

# Congestion Management Safety Plan - Phase III

Summary Report



for  
MnDOT Metro District

February 2013





## Minnesota Department of Transportation

### Metropolitan District

1500 West County Road B-2

Roseville, MN 55113

**February 2013**

Transportation Stakeholders and Policymakers,

MnDOT is seeking new opportunities to provide a safe and efficient transportation system for Minnesotans. With limited resources, creative solutions are needed. The Congestion Management Safety Plan (CMSP) will help to deliver efficient and effective improvements.

Through recent project investments and demonstration projects, MnDOT has proven that lower-cost/high-benefit projects are effective at limiting congestion and improving safety on Minnesota highways. These solutions are able to deliver many of the benefits of traditional projects, but at a fraction of the construction cost.

The CMSP effort recently undertaken also represents a comprehensive inventory of problem locations across the Metro District State Trunk Highway system. All locations with congestion and crash problems were considered, and the most severe issues rose to the top. The CMSP Opportunity List positions MnDOT to rapidly identify applicable solutions and implement them more quickly than traditional projects.

MnDOT seeks to grow its partnerships with cooperative agencies in the region. CMSP featured an outreach effort to obtain input from local stakeholders and transit officials. Now, there are opportunities to move individual projects forward through collaborative ventures with regional partners.

Please review the information in this report. Many challenges remain ahead, but this effort continues to help us move towards our goals of providing a 21st Century transportation system.

Scott McBride, P.E.  
MnDOT Metro District Engineer

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## Introduction

Phase III of the Congestion Management and Safety Plan (CMSP) was undertaken to identify a list of lower-cost/high-benefit projects that seek to maximize mobility and reduce crash risk at key congestion and safety problem locations. This was accomplished through three distinct stages:

- Problem location identification
- Primary screening to identify the highest-priority problem locations
- Secondary screening to identify the strongest potential improvement locations

The final result of CMSP Phase III is an opportunity list that will be provided to MnDOT decision makers so that they can select solutions for additional scoping and eventual programming/implementation.

CMSP Phase III exposed a wide variety of challenges on the way to achieving its final outcome. These challenges required unique solutions that sought to be inclusive, creative, and a departure from traditional design methods. Some of these approaches have become hallmarks of CMSP such as the Local Agency Work Sessions and Design Charrettes. Innovative and creative methods developed through CMSP have an opportunity to reshape some of the strategies employed by MnDOT and other agencies.

## Fiscal Context

The resources available to MnDOT to address safety and congestion issues on the metropolitan trunk highway system are projected to be increasingly scarce in the coming decades. The purchasing power of revenues generated from fuel tax are expected to fall far short of what is required to maintain the transportation system, much less expand it to address current and projected congestion problems.

Recognizing that system-wide capacity expansion will not be feasible, MnDOT Metro District and the Metropolitan Council have designated funding for lower-cost/high-benefit improvements in their planning documents, specifically Metropolitan Council's *2030 Transportation Policy Plan* and MnDOT Metro District's *20-year Highway Investment Plan*.

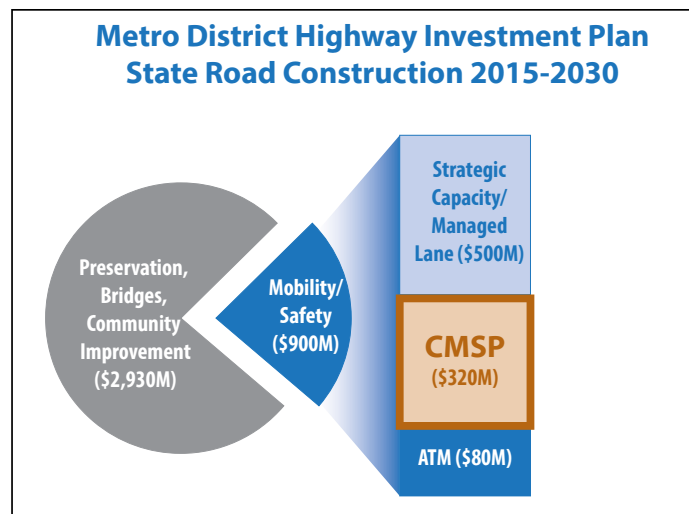


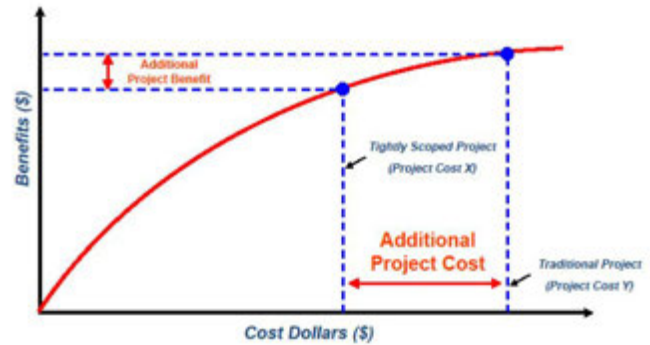
Figure 1: Metro District Highway Investment Plan: State Road Construction 2015-2030

## Guiding Principles

The work completed in Phase III relied upon the guiding principles and solution characteristics established for CMSP. The two guiding principles are the Right-Sizing of Projects and the Time Value of Resources. Both principles were referenced extensively in all Phase III outreach efforts and used to direct the path of the study.

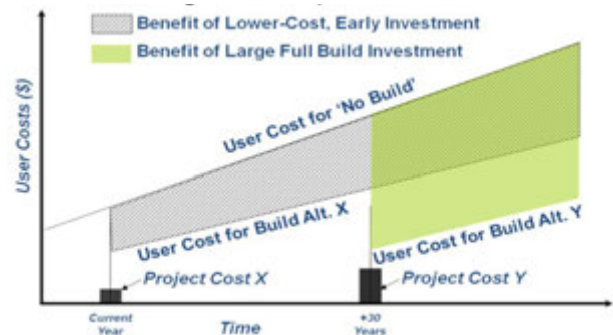
### Right-Sizing Projects

Effectively managing congestion and safety issues requires an understanding of the concept of diminishing returns. This is the point at which additional costs do not yield as great a benefit for the additional dollar invested. A lower-cost or more tightly scoped project may be likely to have a greater benefit to cost ratio. Additionally dollars "saved" as a result of this approach can be invested in other locations.



### Time Value of Resources

Congestion management alternatives may range from lower-cost investments that can be made sooner to higher-cost investments that cannot be made for a number of years due to funding constraints. While the lower-cost investment may not yield the same magnitude of benefit initially as the higher-cost investment, it may be more fiscally feasible and it may yield a greater cumulative benefit over the longer period of time because it was implemented earlier. This consideration is important when selecting tools to address congestion problems.



### CMSP Characteristics

Proposed solutions developed as CMSP opportunities are intended to meet most of the characteristics developed during the CMSP Study to help "define" what a CMSP project\* might look like. It is important to note that these guidelines were termed "characteristics" and not "rules" because not all solutions may adhere to all of them.

*\*CMSP projects are relatively inexpensive spot treatments aimed at improving the mobility, reliability, and safety of the roadway at those points.*

### CMSP Characteristics

1. Solutions attempt to improve mobility and/or safety
2. Solutions utilize existing pavement and right of way to the fullest extent possible
3. Solutions support future plans or visions
4. Solutions have shorter implementation timeframes
5. Solutions take advantage of other funded projects/leverage capabilities
6. Solutions are typically less than one mile in length
7. Solutions seek to improve transit advantages
8. Solutions are intended to tune system rather than expand it



## Implementation

While the CMSP Opportunity List is the final product of the Phase III study, it represents a snapshot of candidate lower-cost/high-benefit improvements to address critical problem locations. There are a number of additional steps to be undertaken by MnDOT Metro District before solutions become programmed improvements.

MnDOT anticipates that many CMSP solutions will be implemented as “opportunity driven projects”. This means that projects are implemented as part of another programmed investment, such as pavement or roadway preservation projects to take advantage of cost saving synergies. These considerations are expected to influence the order in which projects are scoped and implemented. Projects that are not implemented will remain on the list to be considered for reevaluation in future cycles.

### MnDOT Scoping and Selection Process

For all projects MnDOT implements, the current programming framework is an iterative process involving numerous offices, committees, and technical reviews by district staff. Candidate projects can come from a variety of sources including existing planning documents, MnDOT technical staff, and safety countermeasures – the CMSP Opportunity List will provide another source. From these sources, a subset of locations are selected for more detailed investigation and formal project scoping. This process provides greater detail on the realistic effort and costs associated with pursuing specific projects. With these details, MnDOT’s Metro District will identify the strongest contenders for inclusion in the four-year Transportation Improvement Program (TIP).

After identifying these opportunities, the scoping process is followed for all projects. As part of that process, the remaining projects will enter a new round of more detailed planning, design, and formal cost estimating. Project concepts that are the most suitable are ultimately added to the TIP for the upcoming cycle. Once in the TIP, projects will enter preliminary design and, if necessary, environmental review. During this process the final elements of the project scope, cost, and impacts are established.

### Local Collaboration and Opportunities

Due to MnDOT funding and staffing limitations, only a subset of concepts on the Opportunity List are expected to be carried forward for additional investigation. MnDOT recognizes these opportunities can provide benefits to the regional system, and looks forward to collaborating with local stakeholders desiring a more active role in moving specific projects forward. MnDOT welcomes partnerships to investigate, scope, design, document, and eventually construct projects led by cooperative agencies.





# Congestion Management and Safety Plan: Opportunity List/Potential Solutions\*

1	TH 5	CSAH 4 (Hennepin)	15	TH 36	WB at I-35E
	Low Risk			High Risk	
	Intersection geometric improvements				
2	TH 7	Aquila Ave/Blake Rd	16	TH 36	TH 120 (Century Ave)
	High Risk			High Risk	
	Intersection geometric improvements				
3	TH 8	CR 23/Green Lake Trl/Pioneer Rd	17	TH 47	Broadway Ave (Minneapolis)
	Low Risk			Low Risk	
	Intersection geometric and operational improvements				
4	TH 8	Chisago School	18	TH 47	CSAH 116 to 142nd Ave
	Low Risk			Medium Risk	
	Revise striping to improve safety				
5	TH 10	EB entrance to I-35W SB	19	TH 51	Larpenteur Ave
	Medium Risk			Medium Risk	
	Freeway geometric improvements				
6	TH 10	TH 47 Interchange	20	TH 55	TH 100 NB Exit Ramp
	Low Risk			Low Risk	
	Intersection geometric improvements				
7	TH 13	CSAH 21 (Scott)	21	TH 55	26th St
	Medium Risk			Low Risk	
	Intersection geometric and operational improvements				
8	I-35	CSAH 50 NB Entrance	22	TH 55	Between CSAH 42 East/West Junctions
	Low Risk			High Risk	
	Freeway geometric improvements				
9	I-35E	Maryland Ave to CR C	23	TH 61	TH 55 and 10th St (Hastings)
	High Risk			Low Risk	
	Freeway geometric improvements				
10	I-35E	TH 96 SB Entrance	24	TH 62	WB Entrance from SB TH 100
	Medium Risk			High Risk	
	Freeway geometric improvements				
11	I-35W	SB I-694 EB Entrance	25	TH 62	EB Loops at TH 100
	Medium Risk			High Risk	
	Freeway geometric improvements/auxiliary lane				
12	I-35W	I-694 Interchange Inside Loops	26	TH 62	WB Valley View Rd to TH 100
	High Risk			High Risk	
	Interchange improvements				
13	I-35W	CSAH 96 to I-694	27	TH 62	EB I-35W to TH 77
	Medium Risk			High Risk	
	Freeway geometric improvements/auxiliary lane				
14	I-35W	NB I-694 to CSAH 96	28	TH 62	WB TH 77 to I-35W
	Medium Risk			Very High Risk	
	Freeway geometric improvements/auxiliary lane				

\*Subject to further internal MnDOT review and scoping.

<b>29 TH 65</b> <b>Low Risk</b> Freeway geometric improvements	<b>CSAH 10</b>	<b>42 TH 169</b> <b>High Risk</b> Restriping to provide additional lane	<b>NB Minnesota River Crossing</b>
<b>30 I-94</b> <b>High Risk</b> Freeway geometric improvements	<b>WB Merge with NB I-494</b>	<b>43 TH 169</b> <b>Very High Risk</b> Interchange reconfiguration/access modification	<b>TH 55, Betty Crocker, I-394</b>
<b>31 I-94</b> <b>Very High Risk</b> Freeway geometric improvements/auxiliary lane	<b>EB Lyndale Ave to I-35W</b>	<b>44 TH 169</b> <b>High Risk</b> Freeway geometric improvements/auxiliary lanes	<b>I-394 to Medicine Lake</b>
<b>32 I-94</b> <b>High Risk</b> Freeway geometric improvements/auxiliary lane	<b>WB TH 55 to 11th St</b>	<b>45 TH 252</b> <b>Very High Risk</b> Additional lane/intersection geometric improvements	<b>85th Ave</b>
<b>33 I-94</b> <b>High Risk</b> Intersection geometric improvements/construct pedestrian bridge	<b>Dale St</b>	<b>46 I-394</b> <b>Medium Risk</b> Freeway geometric improvements	<b>WB TH 169 C-D Road</b>
<b>34 I-94</b> <b>Medium Risk</b> Freeway geometric improvements	<b>WB at I-35E South</b>	<b>47 I-394</b> <b>Low Risk</b> Freeway geometric improvements	<b>EB at TH 100</b>
<b>35 I-94</b> <b>High Risk</b> Freeway geometric improvements/auxiliary lane	<b>WB TH 52 to I-35E North</b>	<b>48 I-394</b> <b>Medium Risk</b> Freeway geometric improvements/additional lane	<b>WB at I-94</b>
<b>36 TH 100</b> <b>Low Risk</b> Freeway geometric improvements	<b>SB at I-394</b>	<b>49 I-494</b> <b>Very High Risk</b> Freeway geometric improvements/auxiliary lane	<b>EB France Ave to I-35W</b>
<b>37 TH 101</b> <b>High Risk</b> Intersection reconfiguration	<b>CSAH 61</b>	<b>50 I-494</b> <b>Very High Risk</b> Freeway geometric improvements/dynamic shoulder lanes	<b>TH 55 to East Fish Lake Rd</b>
<b>38 TH 101</b> <b>Low Risk</b> Intersection geometric improvements	<b>I-94 Interchange</b>	<b>51 I-494</b> <b>Low Risk</b> Intersection geometric and operational improvements	<b>CSAH 9 (Rockford Rd)</b>
<b>39 TH 120</b> <b>Low Risk</b> Additional lane/intersection geometric improvements	<b>Century College</b>	<b>52 I-694</b> <b>High Risk</b> Freeway geometric and interchange improvements	<b>WB approach to I-94/TH 252</b>
<b>40 TH 169</b> <b>Very High Risk</b> Grade separation	<b>TH 41</b>	<b>53 I-694</b> <b>Very High Risk</b> Freeway geometric improvements/additional lane	<b>WB at Rice St</b>
<b>41 TH 169</b> <b>Low Risk</b> Intersection geometric improvements	<b>Marschall Rd</b>		

*Risk categories were assigned to locations in the CMSP Opportunity List based on anticipated complexity and issues associated with potential solutions. More detailed descriptions of CMSP risk categories are provided on page 13.*



## Local Agency and Transit Operations Work Sessions

### Description of Work Sessions

CMSP Phase III undertook an extensive outreach effort through a series of interactive work sessions with local stakeholders and transit officials held between February and April 2011. The purposes of these work sessions were to inform and educate stakeholders on the goals and objectives of CMSP and to gather information about specific congestion and safety problem locations on MnDOT's trunk highway system.

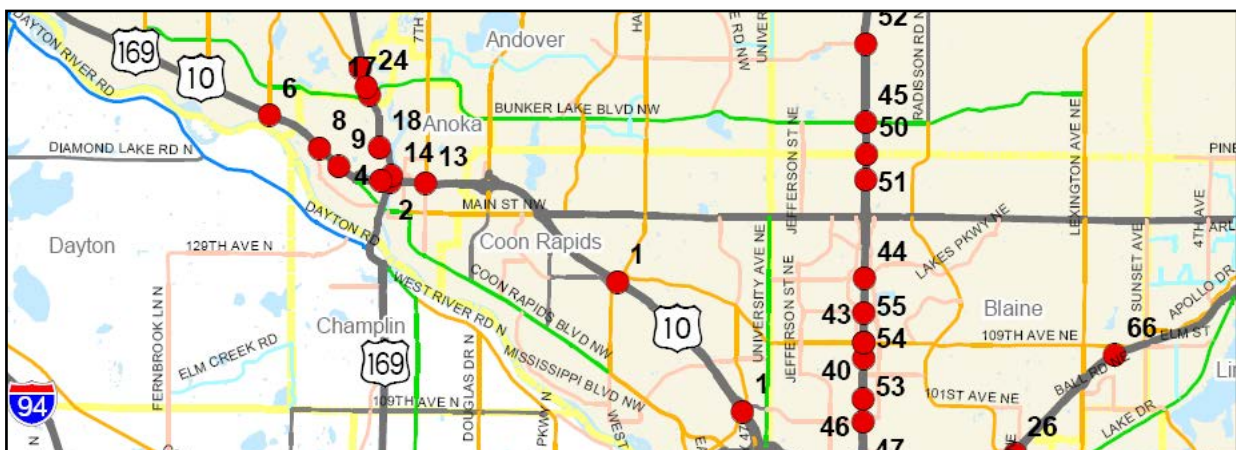
Local stakeholder input was particularly crucial for the identification of non-freeway trunk highway problem locations, where data is not as readily available. Rather, the CMSP problem identification process relied on a "boots on the ground" approach to gather this information.

The work sessions generally resulted in identification of 20 to 60 trunk highway problem locations for each county – 320 in total. Participants also identified a subset of their counties' problem locations as priority locations, typically five to ten specific issues that were agreed upon by most participants.

### Policy Comments

*A variety of comments/perceptions regarding MnDOT policies were prevalent among participants at the work sessions.*

- *Concern over MnDOT's inability to add capacity; MnDOT is primarily adding capacity through managed lanes*
- *Local agencies feel they are in a better position to acquire right-of-way more cost effectively than MnDOT*
- *Local agencies feel they have to supplement congested principal arterials by expanding parallel roadways*
- *CMSP funding could be a good opportunity for turnback projects*
- *CMSP is good, but there is no opportunity to upgrade two-lane roadways*
- *Signal timing is a big issue: local agencies expand side-street approaches only to have green time taken away*
- *Local agencies perceive design standards getting in the way of "right-sizing" projects*



Example of problem location map from Anoka County work session.

## Primary Screening

A primary screening was performed to quantitatively identify those problem locations with the most severe operational and safety issues. Traffic volume and crash costs were used to compare all of the problem locations considered, with those having the highest levels being carried forward for the development of solution concepts.

The complete list of congestion and safety problem locations included over 400 unique records. These locations were identified from the list of Phase I concepts, the Phase II *System Problem Statement* maps of congestion causes, and the Local Agency and Transit Operations Work Sessions.

The next step was to develop lower-cost/high-benefit solutions for a set of problem locations. To accomplish this effectively, the list of over 400 locations required was screened down to approximately 80 locations.

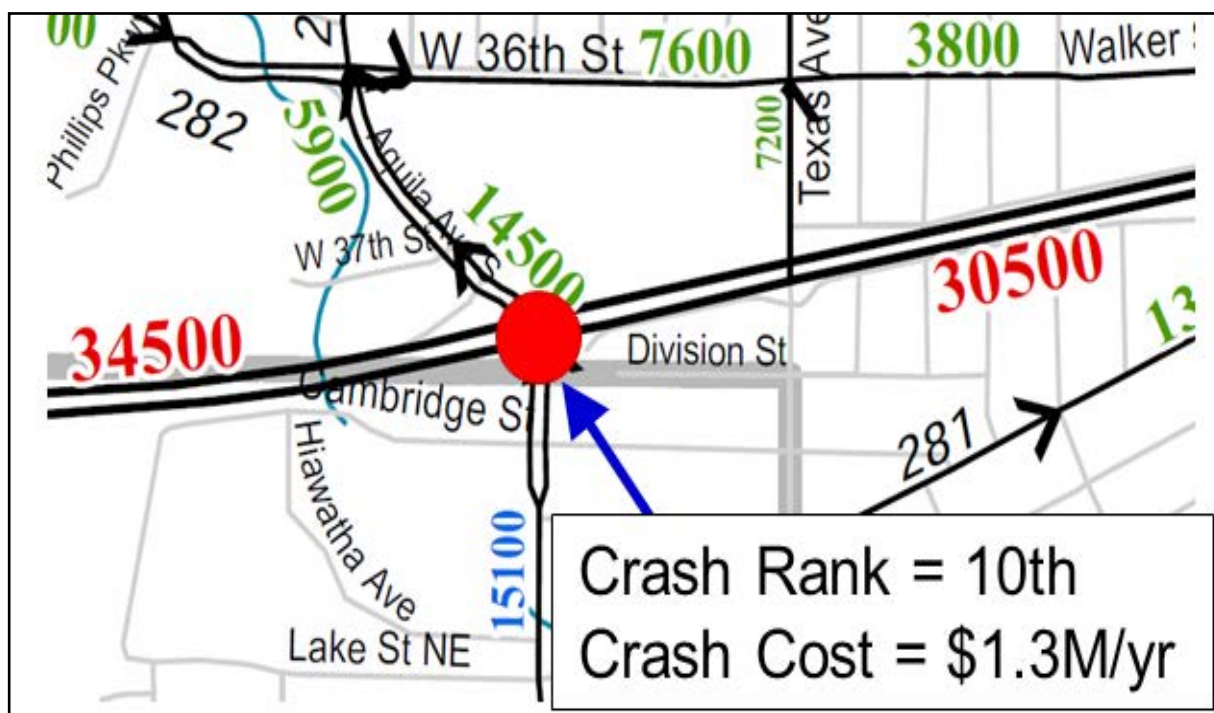
## Problem Location Categorization

In order to carry out reasonable comparisons of the problem locations, they were categorized by roadway type and link or node locations. Four roadway types were used.

- Four-lane freeways
- Six+ lane freeways
- Expressways (signalized trunk highways with four or more lanes)
- Arterials (two-lane signalized trunk highways)

## Project Screening

For each category, the problem locations were screened based on traffic volumes and crash data.



## CMSP Design Charrettes

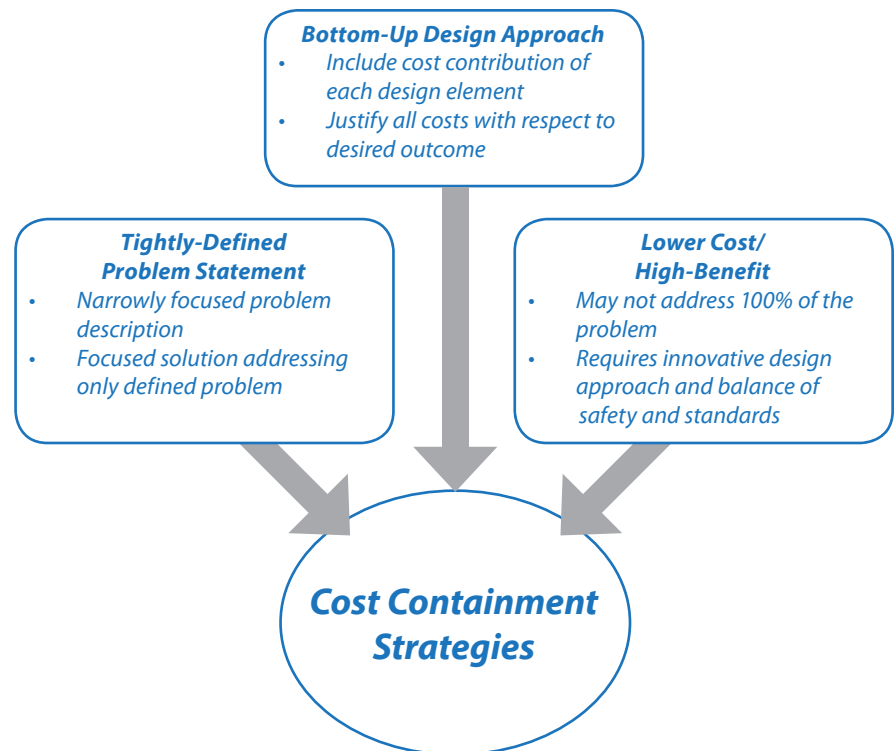
A series of intensive design charrettes were held to develop potential solutions for selected regional problem locations. These events assembled MnDOT, FHWA, and SRF engineers with expertise in highway design, cost estimating, and traffic operations. An extensive preparation effort was undertaken to provide participants with the necessary information to develop concepts for all of the problem locations under consideration in a very short period of time.

The CMSP Design Charrettes resulted in proposed solutions for 63 problem locations. These solutions were selected based on their potential for maximizing benefits to travelers while minimizing costs to address the congestion and safety problems.

**Data Sources** – An extensive inventory of existing conditions data were made available to charrette designers to assist in the development of effective solution concepts.

Charrette products included:

- Concept sketch
- Solution worksheet
- Concept estimate
- Solution effectiveness



### "The Numbers"

**3** – Design Charrette events

**17** – Participants

**22.8** – Average minutes to develop each concept

**24** – Hours of design/estimating/evaluation

**63** – Solutions proposed

**79%** – Highest solution effectiveness

**\$4,000** – Lowest concept estimate

**\$209,000,000** – Total estimate of proposed solutions

## Secondary Screening

The proposed solutions developed at the Design Charrettes were scored and ranked in the secondary screening process. The scoring used the quantified attributes for the proposed solutions of problem magnitude, concept estimates, and effectiveness. The score for each solution was expressed as a return period, or the length of time needed for accrued benefits to cover the concept estimate. Supplemental information for the solutions was added to the list to assist decision-makers in selecting projects for scoping.

### Geometric Review Session

Following the initial ranking of solutions in the secondary screening process, a geometric review session was held with MnDOT functional area and FHWA staff.

This event also included discussion regarding the accuracy of the concept estimates and the risks associated with implementing the proposed solutions. This demonstrated the need for additional information on the secondary screening list that can inform decision makers of a variety of conditions that may influence the costs or feasibility of specific locations.

**CMSP Risk Categories** were assigned based on typical features of solutions in each range.

- **Low:** minimal pavement, improvements within the existing roadway footprint
- **Medium:** concepts may include more substantial construction activities but are still confined to the existing footprint
- **High:** some structural elements, more substantial pavement addition; potentially sensitive to soil conditions, may trigger need for drainage and ponding
- **Very High:** costly and complex projects; could result in major changes to roadway facilities including mainline capacity, local access, right of way, and environmental documentation

**Design Exceptions** may potentially be required for some of the proposed solutions in the secondary screening. It should be noted that the design request and approval process may add time and effort to the project development process.

**CMSP Characteristics** may not all be met for some of the proposed solutions in order to balance the scope of the solution with the problem magnitude. Maintaining flexibility in the development of concepts is precisely why these guidelines were termed “characteristics” and not “rules”.

**Other Considerations** were also documented for some highway improvements. In many cases, a highly detailed review of the project area will be required to reveal these conditions and how they might influence the design or cost of potential solutions.



## Phases I and II Background

This summary provides an overview of the critical steps undertaken to develop the CMSP Opportunity List. CMSP Phases I and II preceded these effort and laid the foundation for identification of projects opportunities. The following products were produced in these earlier phases, and can be obtained from MnDOT upon request.

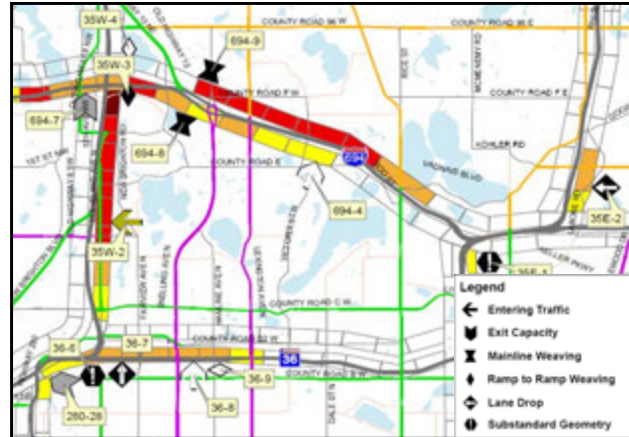
The **System Problem Statement** documented all of the congestion causes on the instrumented highway system shown in the *2008 Congestion Report*. Peak period congestion locations were classified into types of congestion causes (such as entering/exiting traffic, weaving, lane drop, etc.). A total of 210 individual congestion causes were identified and depicted visually on maps of the system.

The **Congestion Management Strategies, Tools, and Application Framework** established much of the approach for Phase III. This technical memorandum included the guiding principles: Right-Sizing of Projects and the Time Value of Resources. It also included extensive lists of tools to address safety and congestion on freeway and non-freeway facilities.

**Project-Specific Before and After Studies** were performed for a number of lower-cost/high-benefit projects that were recently implemented in the Twin Cities. The results demonstrated that these types of solutions could effectively improve safety and congestion issues for a fraction of the investment required for traditionally scoped projects.

**Congestion Management Case Studies** were summarized from similar efforts in other regions. These included active traffic management in Seattle, Washington; managed lanes in Houston, Texas; hard shoulder running in Germany; and bottleneck removal in Dallas, Texas.

The **Flexible Design and Managed Corridor Workshops** were held in July 2009 to introduce transportation professionals in the Twin Cities region to these innovative approaches. The flexible design workshop provided an overview of creative improvement concepts and a discussion of context sensitive solutions. The managed corridor workshop was headlined by a presentation on integration of roadways and technologies within corridors to maximize system performance. The events engaged national experts in these fields via video conference.





## Phase III Study Products

The Phase III evaluations described in this report were documented following the completion of each step throughout the study. These technical memorandums provide additional details about the analytical tools used for the inventory, evaluation, and prioritization of problem locations on the system.

### Initial Screening of Phase I Candidate Projects

The first phase of CMSP, then titled the Congestion Management Planning Study and completed in 2007, produced a list of 186 lower-cost projects. As of the start of Phase III, 30 of these had been implemented, either as lower-cost/high-benefit demonstration projects, as part of the I-35W bridge traffic restoration effort, or through the American Recovery and Reinvestment Act. This stage included review of the remaining solutions on the list and linking them to the congestion causes identified in the System Problem Statement.

### Local Agency and Transit Operations Work Sessions

Participation in these work sessions was robust – with over 70 participants representing all eight counties as well as many cities and transit operators. A compendium was prepared that included lists and maps of problem locations identified at all of the work sessions.

### Primary Screening

Details of the analysis performed for the Primary Screening were documented in a technical memorandum. This includes a full listing of data sources including traffic volumes and crash rankings, and how they were assigned to problem locations using GIS techniques.

### CMSP Design Charrettes – Preparations and Outcomes

A memorandum was prepared documenting the preparation carried out to provide charrette participants with guidance and information for the event including detailed congestion and safety problem statements, traffic volume data, tools lists, unit cost estimates, right of way maps, bridge plans, and design manuals.

The design concepts for high-priority problem locations developed at the charrettes were documented in a separate memorandum. This includes the names of the participants, dates of the events, and an example of the type of discussion for an interesting problem location.

### Secondary Screening

The analysis performed for the Secondary Screening was documented in a technical memorandum. This includes details of the calculations of the scoring and ranking process and the CMSP Opportunity List. This document also summarizes the proceedings and outcomes of the Geometric Review Session.

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