add dual EBLs (duals will require shifting EBT lanes on east leg)	CMSP	$210,000	$373,400	17%	$62,000	$240,500	10%	$24,000	$210,500	34%	$72,000	$824,400	19%	$158,000	1.3
5047	5047	TH169	I-94	Entering Traffic	Hennepin	West	Extend EB I-94 to SB TH 169 acceleration lane and remove dirt mound between on-ramp and SB TH 169 mainline	CMSP	$250,000	$1,788,200	3%	$47,000	$390,300	51%	$198,000	$560,400	16%	$91,000	$2,738,900	12%	$336,000	0.7
5050	5050	TH100	Cedar Lake Rd	Entering Traffic	Hennepin	West	Provide 2-lane off-ramp from NB TH 100 to EB I-394, add lane further south with 3-2 split at off-ramp	CMSP	$1,870,000	$2,106,800	15%	$312,000	$1,242,700	20%	$252,000	$1,987,700	25%	$499,000	$5,337,200	20%	$1,063,000	1.8
5080	5080	I494	I-394 EB exit	Exit Capacity	Hennepin	West	Create 2-lane exit from NB I-494 to EB I-394, modify EB I-394 CD road from add-lane to merge condition	CMSP	$1,740,000	$5,340,400	16%	$863,000	$602,100	26%	$156,000	$3,225,700	9%	$295,000	$9,168,200	14%	$1,314,000	1.3
5100	5100	I394	I-94 & Dunwoody entrances	Entering Traffic	Hennepin	West	WB auxiliary lane from lane drop coming out of downtown to TH 100 off-ramps	Strategic Capacity	$5,770,000	$1,984,100	77%	$1,525,000	$1,382,900	23%	$312,000	$933,200	78%	$726,000	$4,300,200	60%	$2,563,000	2.3
5102	5102	I94	Maple Grove Pkwy	Entering Traffic	Hennepin	West	EB auxiliary lane from Maple Grove Parkway on-ramp to Weaver Lake Rd off-ramp	CMSP	$5,530,000	$3,164,400	10%	$308,000	$1,505,100	20%	$296,000	$2,045,900	15%	$302,000	$6,715,400	13%	$906,000	6.1
5119	5119	TH169	109TH AVE N	Intersection	Hennepin	West	Add dual left-turn lanes to NB, SB, and WB approaches (lengthen NBLs), add raised median to west leg to provide thru-lane alignment	CMSP	$490,000	$1,030,200	28%	$293,000	$773,200	27%	$210,000	$389,100	65%	$252,000	$2,192,500	34%	$755,000	0.6
5144	5144	TH12	CR 29 (Baker Park Rd)	Intersection	Hennepin	West	Continuous Green T with ped phase, move ped crossing to west side	CMSP	$570,000	$262,300	39%	$101,000	$152,500	44%	$67,000	$184,700	43%	$79,000	$599,500	41%	$247,000	2.3
5154	5154	TH7	WILLISTON RD	Intersection	Hennepin	West	Extend WBL and WBR turn lanes, evaluate signing upgrades (slow speed signal ahead flashers, glare shields, advance queue length)	CMSP	$170,000	$546,700	5%	$26,000	$540,500	15%	$82,000	$361,900	18%	$66,000	$1,449,100	12%	$174,000	1.0
5221	5221A	TH100	Brooklyn Blvd	Entering Traffic	Hennepin	West	Aux from France Ave to Brooklyn Blvd and NB acceleration lane at Brooklyn Blvd on-ramp	CMSP	$4,590,000	$785,300	6%	$49,000	$1,058,500	5%	$57,000	$697,900	5%	$34,000	$2,541,700	6%	$140,000	32.7
	5221B						Aux from France Ave to Brooklyn Blvd and aux from Brooklyn Blvd to 5th Ave	CMSP	$4,750,000	$785,300	7%	$57,000	$1,058,500	6%	$67,000	$697,900	6%	$40,000	$2,541,700	6%	$164,000	28.9
	5221C						Capacity from France Ave to 57th Ave	Strategic Capacity	$4,900,000	$785,300	38%	$298,000	$1,058,500	33%	$351,000	$697,900	36%	$255,000	$2,541,700	36%	$904,000	5.4
5252	5252A	I35W	W Old Shakopee Rd	Entering Traffic	Hennepin	West	SB Auxiliary lane from Old Shakopee Rd to 106th St	CMSP	$1,780,000	$1,299,100	0%	$0	$2,857,100	12%	$334,000	$867,400	5%	$40,000	$5,023,600	7%	$374,000	4.8
	5252B						Capacity from Old Shakopee Rd to 106th SB add-lane	Strategic Capacity	$2,200,000	$1,299,100	88%	$1,137,000	$2,857,100	23%	$667,000	$867,400	74%	$641,000	$5,023,600	49%	$2,445,000	0.9
5253	5253A	I35W	I-94 CD Road	Exit Capacity	Hennepin	West	Close access from CD to SB TH 55 and restripe/reconfigure lanes on CD, tie in NB TH 55 to WB I-94 first, then tie in SB I-35W seperately	CMSP	$70,000	$2,309,100	0%	$0	$2,528,900	2%	$43,000	$1,272,100	3%	$39,000	$6,110,100	1%	$82,000	0.9
	5253B						Close access from CD to SB TH 55 and restripe/reconfigure lanes on CD, tie in NB TH 55 to WB I-94 first, then tie in SB I-35W seperately, extend the two-lane entrance to the 11th St exit with an escape lane, contra-flow ramp on 3rd St for stadium events	CMSP	$100,000	$2,309,100	13%	$305,000	$2,528,900	2%	$43,000	$1,272,100	11%	$144,000	$6,110,100	8%	$492,000	0.2
5257	5257A	I35W	Hiawatha to University	Ramp to Ramp Weaving	Hennepin	West	Reconfigure 2-2 split at Washington Ave exit to 3-2 split, convert add-lane at Hiawatha entrance to long acceleration lane	Strategic Capacity	$230,000	$4,789,500	-12%	-$588,000	$1,921,600	-11%	-$206,000	$544,800	51%	$279,000	$7,255,900	-7%	-$515,000	0.0
	5257B						Reconfigure 2-2 split at Washington Ave exit to 3-2 split, maintain Hiawatha entrance as add-lane and convert 4th St on-ramp to merge condition	Strategic Capacity	$320,000	$4,789,500	55%	$2,648,000	$1,921,600	21%	$402,000	$544,800	57%	$311,000	$7,255,900	46%	$3,361,000	0.1
6003	6003A	TH51	Co Rd C	Intersection	Ramsey	North	Third NBT lane	Strategic Capacity	$9,030,000	$528,600	44%	$232,000	$379,500	21%	$81,000	$229,400	76%	$174,000	$1,137,500	43%	$487,000	18.5
	6003B						Grade separate Lydia	Strategic Capacity	$12,670,000	$528,600	21%	$110,000	$379,500	19%	$70,000	$229,400	30%	$68,000	$1,137,500	22%	$248,000	51.1
	6003C						Displaced EBL at Lydia	CMSP	$580,000	$528,600	19%	$100,000	$379,500	17%	$64,000	$229,400	28%	$64,000	$1,137,500	20%	$228,000	2.5
6028	6028	TH5	White Bear Ave	Intersection	Ramsey	North	Stripe LTs on EB and WB approach	CMSP	$10,000	$168,200	9%	$15,000	$309,500	10%	$31,000	$66,000	25%	$16,000	$543,700	11%	$62,000	0.2
6035	6035	TH61	Maryland Ave	Intersection	Ramsey	North	Restripe to 3-lane on TH 61, restrict on-street parking	CMSP	$20,000	$178,500	-28%	-$49,000	$104,100	37%	$39,000	$50,900	-156%	-$79,000	$333,500	-27%	-$89,000	0.0
6037	6037	TH61	I-694 Ramps	Intersection	Ramsey	North	Add dual NBLs at westbound terminal, realign NB lanes at eastbound terminal to facilite shift in lanes at westbound teminal	CMSP	$260,000	$645,100	6%	$41,000	$909,100	7%	$63,000	$212,100	24%	$51,000	$1,766,300	9%	$155,000	1.7
6040	6040	TH61	Beam Ave	Intersection	Ramsey	North	NBR has signal and Yield sign - remove either, tree trimming	CMSP	$19,000	$356,100	0%	$0	$634,400	13%	$82,000	$168,600	18%	$31,000	$1,159,100	10%	$113,000	0.2

Congestion Management Safety Plan 4 - Solution Effectiveness Summary

DRAFT

										Delay			Safety			Reliability			Total			
Loc ID	Solution ID	HWY	Location	Problem Type	County	Area	Solution Description	Policy Review	Project Cost	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Return Period (Years)
6143	6143A	TH36	Snelling Ave	Entering Traffic	Ramsey	North	EB auxiliary lane from lane drop (east of Cleveland Ave) to Snelling Ave SB TH 51 ramp	Strategic Capacity	$6,790,000	$1,176,700	15%	$181,000	$905,700	13%	$120,000	$580,500	30%	$172,000	$2,662,900	18%	$473,000	14.4
	6143B						EB auxiliary lane from lane drop (east of Cleveland Ave) to Snelling Ave NB TH 51 loop	Strategic Capacity	$7,200,000	$1,176,700	15%	$181,000	$905,700	13%	$120,000	$580,500	40%	$233,000	$2,662,900	20%	$534,000	13.5
6164	6164A	I35E	Shepard Rd	Entering Traffic	Dakota	South	Aux from TH 13 to WB TH 110 off-ramp	CMSP	$11,340,000	$933,000	0%	$0	$458,300	0%	$0	$1,313,600	1%	$10,000	$2,704,900	0%	$10,000	1106.8
	6164B						Capacity from TH 13 lane drop to WB TH 110 off-ramp	Strategic Capacity	$11,420,000	$933,000	57%	$528,000	$458,300	48%	$222,000	$1,313,600	47%	$621,000	$2,704,900	51%	$1,371,000	8.3
	6164C						Capacity from TH 13 lane drop to EB TH 110 off-ramp	Strategic Capacity	$11,730,000	$933,000	74%	$690,000	$458,300	63%	$290,000	$1,313,600	56%	$740,000	$2,704,900	64%	$1,720,000	6.8
6502	6502	TH61	WARNER RD	Intersection	Ramsey	North	High T, Burns Ave - convert east access to RIRO, close west access and construct west frontage road with new signalized intersection at Warner Rd just west of TH 61	CMSP (Partial grade-separation)	$15,380,000	$398,700	84%	$335,000	$502,400	78%	$394,000	$129,200	100%	$129,000	$1,030,300	83%	$858,000	17.9
6504	6504	TH61	LOWER AFTON RD	Intersection	Ramsey	North	Continuous Green T, median transit station to accommodate peds	CMSP	$2,970,000	$57,600	10%	$6,000	$530,400	21%	$112,000	$47,300	61%	$29,000	$635,300	23%	$147,000	20.2
7001	7001	TH13	160th St SE	Intersection	Scott	South	Signal coordination	ATM	$13,000	$69,600	6%	$4,000	$178,100	6%	$11,000	$49,900	50%	$25,000	$297,600	13%	$40,000	0.3
7003	7003	TH13/CSAH 101	US 169 to TH 13	Ramp to Ramp Weaving	Scott	South	Raise WB CSAH 101 prior to TH 13 High T, provide right-side diverge and merge for TH 13 access	Strategic Capacity	$17,610,000	$1,412,200	33%	$469,000	$618,700	16%	$100,000	$1,154,700	42%	$481,000	$3,185,600	33%	$1,050,000	16.8
7007	7007	TH169	TH 282	Intersection	Scott	South	Remove left-turns, provide local on/off access with RIRO at Creek Ln (access to northeast), provide third NBT and SBT thru lanes from Creek Ln access through TH 282 as accel/decel lanes, possibly provide displaced left-turns on minor approaches	CMSP	$580,000	$451,900	52%	$234,000	$198,300	52%	$103,000	$363,000	50%	$182,000	$1,013,200	51%	$519,000	1.1
7021	7021	TH13	LYNN AVE	Intersection	Scott	South	Close access to north leg, continuous Green T, provide access to north leg from north frontage road east of Lynn Ave	CMSP	$1,300,000	$624,300	50%	$314,000	$193,200	18%	$35,000	$374,400	68%	$254,000	$1,191,900	51%	$603,000	2.2
8003	8003	TH61	HIGHWAY 61 & MANNING AVE S	Intersection	Washington	East	Provide dual SBLs from TH 95 to SB TH 61	CMSP	$130,000	$193,700	22%	$42,000	$150,800	10%	$15,000	$122,600	42%	$51,000	$467,100	23%	$108,000	1.2
8006	8006	TH61	140th ST N and Frenchman Rd	Intersection	Washington	East	TWLTL between 140th St and Frenchman Rd, add RTs to local access	CMSP	$90,000	$86,200	1%	$1,000	$240,400	37%	$89,000	$46,800	62%	$29,000	$373,400	32%	$119,000	0.8
8502	8502	TH36	LAKE ELMO AVE N	Intersection	Washington	East	Signalized RCI	CMSP	$1,330,000	$6,800	7%	$500	$736,900	35%	$256,000	$22,700	27%	$6,000	$766,400	34%	$262,500	5.1
Potential corridor-grouped solutions																						**Aggregate Corridor Return Period**
1007	1007	TH65	TH 65 & 105TH AVE	Intersection	Anoka	North	Green T with closed west leg and ped signal for SBTs, displaced WBL turn, construct west frontage road	CMSP	$2,255,000	$1,058,400	67%	$714,000	$1,473,500	23%	$337,000	$465,400	93%	$435,000	$2,997,300	50%	$1,486,000	1.5	3.5
1008	1008		TH 65 & 99TH AVE	Intersection	Anoka	North	Green T with closed east leg, realign east frontage road	CMSP	$459,000	$1,524,900	66%	$1,002,000	$1,429,500	34%	$493,000	$661,700	80%	$532,000	$3,616,100	56%	$2,027,000	0.2	
1009	1009A		TH 65 & 109TH AVE	Intersection	Anoka	North	Tight diamond interchange	Strategic Capacity	$10,468,000	$495,100	93%	$461,000	$327,700	42%	$138,000	$252,400	100%	$252,000	$1,075,200	79%	$851,000	12.3	
	1009B						Single point interchange	Strategic Capacity	$12,004,000	$495,100	72%	$357,000	$327,700	42%	$138,000	$252,400	100%	$252,000	$1,075,200	69%	$747,000	16.1	
1031	1031		TH 65 & BUNKER LAKE BLVD	Intersection	Anoka	North	Displaced left-turns on minor approaches, provide dual EBTs and WBTs	CMSP	$2,176,000	$299,500	21%	$64,000	$761,200	15%	$112,000	$319,500	9%	$29,000	$1,380,200	15%	$205,000	10.6	
1507	1507		TH 65 & 93RD LN	Intersection	Anoka	North	Develop overpass for mainline (with south ramps), connect 93rd Lane under bridge	Strategic Capacity	$7,580,000	$1,266,200	96%	$1,221,000	$856,700	42%	$360,000	$423,700	100%	$423,000	$2,546,600	79%	$2,004,000	3.8	
5024	5024	TH55	38TH ST E & HIAWATHA AVE	Intersection	Hennepin	West	Displaced left-turns, close adjacent access on north leg	CMSP	$2,290,000	$1,222,300	13%	$157,000	$528,000	13%	$68,000	$247,200	49%	$121,000	$1,997,500	17%	$346,000	6.6	7.1
5027	5027		46TH ST E & HIAWATHA AVE	Intersection	Hennepin	West	Displaced left-turns, close adjacent two access points on north leg	CMSP	$1,930,000	$825,400	30%	$249,000	$307,700	27%	$84,000	$226,200	48%	$108,000	$1,359,300	32%	$441,000	4.4	
5506	5506		32ND ST E & HIAWATHA AVE	Intersection	Hennepin	West	Displaced NB left-turn, realign SBT lane coming from Lake St further east adjacent to other SBT lanes with	CMSP	$990,000	$401,100	11%	$43,000	$686,400	10%	$69,000	$97,100	19%	$18,000	$1,184,600	11%	$130,000	7.6	
5507	5507		35TH ST E & HIAWATHA AVE	Intersection	Hennepin	West	Displaced left-turns, close adjacent two access points on north leg	CMSP	$1,690,000	$410,800	13%	$52,000	$363,700	12%	$45,000	$86,000	55%	$47,000	$860,500	17%	$144,000	11.7	
5543	5543		42ND ST E & HIAWATHA AVE	Intersection	Hennepin	West	Displaced left-turns, close adjacent access on north leg	CMSP	$1,710,000	$403,400	17%	$68,000	$275,500	15%	$42,000	$84,800	52%	$44,000	$763,700	20%	$154,000	11.1	
5206	5206	TH169	TH 55	Entering Traffic	Hennepin	West	NB auxiliary lane from Plymouth Ave on-ramp to Medicine Lake Rd off-ramp	CMSP	$1,000,000	$4,342,100	2%	$76,000	$1,496,300	11%	$164,000	$1,869,900	7%	$140,000	$7,708,300	5%	$380,000	2.6	2.2
5207	5207		36th Ave	Ramp to Ramp Weaving	Hennepin	West	NB auxiliary lane from Medicine Lake Rd to 36th St with 6' shoulder	CMSP	$710,000	$1,752,700	4%	$76,000	$652,900	12%	$79,000	$1,099,300	10%	$109,000	$3,504,900	8%	$264,000	2.7	
5208	5208		CSAH 9	Ramp to Ramp Weaving	Hennepin	West	Interchange ramp reconfiguration (remove NE loop and signalize NB off-ramp)	CMSP	$1,940,000	$1,541,900	22%	$333,000	$280,300	38%	$108,000	$851,700	45%	$385,000	$2,673,900	31%	$826,000	2.4	
5209	5209		CSAH 10 EB	Ramp to Ramp Weaving	Hennepin	West	NB auxiliary lane from Schmidt Lake Rd on-ramp to Bass Lake Rd EB off-ramp, interchange ramp reconfiguration (remove NE loop and signalize NB off-ramp)	CMSP	$1,910,000	$2,751,400	12%	$329,000	$572,400	49%	$279,000	$1,230,400	36%	$438,000	$4,554,200	23%	$1,046,000	1.8	

10/30/2017

Congestion Management Safety Plan 4 - Solution Effectiveness Summary

DRAFT

											Delay			Safety			Reliability			Total			
	Loc ID	Solution ID	HWY	Location	Problem Type	County	Area	Solution Description	Policy Review	Project Cost	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Return Period (Years)
Study Name	Locations in accordance with current and past studies																						
I-494/TH 62 Congestion Relief Study	5074	5074	TH62	I-35W to TH 77	Entering Traffic	Hennepin	West	Two-lane on-ramp from SB I-35W to EB TH 62 (right lane becomes option) with aux lane from I-35W on-ramp to SB TH 77 off-ramp, close Bloomington Ave ramps	Strategic Capacity	$9,950,000	$2,129,700	69%	$1,468,116	$636,000	46%	$289,600	$632,600	81%	$510,703	$3,398,300	67%	$2,268,419	4.4
	5076	5076	TH62	Xerxes Ave	Entering Traffic	Hennepin	West	WB Aux lane from Penn Ave off-ramp to France Ave on-ramp	Strategic Capacity	$12,800,000	$1,311,000	3%	$33,375	$1,012,300	2%	$23,400	$1,247,700	18%	$225,165	$3,571,000	8%	$281,940	45.4
	5078	5078A	TH62	Valley View Rd	Entering Traffic	Hennepin	West	WB Aux lane from Valley View on-ramp to NB TH 100 off-ramp	CMSP	$8,100,000	$592,600	29%	$172,153	$1,627,200	28%	$461,700	$789,800	46%	$366,342	$3,009,600	33%	$1,000,196	8.1
	5072	5072	TH62	Gleason Rd	Lane Drop	Hennepin	West	Aux lane from Gleason Rd lane drop to SB TH 100 off-ramp	Strategic Capacity	$9,050,000	$1,367,100	36%	$486,136	$621,900	35%	$220,300	$1,415,800	57%	$809,297	$7,109,100	41%	$2,883,805	3.1
	5114	5114	TH62	uphill grade	Substandard Geometry or Other	Hennepin	West				$2,302,500	32%	$742,584	$511,500	30%	$153,400	$890,300	53%	$472,088				
	5075	5075	TH62	TH 77 NB	Entering Traffic	Hennepin	West	Aux lane from NB TH 77 on-ramp to Portland Ave	Strategic Capacity	$9,950,000	$1,772,100	93%	$1,640,169	$1,680,000	50%	$834,300	$1,743,500	78%	$1,355,183	$5,195,600	74%	$3,829,652	2.6
	5062	5062	I494	France Ave	Entering Traffic	Hennepin	West	Aux lane from SB France Ave on-ramp to Penn Ave on-ramp	Strategic Capacity	$12,900,000	$4,581,600	46%	$2,092,626	$1,926,500	43%	$825,000	$1,600,600	57%	$906,425	$8,108,700	47%	$3,824,051	3.4
	5180	5180	TH62	TH 169 to TH 100	Ramp to Ramp Weaving	Hennepin	West	Not cost effective in 494/62 evaluation: Reconfigure EB TH 62 CD Road - merge EB TH 62 mainline traffic prior to TH 169 loops	CMSP		$1,020,200			$599,100			$1,113,000			$2,732,300			
	5181	5181	TH62	Xerxes Ave entrance	Entering Traffic	Hennepin	West	Not cost effective in 494/62 evaluation: Aux lane from France Ave off-ramp to Penn Ave on-ramp	Strategic Capacity		$8,678,200			$4,147,300			$5,433,600			$18,259,100			
	5077	5077	TH62	Lyndale Ave	Entering Traffic	Hennepin	West	No solution identified			$776,300			$598,100			$895,000			$2,269,400			
	5064	5064	I494	TH 77 entrance	Exit Capacity	Hennepin	West	No solution identified			$2,287,400			$1,756,700			$1,001,000			$5,045,100			
	5069	5069	I494	Penn Ave to France Ave	Ramp to Ramp Weaving	Hennepin	West	No solution identified			$1,203,100			$3,264,400			$1,259,200			$5,726,700			
	5066	5066	I494	Portland Ave to Nicollet Ave	Entering Traffic	Hennepin	West	No solution identified			$2,655,400			$1,147,500			$1,069,100			$4,872,000			
	5189	5189	I494	France Ave	Lane Drop	Hennepin	West	No solution identified			$5,454,900			$2,029,600			$4,451,100			$11,935,600			
	5190	5190	I494	I-35W NB to Lyndale Ave	Ramp to Ramp Weaving	Hennepin	West	No solution identified			$2,266,100			$1,872,500			$1,548,700			$5,687,300			
TH 169 Mobility Study	7005	7005B	US169	From MN 13	Entering Traffic	Scott	South	Bridge braid with NB TH 169 to Old Shakopee Rd and WB TH 101 to NB TH 169 traffic	Strategic Capacity	$30,000,000	$3,459,500	58%	$1,997,632	$1,183,500	41%	$483,200	$2,766,100	61%	$1,681,812	$7,409,100	56%	$4,162,644	7.2
		7005A						Restripe NB TH 169 - NB CR 21 on-ramp adds third lane, WB TH 101 adds fourth lane and drops at Old Shakopee Rd off-ramp, Old Shakopee Rd on-ramp becomes merge	CMSP	$35,000	$3,459,500	38%	$1,301,655	$1,183,500	17%	$200,900	$2,766,100	27%	$749,449	$7,409,100	30%	$2,252,004	0.0
	5039	5039B		36th St to Minnetonka Blvd	Ramp to Ramp Weaving	Hennepin	West	Tie aux lane from 36th St to Cedar Lake Rd (as third NB lane), Minnetonka Blvd ramps become diverge and merge	Strategic Capacity	$2,300,000	$2,732,100	16%	$438,548	$557,200	13%	$73,500	$1,036,100	15%	$153,705	$4,325,400	15%	$665,753	3.5
		5039A						Provide escape lane from Minnetonka Blvd off-ramp	CMSP	$95,000	$2,732,100	5%	$127,334	$557,200	4%	$21,300	$1,036,100	3%	$35,008	$4,325,400	4%	$183,643	0.5
	5040	5040A		Minnetonka Blvd	Entering Traffic	Hennepin	West	Restrict access from Minnetonka Blvd to NB TH 169, provide frontage road to Cedar Lake Rd ramps	CMSP	$3,000,000	$1,873,300	30%	$564,289	$303,300	27%	$82,200	$590,600	59%	$347,679	$2,767,200	36%	$994,168	3.0
		5040B						Provide CD road for Minnetonka Blvd on-ramp and Cedar Lake Rd ramps	CMSP	$7,550,000	$1,873,300	47%	$874,733	$303,300	42%	$127,400	$590,600	59%	$350,826	$2,767,200	49%	$1,352,959	5.6
	5041	5041A		Minnetonka Blvd	Entering Traffic	Hennepin	West	Tie aux lane from Cedar Lake Rd to TH 7 (as third SB lane), Minnetonka Blvd off-ramp becomes diverge, full aux between Minnetonka Blvd on-ramp and 36t St off-ramp	Strategic Capacity	$2,300,000	$1,062,900	47%	$504,704	$652,000	40%	$263,400	$1,115,200	58%	$642,074	$2,830,100	50%	$1,410,178	1.6
	5043	5043		I-394 to TH 55	Ramp to Ramp Weaving	Hennepin	West	Remove access from Betty Crocker and provide east frontage road from TH 55 to Betty Crocker, close S-E ramp, E-N ramp, N-W ramp and south loops at TH 55 and provide signalized ramp terminals	CMSP	$7,000,000	$5,648,200	23%	$1,279,639	$1,645,900	49%	$810,600	$7,252,400	56%	$4,042,853	$14,546,500	42%	$6,133,092	1.1
	5042	5042		I-394 EB entrance	Entering Traffic	Hennepin	West	Lengthen EB I-394 to SB TH 169 acceleration lane	CMSP	$500,000	$1,495,800	0%	$0	$674,800	23%	$158,300	$1,183,400	0%	$0	$3,354,000	5%	$158,300	3.2

Congestion Management Safety Plan 4 - Solution Effectiveness Summary

DRAFT

	Loc ID	Solution ID	HWY	Location	Problem Type	County	Area	Solution Description	Policy Review	Project Cost	Delay			Safety			Reliability			Total			Return Period (Years)
											Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	Problem Magnitude	Effectiveness	Annual Cost Reduction (Benefit)	
TH 10 Access Planning Study	1022	1022A	TH10	TH 10 & SUNFISH LAKE BLVD	Intersection	Anoka	North	Provide flyover for WBT vehicles, other movements remain signalized	CMSP (Partial grade-separation)	$10,800,000	$1,304,400	52%	$679,153	$1,265,700	35%	$437,400	$695,600	41%	$282,612	$3,265,700	43%	$1,399,165	7.7
		1022B			Intersection	Anoka	North	High T with RIRO access on south leg		$14,000,000	$1,304,400	90%	$1,169,107	$1,265,700	59%	$752,900	$695,600	100%	$695,600	$3,265,700	80%	$2,617,607	5.3
	1514	1514A		TH 10 & THURSTON AVE	Intersection	Anoka	North	Provide flyover for WBT vehicles, other movements remain signalized		$16,000,000	$948,300	53%	$501,831	$653,700	41%	$267,500	$410,100	77%	$315,780	$2,012,100	54%	$1,085,110	14.7
		1514B			Intersection	Anoka	North	High T with RIRO access on south leg		$17,500,000	$948,300	90%	$849,142	$653,700	69%	$452,600	$410,100	100%	$410,100	$2,012,100	85%	$1,711,842	10.2
	1002	1002A		TH 10 & RAMSEY BLVD	Intersection	Anoka	North	Provide flyover for WBT vehicles, other movements remain signalized		$11,400,000	$475,000	21%	$98,425	$560,000	11%	$61,400	$405,500	43%	$173,487	$1,440,500	23%	$333,312	34.2
		1002B			Intersection	Anoka	North	High T with RIRO access on south leg		$13,750,000	$475,000	64%	$305,342	$560,000	34%	$190,500	$405,500	100%	$405,500	$1,440,500	63%	$901,342	15.3
CMSP 3 Opportunities	5025	5025	MN55	26th St	Intersection	Hennepin	West	Remove channelized right-turns	CMSP	$200,000	$788,200	0%	$0	$350,900	19%	$65,000	$212,200	0%	$0	$1,351,300	5%	$65,000	3.1
	5115	5115	I94	Hennepin/Lyndale to I-35W SB	Mainline Weaving	Hennepin	West	Provide buffer lane between Lyndale and SB I-35W with escape lane	CMSP	$5,950,000	$11,688,300	29%	$3,391,181	$4,994,700	5%	$255,000	$4,101,700	0%	$0	$20,784,700	18%	$3,646,181	1.6
	5071	5071	I694	I-94 EB exit	Exit Capacity	Hennepin	West	Provide two-lane exit for I-694 westbound to TH 252 southbound loop, provide additional lane on TH 252 southbound between I-694 and I-94, connect I-694 westbound auxiliary lane through East River Rd interchange	CMSP	$2,400,000	$3,178,900	67%	$2,119,535	$1,712,500	34%	$589,000	$1,430,000	0%	$0	$6,321,400	43%	$2,708,535	0.9
	5145	5145	MN5	CSAH 4	Intersection	Hennepin	West	Extend EBL and WBR storage bays	CMSP	$250,000	$709,600	0%	$0	$1,039,500	4%	$40,000	$418,600	0%	$0	$2,167,700	2%	$40,000	6.3
	5541	5541	TH7	TH 7 & BLAKE RD	Intersection	Hennepin	West	Provide three through lanes on TH 7 between Texas Ave and Minnehaha Creek bridge	CMSP	$1,500,000	$161,500	0%	$0	$1,155,700	35%	$403,000	$65,100	0%	$0	$1,382,300	29%	$403,000	3.7
	6032	6032	TH36	TH 36 & TH 120 (CENTURY AVE)	Intersection	Ramsey	North	Project completed in fall of 2015, implemented solution (extend EBL storage bay) differed from CMSP 3 concept (quadrant roadways in northeast and southwest quadrants)	CMSP	$1,800,000	$1,063,900	18%	$193,721	$823,200	45%	$372,000	$459,500	0%	$0	$2,346,600	24%	$565,721	3.2
Rethinking I-94	5259	5259	I94	I-35W SB exit	Exit Capacity	Hennepin	West	Spot improvements from I-94 study have yet to be developed			$5,324,300			$2,920,700			$2,722,900			$10,967,900			
	5110	5110	I94	CD Road entrance	Entering Traffic	Hennepin	West				$1,899,100			$1,688,500			$844,000			$4,431,600			
	6140	6140	I94	I-94/I-35E	Exit Capacity	Ramsey	North				$4,956,100			$4,842,400			$2,976,300			$12,774,800			
	6067	6067	I94	Snelling Ave	Lane Drop	Ramsey	North				$1,628,000			$1,989,300			$1,848,700			$5,466,000			
	6139	6139	I94	Snelling Ave	Lane Drop	Ramsey	North				$1,991,600			$1,434,800			$1,041,100			$4,467,500			

Notes - methods used in other studies for developing solutions differed from CMSP process

locations that did not pass policy review were not included in Recommneded Solution List

-

B) Recommended Spot Mobility Location Map

Recommended Spot Mobility Locations