

Minnesota Statewide Freight System Plan

Task 4.2 - Freight System Needs, Issues and Opportunities

draft report

prepared for

Minnesota Department of Transportation

prepared by

Cambridge Systematics, Inc.

with

SRF Consulting Group, Inc.
Kimley-Horn and Associates, Inc.
Leo Penne Consulting

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Cambridge Systematics, Inc.
115 South LaSalle Street, Suite 2200
Chicago, IL 60603

date

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Table of Contents

1.0	Introduction	1-1
2.0	Condition and Performance of the Freight System	2-1
2.1	Minnesota’s Compliance with U.S. DOT Guidance	2-1
2.2	Economy Performance Measures	2-3
2.3	Mobility Performance Measures.....	2-6
2.4	Infrastructure Condition Performance Measures	2-11
2.5	Safety Performance Measures.....	2-15
2.6	Overall Assessment of Multimodal Freight System Condition and Performance.....	2-18
3.0	Freight System Needs and Issues	3-1
3.1	Stakeholder Outreach.....	3-2
3.2	Support Minnesota’s Economy.....	3-5
3.3	Improve Minnesota’s Mobility	3-9
3.4	Preserve Minnesota’s Infrastructure	3-11
3.5	Safeguard Minnesotans.....	3-14
3.6	Protect Minnesota’s Environment and Communities	3-16
3.7	Integrate Freight Throughout Minnesota.....	3-18
4.0	Freight System Opportunities	4-1
5.0	Next Steps	5-1
A.	NPMRDS Analysis	A-1
B.	Summary of Minnesota Statewide Freight Summit Feedback	B-1
B.1	Small Group Discussion #1: Public-Private and Public-Public Partnerships.....	B-1
B.2	Small Group Discussion #2: Minnesota’s Strategic Freight Network	B-3
B.3	Small Group Discussion #3: Minnesota Supply Chains	B-5
B.4	Small Group Discussion #4: Chokepoints on Minnesota’s Freight System	B-7
B.5	Small Group Discussion #5: Strengthening Minnesota’s Economic Competitiveness	B-9

C. Online Survey Results	C-1
C.1 Mobility	C-1
C.2 Infrastructure.....	C-6
C.3 Safety, Environment and Community.....	C-11
C.4 Economy	C-13
C.5 Organization and Policy	C-13

List of Tables

Table 2.1	Top AM Peak Bottlenecks by Average Truck Speed (October 2014)	2-8
Table 2.2	Top PM Peak Bottlenecks by Average Truck Speed (October 2014)	2-8
Table 2.3	Top AM Peak Bottlenecks by Truck Travel Time Reliability (October 2014).....	2-9
Table 2.4	Top PM Peak Bottlenecks by Truck Travel Time Reliability (October 2014).....	2-9
Table 2.5	Crashes Involving Commercial Vehicles - 2014	2-16
Table 2.6	10-Year Accident/Incident Overview by Calendar Year, Minnesota.....	2-17
Table 2.7	Overall Assessment of Multimodal Freight System	2-19
Table 3.1	Minnesota Statewide Freight System Plan Committees.....	3-2
Table 3.2	Minnesota Statewide Freight System Plan Outreach Techniques.....	3-3
Table 3.3	Summary of Needs Related to Supporting Minnesota’s Economy	3-8
Table 3.4	Summary of Needs Related to Improving Minnesota’s Mobility ...	3-10
Table 3.5	Summary of Needs Related to Preserving Minnesota’s Infrastructure	3-14
Table 3.6	Summary of Needs Related to Safeguarding Minnesotans	3-16
Table 3.7	Summary of Needs Related to Protecting Minnesota’s Environment and Communities	3-18
Table 3.8	Summary of Needs Related to Integrating Freight Throughout Minnesota.....	3-21

List of Figures

Figure 2.1	Mode Share by Weight, 2012 and 2040	2-4
Figure 2.2	Mode Share by Value, 2012 and 2040.....	2-5
Figure 2.3	Minnesota 2012 Transportation Results Scorecard (Freight)	2-5
Figure 2.4	Truck Commodity Value and Truck Delay.....	2-7
Figure 2.5	Minnesota 2012 Transportation Results Scorecard (State Highway Operations).....	2-10
Figure 2.6	Ride Quality Index Performance Categories.....	2-12
Figure 2.7	NBI Deck Condition Description.....	2-12
Figure 2.8	Ride Quality Index on the Principal Freight Network	2-13
Figure 2.9	Bridge Deck Condition on the Principal Freight Network	2-14
Figure 2.10	Minnesota 2012 Transportation Results Scorecard (Asset Management).....	2-15
Figure 2.11	Minnesota 2012 Transportation Results Scorecard (Safety).....	2-17
Figure 2.12	10-Year Accident/Incident Overview by Calendar Year, Minnesota.....	2-18
Figure 3.1	Freight Investments Shape the Economy	3-5
Figure A.1	Statewide Average Truck Speed – AM Peak (October 2014).....	A-1
Figure A.2	Statewide Average Truck Speed – Midday Peak (October 2014).....	A-2
Figure A.3	Statewide Average Truck Speed – PM Peak (October 2014).....	A-3
Figure A.4	Metro Area Average Truck Speed – AM Peak (October 2014).....	A-4
Figure A.5	Metro Area Truck Speed – Midday Peak (October 2014).....	A-5
Figure A.6	Metro Area Truck Speed – PM Peak (October 2014).....	A-6
Figure A.7	Metro Area Speed Bottlenecks – AM Peak (October 2014)	A-7
Figure A.8	Metro Area Speed Bottlenecks – PM Peak (October 2014).....	A-8
Figure A.9	Metro Truck Reliability Index – AM Peak (October 2014)	A-9
Figure A.10	Metro Truck Reliability Index – Midday Peak (October 2014).....	A-10
Figure A.11	Metro Truck Reliability Index – PM Peak (October 2014).....	A-11
Figure A.12	Top Reliability Bottlenecks – AM Peak (October 2014).....	A-12

Figure A.13 Top Reliability Bottlenecks - PM Peak (October 2014).....A-13
Figure C.1 Identified Mobility Issue Locations: Highway System..... C-2
Figure C.2 Identified Mobility Issue Locations: Rail System C-4
Figure C.3 Identified Mobility Issue Locations: Waterway System..... C-6
Figure C.4 Identified Infrastructure Issue Locations: Highway System C-8
Figure C.5 Identified Infrastructure Issue Locations: Rail System..... C-9
Figure C.6 Identified Infrastructure Issue Locations: Waterway System..... C-10
Figure C.7 Identified Community Issue Locations: Highway System C-12

1.0 Introduction

The objective of *Task 4 – Project Development Guidance* of the Minnesota Statewide Freight System Plan (Plan) was to assess the condition and performance of Minnesota’s freight transportation system and to identify the most important needs, issues and opportunities of that system. This Tech Memo accomplishes this utilizing both “bottom up” and “top down” approaches. In this approach, several critical “building blocks” were essential:

- **Freight System Performance Measures.** A quantitative “top down” approach using performance measures developed in Subtask 4.1 identifies potential system hot spots of activity and bottlenecks, as the data were available, on Minnesota’s Principal Freight Network.
- **Stakeholder Outreach.** Interviews with key stakeholders and with various users of the freight system are being conducted in Task 1 as a “bottom up” approach to identifying issues and deficiencies. Extensive outreach to a wide array of private sector freight stakeholder and the general public was also conducted.
- **Previous Studies and Plans.** These new qualitative and quantitative results generated in this Plan build on recent plans (e.g., regional freight studies, State Rail Plan, etc.) that include detailed analyses to identify capacity constraints, bottlenecks, and operational concerns – these were identified in Task 2.

This multipronged process provided a comprehensive multimodal evaluation of Minnesota’s freight system and identified issues, areas of critical need, and opportunities that MnDOT should consider focusing on in all freight-related endeavors in the future.

This Tech Memo is organized into the following sections:

- **Section 2.0 – Condition and Performance of the Freight System in Minnesota.** This section applies the freight performance measures determined through the Ad Hoc Working Group discussions in Task 4.1, and provides an assessment of the freight systems condition and performance (focused on the highway system).
- **Section 3.0 – Freight System Needs and Issues.** This section describes the outreach conducted during Plan development and links results of the condition and performance evaluation and stakeholder perspectives to identify multimodal freight system needs and issues.
- **Section 4.0 – Freight System Opportunities.** This section highlights a handful of opportunities MnDOT should incorporate in its activities and processes moving forward.

- **Section 5.0 – Next Steps.** This section briefly notes how the findings in this Tech Memo will be used during continued Plan development.

2.0 Condition and Performance of the Freight System

This section describes the process used to measure, and the resultant assessment of, the condition and performance of the freight system in Minnesota.

2.1 MINNESOTA'S COMPLIANCE WITH U.S. DOT GUIDANCE

U.S. DOT Guidance

The Moving Ahead for Progress in the 21st Century Act (MAP-21) legislation¹ includes specific guidance for state's developing State Freight Plans, detailed in Section 1118.² As specified in Section 1118, a State Freight Plan must include a description of how the plan will improve the ability of the State to meet the national freight goals established under 23 U.S.C. 167. These National Freight Policy goals include:

- Improve the contribution of the freight transportation system to economic efficiency, productivity, and competitiveness;
- Reduce congestion on the freight transportation system;
- Improve the safety, security, and resilience of the freight transportation system;
- Improve the state of good repair of the freight transportation system;
- Use advanced technology, performance management, innovation, competition, and accountability in operating and maintaining the freight transportation system; and
- Reduce adverse environmental and community impacts of the freight transportation system.

¹ Moving Ahead for Progress in the 21st Century Act (MAP-21) Legislation, <https://www.fhwa.dot.gov/map21/legislation.cfm>

² Interim Guidance on State Freight Plans and State Freight Advisory Committees, Federal Register, <https://www.federalregister.gov/articles/2012/10/15/2012-25261/interim-guidance-on-state-freight-plans-and-state-freight-advisory-committees#h-13>

In order to effectively contribute to these goals, Minnesota must first assess how the State fits within the National freight picture with respect to these goals. This is done in part through an assessment of the condition and performance of the freight system in Minnesota.

Also specified in Section 1118, a State Freight Plan must include the performance measures that will guide the freight-related transportation investment decisions of the State. U.S. DOT recommends that this include an analysis of the condition and performance of the State's freight transportation system and that analysis includes the identification of bottlenecks in the freight transportation system that cause delays and unreliability in freight movements, as well as other specific locations that are in a poor state of good repair, create safety hazards, or create other performance problems. In general, U.S. DOT recommends that measures of conditions and performance reflect the State's freight transportation goals—for each goal, there would be at least one measure that indicates how well the freight transportation system is doing in achieving that goal.

Minnesota's Compliance

As guided by U.S. DOT, the Minnesota Department of Transportation (MnDOT) developed freight-specific performance measures (and indicators) through which monitor freight system activity and assess the condition and performance of the freight transportation system. This was done as part of *Task 4 - Project Development Guidance* of the Statewide Freight System Plan (Plan), and was also the focus area for one of the Plan's Ad Hoc Working Groups. This process is thoroughly documented in a companion Tech Memo.

The focus of freight performance measure development was to link to expected U.S. DOT performance measure guidance and build on MnDOT's existing programs by identifying ways existing measures could be viewed through a "freight lens." Performance measures were developed to generally align with Minnesota's long range transportation vision, Minnesota GO, and MnDOT's active performance measurement program. Performance measure categories link to U.S. DOT's National Freight Policy goals, as well as freight planning best practices, and include:

- Economy
- Mobility
- Infrastructure Condition
- Safety

The remainder of Section 2.0, documents the application of Minnesota's freight system performance measures in each of these categories. When possible, the

measures are applied to Minnesota's Principal Freight Network (PFN),³ or to the entire statewide transportation system, when indicated.

2.2 ECONOMY PERFORMANCE MEASURES

The link between transportation and economic measures has become more important as a political and programming consideration in recent years. A reliable multimodal freight system is key to the success of Minnesota's economic engine, and understanding the relationship between freight and the economy is an important part of developing a comprehensive set of performance measures.

Freight system demand measures are some of the most commonly used indicators of performance, as they are relatively straightforward to measure and serve as foundational measures for how the system is utilized. Freight system demand is a foundational category that can shed light on each part of the multimodal transportation system, its condition and use, and provide critical inputs in policy development and program decision-making.

Collecting and maintaining freight system demand data provides a base-level understanding of strategic system concepts, such as the modes that are conveying goods, the share moved by each mode, and the commodities conveyed. Additionally, many other performance measure categories, such as safety and mobility, rely on demand measures to accurately express the scale and importance of the measurement. System level information is valuable and relatively easy to obtain. Demand measures can provide additional value when applied at the region, and corridor levels, yet often this level of information is more difficult to obtain.

Two economy (demand) performance indicators are:

- **Freight Mode Share in Minnesota (tons)**
- **Freight Mode Share in Minnesota (value)**

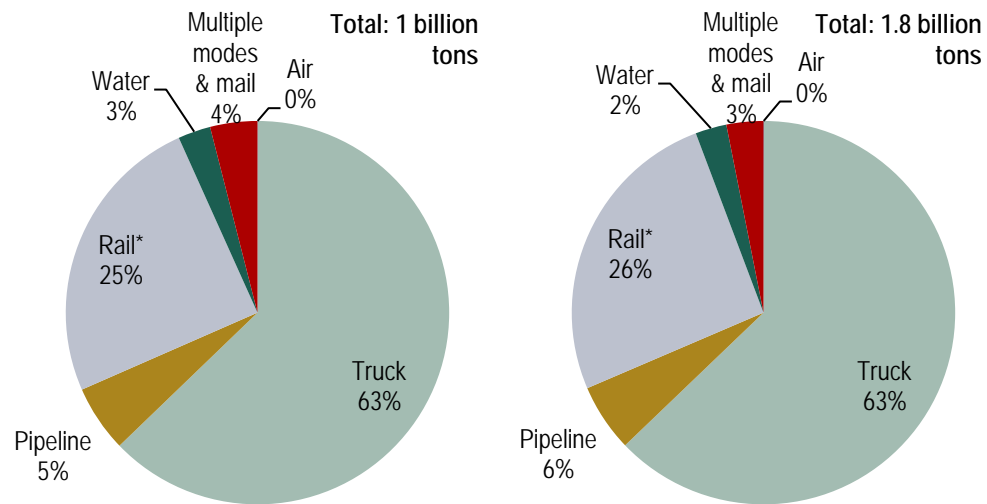
Analysis using Federal Highway Administration (FHWA) Freight Analysis Framework (FAF) data and Surface Transportation Board (STB) Confidential Waybill Sample data was conducted to determine the tons and value of freight moving on each of Minnesota's modal transportation networks.

In 2012, one billion tons of freight moved over Minnesota's transportation system, as shown in Figure 2.1. Trucks carried 63 percent of all inbound, outbound, intrastate and through freight tonnage, while rail (carload and

³ Minnesota's Principal Freight Network (PFN) was designated as part of *Task 4 – Project Development Guidance* of the Statewide Freight System Plan (Plan), and was also the focus area for one of the Plan's Ad Hoc Working Groups. The designation process and results are thoroughly documented in a companion Tech Memo.

intermodal) carried about 25 percent.⁴ By 2040, the FAF forecast indicates total volume will amount to 1.8 billion tons, an increase of 44 percent overall. With mode shares somewhat remaining unchanged through the forecast period, rail volumes are expected to grow proportionately.

Figure 2.1 Mode Share by Weight, 2012 and 2040



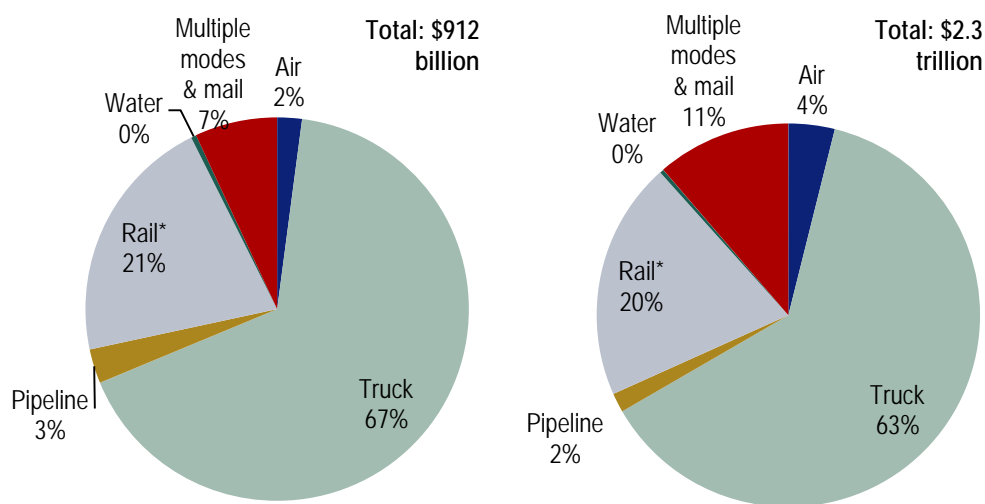
Source: FHWA FAF3 2015 Provisional estimates and 2040 Forecast, and through truck traffic estimated by routing these data; and, STB 2012 Confidential Carload Waybill Sample and FHWA FAF 3.5 forecast for 2040 processed by Cambridge Systematics.

Note: *Rail intermodal was excluded from Multiple Modes and Mail and included in Rail.

Figure 2.2 shows the proportional value carried by each of Minnesota’s freight modes. In 2012, \$912 billion in freight moved over the state’s transportation system, an amount that is expected to grow 161 percent to \$2.3 trillion by 2040. Trucks carried 67 percent of the state’s freight value and by 2040 this share is expected to decrease to 63 percent. Rail carried 21 percent of the freight value; this share is expected to remain somewhat constant through the forecast period.

⁴ The data source for freight demand for other modes but rail was FHWA’s FAF version 3.5. FAF utilizes a 2007 base year with synthesized 2012 values, and a 2040 forecast.

Figure 2.2 Mode Share by Value, 2012 and 2040

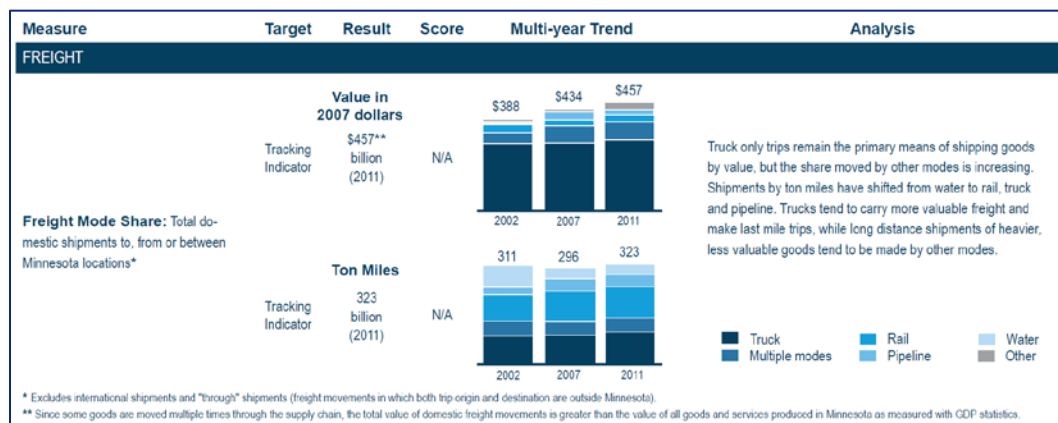


Source: FHWA FAF3 2015 Provisional estimates and 2040 Forecast, and through truck traffic estimated by routing these data; and, STB 2012 Confidential Carload Waybill Sample and FHWA FAF 3.5 forecast for 2040 processed by Cambridge Systematics.

Note: *Rail intermodal was excluded from Multiple Modes and Mail and included in Rail.

Minnesota’s Annual Transportation Performance Report has also provided this type of information since 2002. The historic trends shown in Figure 2.3 imply continued growth in value and ton-miles shipped, and that trucking has been, and will continue to be, the dominant mode by both tons and value. However, rail leads by ton-miles shipped, due to its long haul efficiency, and shows an increasing trend.

Figure 2.3 Minnesota 2012 Transportation Results Scorecard (Freight)



Source: Annual Transportation Performance Report, MnDOT, 2012

2.3 MOBILITY PERFORMANCE MEASURES

Freight system mobility measures can cover a wide range of aspects of the transportation system. For the purpose of this report, these measures particularly focus on delay, congestion, and overall reliability of the highway system. In particular, it is important to understand how these issues affect the highway portion of the PFN, which includes 5,350 miles of roadways throughout the state and facilitates connections between key facilities and modes. Knowing where these issues (and bottlenecks) arise on freight significant corridors can inform policy and investment decision-making.

The two highway-focused mobility performance measures are:

- **Annual Hours of Truck Delay (AHTD)**
- **Truck Reliability Index (RI80)**

The performance of Minnesota's highway system using these two measures is described in the next two sections.

Annual Hours of Truck Delay (AHTD)

In its most recent Urban Mobility Report (2012), the Texas Transportation Institute calculated that nationally, transportation congestion costs citizens about \$121 billion in delay and fuel expenses, and 5.5 billion hours of extra time spent in transit. Of this total, 22 percent (\$27 billion) was attributed to the effect of congestion on truck operations, which in turn impacts business operating expenses, supply chain reliability, and ultimately, costs to consumers. The Minneapolis-St. Paul area is ranked 24th in annual truck delay, 17th in truck commodity value, and 19th in total annual delay, as shown in Figure 2.4. As demand for goods and services continues to grow, the issue of AHTD will expand as shippers seek out efficiencies in their supply and distribution chains.

Figure 2.4 Truck Commodity Value and Truck Delay

Urban Area	Total Annual Delay		Annual Truck Delay			Truck Commodity Value	
	(1,000 Hours)	Rank	(1,000 Hours)	Rank	Congestion Cost (\$million)	(\$ million)	Rank
Large Average (32 areas)	39,747		2,402		182	63,077	
Baltimore MD	70,263	17	5,017	15	379	96,445	19
Denver-Aurora CO	76,154	15	4,162	16	316	76,748	22
Riverside-San Bernardino CA	51,195	21	4,124	17	310	109,604	14
St. Louis MO-IL	49,605	22	4,028	19	300	107,500	15
Orlando FL	46,607	25	3,265	20	248	63,858	32
Tampa-St. Petersburg FL	62,876	18	3,223	21	246	62,643	33
Indianapolis IN	35,186	35	3,222	22	241	85,407	21
Portland OR-WA	51,987	20	3,178	23	244	65,610	30
Minneapolis-St. Paul MN	60,788	19	3,110	24	232	97,828	17
Cincinnati OH-KY-IN	42,785	29	3,039	25	230	65,182	31
Pittsburgh PA	46,725	24	2,833	26	213	70,352	25
Nashville-Davidson TN	35,781	33	2,635	27	199	66,124	29
Sacramento CA	39,138	31	2,268	28	172	52,561	37
Charlotte NC-SC	28,974	38	2,222	29	168	69,136	26
San Juan PR	45,991	27	2,213	30	176	23,406	60
Austin TX	38,307	32	2,083	31	157	33,256	52
Memphis TN-MS-AR	28,700	39	2,027	32	153	99,459	16
San Jose CA	47,385	23	1,990	34	153	52,751	36
Kansas City MO-KS	29,448	37	1,974	35	148	72,882	23
Columbus OH	35,689	34	1,944	36	145	70,584	24
Louisville KY-IN	26,253	42	1,930	38	145	55,941	35
San Antonio TX	39,998	30	1,865	39	139	51,263	39
Las Vegas NV	45,419	28	1,806	40	137	36,032	49
Milwaukee WI	27,755	40	1,746	41	131	67,328	28
Virginia Beach VA	46,172	26	1,741	42	131	43,521	42
Cleveland OH	34,980	36	1,729	43	130	68,720	27
New Orleans LA	19,125	52	1,690	44	127	34,397	50
Jacksonville FL	22,629	46	1,366	48	103	42,002	44
Buffalo NY	21,545	48	1,315	49	102	48,933	41
Raleigh-Durham NC	17,923	54	1,268	50	96	50,194	40
Salt Lake City UT	21,903	47	949	54	71	56,934	34
Providence RI-MA	24,618	44	893	56	69	21,863	61

Very Large Urban Areas—over 3 million population.

Large Urban Areas—over 1 million and less than 3 million population.

Travel Delay—Travel time above that needed to complete a trip at free-flow speeds for all vehicles.

Truck Delay—Travel time above that needed to complete a trip at free-flow speeds for large trucks.

Truck Commodity Value—Value of all commodities moved by truck estimated to be traveling in the urban area.

Note: Please do not place too much emphasis on small differences in the rankings. There may be little difference in congestion between areas ranked (for example) 6th and 12th. The actual measure values should also be examined.

Also note: The best congestion comparisons use multi-year trends and are made between similar urban areas

Medium Urban Areas—over 500,000 and less than 1 million population.

Small Urban Areas—less than 500,000 population.

Source: Urban Mobility Report-2012. Texas Transportation Institute.

Truck Reliability Index (RI80) and Average Truck Speed

Using the National Performance Management Research Data Set (NPMRDS), the Truck Reliability Index (RI80) and average truck speed on the PFN was determined for Minnesota. The NPMRDS is a vehicle probe-based travel time data set acquired by the FHWA to support its Freight Performance Measures program. The NPMRDS consists of average travel times reported every 5 minutes on the National Highway System (NHS) as defined in MAP-21 (which aligns with the highway system designation for Minnesota's PFN). Appendix A includes the complete series of analyses conducted using a sample period of October 2014 during the AM Peak (5-10 AM), Midday Peak (10 AM-2 PM), and PM Peak (2-7 PM) hours.

Tables 2.1 through 2.4 identify the Top Ten AM and PM peak bottlenecks by both average truck speed and reliability. Figures for these bottlenecks are provided in Appendix A (Figures A.7 and A.8 show speed bottlenecks, and Figures A.12 and A.13 show reliability bottlenecks). For this analysis, Reliability is equal to the 80th Percentile Truck Travel Time/ Truck Travel Time at Threshold Speed, where the Threshold Speed is 45 mph.

As shown, Minnesota's highway system is becoming increasingly congested, and in particular in the Minneapolis-St. Paul area. While congested segments are

present throughout the state on the highway system, all of the truck system bottlenecks based on either speed or reliability are in the Metro District.

Table 2.1 Top AM Peak Bottlenecks by Average Truck Speed (October 2014)

Rank	Roadway	County	Length (Miles)	Average Truck Speed (mph)
1	I-394	Hennepin	0.37	3.48
2	US-52	Ramsey	0.11	7.77
3	I-35E	Ramsey	0.12	9.71
4	MN-101	Wright	1.30	9.96
5	MAIN ST	Hennepin	1.32	10.04
6	US-52	Ramsey	0.13	10.94
7	I-394	Hennepin	0.55	11.49
8	MN-62	Hennepin	0.33	11.60
9	MN-77	Hennepin	0.50	11.96
10	I-394	Hennepin	0.36	12.22

Source: FHWA National Performance Management Research Data Set

Table 2.2 Top PM Peak Bottlenecks by Average Truck Speed (October 2014)

Rank	Roadway	County	Length (Miles)	Average Truck Speed (mph)
1	I-35W	Hennepin	0.15	5.97
2	MN-65	Hennepin	0.50	6.44
3	I-35E	Ramsey	0.38	7.21
4	I-35W	Hennepin	0.16	7.27
5	I-35W	Hennepin	0.27	7.67
6	I-35W	Hennepin	0.14	7.82
7	MN-62	Hennepin	0.33	8.25
8	US-169	Hennepin	0.077	8.93
9	I-35E	Ramsey	0.40	9.43
10	I-94	Hennepin	0.62	9.60

Source: FHWA National Performance Management Research Data Set

Table 2.3 Top AM Peak Bottlenecks by Truck Travel Time Reliability (October 2014)

Rank	Roadway	County	Length (Miles)	Truck Travel Time Reliability
1	MN-101	Wright	1.30	8.04
2	I-394	Hennepin	0.36	6.47
3	I-394	Hennepin	0.55	6.03
4	Main St	Hennepin	1.32	5.17
5	I-35E	Ramsey	0.45	5.16
6	I-94	Hennepin	1.71	4.39
7	I-35E	Ramsey	0.12	4.24
8	I-35E	Ramsey	0.12	4.18
9	I-35W	Dakota	0.59	4.15
10	MN-36	Ramsey	0.66	3.74

Source: FHWA National Performance Management Research Data Set

Table 2.4 Top PM Peak Bottlenecks by Truck Travel Time Reliability (October 2014)

Rank	Roadway	County	Length (Miles)	Truck Travel Time Reliability
1	I-35W	Hennepin	0.15	10.78
2	MN-62	Hennepin	0.33	9.06
3	MN-65	Hennepin	0.50	8.91
4	I-35W	Hennepin	0.16	8.08
5	I-35W	Hennepin	0.27	8.04
6	I-35W	Hennepin	0.14	8.01
7	US-169	Hennepin	0.077	6.50
8	I-394	Hennepin	0.55	6.50
9	I-94	Hennepin	0.62	6.30
10	I-35W	Hennepin	0.25	6.05

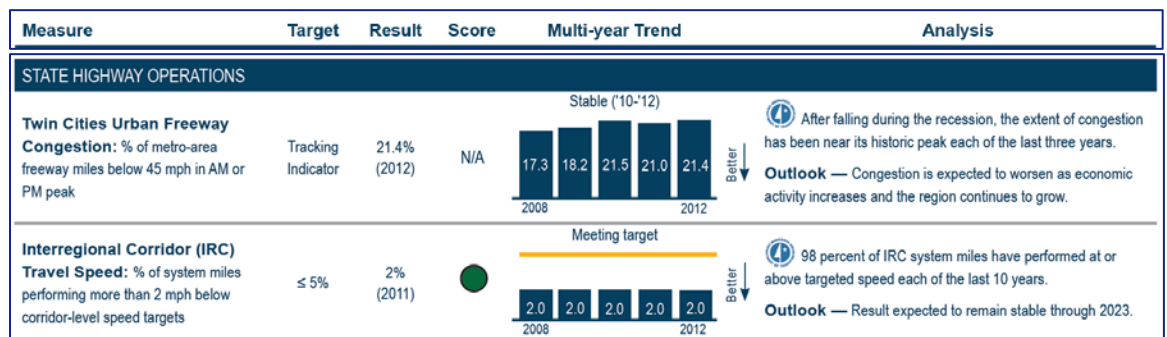
Source: FHWA National Performance Management Research Data Set

Minnesota's most recent Annual Transportation Performance Report provides similar information dating back to 2008. Figure 2.5 shows the percent of total urban freeway miles in the Twin Cities below 45 mph. While congested miles

decreased slightly during the recession, in recent years percent of congested miles has been at historic highs. It is expected that as vehicular and truck traffic increases in urban areas, so too will the percent of congested roadways.

Figure 2.5 also shows the percent of interregional corridor miles that are performing at least 2 mph below the target speed. Unlike the urban areas, these corridors are generally exceeding their performance target. The figures in Appendix A can provide insight on locations where spot improvements may be needed.

Figure 2.5 Minnesota 2012 Transportation Results Scorecard (State Highway Operations)



Source: Annual Transportation Performance Report, MnDOT, 2012

2.4 INFRASTRUCTURE CONDITION PERFORMANCE MEASURES

Freight system condition performance measures provide information about the physical condition of Minnesota's freight transportation infrastructure, and can help inform system maintenance and preservation programs. One of Minnesota GO's principles is to "strategically maintain and upgrade critical existing infrastructure," of which the highway portion of the PFN is a key part. The highway-focused infrastructure condition performance measures are:

Pavement Condition

- **Interstate Pavement in Good, Fair and Poor Condition based on the International Roughness Index (IRI)**
- **Non-Interstate NHS Pavement in Good, Fair and Poor Condition based on the International Roughness Index (IRI)**
- **Pavement Structural Health Index**

Bridge Condition

- **Percent of Deck Area on Structurally Deficient Bridges**
- **NHS Bridges in Good, Fair and Poor Condition based on Deck Area**

The condition of Minnesota highway portion of the PFN using is described in the following sections.

Pavement Condition

Of the three pavement measures noted above, MnDOT doesn't technically currently track the first two performance measures, although similar data is tracked. It is expected U.S. DOT recommended pavement measures will be based on the International Roughness Index (IRI), while MnDOT currently measures the "Ride Quality Index." While the systems and terminology differs, MnDOT's index is a conversion from the IRI data.

MnDOT actively monitors the Ride Quality Index (RQI) on the Interstate system, the non-Interstate NHS, and on all state highways. RQI is a 0-5 scale, shown in Figure 2.6 that measures how pavement smoothness is perceived by a typical driver, with new projects having an index of over 4. Indices of 2 or below are considered "poor." MnDOT extracted the RQI for the PFN and the majority of the network rated as fair to very good, as shown in Figure 2.8. Of the 5,350 miles in the network, only 166 miles are indexed at less than 2.

Figure 2.6 Ride Quality Index Performance Categories

Descriptive Category	RQI Range	Performance Measure Category
Very Good	5.0 – 4.1	Good
Good	4.0 – 3.1	
Fair	3.0 – 2.1	
Poor	2.0 – 1.1	Poor
Very Poor	1.0 – 0.0	

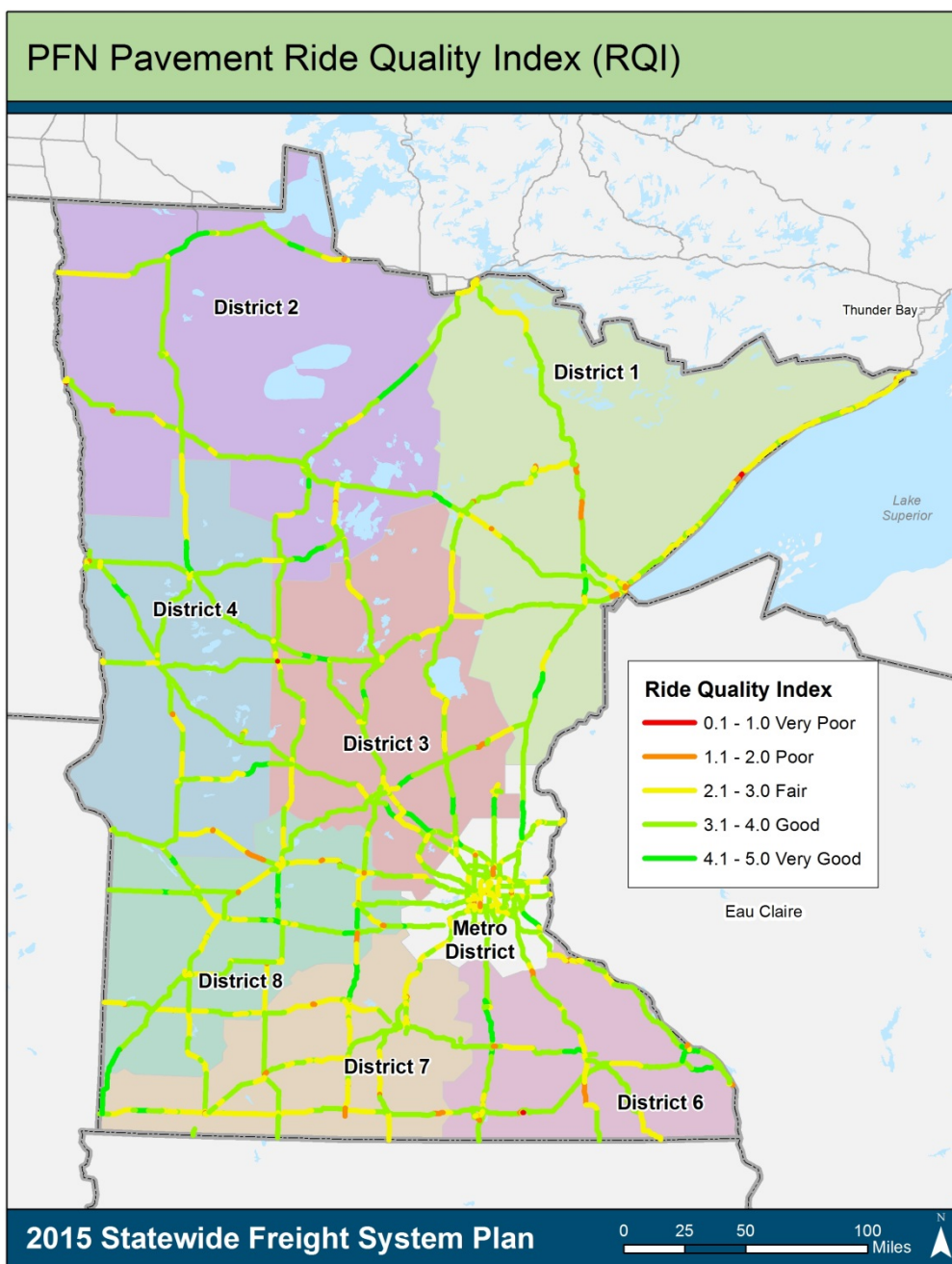
Bridge Condition

MnDOT actively inspects bridge deck and structural conditions based on multiple factors for the 3,600 NHS bridges throughout the state. A summary of deck ratings and descriptions based on the National Bridge Inventory (NBI) scale are shown in Figure 2.7. Bridges with a rating of 4 or below are considered to be in poor condition. Those bridges on Minnesota’s PFN in “poor” condition are shown in Figure 2.9. In total, 26 bridges are rated as 4 on the system, with the majority of those in the Metro District.

Figure 2.7 NBI Deck Condition Description

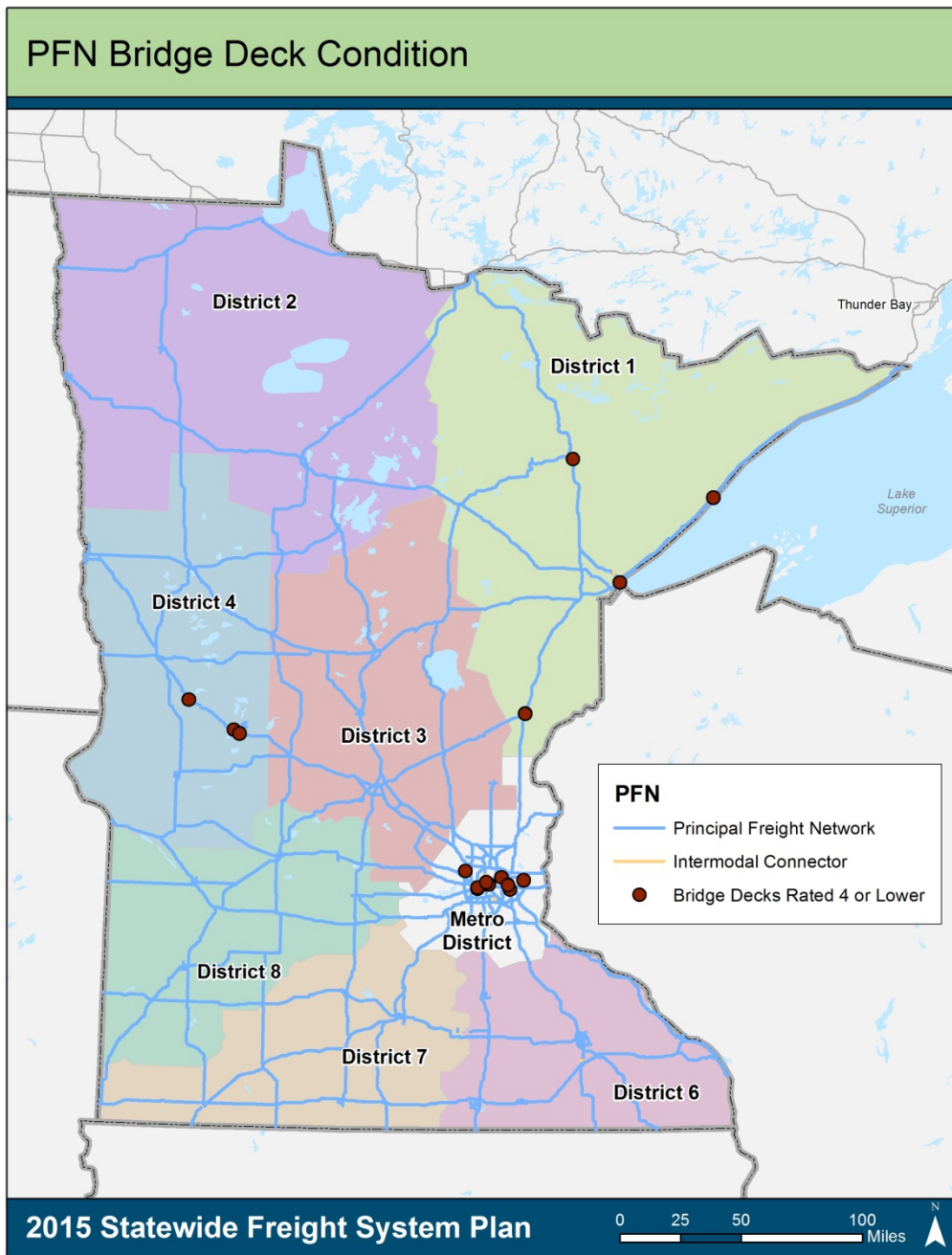
Code	NBI Deck Condition Description
N	Not Applicable: Use for culverts, roadway tunnels, or filled spandrel arch bridges.
9	Excellent Condition: Deck is in new condition (recently constructed).
8	Very Good Condition: Deck has very minor (and isolated) deterioration. <ul style="list-style-type: none"> Concrete: minor cracking, leaching, scale, or wear (no delamination or spalling). Timber: minor weathering - isolated (minor) splitting. Steel: no corrosion (paint/protection system remains sound).
7	Good Condition: Deck has minor (or isolated) deterioration. <ul style="list-style-type: none"> Concrete: minor cracking, leaching, scale, or wear (isolated delamination, spalling, or temporary patches). Timber: minor weathering or splitting (no decay or crushing) - all planks are secure. Steel: minor paint failure or corrosion (no section loss) - all connections are secure.
6	Satisfactory Condition: Deck has minor to moderate deterioration (no repairs are necessary). <ul style="list-style-type: none"> Concrete: moderate cracking, leaching, scale, or wear (minor delamination or spalling). Timber: moderate weathering or splitting (isolated decay or crushing) - some planks may be slightly loose. Steel: moderate paint failure and/or surface corrosion (minor section loss) - some connections may have worked loose.
5	Fair Condition: Deck has moderate deterioration (repairs may be necessary). <ul style="list-style-type: none"> Concrete: extensive cracking, leaching, scale, or wear (moderate delamination or spalling). Timber: extensive weathering or splitting (moderate decay or crushing) - some planks may be loose, broken, or require replacement. Steel: extensive paint failure and/or surface corrosion (moderate section loss) - several connections may be loose or missing, but all deck components remain secure.
4	Poor Condition: Deck has advanced deterioration (replacement or overlay should be planned). <ul style="list-style-type: none"> Concrete: advanced cracking, leaching, scale, or wear (extensive delamination or spalling) - isolated full-depth failures may be imminent. Timber: advanced weathering, splitting, or decay - numerous planks may be loose, broken, or require replacement. Steel: advanced corrosion (significant section loss) - deck components may be loose or slightly out of alignment.
3	Serious Condition: Deck has severe deterioration - immediate repairs may be necessary. <ul style="list-style-type: none"> Concrete: severe cracking, leaching, delamination, or spalling - full-depth failures may be present. Timber: severe splitting, crushing or decay - majority of planks may need replacement. Steel: severe and section loss - deck components may be severely out of alignment.
2	Critical Condition: Deck has failed - it may be necessary to close the bridge until repairs are completed.
1	"Imminent" Failure Condition: Bridge is closed - corrective action is required to open to restricted service.
0	Failed Condition: Bridge is closed - deck replacement is necessary.

Figure 2.8 Ride Quality Index on the Principal Freight Network



Source: MnDOT Office of Materials

Figure 2.9 Bridge Deck Condition on the Principal Freight Network

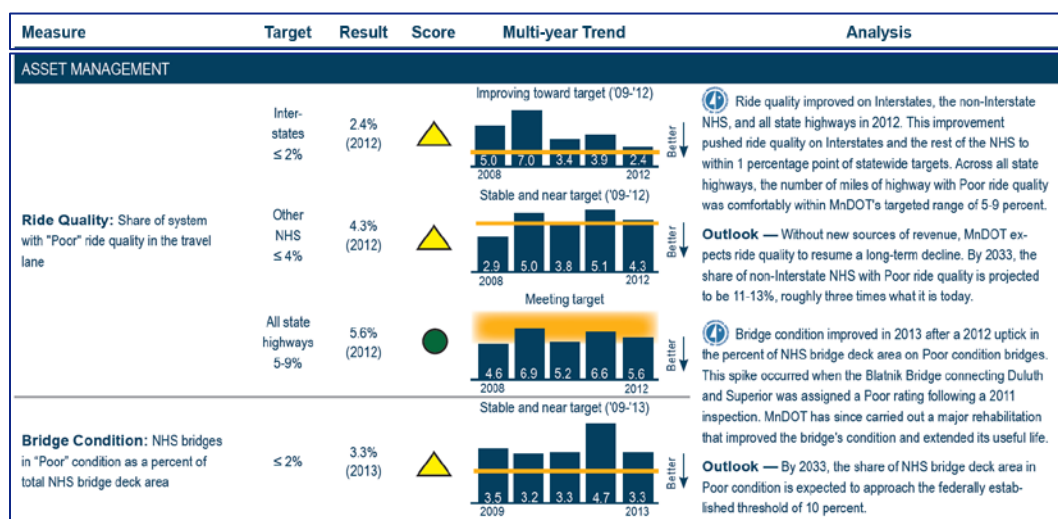


Source: MnDOT Bridge Office

Minnesota’s most recent Annual Transportation Performance Report provides both ride quality and bridge condition information dating back to 2008. In recent years ride quality has significantly improved, on interstates, non-interstate NHS routes, and all state highways, and has come close to reaching the target set by MnDOT. However, absent no new revenue, MnDOT expects that ride quality will experience a long term decline.

Figure 2.10 shows that bridge condition has also made a great improvement in recent years due to major rehabilitation efforts. MnDOT’s own target of equal or less than 2 percent bridges in poor condition is close to being met, however similar to ride quality noted above, absent new revenue, bridges in poor condition are expected to approach the Federal target of 10 percent.

Figure 2.10 Minnesota 2012 Transportation Results Scorecard (Asset Management)



Source: Annual Transportation Performance Report, MnDOT, 2012

2.5 SAFETY PERFORMANCE MEASURES

In the State of Minnesota and the Nation, safety is at the forefront of planning and investment decision-making. One of Minnesota GO’s principles is to “systematically and holistically improve safety for all forms of transportation” through the integration of safety in all that the agency does. Traditionally passenger vehicles have been the focus of state safety programs, but understanding whether or not other modes, such as trucks or railroads, have different risks is critically important for the state to make the correct investments.

The safety performance measures are:

- **Number of Fatalities**
- **Fatality Rate**

- **Number of Serious Injuries**
- **Serious Injury Rate**
- **Severe Crashes Involving Trucks**
- **Incidents at Highway/Railroad Crossings**

The following sections describe the application of these performance measures to Minnesota’s highways.

Truck Fatalities and Injuries

MnDOT actively maintains a comprehensive crash database from police reports, with a field that indicates whether a commercial vehicle was involved. MnDOT extracted commercial vehicle crash data for 2014 on the trunk highway system, shown in Table 2.5. The number of crashes that involve only property damage and commercial vehicles is more than double crashes that involve personal injury, combined. Also the number of commercial vehicle crash injuries and fatalities are split fairly evenly among Interstates, U.S. Highways, and State Highways in Minnesota.

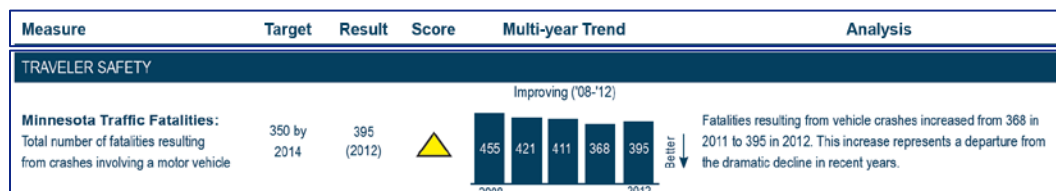
Table 2.5 Crashes Involving Commercial Vehicles – 2014

	Fatal Crash	Incapacitating Crash	Non-Incapacitating Crash	Possible Injury Crash	Property Damage Only Crash	Total by Highway Type
Interstate Highways	19	16	82	203	1,104	1,424
U.S. Highways	37	17	60	103	506	723
State Highways	67	34	79	144	627	951
<i>Total Crashes</i>	<i>123</i>	<i>67</i>	<i>221</i>	<i>450</i>	<i>2,237</i>	

Source: Minnesota Department of Public Safety, Office of Traffic Safety

Minnesota's most recent Annual Transportation Performance Report provided total vehicle fatality information dating back to 2008. While in the most recent year of data fatalities increased slightly, the historic trend shown in Figure 2.11 implies that fatalities have been decreasing.

Figure 2.11 Minnesota 2012 Transportation Results Scorecard (Safety)



Source: Annual Transportation Performance Report, MnDOT, 2012

Railroad Safety

Rail crossing safety is a topic of great importance to Minnesota, in large part due to the increase in crude-by-rail movements traveling through the state from North Dakota. Rail crossing safety was recently reviewed qualitatively in the 2015 *Minnesota State Rail Plan*, and assessed in more detail in the 2014 report *Improvements to Highway-Rail Grade Crossings and Rail Safety*.

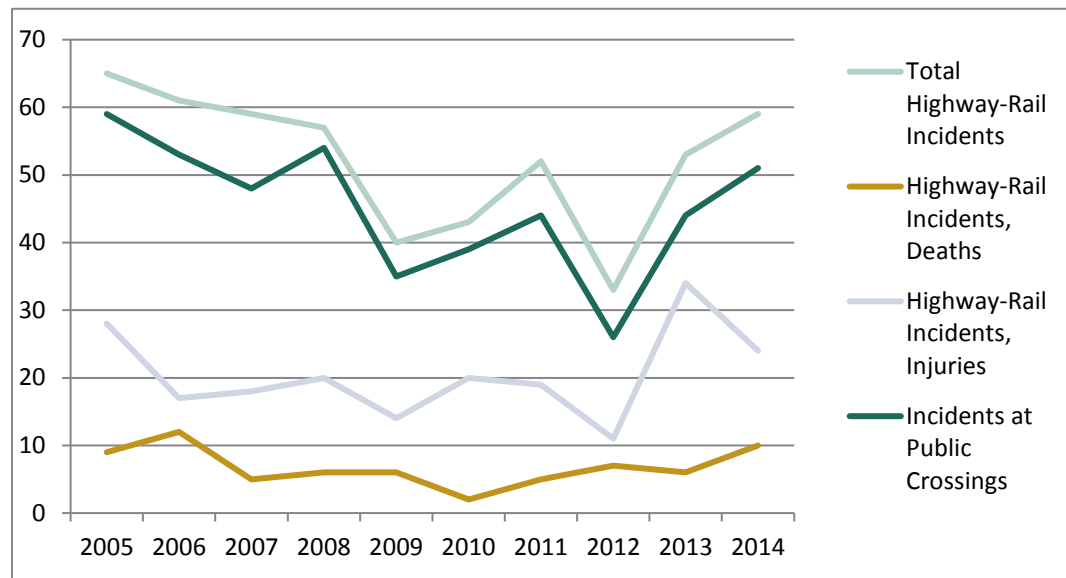
The Federal Railroad Administration (FRA) houses at-grade rail crossing statistics for the nation's railroad network, by state. Ten years of data were extracted to determine whether or not rail crossing safety is improving or in decline. Table 2.6 and Figure 2.12 highlight this data.

Table 2.6 10-Year Accident/Incident Overview by Calendar Year, Minnesota

Category	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Highway-Rail Incidents (All)	65	61	59	57	40	43	52	33	53	59
Highway-Rail Incidents, Deaths	9	12	5	6	6	2	5	7	6	10
Highway-Rail Incidents, Injuries	28	17	18	20	14	20	19	11	34	24
Incidents at Public Crossings	59	53	48	54	35	39	44	26	44	51

Source: Federal Railroad Administration

Figure 2.12 10-Year Accident/Incident Overview by Calendar Year, Minnesota



In 2014, there were 59 highway-rail crossing incidents, resulting in 10 fatalities and 24 injuries in Minnesota. 51 of those incidents occurred at one of Minnesota’s 4,300 public at-grade road crossings of railroads throughout the state. The state has approximately an equal number of private grade crossings. The figure shows that it is difficult to determine whether an increasing or decreasing trend related to incidents is present. In the last year the number of highway-rail injuries was down, but total incidents and fatalities were up. This is a trend that MnDOT should continue to monitor and set a target for achieving.

2.6 OVERALL ASSESSMENT OF MULTIMODAL FREIGHT SYSTEM CONDITION AND PERFORMANCE

Table 2.7 provides a high-level summary of the current, and potential future, condition and performance of Minnesota’s freight system.

Table 2.7 Overall Assessment of Multimodal Freight System

Performance Category	Expected Trend	Possible Implication
ECONOMY		
Freight Mode Share in Minnesota (tons)	Increase	Increasing tons transported equates to the need for a truly multimodal system to serve industry needs. More long haul rail movements will occur in the future, and will need handling facilities in the Twin Cities.
Freight Mode Share in Minnesota (value)	Increase	More trucks traveling on the system, in particular making first- and last-mile connections to deliver high valued consumer goods, will require local connectivity
MOBILITY		
Annual Hours of Truck Delay (AHTD)	Increase	Nationally, annual hours of truck delay is increasing, adding cost to consumer. This delay is worst in the largest urban areas in the U.S.
Truck Reliability Index (RI80) and Average Truck Speed	Decrease	Urban areas (the Metro District) will have the most congestion, lowest travel speeds in the future. This will get worse as more passenger vehicles and trucks use these roadways, especially during peak hours.
INFRASTRUCTURE		
Ride Quality Index	Decrease	The improving trend will cease in the future, and rough pavements will make Minnesota's roads unattractive for trucks to use.
NHS Bridge Decks in Poor Condition	Decrease	Similar to ride quality, the improving bridge condition trend will cease in the future, making Minnesota's bridges unattractive for trucks to use (and potentially unsuitable for larger, heavier trucks).
SAFETY		
Number of Truck Fatalities, Injuries	--	It is unknown how this category will trend in the future absent past data. Overall traffic fatalities experienced a slight increase in the most recent year. MnDOT should make every effort to reduce highway and truck-related incidents through targeted actions.
Incidents at Highway/Railroad Crossings	--	It is unknown how this category will trend in the future absent past data, however MnDOT should make every effort to reduce highway/rail crossing incidents through targeted actions.

The next sections further explore Minnesota's multimodal freight system needs based on this assessment, as well as other qualitative mechanisms.

3.0 Freight System Needs and Issues

A variety of quantitative and qualitative data were reviewed to determine the needs and issues of the multimodal freight system in Minnesota. This includes the performance assessment from Section 2.0, stakeholder feedback and other outreach conducted during this plan, and the variety of previous freight related plans developed by MnDOT. The needs and issues identified are organized in this Tech Memo by key theme. These themes have been developed to reflect the features most important to Minnesota's freight system, to align with the focus of Minnesota GO, and link to U.S. DOT's National Freight Policy goals. These key themes are:

- Support Minnesota's Economy;
- Improve Minnesota's Mobility;
- Preserve Minnesota's Infrastructure;
- Safeguard Minnesotans;
- Protect Minnesota's Environment and Communities; and
- Integrate Freight Throughout Minnesota.

In each section an overview of the needs and issues are generally described and are further summarized in a table. These tables attempt to consolidate all known information in a single place. These tables include the following fields:

- **Need.** Identification of the needs and issues within each of the key themes.
- **Mode.** Freight mode that the need/issue impacts, including trucking, rail, maritime, aviation, or multimodal (i.e., affecting more than one mode).
- **Type of Issue.** Whether the need/issue is one that is physical, operational, or organizational/policy in nature.

This process is intended to identify areas where Minnesota may have weaknesses related to the goals of this Plan, and can be used to help generate a prioritized list of existing/future problem areas to be addressed.

This section begin with a summary of outreach techniques used and key findings those efforts generated related to freight system needs and issues.

3.1 STAKEHOLDER OUTREACH

A large component of developing the Minnesota Statewide Freight System Plan (Plan) is stakeholder outreach. As this Plan will provide the framework and strategies to guide investment in Minnesota’s freight system into the future, it was critical to understand each stakeholder’s perspective in order to ensure that recommendations made in this Plan are not only important to MnDOT, but in sync with industry operation and need. The two tables below outline the various agency/organization participants in project oversight (Table 3.1) and the variety of techniques used to collect input during plan development (Table 3.2).

Table 3.1 Minnesota Statewide Freight System Plan Committees

Committee	Purpose
<p>Project Management Team (PMT)</p> <ul style="list-style-type: none"> Representatives from various functional and modal groups within MnDOT 	<ul style="list-style-type: none"> Guides development of the Freight Plan and coordinates with Minnesota Freight Advisory Committee
<p><i>PMT Representation: MnDOT Office of Freight and Commercial Vehicle Operations; MnDOT Customer Relations; MnDOT Office of Multimodal Planning; University of Minnesota Center for Transportation Studies; consultant team</i></p>	
<p>Advisory Committee (AC)</p> <ul style="list-style-type: none"> Policy leaders and directors at the Federal, state, regional, and local levels. 	<ul style="list-style-type: none"> “Big picture thinkers” who provide high-level policy guidance on issues and strategies as well as feedback on major findings and documents.
<p><i>AC Representation: MnDOT - Modal Division Director, Office of Freight and Commercial Vehicle Operations, District Resources, and Planning Management Group; Hennepin and Marshall counties; District Minnesota Freight Action Committee Chair; Metropolitan Council; Federal Highway Administration; Department of Employment and Economic Development; Bay & Bay Transportation; Minnesota Trucking Association; St. Paul Port Authority; Port of Duluth; Regional Rail Authority; BNSF; Upper River Services; Minnesota Shipping Association; Minnesota Grain & Feed Association; Minnesota Office of Trade; Minnesota State Patrol; Mid-America Freight Coalition; Regional Development Commission; Minnesota Transportation Alliance</i></p>	
<p>Technical Team (TT)</p> <ul style="list-style-type: none"> Members have specific technical expertise related to freight. 	<ul style="list-style-type: none"> The “implementers” who will facilitate coordination and partnership in implementing future freight projects. They provide input into how the elements of the plan can be followed through and what is needed to be successful.
<p><i>TT Representation: MnDOT - District 6, District 7, Freight Planning, Multimodal Statewide Planning, Performance Management, Highway Safety, Metro Planning, Permitting, Geometrics, and Research Development; Metropolitan Council Planning; Minnesota Freight Advisory Committee; Arrowhead Regional Development Commission</i></p>	

Table 3.2 Minnesota Statewide Freight System Plan Outreach Techniques

Technique	About
<p>Dynamic Working Groups</p> <ul style="list-style-type: none"> Members have specific technical expertise related to working group topics of freight infrastructure, performance measures, and freight policy, and represent a variety of public sector agencies across Minnesota. 	<ul style="list-style-type: none"> Each work group reviewed current research and reports relevant to the topic, identified data or policy gaps/deficiencies, and developed recommendations to forward to the Technical Team for action.
<p>Industry Interviews</p> <ul style="list-style-type: none"> Executives from Minnesota's key freight industries 	<ul style="list-style-type: none"> One-on-one interviews with business leaders across the state to help understand the specific freight needs of industry, and the cost of "doing nothing." These interviews compliment the extensive interviews conducted in some MnDOT Districts.
<p>MnDOT District Meetings</p> <ul style="list-style-type: none"> Planners and engineers in each of the MnDOT Districts 	<ul style="list-style-type: none"> MnDOT Freight Office staff are engaging the Districts to identify projects and help build the partnership between Central Office and the Districts that will be important for plan implementation.
<p>Neighbor State Interviews</p> <ul style="list-style-type: none"> States and Canadian Provinces that share borders with Minnesota 	<ul style="list-style-type: none"> Freight doesn't stop at Minnesota's borders. Interviews with Minnesota's neighbors explored chokepoints to goods movement in these States and identified opportunities to work together for a common goal – a freight system that works for business
<p>Freight Summit</p> <ul style="list-style-type: none"> Public and private sector freight industry leaders 	<ul style="list-style-type: none"> Held December 5, 2014 with the objective to foster executive-level engagement between government and industry in development of a freight action plan that supports an efficient and competitive freight transportation network in Minnesota. Attendees helped shape the development of a statewide freight action agenda through sessions focused on identifying needs, issues, and opportunities, and translating into actions.
<p>Online Engagement</p> <ul style="list-style-type: none"> Two rounds of an interactive online tool 	<ul style="list-style-type: none"> Round 1, conducted in Fall 2014, garnered over 600 responses from specific freight stakeholders and the general public on their freight system priorities, needs, and issues. Round 2 will be deployed in Summer 2015 and will focus on receiving feedback on preliminary Plan recommendations.
<p>Public Open House Meetings</p> <ul style="list-style-type: none"> General public 	<ul style="list-style-type: none"> Early in plan development, information on the Plan was included in a series of State Rail Plan meetings held across Minnesota and in bordering cities in North Dakota and Wisconsin. The MnDOT Freight Office will host its own round of open houses across Minnesota to share, and receive feedback on, the Plan findings and recommendations at the end of the project.

Each type of outreach served a distinct purpose and engaged key freight industry stakeholders in the public and private sectors, both within and outside Minnesota's borders. Two outreach techniques yielded significant useful information for identifying Minnesota's freight system needs and issues, as described below.

Freight Summit

Held December 5, 2014 in partnership with the University of Minnesota's Center for Transportation Studies, this one day event fostered executive-level engagement between government and industry. Through small and large group discussion, attendees identified critical freight system needs and issues and initiated the development of Minnesota's Freight Action Agenda.

Small group discussions were focused on five topics:

- Public-Private and Public-Public Partnerships
- Minnesota's Strategic Freight Network
- Minnesota Supply Chains
- Chokepoints on Minnesota's Freight System
- Strengthening Minnesota's Economic Competitiveness

Through interactive discussions, each small group provided insight into strengths, weaknesses, and opportunities related to each topic. Summary findings from the Freight Summit are provided in Appendix B, and are included where appropriate in the following sections.

Online Engagement

As part of Plan outreach an interactive online survey (i.e., MetroQuest) was used to gather information on the current state of the multimodal freight system in Minnesota. The survey was available from September 23, 2014 through December 19, 2014 and gave participants the opportunity to comment on issues they believed to be of importance to the freight industry. Participants were also given an interactive map and asked to identify specific locations where they experienced issues, or felt there was a need for improvement, within these systems.

Approximately 600 individuals participated in the survey with 234 respondents being actively involved in the freight industry. Of the 234 freight industry respondents approximately 63 percent worked in the private sector with the remaining being employed in the public sector.

In total participants identified 476 specific locations, using the interactive map, where the freight system had an issue or needed improvement. In some cases a location was noted to have multiple issues (e.g. chokepoint and poor pavement condition). The majority of the identified locations were related to the highway

system with the rail system having the second most locations. The waterway and aviation system had the smallest number of identified issue locations.

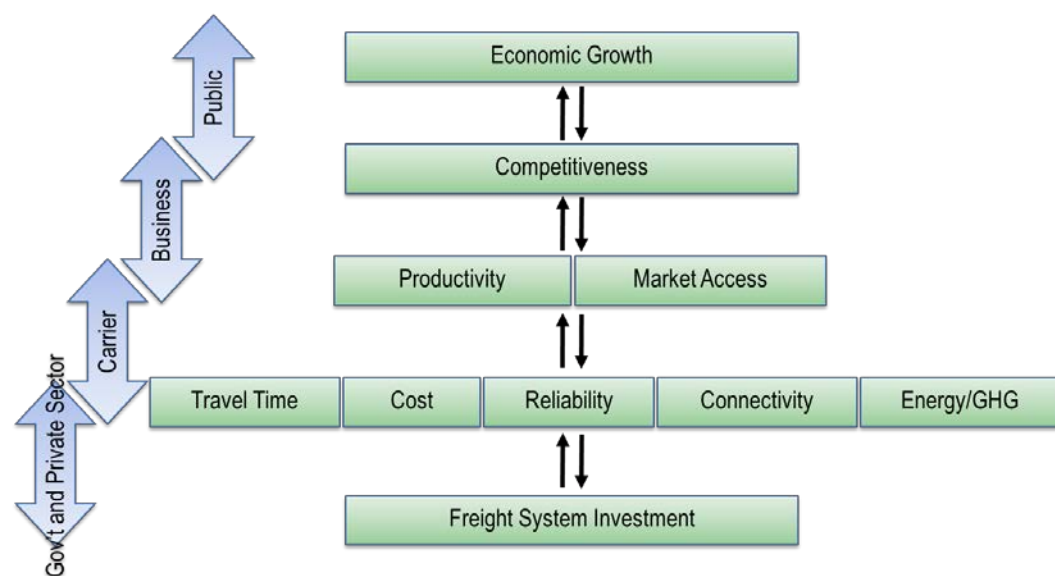
The summary of results from the online survey are provided in Appendix C, and are included where appropriate in the following sections.

3.2 SUPPORT MINNESOTA’S ECONOMY

The ability of businesses and industries in Minnesota to compete goes beyond simply being industrious; they also demand an efficient freight transportation system and workforce that can produce/deliver goods competitively. The freight transportation system that these businesses depend on is multimodal and conveys goods not only within Minnesota, but also to key freight hubs like Chicago and to export ports such as those in the Pacific Northwest. For this reason, Minnesota’s freight system (i.e., physical infrastructure, operations and organization/policies) needs to incorporate and respond to the conditions of the state, as well as to the significant transportation and economic condition of the greater U.S. economy.

As shown in Figure 3.1, both public and private sector entities in the State of Minnesota have roles in fostering economic growth. State, regional and local government agencies in partnership with the private sector can make physical infrastructure investments and adopt policies/regulations that improve travel time, cost, reliability, connectivity, and transportations environmental footprint, to ensure business in the state remain competitive and grow.

Figure 3.1 Freight Investments Shape the Economy



Source: Cambridge Systematics

The key to Figure 3.1 is not simply “making freight system investments,” but identifying and pursuing in partnership the “most strategic freight system investments” that will produce the carrier, business and public benefits desired. Done well, investment in the freight system will contribute to a more competitive economy and a society that makes best use of its capital, knowledge, and labor. And, in a world looking to reduce petroleum use and greenhouse gases, many freight-related investments and actions can result in a more energy-efficient and lower-emission transportation system. In this context, this Plan uncovered several needs and issues related to supporting and enhancing Minnesota’s economy.

- **Need to tell a compelling story.** Freight is often a “hidden” component of the economy, not well understood by the general public unless something goes wrong. Being able to explain why a project is important and what it achieves are critical in obtaining both funding and public support. Industries and jobs are reliant on freight movement. Emphasizing individual commodity “stories” may help make freight movement issues more apparent and relevant.
- **Need to understand changing economic conditions and new market demands.** Changes in the global economy will have an effect on Minnesota’s industries and how they use the transportation system related to the type, quantity, and destination for many goods. For example, as the U.S./Midwest continues to serve at the world’s breadbasket, agricultural commodities will be demanded in far off places such as China and Brazil, and the transportation system needs to provide connections to do this. Meanwhile, core and traditional markets that have been served by Minnesota’s freight system, such as coal on the rail and port systems, are losing share to new commodities such as crude oil, natural gas, and petroleum products. Minnesota must be prepared to respond to these and other supply chain shifts and be proactive in understanding future opportunities that the state can use to grow local industries, and continue to diversify the state’s economy. Finally, as the state grows its advanced and medical manufacturing industries, air cargo and specialized trucking services may play a larger role in the future.
- **Need to identify freight projects that create a return on investment.** The volume and value of freight moving on a corridor are not the only indicators of importance. Identifying infrastructure that provides (or could provide) a large return on investment is critical in Minnesota. Small improvements that help rural/remote areas – such as infrastructure enhancements at a small airport – may produce employment and economic benefits that justify a project even though the total volume or value of freight moved is small. This may also help develop clusters and strategic locations outside of large urban areas where freight improvements can drive economic activity.
- **Need to capture value of through traffic.** Minnesota is heavily a “through” state in terms of overall freight flow. Most of the goods moving in Minnesota

are arriving from and bound for locations outside of the state – this is particularly true for the freight rail system. This means Minnesota’s infrastructure bears the costs of goods movement while the state’s economy reaps few of the benefits. This Plan identified Minnesota’s Principal Freight Network - corridors that connect major freight routes (measured by volume or value) to ports, airports, warehouses, and other job-creating facilities. These routes and nodes of multimodal connectivity/activity should be capitalized to ensure that economic benefits are received even when freight is only “passing through.”

- **Need for improved and expanded intermodal services.** The Minneapolis-St. Paul region is the only location where rail intermodal (the haulage of containers and trailers) service is available in Minnesota; and Chicago and the Pacific Northwest/Western Canada are the only markets that are served directly. Stakeholders have remarked that oftentimes containers are unavailable for loading in Minnesota, and sometimes it is more cost effective to truck goods for transload into containers in Chicago, rather than be served directly in Minnesota.

Although efforts to provide service in other parts of the state have not been successful, stakeholder conversations revealed a strong desire for intermodal service in Duluth and the western and southern parts of the state, as well as additional terminal capacity and services in the Twin Cities. Intermodal service is density driven, and given that a broadly used competitive service must typically operate on a daily basis, the volume requirements are substantial. Particular interest has developed around the need for service from Minnesota to the Pacific Northwest gateways. For a terminal served by a Class I railroad, the minimum volume threshold is around 50,000 units, while for a short line it may be less.

- **Need to understand how modes are connected; first-/last-mile connectivity.** First- and last-mile road, railway and port connections are the front door for Minnesota’s industries. Through designation of Minnesota’s Principal Freight Network it was determined that MnDOT can provide benefits, and help ensure the multimodal freight system has seamless connections between modes, by being proactive related to facility and industry connections to the network. The process of designating principal rail, port, airport and pipeline facilities highlighted that there are numerous significant freight generators in the state where the modal systems need to be connected. Review of Minnesota’s designated NHS intermodal connectors highlighted that the majority of these freight facilities identified meet FHWA’s primary or secondary criteria for NHS intermodal connector designation, but are not formally designated (or are only designated for passenger travel).
- **Need to address systemic and multimodal problems.** Freight is multimodal, and systematic issues such as need for regulation, management, or education in one mode will affect multiple modes. For example, a lack of qualified truck drivers, caused partially by education and regulation shortfalls,

exaggerates the lack of capacity in the trucking industry. These effects are spread across modes – i.e. a trucking shortage impacts the rail industry. These issues need to be viewed at the multimodal, system level, and solutions may bridge more than a single mode. For example, speeding permitting procedures to allow a pipeline to carry oil could cause a mode shift that reduces capacity issues for rail. Or, the lack of consistency between Minnesota and surrounding states on commercial vehicle size and weight restrictions hinders efficient truck operations and may be a deterrent for business.

A summary of needs and issues identified related to enhancing Minnesota’s economy are shown in Table 3.3.

Table 3.3 Summary of Needs Related to Supporting Minnesota’s Economy

Need/Issue	Type of Need/Issue	Mode(s) Impacted
Equipment and container shortages	Operational	Rail
First-/last-mile connectivity	Physical Infrastructure	Truck, Rail, Port
International air cargo regional distribution center to encourage additional international trade	Physical Infrastructure	Air
Need for consistency with neighbor states on truck size and weight	Operational, Organizational/Policy	Truck
Need for improved and expanded intermodal services	Physical Infrastructure	Rail
Need for quantification of investments/benefits to freight made by MnDOT	Organizational/Policy	Multimodal
Need to address systemic and multimodal problems	Physical Infrastructure, Operational, Organizational/Policy	Multimodal
Need to capture value of through traffic	Organizational/Policy	Multimodal
Need to identify freight projects that create a return on investment	Organizational/Policy	Multimodal
Need to recognize and balance national, state and local interests	Organizational/Policy	Multimodal
Need to tell a compelling "freight story"	Organizational/Policy	Multimodal
Need to understand changing economic conditions and new market demands.	Organizational/Policy	Multimodal
Need to understand how modes are connected	Organizational/Policy	Multimodal
Need to understanding policies that inhibit business growth (onerous policies, taxes, etc.)	Organizational/Policy	Multimodal
Truck driver shortages	Operational	Truck

3.3 IMPROVE MINNESOTA’S MOBILITY

As noted in the Section 2.0 performance evaluation, the annual hours of freight system delay are increasing nationally, and subsequently increasing costs to consumers. This delay is worst in the largest urban areas in the U.S.; the Minneapolis-St. Paul region ranked in the Top 20 U.S. cities with the worst delay. Typically, urban areas also have the most congestion and slowest travel speeds. This holds true for the Minneapolis-St. Paul region today, and it is expected to get worse as more passenger vehicles and trucks use these roadways, especially during peak hours, in the future. Delay, slow travel speeds and congestion are all related, and all translate into a freight transportation system that is unreliable and may be unattractive for industries to use, and depend on, especially when “just-in-time” delivery is dominant model. In this context, this Plan uncovered several needs and issues related to improving the mobility of Minnesota’s freight transportation system.

- **Need to recognize and adapt to evolving supply chain operations.** Changing definitions of “value” has led modern supply chains to operate on a just-in-time schedule. This is true across industries—deliveries direct-to-customers are just as time-sensitive as shipments to industrial plants. In the past, industries held materials at a site as part of a strategic reserve; now, less inventory is stored on site, decreasing the ability of a business to endure a supply chain disruption. This has changed the nature of the freight transportation system, increasing the need for resiliency and redundancy across all transportation modes and along the supply chain.
- **Need to address chokepoints within and outside Minnesota that impact the state.** Chokepoints both within and outside of Minnesota have a negative impact on freight movement within the state. Minnesota’s Top Ten highway bottlenecks related to delay and average speed were identified in Section 2.0.

Although rail trackage extensively covers all regions of Minnesota, there are some significant bottlenecks. The Hoffman Junction east of the Union Depot in St. Paul is used by BNSF, CP and UP, and carries 120 trains per day. Bottlenecks in the Minneapolis Junction and corridors to the north caused delays for both the Northstar Commuter Rail service and for freight shipments. The East Metro Rail Study, funded jointly by the three Class I railroads and Ramsey County Regional Railroad Authority, identified specific Hoffman Junction-area capacity improvements that are being systematically pursued. Other bottlenecks near La Crescent and Moorhead worsened statewide system performance. Double tracking segments within the bottlenecks, adding/increasing siding length, improving signal systems, and rehabilitating outdated structures will alleviate these problems as freight shipments and passenger rail demand grow.

Rail congestion, specifically in Chicago, IL and at the BNSF La Crosse, WI complex were cited as problems that create backups through WI, MN, and beyond.

- **Need to develop freight system redundancy.** Infrastructure across all modes is aging, raising the possibility that a critical link will fail. Temporary closures due to weather (especially high and low water on the inland waterway system) are also a concern. Redundancy, either via alternative routes or alternative modes, should be a consideration in freight system planning. Whenever possible, routes and modes that can allow the flow of goods to continue even when a standard route is not available should be identified. Redundancy will also allow for options when a particular mode or route is unsuitable due to safety concerns or competing demands.
- **Need to increase system-wide capacity, across modes (make better use of existing modes).** Capacity over the entire multimodal freight network is stressed. Delays along one route or on one mode spreads to other networks and affects both passenger and freight travel. For example, increased oil, gas, and agriculture rail shipments along BNSF's corridor from North Dakota to Minneapolis have negatively impacted the on-time performance of NorthStar commuter rail and Amtrak service. This has reduced ridership on these routes, and led to increased vehicle usage on the I-94 and US 10 corridors which are already congested. Redundancy across modes and system-wide capacity expansion are needed.

In addition, there exists the need to streamline truck size and weight restrictions and align them with adjacent states and provinces to make it easier for haulers to do business across state lines.

A summary of needs and issues identified related to improving Minnesota's mobility are shown in Table 3.4.

Table 3.4 Summary of Needs Related to Improving Minnesota's Mobility

Need/Issue	Type of Need/Issue	Mode(s) Impacted
Captive shippers	Physical Infrastructure, Operational, Organizational/Policy	Rail
Highway congestion	Physical Infrastructure, Operational	Truck
Need to develop freight system redundancy	Physical Infrastructure	Multimodal
Need to identify and address chokepoints within and outside of Minnesota that impact the state	Physical Infrastructure, Operational, Organizational/Policy	Multimodal
Need to increase system-wide capacity, across modes (make better use of existing modes)	Physical Infrastructure, Operational, Organizational/Policy	Multimodal
Need to plan for shared right-of-way uses	Physical Infrastructure, Operational	Truck, Rail
Need to recognize and adapt to evolving supply chain operations.	Physical Infrastructure, Operational,	Multimodal

Need/Issue	Type of Need/Issue	Mode(s) Impacted
	Organizational/Policy	
Need to streamline truck size and weight restrictions	Organizational/Policy	Truck
Rail congestion	Physical Infrastructure, Operational	Rail

3.4 PRESERVE MINNESOTA'S INFRASTRUCTURE

Continued growth in freight transportation will continue to stress the freight infrastructure in Minnesota. As noted in the Section 2.0 condition assessment, MnDOT expects pavement ride quality and bridge deck conditions to be reduced in the future and in the future making Minnesota's roadways less attractive for goods movement. The rail and waterway systems have similar infrastructure condition needs and issues that must be addressed in the future to continue their viability. In this context, this Plan uncovered several needs and issues related to preserving the freight transportation infrastructure in Minnesota.

- Need to maintain and improve highway system condition.** In the online survey, the most common highway infrastructure issues identified by freight industry respondents were poor pavement conditions, inefficient interchanges, and inadequate roadway capacity. The majority of the infrastructure issues identified are in and around the greater Minneapolis-St. Paul area, with additional issues located along major freight corridors throughout the state. In and around greater Minneapolis-St. Paul the primary infrastructure issue, according to respondents, is a lack of capacity. U.S. 212 west of the metro area and U.S. 169 are two roads that respondents stated should have lanes added. Inadequate and outdated interchanges were other issues highlighted within the area. In particular the interchange between I-494 and I-35 was identified as having an outdated design that contributes to traffic congestion. Improving access between I-94 and I-35 was also requested.

Pavement conditions were an issue highlighted throughout the state. Within greater Minneapolis-St. Paul road and bridge conditions were identified as an issue by survey respondents. I-94, I-35, and US 10 were all identified as having poor pavement conditions. Outside of the area pavement conditions along the highways leading out of Minneapolis, in Grand Rapids, and in various rural locations around the state were identified as poor.

- Need to achieve FRA Class 2 track, or better, on the rail system.** One of the goals of the 2015 *Minnesota State Rail Plan* is to upgrade main line track (all Class I-III railroads) to 25 mph minimum speed (FRA Class 2 track), as warranted. This is needed to ensure commercial viability and safety for rail operators in order to meet the needs of the current and future shippers that rely on them. This is primarily an issue for short line railroads where infrastructure conditions tend to be inferior to those of the large railroads.

Track is less well maintained, with lighter weight rail, inferior tie and ballast conditions, and no active signaling system. As a result, mainline trains speeds are lower. Although these conditions are usually adequate for existing business, many carriers struggle to maintain track at minimal commercially acceptable levels, and are unable to accommodate some modern rolling stock.

- **Need to achieve 286,000-lb. compliance on the rail system.** One of the goals of the 2015 *Minnesota State Rail Plan* is to improve the freight rail network (all Class I-III railroads) to support the use of 286,000 pound railcars throughout. This weight limit has become the industry-wide standard, and the viability of lines and shipper's facilities that do not have this capacity will diminish over time. In Minnesota there are 453 miles of railroad that currently cannot handle 286,000 pound railcars. Most noncompliant lines are restricted from carrying any heavy railcar in excess of 263,000 pounds. With the large railroads having moved from 263,000 to 286,000 pounds as the standard maximum car weight, the ability to handle standard modern rolling stock has become a particular concern; without accommodation of these heavier cars, the competitive position of many short line railroad will be substantially compromised.
- **Need to maintain adequate navigable depth.** The need for period dredging – the removal of the built-up underwater sediment, is an ongoing issue both for the Mississippi River System (MRS) and the port and harbor areas on the Great Lakes. The U.S. Army Corps of Engineers bears the responsibility for maintaining the waterways, including dredging. In 2012, the USACE spent \$9.3 million for dredging the Minnesota MRS; however a backlog of \$12.7 million in needs exists. Similarly, \$5 million was spent on dredging in the Great Lakes in Minnesota, but additional needs remain. Lake Superior Harbors are currently maintained at only 12 inches of depth; a depth of 60 inches is needed to allow for more efficiently loaded ships. Disposal of dredging material is also challenging, and finding proper ways to reuse an ever-accumulating amount of waste material will continue to be a challenge.
- **Need for lock and dam maintenance.** On both the Mississippi River System and the Great Lakes there is a backlog of projects to improve the lock and dam system. Located at the head of both systems, Minnesota more than any other state relies on lock and dam infrastructure throughout the system to connect its industries to suppliers and customers. Most locks on the marine system are over 50 years old, leading to more frequent (scheduled and unscheduled) closures for repairs. Additionally, the Sault Ste. Marie locks in Michigan, which serve as the connector between the Port of Duluth and other destinations have need for repair or replacement. There is no redundancy for the largest lock, which handles 70 percent of the traffic, although even this lock is not able to handle the largest vessels on the system. According to a

Congressional estimate, the impact of a thirty day unscheduled outage would be \$160 million dollars.⁵

- **Need for freight-friendly design standards.** Stakeholder feedback throughout Plan development noted that MnDOT and its transportation partners should ensure that roadways, in particular intermodal connectors, are designed so they are adequate for heavy and frequent truck movements. This means that pavement, geometrics such as travel lane width, turning radii, and vertical and horizontal bridge clearances, are designed to provide added ease of navigation for large vehicles. This also means that any impediments to goods movement, e.g. roundabouts, are considered in context, prior to construction.

While many design criteria such as pavement thickness, passing lanes, and increased shoulder widths are desirable for roadways that experience high levels of freight activity, the implementation of these feature may be costly if additional right-of-way is required or if other site-specific characteristics make implementation difficult. As such, these standards should be primarily considered on Minnesota's PFN facilities.

- **Need for designation and enforcement of truck size and weight standards.** MnDOT's Commercial Vehicle Office administers oversize-overweight permits for trucks traveling on the trunk highway system in the state. In Minnesota, individual counties are responsible for permitting loads on their county road networks. Generally, loads that exceed a width of 8'6", a height of 13'6", a length of 75'0", and a gross vehicle weight of 80,000 pounds require an OSOW permit. A common issue in Minnesota, and most other states, is that the number of enforcement staff at the state and local level trained in commercial vehicle operations is insufficient to reliably enforce the OSOW permitting program. Permitting requirements and nuances in the state are fairly complex and include a number of exceptions and provisions based on commodity types, truck configurations, and travel plans. One resulting issue is that unpermitted and improperly permitted loads can cause inordinate amounts of damage to state and local roadways.

A summary of needs and issues identified related to preserving Minnesota's infrastructure are shown in Table 3.5.

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http://www.mlive.com/business/index.ssf/2015/03/congress_to_army_corps_priorit.html

Table 3.5 Summary of Needs Related to Preserving Minnesota’s Infrastructure

Need/Issue	Type of Need/Issue	Mode(s) Impacted
Need for overdimensional routes	Physical Infrastructure, Operational	Truck
Need for freight-friendly design standards	Physical Infrastructure	Multimodal
Need for lock and dam maintenance	Physical Infrastructure	Water
Need for port facility improvements	Physical Infrastructure	Water
Need for spot roadway expansion, lane additions	Physical Infrastructure	Truck
Need to achieve 286,000-lb. compliance on the rail system	Physical Infrastructure	Rail
Need to achieve FRA Track Class 2, or better on the rail system	Physical Infrastructure	Rail
Need to maintain and improve highway system bridge and pavement conditions	Physical Infrastructure	Truck
Need to maintain adequate navigable depth	Physical Infrastructure	Water

3.5 SAFEGUARD MINNESOTANS

Safety is one of MnDOT’s top priorities; the agency is taking steps to make sure that safety is considered and integrated into all that it does. Freight-focused system safety is a relatively new topic of Minnesota, but in recent years has been the focus of significant efforts related to the rail system and the increase in rail movements of crude through the state. In this context, this Plan uncovered several needs and issues related to safeguarding Minnesotans.

- **Need for improved safety at highway-rail grade crossings.** As shown in the performance evaluation of Section 2.0, high-way crossing safety is a concern due to a history of accidents with crossing vehicles, trucks, bicyclists and pedestrians. Significant improvement has been made with the safety of rail crossings in Minnesota, but many of the currently installed warning devices will need to be replaced by 2030, and improvements beyond active warning devices also will be necessary in some locations.

The 2015 *Minnesota State Rail Plan* noted that MnDOT recently conducted an analysis of grade crossing active warning devices to determine the prevalence of and the need to upgrade aging infrastructure. This effort estimated that approximately 270 signals are 20 years old or older (as of 2006), while the normal lifespan for an active warning device is 25 years. Aging active warning devices are increasingly difficult to maintain due to technological obsolescence thus often entirely new warning devices must be installed at a cost of \$200,000 to \$500,000, depending on the complexity of the installation. As many signals were installed in the 1980s and 1990s, MnDOT

estimates that within 20 years, almost all of the 1,400 warning devices will need upgrading. At current values, it is estimated that \$280 million over 20 years will be needed, and the capacity to install 70 major grade crossing devices each year, not counting new installations for high-speed passenger corridors, quiet zones, and the proposed expanded deployment of an additional 170 devices on paved county roads.

- **Need to take proactive actions related to crude-by-rail movements.** As described in the 2015 *Minnesota State Rail Plan*, the ongoing North Dakota oil boom has resulted in a rapid increase in crude oil and silica sand transported by rail through Minnesota. This increase in traffic has had significant impacts on rail and roadway congestion, safety, and quality of life. Despite volatility and uncertainty in crude oil prices, current levels of crude-by-rail unit train activity are expected to continue, and could increase significantly with a future rise in worldwide oil prices and increasing crude oil extraction from North Dakota and Canadian sources.

Concerned about the large increase in Bakken oil shipments and the associated safety implications, the 2014 Minnesota Legislature directed MnDOT to conduct a study of highway-rail grade crossing improvements for rail corridors carrying unit trains of crude oil and other hazardous materials. MnDOT investigated areas along this mileage where safety could be improved to reduce public exposure to derailments, spills, and fires. The study identified site needs including grade crossing signal systems and alternative railroad grade crossing improvements. The study noted 683 at-grade rail crossings where Bakken crude oil passes. To find the most at-risk crossings, an aggregate score was calculated using a combination of GIS population analysis near crossings, federal crossing safety standards, and frequency of crude traffic on the respected rail line. Of the 100 crossings, 40 were researched further. Improvement recommendations for these 40 were made based on the aggregate score and cost-benefit feasibility of each crossing. Depending on the importance and the aggregate score of each crossing, recommended improvements include closing non-essential at-grade crossings, upgrading passive warnings to active signals, improving active signal protection with more effective safety treatments, or constructing new grade separations along the lines.

The Legislature appropriated \$2 million to make a first round of short-term improvements to key crossings around the state. MnDOT determined these initial improvements will take place at crossings in Big Lake, Clear Lake, Elk River, Perham, St. Cloud, St. Paul Park, Wadena, and Winona.

- **Need to implement Positive Train Control (PTC).** The purpose of PTC is to prevent most train-to-train collisions, overspeed derailments and casualties or injuries to roadway workers. The technology combines precise locating of all trains and other track vehicles; lineside infrastructure such as switches, crossings and junctions; automated cataloging of speed restrictions and traffic conditions; and real-time wireless communications with locomotives

and other operating equipment. The U.S. Rail Safety Improvement Act of 2008 mandated the widespread installation of PTC systems by December 2015 on most lines handling passenger trains or hazardous materials, a network totaling 80,000 miles. The Class I railroads are implementing PTC largely at their own expense, and installation is well underway in Minnesota and elsewhere. However, PTC poses costly challenges to some short lines that are handling hazardous materials, or more commonly must operate over PTC-equipped Class I main lines. The \$100,000 plus cost of retrofitting older locomotives that are typical of short line fleets is beyond the financial ability of many carriers.

A summary of needs and issues identified related to safeguarding Minnesotans are shown in Table 3.6.

Table 3.6 Summary of Needs Related to Safeguarding Minnesotans

Need/Issue	Type of Need/Issue	Mode(s) Impacted
Need for improved safety at highway-rail grade crossings	Physical Infrastructure, Operational, Organizational/Policy	Truck, Rail
Need to address high truck crash locations and other freight safety hot spots	Physical Infrastructure, Operational	Truck
Need to implement Positive Train Control (PTC)	Physical Infrastructure, Operational	Rail
Need to integrate freight safety into all MnDOT projects and plans	Organizational/Policy	Multimodal
Need to provide hazardous materials routing for trucks and rail	Physical Infrastructure, Operational, Organizational/Policy	Truck, Rail
Need to provide truck parking for trucks so they can comply with Federal Hours Of Service regulations, and pull off the road to rest or avoid congestion	Physical Infrastructure	Truck
Need to take proactive actions related to crude-by-rail movements	Physical Infrastructure, Operational, Organizational/Policy	Rail

3.6 PROTECT MINNESOTA’S ENVIRONMENT AND COMMUNITIES

While Minnesota residents and businesses rely on freight to provide their day-to-day needs, this activity sometimes leads to unintended impacts that should be mitigated. Some of these issues relate to air quality and noise, the presence of trucks in neighborhoods, and incompatible land uses adjacent to each other. Sometimes these issues more severely impact Minnesota’s environmental justice populations-racial and ethnic minorities, households without vehicles, and

persons who are low-income, are age 65 or older, are age 16 or younger, or who have limited English proficiency. Safety is also important to community quality of life and was presented in the previous section. In this context, this Plan uncovered several needs and issues related to protecting Minnesota's environment and communities.

- **Need to connect land use and transportation planning.** Anecdotal evidence suggests that land use designations do not accurately reflect where companies want to and are locating. The impact of transportation networks on location choices should be better understood and applied to land use planning. More rigorous zoning is needed in some cases to advance freight needs minimize incompatibility between adjacent land uses, and prevent encroachment of development.
- **Need to provide and preserve land for freight-focused development adjacent to freight infrastructure.** In the Minneapolis-St. Paul area and other parts of the state, businesses and shippers have found difficulty obtaining land with rail and port access. In some cases, zoning has become restrictive toward industrial and commercial uses, and in other cases, citizens have rallied to prevent expansion in rail traffic and operations due to noise and environmental concerns. Additionally, if land development patterns continue to emphasize dense residential and commercial development where historic freight activities have been present, older industrial space will be converted to these higher value uses, pushing many goods movement-dependent industries to locations on the periphery of the region or out of the region altogether, often in to neighboring regions. For many of these businesses, there will still be a need to access the central core areas (e.g., for intermodal or water port access), and these emerging development patterns will create a need for trucks to travel longer distances from distribution centers and corporation yards that are far from urban centers in order to make deliveries during limited daytime hours.
- **Need to plan for truck routes/operations in urban areas.** Urban areas are where often the most conflicts between trucks and other motoring vehicles occur. This is not only on the highway system, but also on the local roadway network, as trucks travel the system making pickups and deliveries. Truck route designation can help to focus through truck trips and minimize neighborhood cut-through traffic.

With the current emphasis on Complete Streets, there is a growing number of streets that have designated bike lanes and pedestrian pathways. In some cases, these uses are occurring on truck routes, creating safety issues and concerns. Trucks that must cross bike lanes to access on-street loading zones or that double-park due to lack of sufficient on-street parking for trucks can create particular hazards for bikes.

With more distribution centers located further from consuming markets, the average trucking distance is likely to increase, often on commuter corridors

already operating with major congestion. In order to operate safely and improve efficiency, truckers operate during off-peak hours whenever possible. As congestion grows, the ability of trucks to avoid operating during peak periods may lessen if they have to longer distances to move between.

- **Need to preserve and manage abandoned rail corridors.** Many unused rail corridors have been preserved through interim uses such as bicycle trails. Converting these corridors back to active rail use is often difficult and costly due to encroachment, regulations, and public opposition. Preserved rail corridors held in the State Rail Bank should be actively managed and evaluated for possible future transportation uses. These uses could involve trails, but could also provide right-of-way for relocation and elimination of road or rail traffic in other parts of the region.

A summary of needs and issues identified related to protecting Minnesota’s environment and communities are shown in Table 3.7.

Table 3.7 Summary of Needs Related to Protecting Minnesota’s Environment and Communities

Need/Issue	Type of Need/Issue	Mode(s) Impacted
Need to connect land use and transportation planning	Organizational/Policy	Multimodal
Need to consider freight in Complete Streets planning and project development	Organizational/Policy	Multimodal
Need to manage and mitigate negative impacts of freight activities	Physical Infrastructure, Operational, Organizational/Policy	Multimodal
Need to plan for truck routes/operations in urban areas	Physical Infrastructure, Operational, Organizational/Policy	Truck
Need to preserve and manage abandoned rail corridors	Organizational/Policy	Rail
Need to provide and preserve land for freight-focused development adjacent to freight infrastructure	Organizational/Policy	Multimodal

3.7 INTEGRATE FREIGHT THROUGHOUT MNDOT

In 2013 MnDOT conducted the *Integrating Freight in Statewide Planning and Programming* study and developed a summary report. The purpose of that study was to explore how a variety of organizational-related freight issues and needs are currently being addressed by MnDOT in its highway planning, project scoping, programming, and delivery process. The study was completed to inform this plan and provided a significant list of recommendations that will be incorporated into this Plans “Freight Action Agenda.” Three top needs and issues related to integrating freight throughout Minnesota have been identified by stakeholders during the outreach conducted for this Plan, and are described, below.

- **Need to build and strengthen partnerships to address significant freight issues.** MnDOT should focus on strengthening and promoting interagency, multi-state, and public-private partnerships. Aging infrastructure, capacity constraints, conflicts between freight and passenger needs, increasing regulations, a shrinking workforce, limited resources – the problems confronting freight movement in Minnesota are complex. Solving them will require communication between the private and public sectors. Public officials should be willing to engage the private sector on topics that are important to them, including potentially controversial topics. As part of this, several supporting needs were identified:
 - **Need to engage the private sector on their terms.** Public sector freight planning typically operates on a 20-25 year time horizon, while private sector planning operates at a much quicker pace. Prioritizing projects that can be developed, built, and show returns quickly is a good way to get the private sector to buy-in to longer-term freight planning. Outreach efforts by public officials should include participation at trade shows, forums, Chambers of Commerce, and other industry events. Individuals should be encouraged to brief public officials on important topics as part of the MFAC or other forum.
 - **Need to promote communication between industries.** Although many different industries may encounter similar freight transportation issues, there are few forums for private sector discussion of transportation or supply chain issues. Beyond public-private communication, industries need to be encouraged to speak with one another to discover where they share overlapping areas of interest, because projects that are backed by and benefit multiple industries are more likely to gain approval and move forward.
 - **Need to listen and respect.** Once successfully engaged, the private sector must feel their voices are heard. Additionally, it is important to recognize (and respect) private sector needs, such as protection of sensitive information.
- **Need to integrate freight considerations into all projects.** Freight is an important part of the entire transportation network. While it is vital to plan specifically for freight at the state, regional and local levels, it also needs to be considered in overall project planning across modes, especially in the project scoping stage. Freight, and its economic impact, should also be considered in the benefit-cost analysis phase. Including a freight project alongside a transit project for example, may increase the cost of a project but create a much higher economic return than is created by transit alone. Integrating freight needs into general project consideration will also help build redundancy in the freight network, allowing industry to quickly shift routes or modes when a break in the normal supply chain occurs.
- **Need for expanded and new funding mechanisms.** Consistent in stakeholder outreach conducted as part of this plan, as well as the findings

from MnDOT's previous freight studies, existing funding mechanisms are inadequate for making the levels of transportation investment needed on the freight system to accommodate current and projected future demand. As example, on the waterways, tariffs and fees charged for freight shipments are typically sufficient to address ongoing operations and maintenance costs, but do not provide the revenue necessary for major capital improvements. Several supporting needs were identified:

- **Need to support the addition of freight funding at the Federal level.** The Obama Administration's current transportation proposal is called the *Generating Renewal, Opportunity, and Work with Accelerated Mobility, Efficiency, and Rebuilding of Infrastructure and Communities throughout America Act*, or **GROW AMERICA Act**. This \$478 billion, six year transportation reauthorization proposal will provide increased funding highways, bridges, transit, and rail systems. One feature of this proposal is that it will provide \$18 billion for a multimodal freight program to strengthen exports and trade. This multimodal freight grant program would fund innovative rail, highway, and port projects focused on improving the movement of goods across the country. The GROW AMERICA Act will also give shippers and transportation providers a real seat at the table for making investment decisions and incentivizes States, like Minnesota, to collaborate and establish long term freight strategic plans.
- **Need to restructure existing funding programs.** On the rail system, Minnesota's revolving loan program, the Minnesota Rail Service Improvement Program (MRSI), has supported a strong rail system in the state for 30+ years; however, funding levels are inadequate, and a broader program is needed to go beyond small loans for infrastructure improvements. The program needs to include a range of solutions and financing options, including branch and short line preservation, and an increase in the maximum loan amount beyond the current \$200,000 ceiling. Additionally, MnDOT's Rail/Highway Grade Crossing program should expand to consider strategies beyond active warning devices.
- **Need to develop criteria for freight project selection and funding.** As there are fewer and fewer dollars to go around, the "biggest bang for the buck" investments need to be made. To help accomplish this, criteria for freight should be considered in selecting and funding projects. Additionally, projects providing freight-related benefits should be identified so that they can be ready to get underway if freight-related funding is available. As example, this could include prioritizing investment on the most heavily traveled freight corridors.

A summary of needs and issues identified related to integrating freight throughout Minnesota are shown in Table 3.8.

Table 3.8 Summary of Needs Related to Integrating Freight Throughout MnDOT

Need/Issue	Type of Need/Issue	Mode(s) Impacted
Lack of flexible funding that can be used for freight projects	Organizational/Policy	Multimodal
Need for better freight data	Organizational/Policy	Multimodal
Need for dedicated freight funding at the Federal or State-level	Organizational/Policy	Multimodal
Need to actively engage the private sector in freight activities on their terms	Organizational/Policy	Multimodal
Need to build and strengthen partnerships to address significant freight issues	Organizational/Policy	Multimodal
Need to consider Public Private Partnerships	Organizational/Policy	Multimodal
Need to develop criteria for freight project selection and funding	Organizational/Policy	Multimodal
Need to educate the public on the importance of freight	Organizational/Policy	Multimodal
Need to engage MnDOT's partner agencies in freight activities	Organizational/Policy	Multimodal
Need to engage neighboring states/provinces in freight activities	Organizational/Policy	Multimodal
Need to integrate freight considerations into all planning projects	Organizational/Policy	Multimodal
Need to listen to and respect industry	Organizational/Policy	Multimodal
Need to promote communication between industries	Organizational/Policy	Multimodal
Need to restructure existing freight funding programs	Organizational/Policy	Multimodal

4.0 Freight System Opportunities

It is important to note that with proper investments and policies, Minnesota's residents and businesses can realize greater benefits from the goods movement system than they do today. Technologies, operational strategies, and planning practices are available to ensure that these benefits can be realized while still providing the residents – even those who live near major goods movement infrastructure – with a high quality of life and economic opportunity. This section of the Tech Memo describes real-world opportunities that should be focused on as Plan recommendations and actions are crafted. These opportunities have a high degree of overlap. A well-crafted plan of investments and policies will be mutually reinforcing for many of the opportunities briefly described below. These opportunities will be expanded as formal Plan recommendations are made.

- **Use the Freight System in Minnesota as an Economic Driver.** The freight system is a conduit for economic activity in the state; this should be recognized and network used as a tool for planning and development, not just by MnDOT, but by all public and private sector stakeholders in the state. As previously noted, transportation system funding and dedicated freight funding is lacking, therefore there is reason to focus resources on those parts of the system that drive the economy. In this Plan Minnesota's Principal Freight Network was designated and several recommendations made for how the network should be used. Several of the recommendations relate to using the freight network to focus new development, prioritizing investments on the network, and providing funding to projects on the freight network.
- **Explore Use of Public-Private Partnerships.** As much of the freight transportation system is owned and operated by the private sector, and the goods conveyed on all systems are conveyed by private companies, public-private partnerships are a natural opportunity for MnDOT. These partnerships may be formal or informal in nature, but should be focused on communication, collaboration and consensus building on actions to be taken. These actions may include needs determination and project development, as well as funding and implementation.
- **Use Advanced Technology.** For the variety of needs and issues identified, there are many opportunities to introduce technology as part of the solution. Transportation related advanced technologies improve operational efficiency, safety, and mobility. Some of these include positive train control (PTC), weigh-in-motion systems (WIMs), dynamic message signs (DMS) for traveler information, global positioning systems (GPS), and intelligent truck parking.

- **Integrate Freight Throughout MnDOT.** As noted, in 2013 MnDOT conducted the *Integrating Freight in Statewide Planning and Programming* study and momentum has gained since that report to more thoroughly consider freight in the day-to-day activities of offices within MnDOT that are not solely focused on freight, as well as at the District level. Ways in which freight can be incorporated include through application/annual tracking of the freight system performance measures developed as part of this Plan, strengthening consideration of freight during project and investment planning, providing assistance to transportation planning organizations, continued coordination with FHWA, and maintaining an effective freight research program in partnership with the University of Minnesota.

5.0 Next Steps

The next, and final task, in developing Minnesota’s Statewide Freight System Plan is to craft a “Freight Action Agenda.” The Freight Action Agenda will be built on strategies designed to address the myriad needs and issues identified in this Tech Memo.

Prior to finalization strategies will be vetted with the Advisory Committee and Technical Team that have checked progress and provided input throughout Plan development. The strategies will also be reviewed by a wide array of stakeholders via an online survey tool, to ensure they are on point and consider all stakeholder perspectives.

The process proposed will result in identification of those actions that should be moved forward into implementation by MnDOT, in partnership with stakeholders, in short-, mid- and longer-term timeframes. The short-term strategies will constitute “quick wins” that MnDOT can act on now; providing industry with tangible benefits and showing that the Plan process, and engaging with MnDOT, was worth their time invested. Larger, higher cost projects that provide benefits to both public- and private-sector stakeholders will also be included in the identification; these projects will be ideal candidates for collaborative grant applications, such as the TIGER⁶ or TED⁷ programs.

⁶ U.S. Department of Transportation *Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grant Program*, <http://www.transportation.gov/tiger>

⁷ Minnesota Department of Employment and Economic Development and MnDOT *Transportation Economic Development Program*, <http://mn.gov/deed/government/financial-assistance/business-funding/ted.jsp>

A. NPMRDS Analysis

The following series of figures show the results of the National Performance Management Research Data Set (NPMRDS) Analysis conducted to determine the mobility of Minnesota's freight system and to identify significant bottlenecks. This information compliments Section 2.3 – Mobility Performance Measures.

Figure A.1 Statewide Average Truck Speed – AM Peak (October 2014)

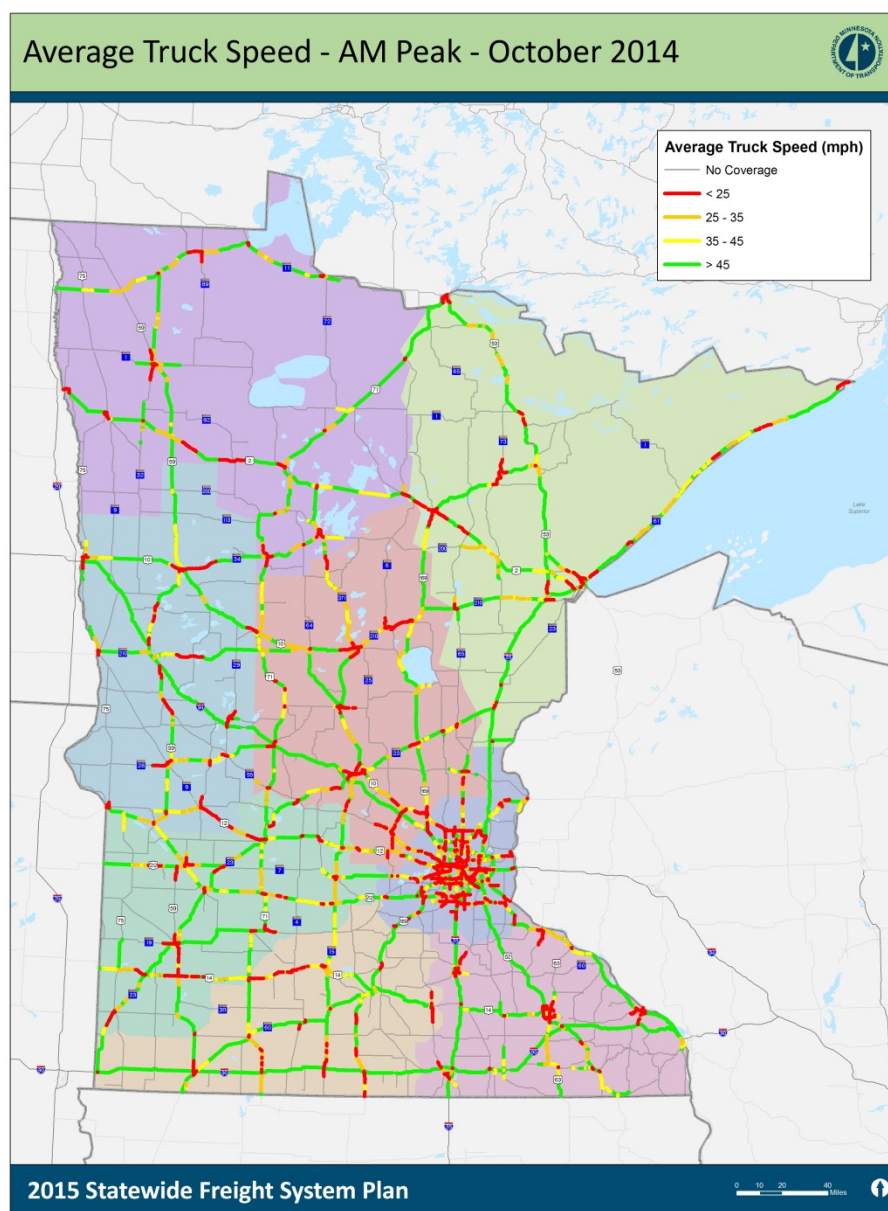


Figure A.2 Statewide Average Truck Speed – Midday Peak (October 2014)

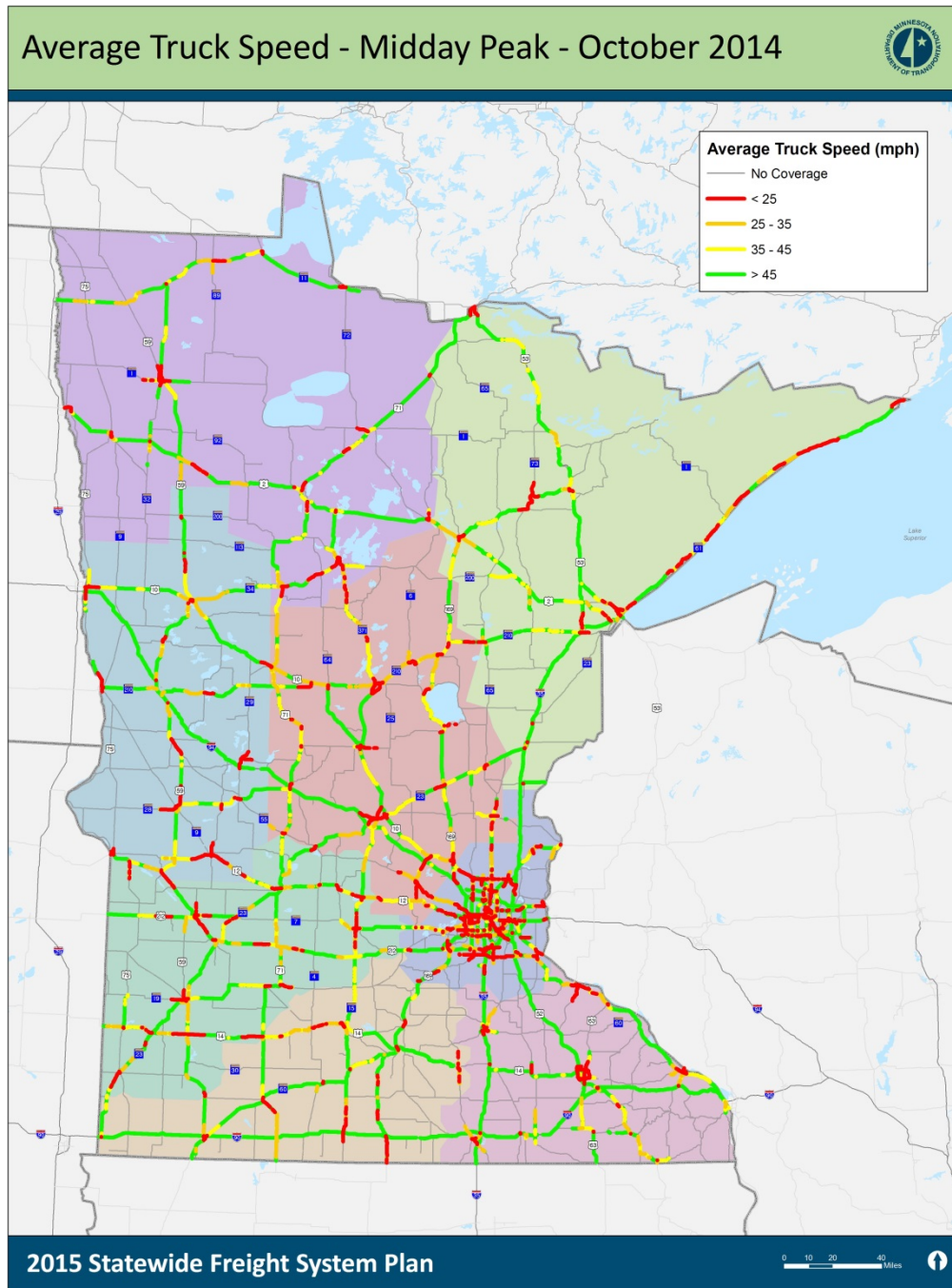


Figure A.3 Statewide Average Truck Speed – PM Peak (October 2014)

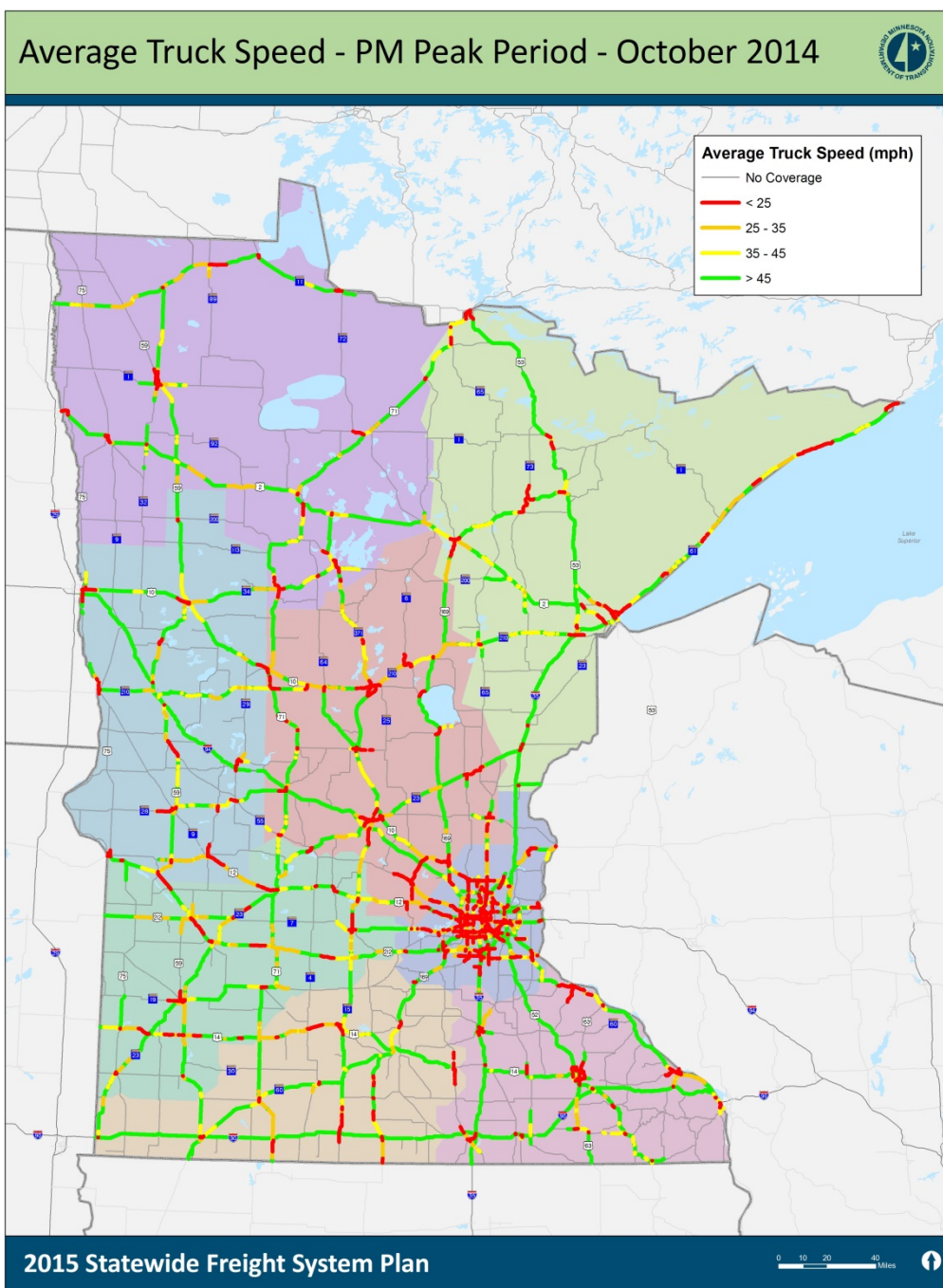


Figure A.4 Metro Area Average Truck Speed – AM Peak (October 2014)

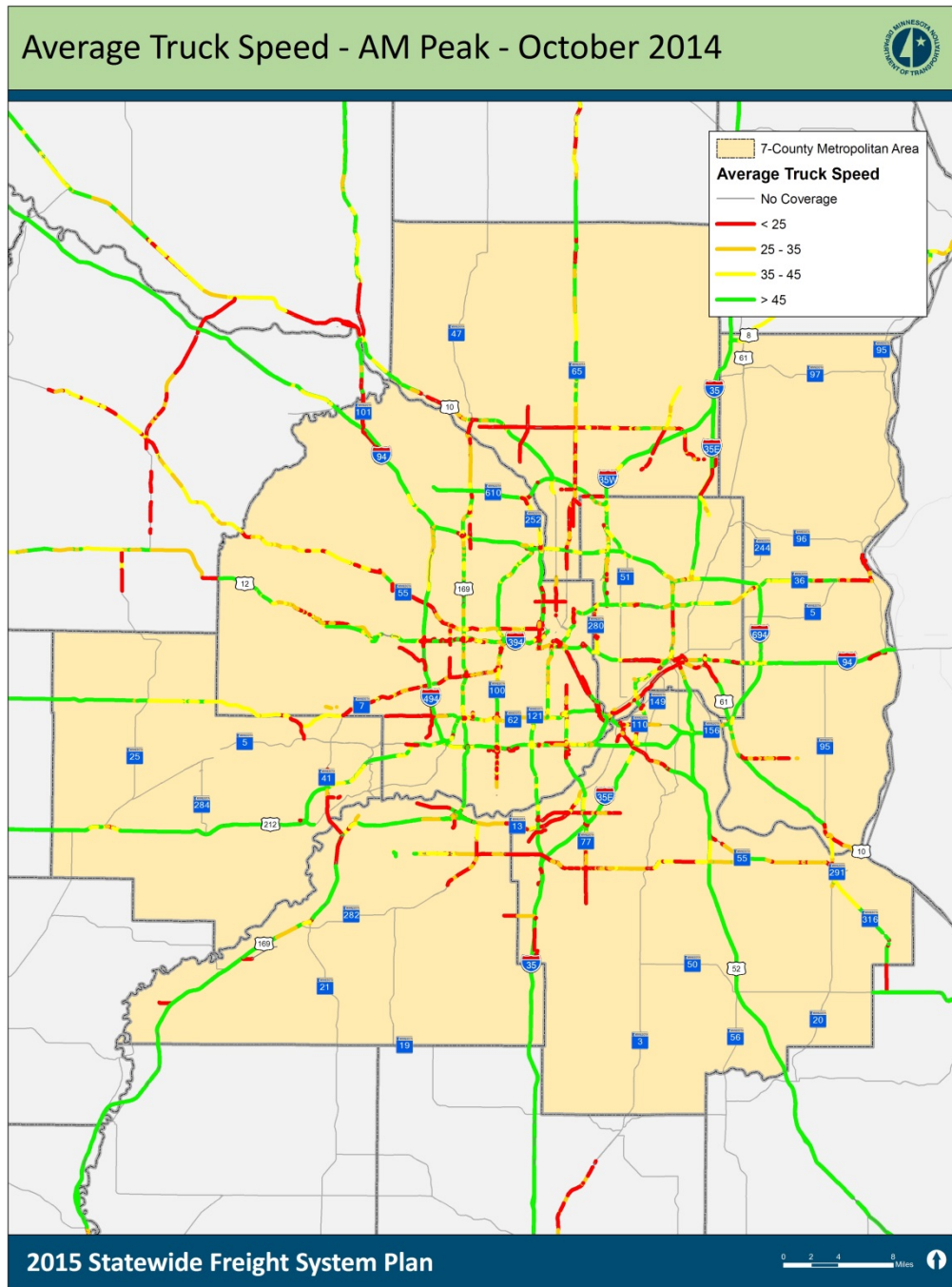


Figure A.5 Metro Area Truck Speed – Midday Peak (October 2014)

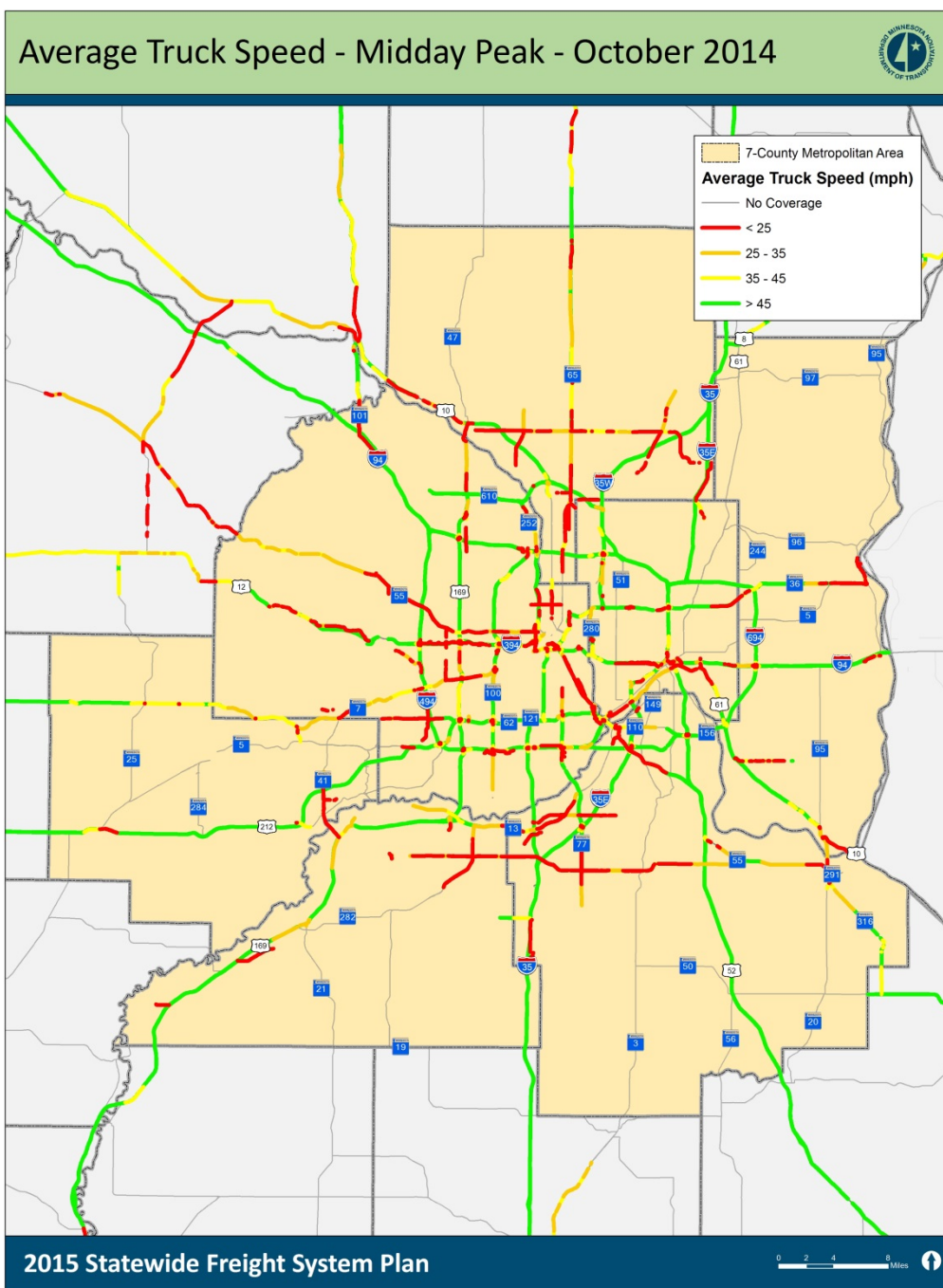


Figure A.6 Metro Area Truck Speed – PM Peak (October 2014)

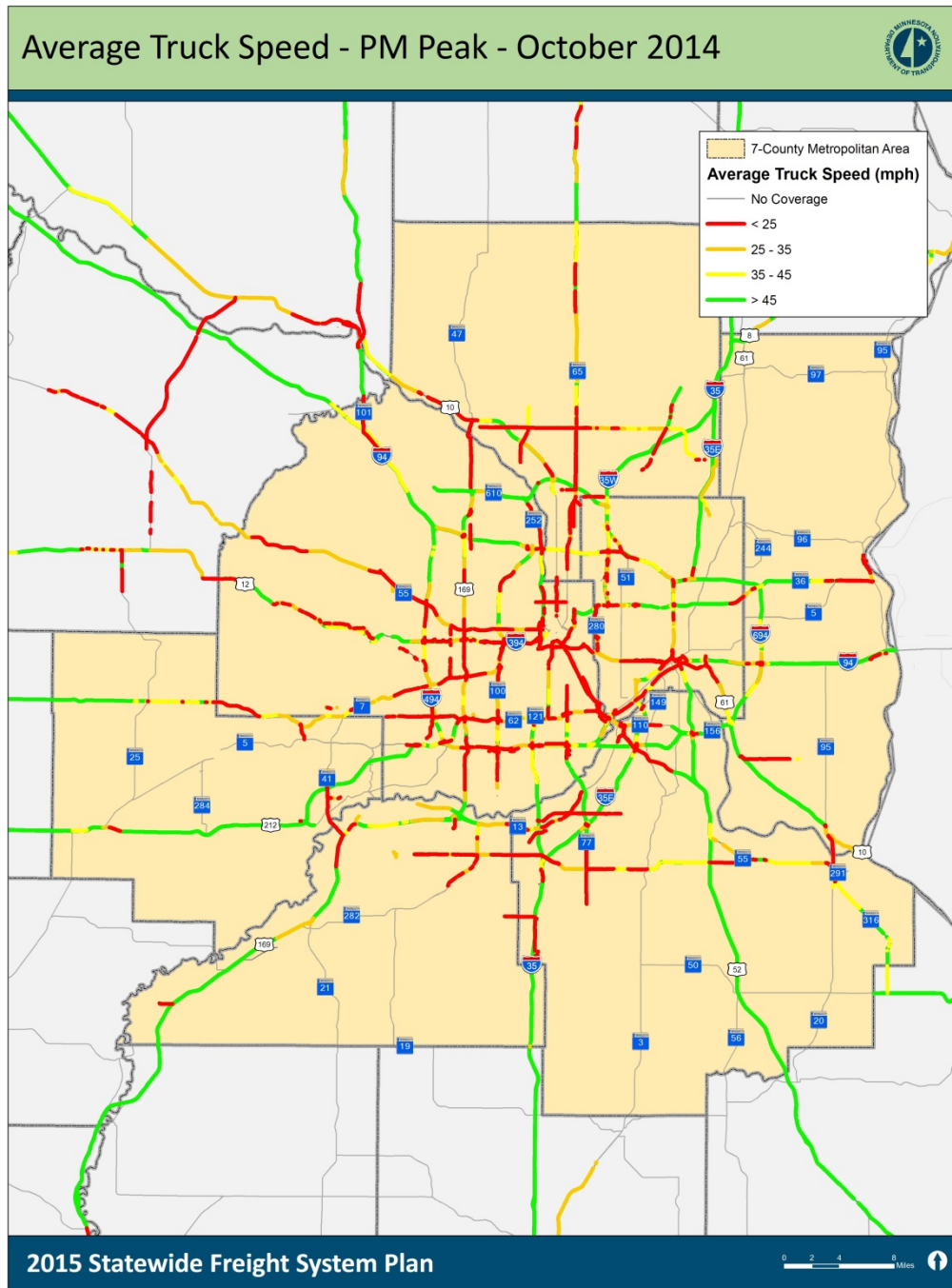


Figure A.8 Metro Area Speed Bottlenecks – PM Peak (October 2014)

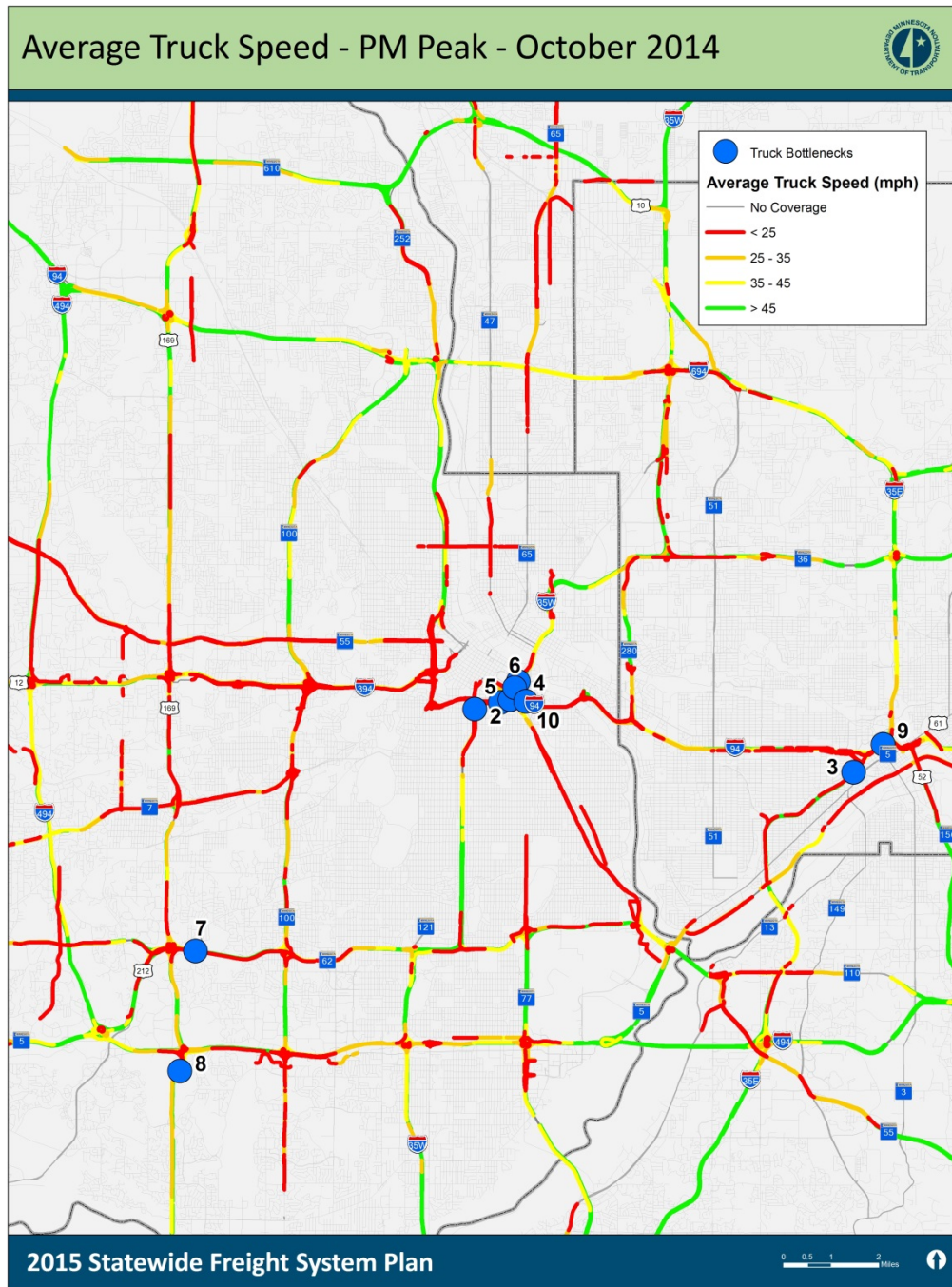


Figure A.9 Metro Truck Reliability Index – AM Peak (October 2014)

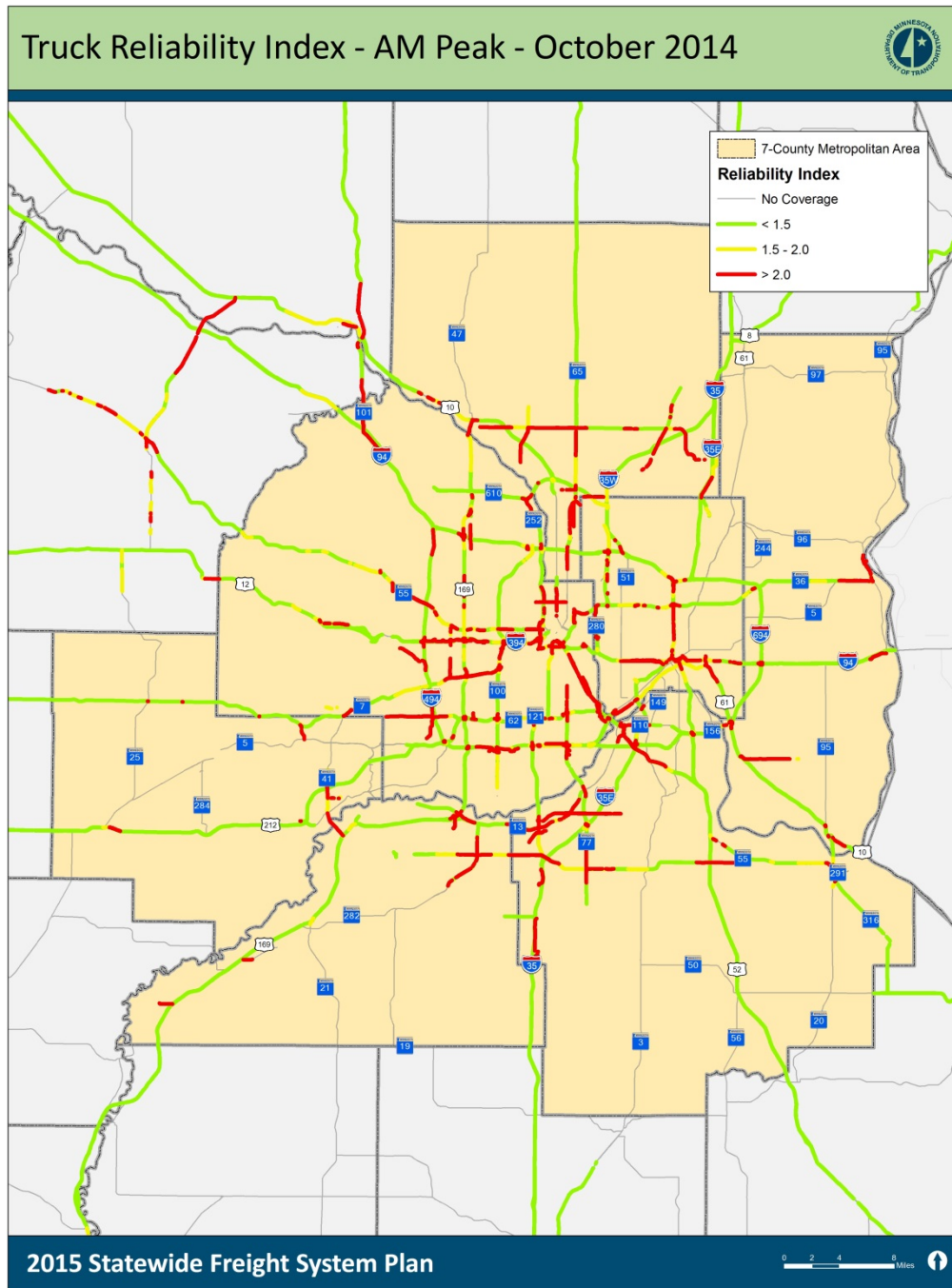


Figure A.10 Metro Truck Reliability Index – Midday Peak (October 2014)

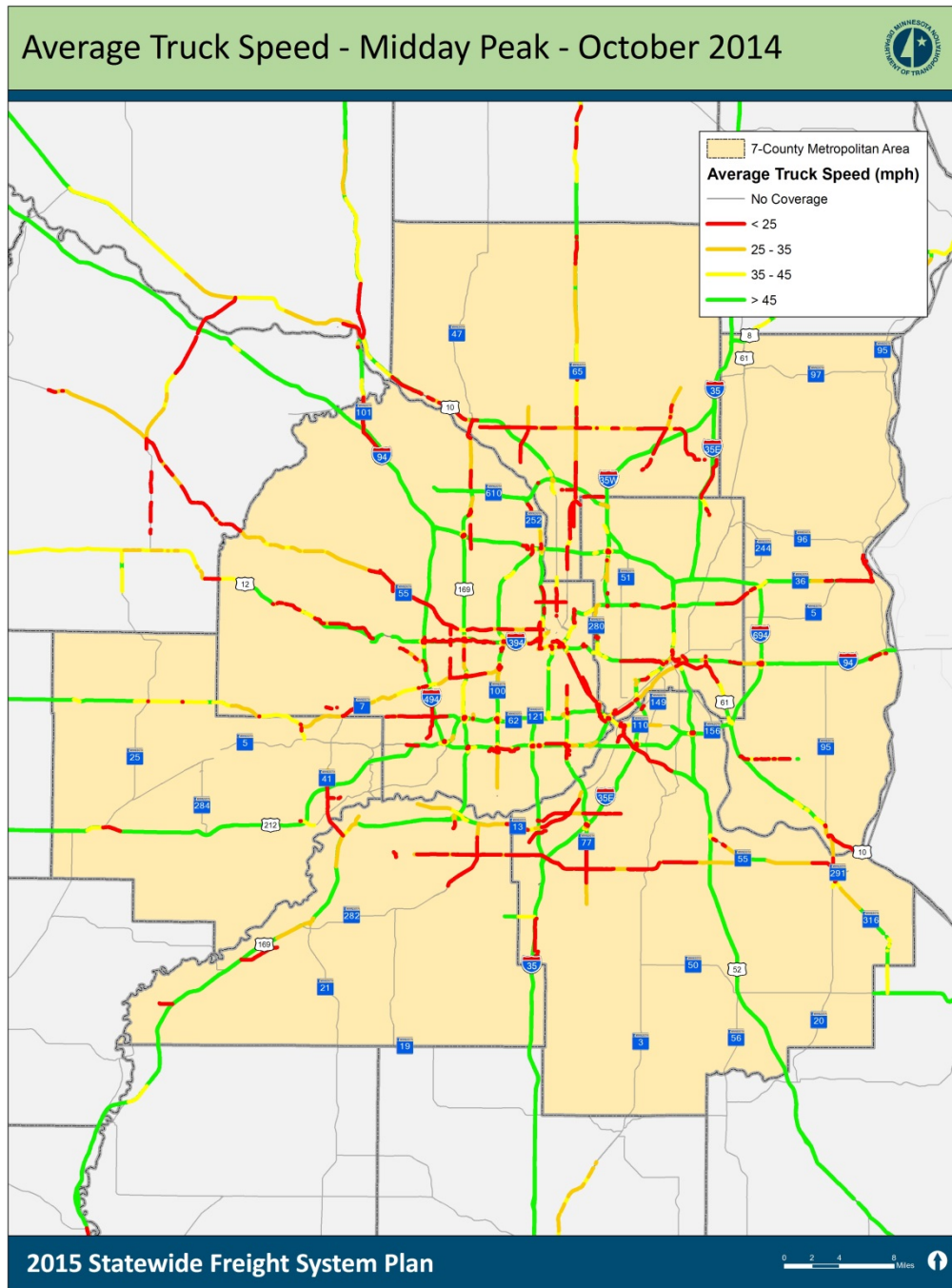


Figure A.11 Metro Truck Reliability Index – PM Peak (October 2014)

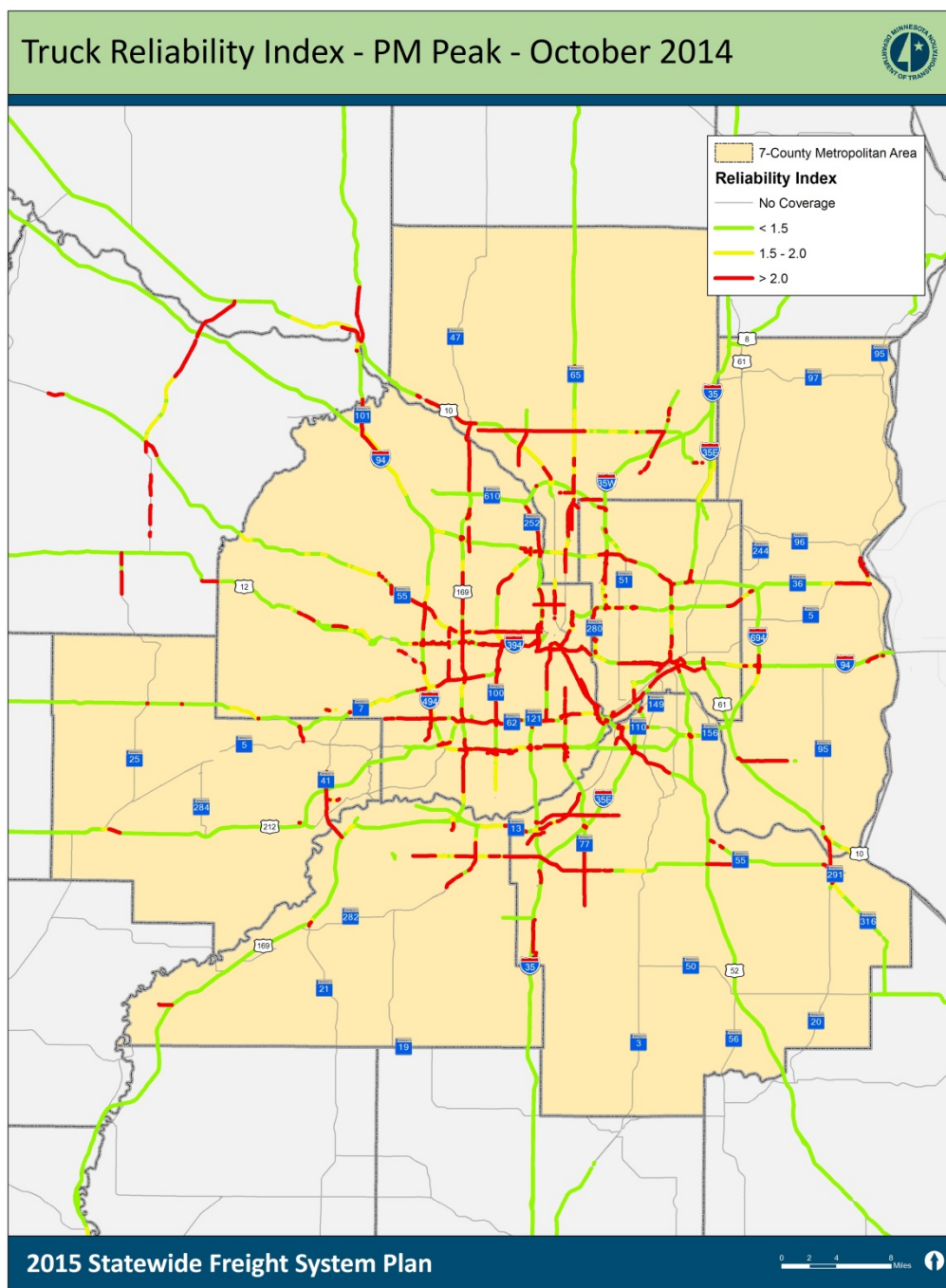


Figure A.12 Top Reliability Bottlenecks – AM Peak (October 2014)

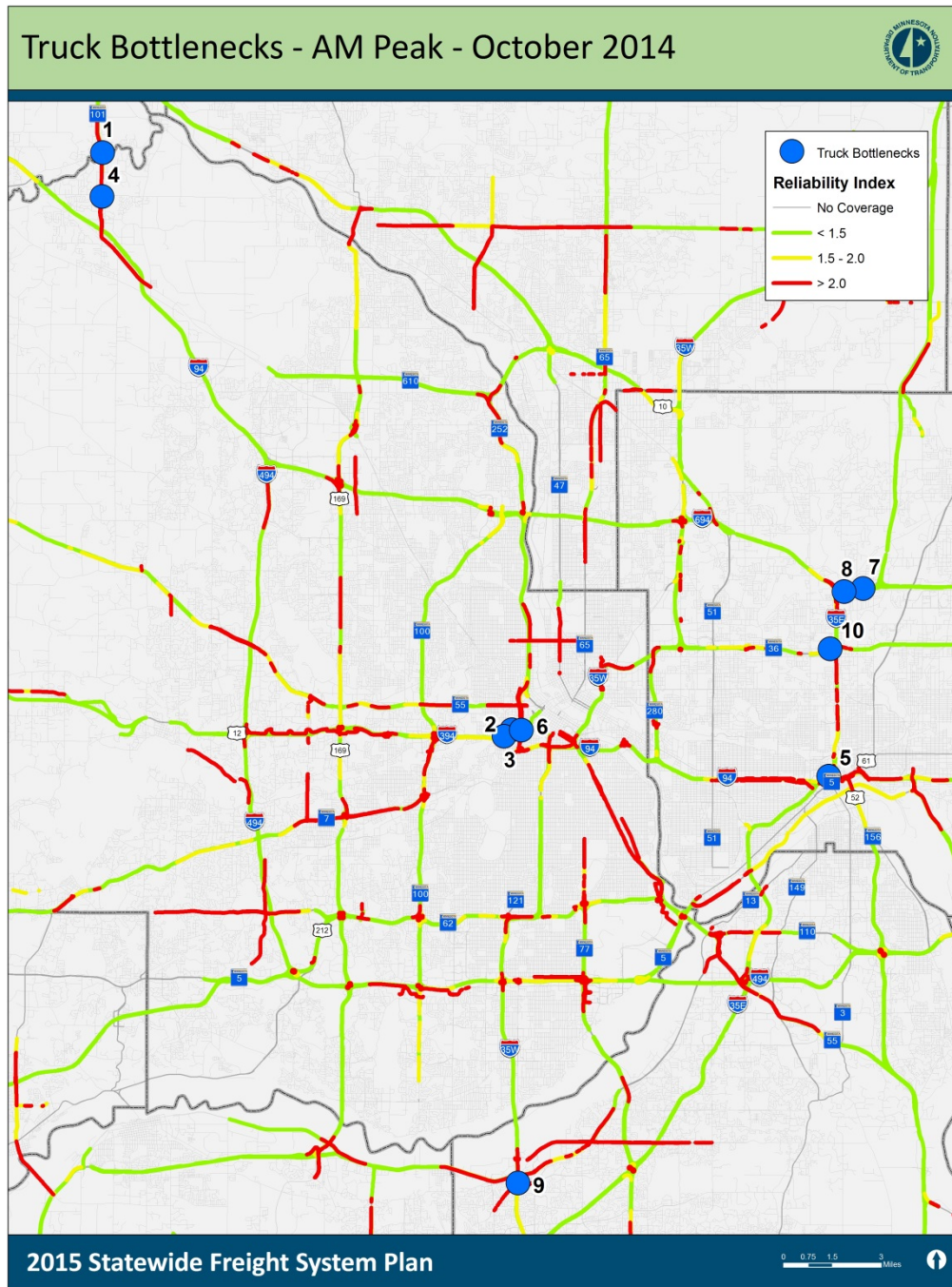
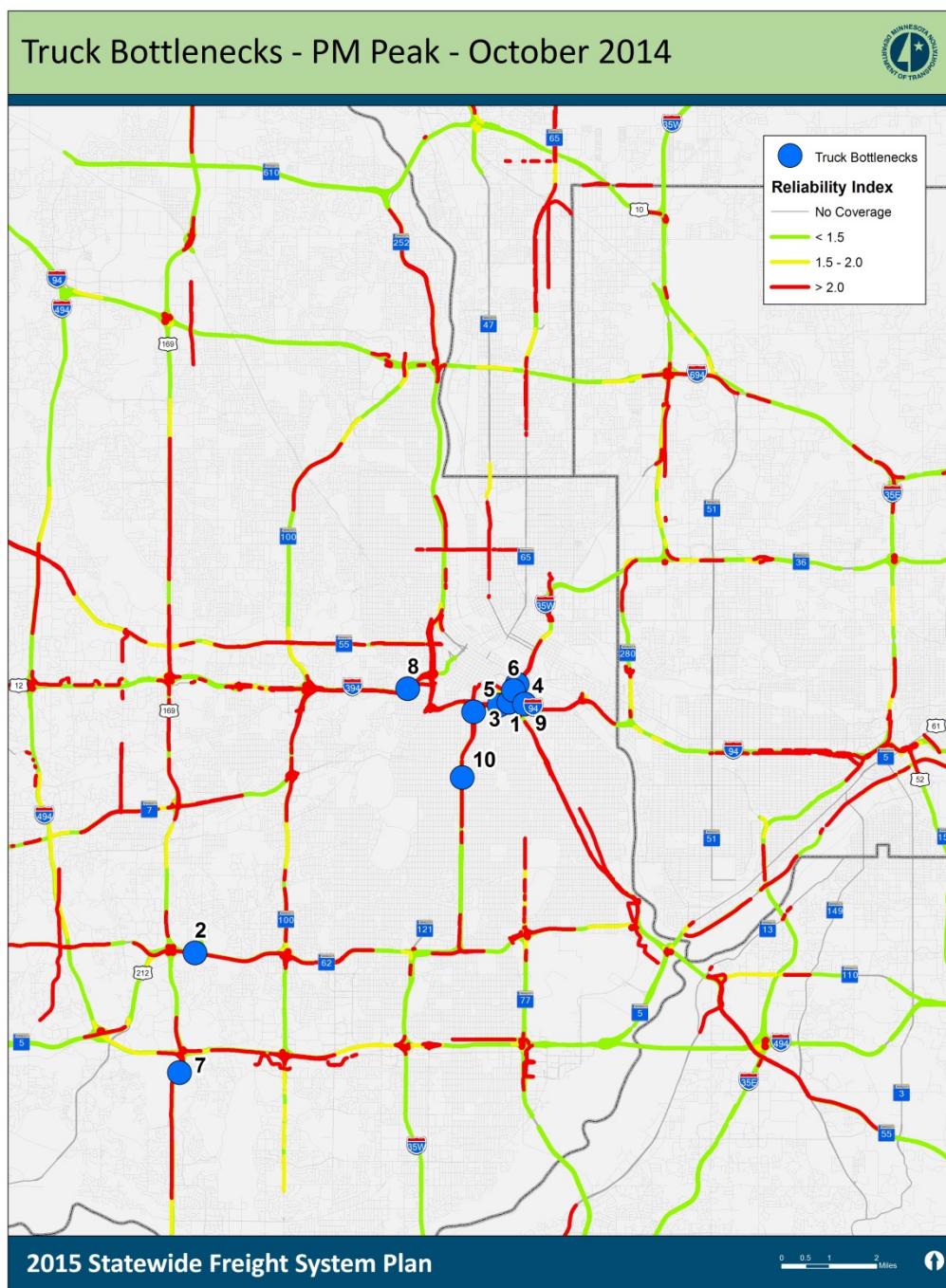


Figure A.13 Top Reliability Bottlenecks – PM Peak (October 2014)



B. Summary of Minnesota Statewide Freight Summit Feedback

B.1 SMALL GROUP DISCUSSION #1: PUBLIC-PRIVATE AND PUBLIC-PUBLIC PARTNERSHIPS

Issue

Freight transportation is a team sport. Within the private sector, carriers, shippers, suppliers, producers, receivers, distributors, and 3PLs collaborate on very complicated processes that involve long supply chains and result in production and distribution of products and services as economically and efficiently as possible. The private sector processes are carried out in a context created by the public sector, including physical infrastructure, operations of that infrastructure, and regulation. Within the public sector multiple agencies within state government, central and field, as well as local governments are responsible for pieces of the public responsibility.

Business benefits from public decisions based on good information and analysis concerning business operations and problems. Public agencies will make better decisions if businesses provide such information and offer support for proposals that will strengthen the freight system. Public agencies can be more effective if consistency and coordination is maintained within and between various agencies and levels.

Question

- What steps should be taken to strengthen the working relationships between public agencies and business and between (and within) agencies at the state, federal, regional, and local levels?

Building Block Questions

- How can business be effectively engaged to provide to public agencies the information needed to make sound decisions related to infrastructure, operations, and regulation that support the efficient operation of the Minnesota freight system (and to provide support for those decisions)?
- Are there examples of problems concerning the Minnesota freight system that have resulted from disconnects between public agencies and business?

- Are there examples of coordination between public agencies and business (within or outside transportation) that offer lessons for strengthening public-private collaboration in the future?
- Where, within Minnesota's state government and the DOT are there opportunities for stronger coordination that will lead to effective actions to strengthen the freight system?
- How important is coordination between Minnesota and its neighboring states?

Findings from Small Group Discussions

- **Information sharing must reach beyond the local scale:** Supply chains that move goods into and out of Minnesota stretch across the state, nation, and globe. Issues and opportunities in the freight logistics realm must be discussed at those same scales. This requires cooperation and communication between public agencies - MnDOT, MPOs, neighboring state MPOs/DOTs, Cooperation with Canadian organization in particular may lead to increased funding opportunities, as cross border trade is a national issue.
- **Tell a compelling story:** Freight is often a "hidden" component of the economy, not well understood by the general public unless something goes wrong. Being able to explain why a project is important and what it achieves are critical in obtaining both funding and public support. Industries and jobs are reliant on freight movement. Emphasizing individual commodity "stories" may help make freight movement issues more apparent and relevant.
- **Engage the private sector on their terms:** Public sector freight planning typically operates on a 20-25 year time horizon, while private sector planning operates at a much quicker pace. Prioritizing projects that can be developed, built, and show returns quickly is a good way to get the private sector to buy-in to longer-term freight planning. Outreach efforts by public officials should include participation at trade shows, forums, Chambers of Commerce, and other industry events. Individuals should be encouraged to brief public officials on important topics as part of the MFAC or other forum.
- **Listen:** Once successfully engaged, the private sector must feel their voices are heard and respected. Electronic surveys and questionnaires, as well as public sector attendance at freight industry forums and meetings are all excellent ways to elicit feedback.
- **Better define "Value":** A better definition of the term "value" is needed to provide a common base for comparison between projects and performance measurement. What is valuable to the private sector versus the public sector may differ. Changing mode shares for example could be of economic value to the state, but not to a private sector industry. Tonnage may be a more accurate measure of "value" for certain commodities. Economic sectors may

also see freight's "value" differently – the price of a commodity may not accurately reflect its worth to a company.

B.2 SMALL GROUP DISCUSSION #2: MINNESOTA'S STRATEGIC FREIGHT NETWORK

Issue

Making decisions to improve freight movement requires focusing on important freight, moving on specific routes, by particular modes or combinations of modes, between key origins and destinations. Minnesota's competitive advantage for business investment will be strengthened by the development of a freight network that achieves efficiency within the state and seamless connectivity with the region, the nation and the global economy.

Question

What criteria will the designated Strategic Freight Network have to meet in order to be judged successful?

Building Block Questions

- What matters most in the designation of Minnesota Strategic Freight Network: Volume of freight or value of freight?
- What are the challenges to blending statewide, sub-state and local factors into the Strategic Freight Network?
- What criteria should be used to incorporate non-highway and multi-modal freight elements into the Strategic Freight Network?
- How should "traditional" and "emerging" industries be balanced in the development of the "Strategic" Freight Network?
- What private sector data is needed for the development of the Strategic Freight Network and how can it be obtained?
- There are freight routes, and facilities outside of Minnesota that are important for Minnesota companies, e.g. locks and dams on the Mississippi and rail in Chicago and North Dakota. Should these be incorporated in the Strategic Freight Network and, if so, how?

Findings from Small Group Discussions

- *Develop adaptable and flexible criteria:* Minnesota's Strategic Freight Network should not be developed based on a single criteria. Season, location, commodity, and industry are factors that influence freight value, volume, route or mode, and so MnDOT should be flexible in designing its criteria. This flexibility will allow MnDOT to designate a multimodal freight

movement network that serves the needs of all industries. It will also allow for consideration of criteria beyond freight – whether a potential Strategic Freight route also serves transit for example.

- ***Capture value of connector routes:*** Minnesota is heavily a “through” state in terms of overall freight flow. Most of the goods moving in Minnesota are arriving from and bound for locations outside of the state. This means Minnesota’s infrastructure bears the costs of goods movement while the state’s economy reaps few of the benefits. The Strategic Freight Network should recognized corridors that connect major freight routes (measured by volume or value) to ports, airports, warehouses, and other job-creating facilities that create economic benefits even when the freight is only “passing through.”
- ***Identify network and projects that creates a return on investment:*** Volume and value of freight moving on a corridor are not the only indicators of importance. Identifying infrastructure that provides (or could provide) a large return on investment is critical in Minnesota. Small improvements that help rural/remote areas – such as runway enhancements at a small airport – may produce employment and economic benefits that justify a project even though the total volume or value of freight moved is small. This may also help develop clusters and strategic locations outside of large urban areas where freight improvements can drive economic activity.
- ***Request and produce better data:*** More complete data will aid Minnesota in creating a comprehensive Freight Strategic Network. Raw freight data should be linked to non-freight specific information such as economic impact, transit service, or wastewater impacts whenever possible. This broader view of the freight system will appeal to the private sector, public sector, users, and politicians. Collaboration with the private sector to obtain this (sometime proprietary) data is key.
- ***Recognize infrastructure outside of Minnesota that is critical to the state:*** Minnesota is geographically removed from the global market and so relies on transportation infrastructure in other states to reach foreign markets. The designation of Strategic Freight Networks in neighboring states will have a direct impact on Minnesota. The state should collaborate with neighboring states to reinforce the importance of infrastructure connectivity and develop a seamless freight network.
- ***Develop redundancy:*** Infrastructure across all modes is aging, raising the possibility that a critical link will fail. Temporary closures due to weather are also a concern. Redundancy, either via alternative routes or alternative modes, should be a consideration in determining the Strategic Freight Network. Whenever possible, the Network should identify routes and modes that can allow the flow of goods to continue even when a standard route is not available. Redundancy will also allow for options when a particular mode or route is unsuitable due to safety concerns or competing demands.

B.3 SMALL GROUP DISCUSSION #3: MINNESOTA SUPPLY CHAINS

Issue

“U.S. business and industry look at the U.S. freight transportation system and think about its performance in terms of shipments along their supply chains. However, the public sector is accustomed to looking at the freight transportation system and thinking about its performance in terms of network and corridor capacity, infrastructure condition, and safety. As a result, we are often not as effective as we should be as a Nation in making strategic investments in our freight transportation system that directly improve our supply chains. We believe that a more systematic effort to look at the performance of supply chains can complement and inform federal, state and local freight transportation policy and investment decisions and result in more effective and competitive supply chains.”

- From recommendations for “Improving U.S. Supply Chain Competitiveness through Freight Policy,” U.S. Department of Commerce Advisory Committee on Supply Chain Competitiveness, September, 2014.

Question

What are the key steps to integrating the realities, challenges, and perspective of business supply chains into public sector planning and investment through Minnesota’s Freight Action Plan?

Building Block Questions

- What criteria (volume, value, location, growth potential, etc.) should be used to identify industry supply chains with the highest priority in Minnesota’s Freight Action Plan, a product of the Minnesota Freight System Plan?
- Should the segments of supply chains important for Minnesota business that lie outside the borders of Minnesota be taken into account in the Freight Action Plan? If so, how? (Currently, what factors outside the borders of Minnesota have the greatest impact on Minnesota supply chains?) – not answered in notes
- How heavily do freight and logistics concerns (i.e., cost, travel time, reliability) factor into decision-making by Minnesota companies into decisions such as location, expansion, pricing, and supply chain structure? - heavily
- What arrangements should be put in place to incorporate supply chain information and analysis that businesses produce and use into public infrastructure planning and investment? – need for data

Findings from Small Group Discussions

- **Connect land use and transportation planning:** Land use categories do not accurately reflect where companies want to and are locating. The impact of transportation networks on location choices should be better understood and applied to land use planning. More rigorous zoning is needed in some cases to advance freight needs.
- **Stress the importance of corridors:** Linking land use and transportation planning should extend beyond specific business locations to the freight corridors that allow goods to flow. Corridors should be treated as a resource. Land use policies along a critical freight corridor can restrict access, making it difficult for businesses to function even if the land uses in their immediate area are conducive to freight operations.

The importance of corridors also extends to the interaction between freight and passenger needs. More rigorous criteria should be developed to guide the future mix between freight and passenger needs--for all modes--and link that mix to appropriate land uses. In some cases, separate corridors for freight may be the best option.

- **Adapt to evolving supply chain operations:** Changing definitions of “value” has led modern supply chains to operate on a just-in-time schedule. This is true across industries – deliveries direct-to-customers are just as time-sensitive as shipments to industrial plants. Material that once was held at a site as a strategic reserve is now measured in terms of dollars of inventory. Excess inventory is no longer stored on site, decreasing the ability of a business to endure a supply chain disruption. This has changed the nature of the transportation system, increasing the need for resiliency and redundancy across all transportation modes and along the supply chain. Need for redundancy has instead been transferred to the transportation system as a whole.
- **Increase outreach:** Freight is a critical component of every-day life. However, that message often does not reach the average citizen. Both the public and private sector need to do a better job of reaching out and educating the public on the role freight plays in the economy. This also requires that accurate information is available to give to the public.
- **Focus on technology:** Accurate information relies on data. Increasingly, that data is arriving from technologically advanced sources. Understanding what data is available, its limits, and what it can show is key to both planning, and developing outreach material for the public. Focus attention on understanding and exploring new and expanding technology as drivers of future growth, and as key resources of information. Existing and developing technology is often first used in the private sector. Making the information derived from that technology available to planners and policy makers will allow the public sector to better anticipate and develop an infrastructure that meets the needs of future businesses.

B.4 SMALL GROUP DISCUSSION #4: CHOKEPOINTS ON MINNESOTA'S FREIGHT SYSTEM

Issue

Like blockages in coronary arteries, chokepoints or bottlenecks on the freight system can produce severe local problems and significantly reduce the efficiency of the entire system. Chokepoints can result from inadequate or insufficient infrastructure (e.g. highway capacity, or highway geometrics), operations issues (e.g. timing of traffic lights, signage), or regulatory measures (e.g. regulations governing oversize/overweight truck movements).

"Our ability to compete in the global marketplace depends on our ability to move freight through supply chains reliably and cost-effectively. But highway interchanges serving critical supply chains are major bottlenecks; ports, border crossings and intermodal terminals are operating over capacity; and, access roads to terminals and distribution centers are deteriorating. These bottlenecks and the delays they cause slow down freight movement, raise the cost of moving goods through our supply chains, and reduce our ability to deliver goods reliably, quickly and on schedule to global and domestic customers. The result is less competitive industries and lost economic opportunity."

- From recommendations for "Improving U.S. Supply Chain Competitiveness through Freight Policy," U.S. Department of Commerce Advisory Committee on Supply Chain Competitiveness, September, 2014.

Question

Where are the most significant chokepoints or bottlenecks on Minnesota's multimodal freight system (discuss both locations and modes affected)?

Building Block Questions

- What criteria should be used to identify and prioritize choke points on Minnesota's freight system? (volume of freight, value of freight, cost of delay, impact on significant industry, etc.)
- Are there chokepoints outside the borders of Minnesota that significantly impact the Minnesota freight system?
- How have chokepoints/bottlenecks affected the decision-making by Minnesota companies in areas such as location, expansion, pricing, and supply chain structure?
- Should Minnesota have an expedited process for dealing with significant chokepoints?
- What are the most significant chokepoints for intermodal transfers in Minnesota, or for Minnesota's companies?

Findings from Small Group Discussions

- ***Develop criteria for identifying and prioritizing chokepoints:*** Cost of delay and impact on significant industry are key criteria for this, because some delays are more injurious to the freight movement system than others. Recurrent delay, for example, may be less costly to some industries due to its predictability. Industry can mitigate or plan for the issue. On the other hand, it is hard to plan for delay when locations that become chokepoints at irregular intervals, leading to more supply chain costs.

Chokepoints that impact major industries can have ripple effects on related industries throughout the supply chain, thus causing greater economic loss than chokepoints that impact smaller or less critical industries. Mining big data sources that are in the public realm – WAZE, INRIX, 511 – and conducting business surveys such as MetroQuest can help identify other bottlenecks without a large outlying of resources.
- ***Recognize the importance of multimodal nodes:*** Limited transfer facilities between truck-rail and truck-water create bottlenecks in the supply chain. Beyond the Twin Cities area and Duluth, there are essentially no major intermodal facilities in the state. Access to these nodes from the rest of the system – covering the “first and last mile” of shipments – are also key components to the freight system.
- ***Identify chokepoints outside of Minnesota that impact the state:*** Chokepoints that exist outside of Minnesota have a negative impact on freight movement within the state. Rail congestion, specifically in Chicago, IL and at the BNSF La Crosse complex were cited as problems that create backups through WI, MN, and beyond. Better coordination across political boundaries is crucial, both in planning for future needs and in resolving current issues – such as differing weight restrictions – that create additional obstacles for freight movement.
- ***Develop redundancies and increase system-wide capacity, across modes:*** Capacity over the entire multimodal freight network is stressed. Delays along one route or on one mode spreads to other networks and affects both passenger and freight travel. For example, increased oil, gas, and agriculture rail shipments along BNSF’s corridor from North Dakota to Minneapolis have negatively impacted the on-time performance of NorthStar commuter rail and Amtrak service. This has reduced ridership on these routes, and led to increased vehicle usage on the I-94 and US 10 corridors which are already congested. Redundancy across modes and system-wide capacity expansion are needed.
- ***Address systemic and multi-modal problems:*** Freight is multi-modal, and systematic issues such as need for regulation, management, or education in one mode will affect multiple modes. For example, a lack of qualified truck drivers, caused partially by education and regulation shortfalls, exaggerates the lack of capacity in the trucking industry. These effects are spread across

modes – i.e. a trucking shortage impacts the rail industry. These issues need to be viewed at the multi-modal, system level, and solutions may bridge more than a single mode. For example, speeding permitting procedures to allow a pipeline to carry oil could cause a mode shift that reduces capacity issues for rail.

- *Businesses are not relocating from Minnesota due to chokepoints:* Seminar participants were unaware of any businesses that left Minnesota due to supply chain chokepoints, nor were they aware of companies choosing other states over Minnesota based on supply chain concerns. Companies that operate in Minnesota are aware of the issues and have the desire and ability to overcome them.

B.5 SMALL GROUP DISCUSSION #5: STRENGTHENING MINNESOTA’S ECONOMIC COMPETITIVENESS

Issue

Whether or not a state’s freight system supports its economy is a judgment that cannot be made in the abstract. Every state is different. No freight system fits all. The strength of Minnesota’s economy lies in the diversity of its industries and the mix of these industries, which has historically supported prosperity and will lead to growth in the future.

The continued strength of the traditional industries and the growth potential of the emerging industries will be affected by the efficiency of the freight transportation system. Although almost every business relies on the transportation system in some capacity, “freight-related” industries in particular are heavily dependent on the transportation system to conduct their business. In general, freight related industries include agriculture and forestry, mining, utilities, construction, manufacturing, wholesale and retail trade, and transportation and warehousing.

A more granular view of Minnesota’s economy may be seen at the district level where the essential geographic connection between industries and transportation needs is made clear with concentrations in some districts of industries such as forestry and logging, crop production, and animal production and in others, industries such as machinery manufacturing, plastics and rubber manufacturing, electrical equipment manufacturing and medical equipment manufacturing. Energy—wind power, hydraulic fracturing and the transport of crude—represents a particularly challenging area for freight transportation. Minnesota’s freight transportation system should be responsive to the needs of all of the above.

Question

What can be done to make sure that decisions concerning Minnesota's freight transportation system result in the highest possible economic return for the state?

Building Block Questions

- What industry developments and trends, both within Minnesota and beyond, are most important for decisions related to the freight transportation system?
- How can long-range infrastructure decisions be reconciled with unexpected events and opportunities in the economy?
- Different industries will have different modal needs (truck, rail, water, air). Currently, what are the strengths and weaknesses in these modal systems in Minnesota? – not answered
- Looking to the future, what one element or combination of elements of the freight transportation system (can be specific or general) require the most attention to support the growth of the Minnesota economy? – not answered

Findings from Small Group Discussions

- ***Promote communication between industries:*** Although many different industries may encounter similar freight transportation issues, there are few forums for private sector discussion of transportation or supply chain issues. Beyond public-private communication, industries need to be encouraged to speak with one another to discover where they share overlapping areas of interest, because projects that are backed by and benefit multiple industries are more likely to gain approval and move forward. Freight advisory committees are one forum that can be facilitated by MnDOT to allow for engagement between industries. However, when having these discussions, it is important to recognize private sector needs, such as protection of sensitive information.
- ***Integrate freight considerations into all planning projects:*** Freight is an important part of the entire transportation network. While it is vital to plan specifically for freight, it also needs to be considered in overall project planning across modes, especially in the project scoping stage. Freight, and its economic impact, should also be considered in the benefit-cost analysis phase. Including a freight project alongside a transit project for example, may increase the cost of a project but create a much higher economic return than is created by transit alone. Integrating freight needs into general project consideration will also help build redundancy in the freight network, allowing industry to quickly shift routes or modes when a break in the normal supply chain occurs.
- ***Encourage discussion of controversial topics:*** Aging infrastructure, capacity constraints, conflicts between freight and passenger needs, increasing regulations, a shrinking workforce, limited resources – the problems

confronting freight movement in Minnesota are complex. Solving them will require communication between the private and public sectors. Public officials should be willing to engage the private sector on topics that are important to them, including potentially controversial topics. The private sector can also provide feedback to policy makers on proposed regulations, tax policy, or other topics where industry support could be crucial to implementation.

- ***Develop pilot programs to test concepts:*** Short-term and low-cost pilot programs can be used to test the viability of concepts at a small, industry specific scale. If proposals succeed, there is an increased likelihood that they will be pursued at a larger scale and can be spread to other industry groups. By reducing the scale of projects and drawing money from a dedicated source, ideas can be implemented quickly – alleviating a common disconnect between public and private freight planning timelines, and can highlight the “real world” consequences of policy-level decisions at a level that is relevant for industry. Pilot programs help answer the, “What is in it for me?” question that often limits private sector involvement in public sector freight planning. The off-hours delivery program pilot is an excellent example of an existing project.

C. Online Survey Results

As part of Plan outreach, an interactive online survey was used to gather information on the current state of the multimodal freight system in Minnesota. The survey was available from September 23, 2014 through December 19, 2014 and gave participants the opportunity to comment on issues they believed to be of importance to the freight industry. Participants were also given an interactive map and asked to identify specific locations where they experienced issues, or felt there was a need for improvement, within these systems.

Approximately 600 individuals participated in the survey with 234 respondents being actively involved in the freight industry. Of the 234 freight industry respondents approximately 63 percent worked in the private sector with the remaining being employed in the public sector.

The survey data was synthesized and analyzed to identify key needs, issues and opportunities for improvement across each of the previously identified modes of transportation. The results of this analysis are provided in this report and have been organized within the following categories:

- Mobility
- Infrastructure
- Safety, Environment and Community
- Economy
- Organization and Policy

In total participants identified 476 specific locations, using the interactive map, where the freight system had an issue or needed improvement. In some cases a location was noted to have multiple issues (e.g. chokepoint and poor pavement condition). The majority of the identified locations were related to the highway system with the rail system having the second most locations. The waterway and aviation system had the smallest number of identified issue locations.

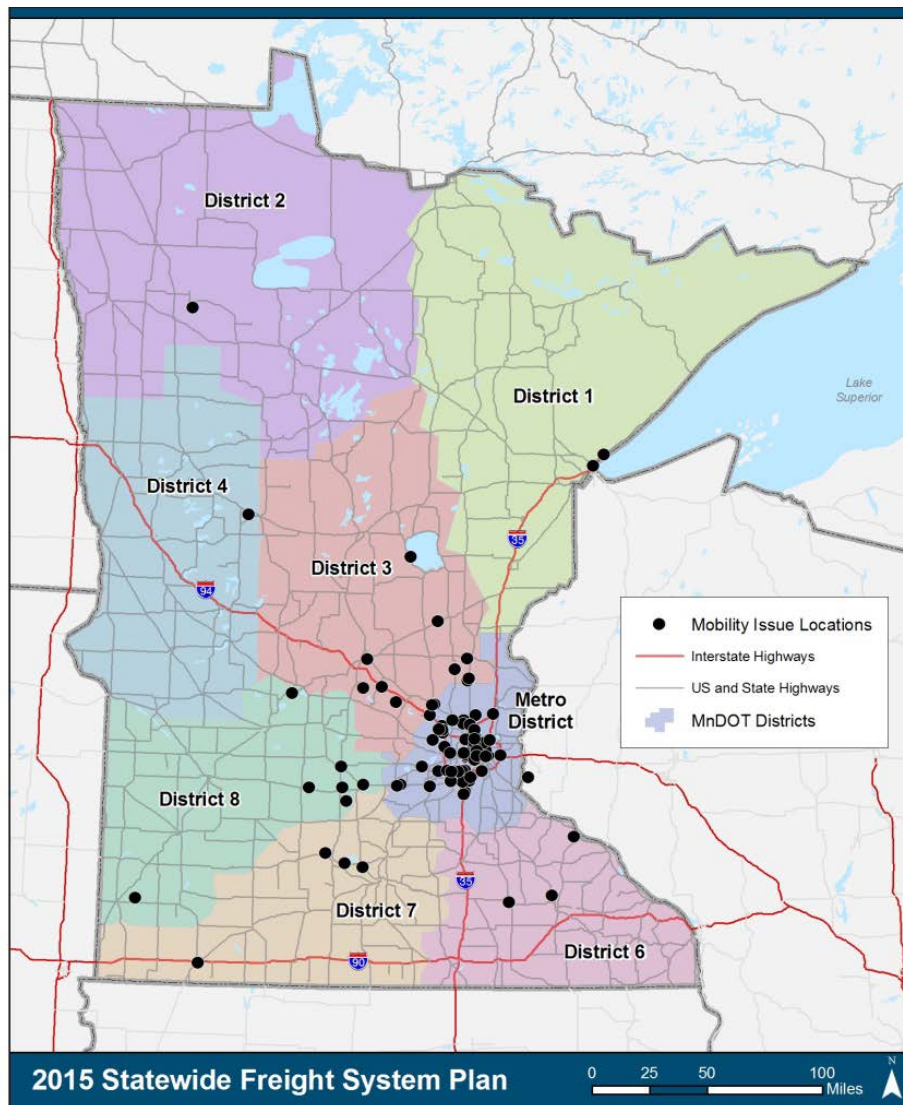
C.1 MOBILITY

Needs and issues identified by survey participants were placed into the mobility category when they were related to system congestion, chokepoints and bottlenecks, travel time and delay, level of service, operational performance, system resiliency, or performance management and accountability.

Highway

According to the survey data the most prevalent highway mobility issues identified by freight industry stakeholders included congestion and corresponding travel delays, roundabouts, inadequate highway widths, and poor road conditions. Figure C.1 shows the locations where survey respondents identified issues related to highway mobility.

Figure C.1 Identified Mobility Issue Locations: Highway System



As shown on the map the majority of the mobility issues that were identified were located within the Metro district with a smaller number of issues being identified outside of the Metro area. The issues identified within the Metro area are primarily chokepoints or bottlenecks where congestion is causing travel

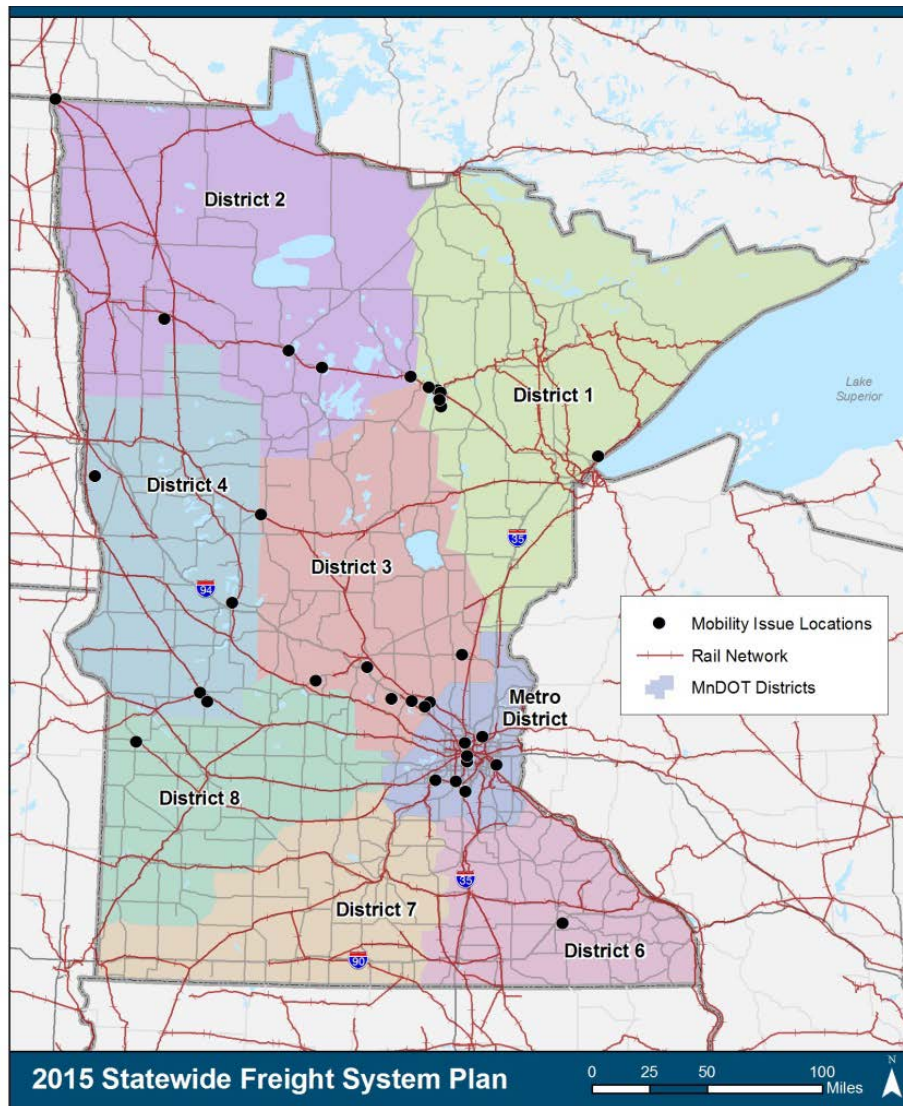
delays. The most commonly referenced routes where congestion is seen occurring are I-35, I-494, I-394, I-94, and U.S. 169. Survey respondents highlighted numerous locations along these roadways where they felt additional lanes or improvements to interchanges and ramps could promote better traffic flow and alleviate congestion. These roadways are all major routes for both commuters and freight moving in and around the Twin Cities. Outside of the Metro area congestion was identified as a concern along State Route 61 going north of Duluth, along U.S. 14 near Rochester, and State Route 23 in the southwestern portion of the State.

Respondents noted that roundabouts located in Champlin, Worthington, and New Ulm, were identified as issues affecting freight mobility. Respondents indicated that these interchanges are not easily navigated by semi-trucks, or other large freight hauling vehicles, causing drivers to seek out alternative routes or attempt to navigate the interchange putting themselves and other drivers at risk. General road and pavement conditions outside of the Metro area were also seen as an issue limiting freight mobility. In the northwestern portion of the state, along the U.S. 10 corridor to Fargo, survey respondents indicated that the existing roadways were too narrow for some of the larger freight hauling vehicles to safely traverse. Along U.S. 212 west of the Metro area is also highlighted as a location that is heavily utilized but its condition is inadequate, limiting its level of service.

Rail

For the rail system the survey data indicated that system congestion, increased delays from stoppages, and the sharing of rail lines by freight and passenger services are the primary issues affecting mobility. Figure C.2 shows the locations where survey respondents identified issues related to rail system mobility.

Figure C.2 Identified Mobility Issue Locations: Rail System



Respondents indicate that, as rail freight demand has grown, the infrastructure has been unable to keep up with demand. Congestion along rail lines from St. Cloud to Minneapolis, in the Metro area, in Grand Rapids, in Duluth, and going in to Fargo were all highlighted in the survey. Respondents indicate that this congestion negatively impacts farmers and other businesses within the state. In addition to the congestion on rail lines within Minnesota respondents also indicated that levels of service on the rail lines in and around the Chicago area were an issue. Respondents indicated that freight movement by rail would be more effective if more options were available for moving freight to the west coast without having to go through Chicago.

The levels of congestion on rail lines in the state often times forces trains to stop and wait for signal clearance or other trains to pass. As indicated by respondents these stoppages exacerbate the congestion issue by causing more delays and further decreasing levels of service. These stoppages can also have an adverse impact on highway system mobility if they are stopped across an at-grade crossing. Grand Rapids is an area where this was highlighted as an issue.

The need for passenger and freight rail service to share tracks was an issue that respondent felt hindered rail mobility and limited opportunities for growth in rail freight. The metro area was the prime location identified by respondents where the sharing of track rights between passenger and freight services had an adverse impact on rail system mobility.

Waterway

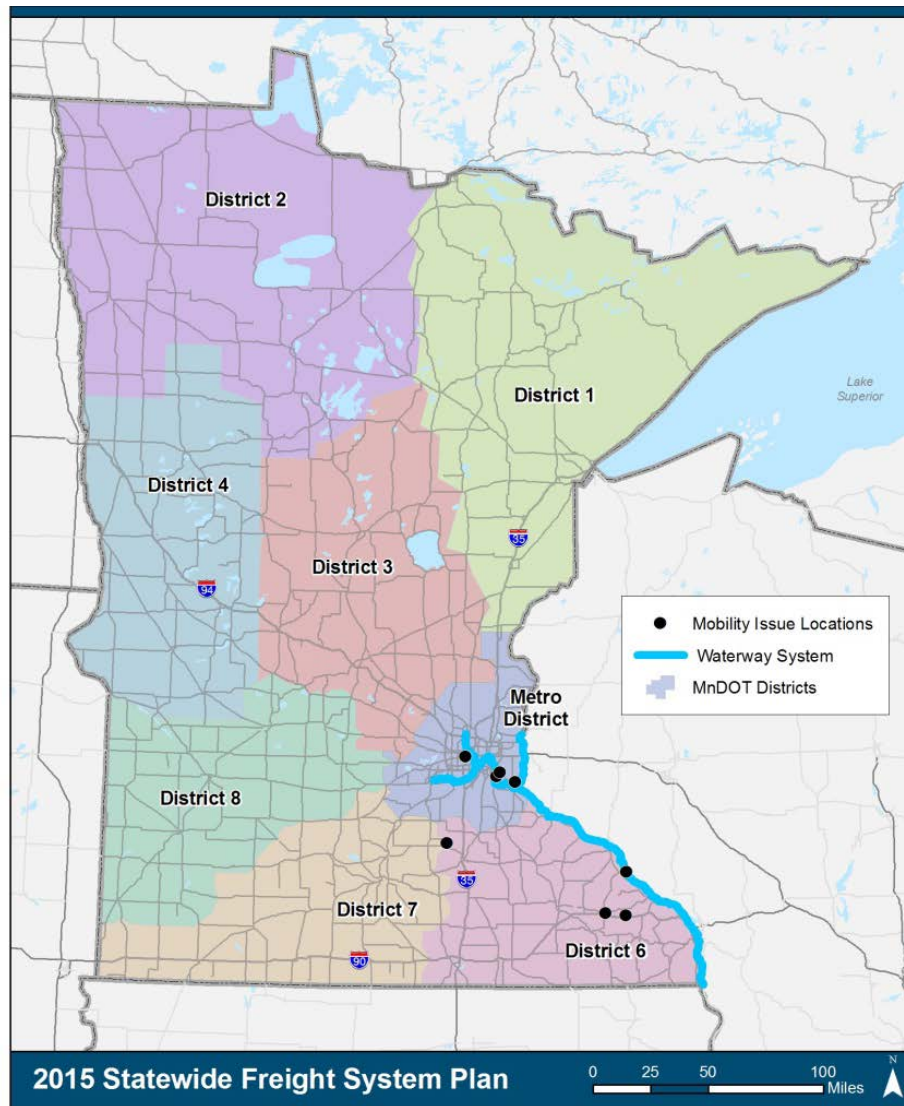
The mobility issues identified for the waterway system included inadequate lock infrastructure, dredging, and bank erosion. Figure C.3 shows the locations where survey respondents identified issues related to waterway mobility.

The mobility issues are primarily located south of the metro area along the Mississippi River. While respondents indicated issues with dredging and erosion the primary issue was the outdated infrastructure. The existing locks along the waterway are old and unable to handle the larger vessels being used to transport freight on the waterways today.

Aviation

The mobility issue that was identified by respondents was commercial capacity at Minnesota's regional airports. In particular the airports in St. Cloud, Red Wing, Mankato, and Willmar were mentioned. Respondents felt that expanding capacity at these locations could make them a more attractive option for moving freight, reducing some of the congestions on Minnesota's highway and rail systems.

Figure C.3 Identified Mobility Issue Locations: Waterway System



C.2 INFRASTRUCTURE

Needs and issues identified by survey participants were placed into the infrastructure category when they were related to access and connectivity, advanced technology and innovative applications, intermodal facilities, and state of good repair.

Highway

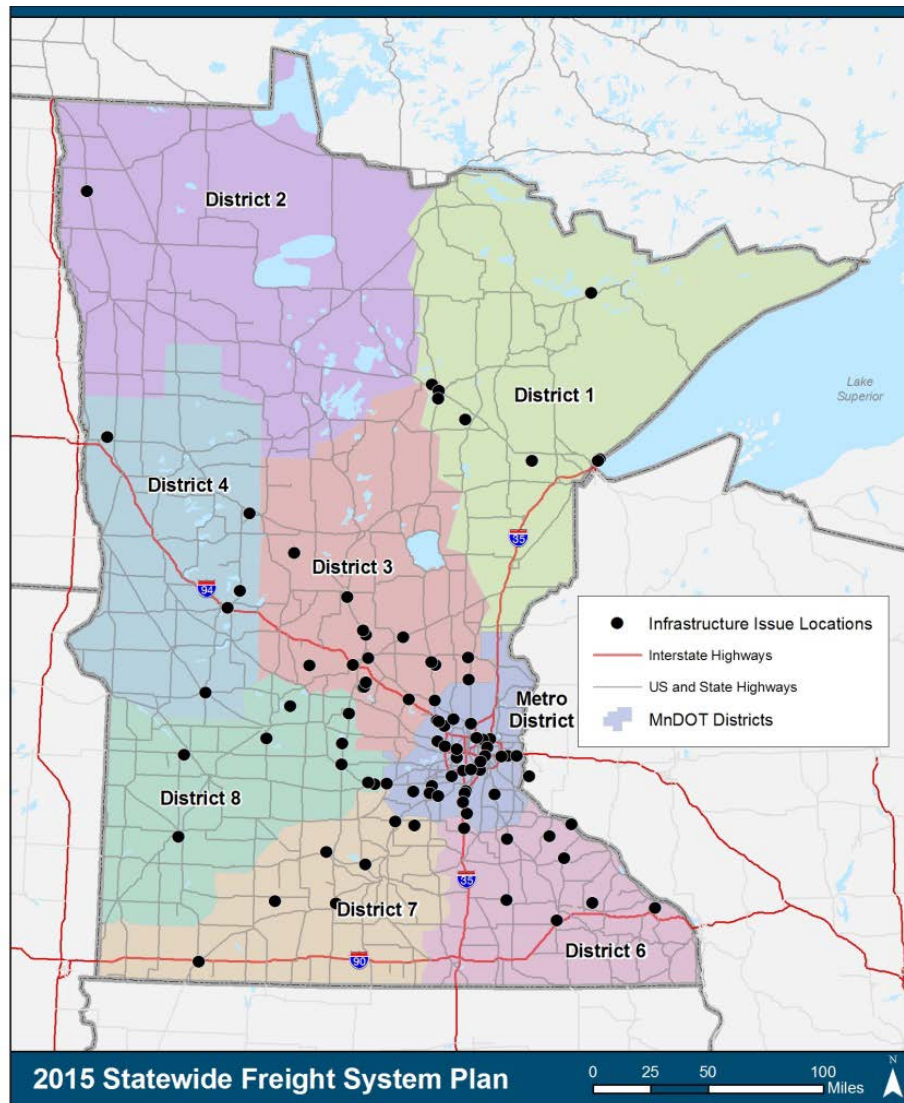
The most common highway infrastructure issues identified by freight industry respondents were poor pavement conditions, inefficient interchanges,

inadequate roadway capacity, and a need for greater intermodal access. Figure C.4 shows the locations where survey respondents identified issues with the existing highway infrastructure.

As shown on the map the majority of the infrastructure issues that were identified are in and around the metro area, with additional issues located along major freight corridors throughout the state. In and around the metro area the primary infrastructure issue, according to respondents, is a lack of capacity. U.S. 212 west of the metro area and U.S. 169 are two roads that respondents stated should have lanes added. Inadequate and outdated interchanges was another issue highlighted within the metro area. In particular the interchange between I-494 and I-35 was identified as having an outdated design that contributes to traffic congestion. Improving access between I-94 and I-35 was also requested.

Pavement conditions were an issue highlighted throughout the state. Within the metro area road and bridge conditions were identified as an issue by survey respondents. I-94, I-35, and U.S. 10 were all identified as having poor pavement conditions. Outside of the metro area pavement conditions along the highways leading out of Minneapolis, in Grand Rapids, and in various rural locations around the state were identified as poor.

Figure C.4 Identified Infrastructure Issue Locations: Highway System



The final prevalent issue identified by respondents was a need for greater intermodal access to move freight from trucks to rail. Respondents highlighted the two intermodal rail yards in the Twin Cities, the BNSF yard in St. Paul and the CP yard in Shoreham Heights, in particular. For the CP yard the construction of a bridge over the rail tracks was suggested.

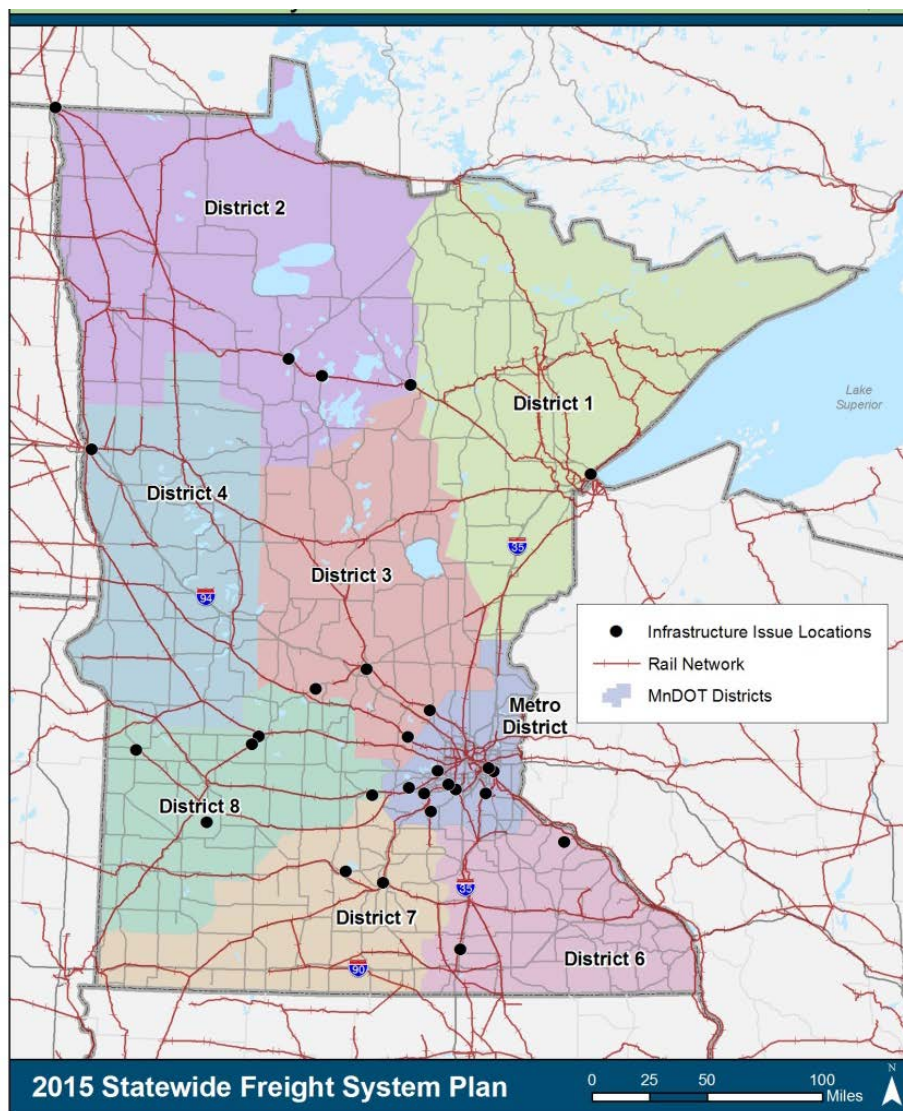
A few of respondents also identified a need for increased trucking parking availability along major trade corridors throughout the state.

Rail

For the rail system respondents indicated lack of existing infrastructure and a need for increased intermodal access as the primary infrastructure needs. Figure

C.5 shows the locations where survey respondents identified issues related to the infrastructure of the rail system.

Figure C.5 Identified Infrastructure Issue Locations: Rail System

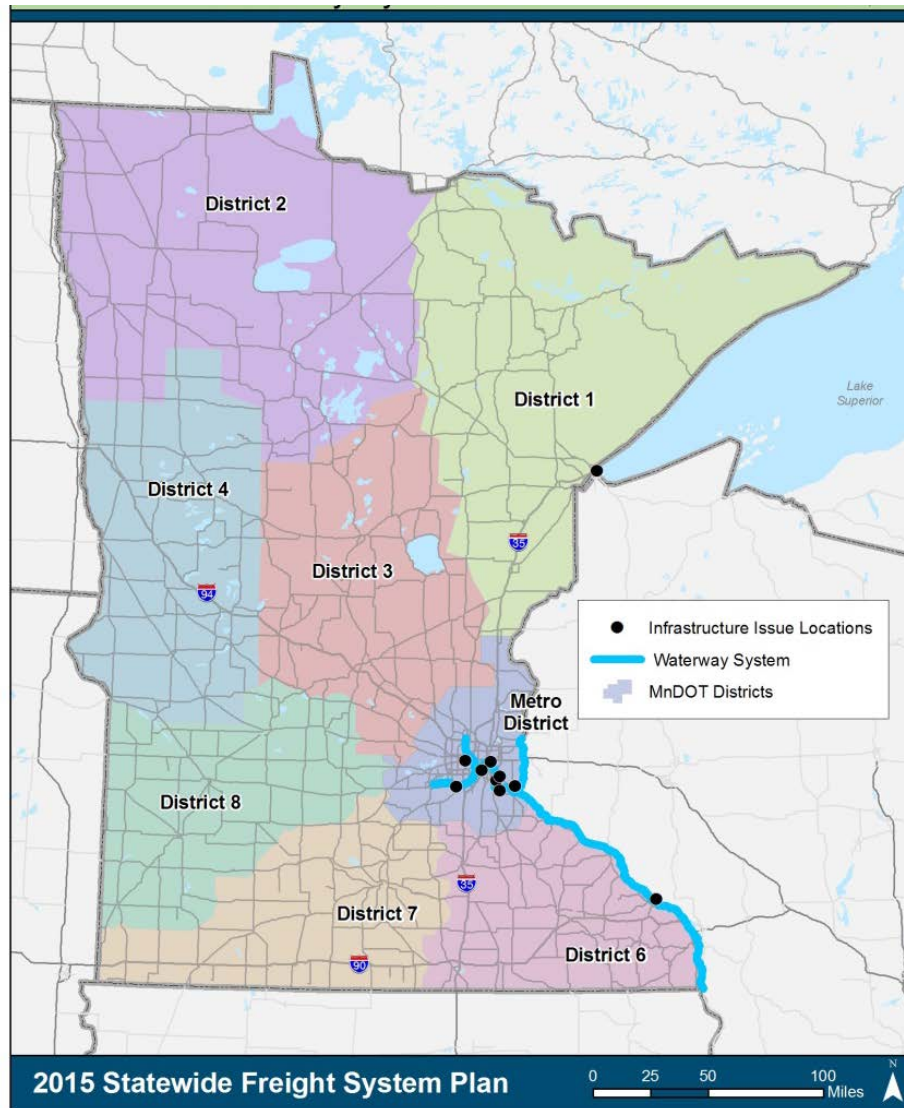


As mentioned previously respondents felt that the current demand on the rail system exceeds existing capacity causing high levels of congestion and hindering the growth of rail freight movement. Respondents suggested updating outdated rail infrastructure in the southwestern portion of the state and adding new rail lines from Duluth to the northwestern portion of the state as well as adding track on the BNSF line in St. Cloud. Intermodal access was identified as an issue at the Port of Duluth, Red Rock Terminal, the Southport River Terminal, and St. Cloud.

Waterway

The infrastructure issues identified for the waterway system are antiquated locks and a lack of facilities to support the use of waterways as a means for moving freight. Figure C.6 shows the locations where survey respondents identified issues related to the waterway infrastructure.

Figure C.6 Identified Infrastructure Issue Locations: Waterway System



As mentioned in the mobility section respondents felt that the existing waterway infrastructure is inadequate for supporting freight travel. Existing locks and dams do not support the tows of modern vessels. Port facilities are also seen as need improvement. Specifically the Port of Duluth is believed to be in need of updates to their break bulk, roll-on roll-off, and bulk grain services. The closing

of a lock near the metro area is another issue that was mentioned as having a negative impact on the waterway system. In addition to the issues within Minnesota respondents also indicated that similar conditions and issues were present with the lock infrastructure further south along the Mississippi on the way to New Orleans.

Aviation

As with the mobility issues, the infrastructure issues identified by respondents were located at Minnesota's regional airports. Specifically respondents felt that extending the length of existing runways, and adding additional runways at the airports in St. Cloud, Red Wing, Mankato, and Willmar was needed. Respondents felt that lengthening runways would make these facilities more attractive to major air freight carriers such as FedEx, UPS, and their competitors.

C.3 SAFETY, ENVIRONMENT AND COMMUNITY

Needs and issues identified by survey participants were placed into the environment and community category when they were related to safety and security, emissions and environmental issues, and land use conflicts.

Highway

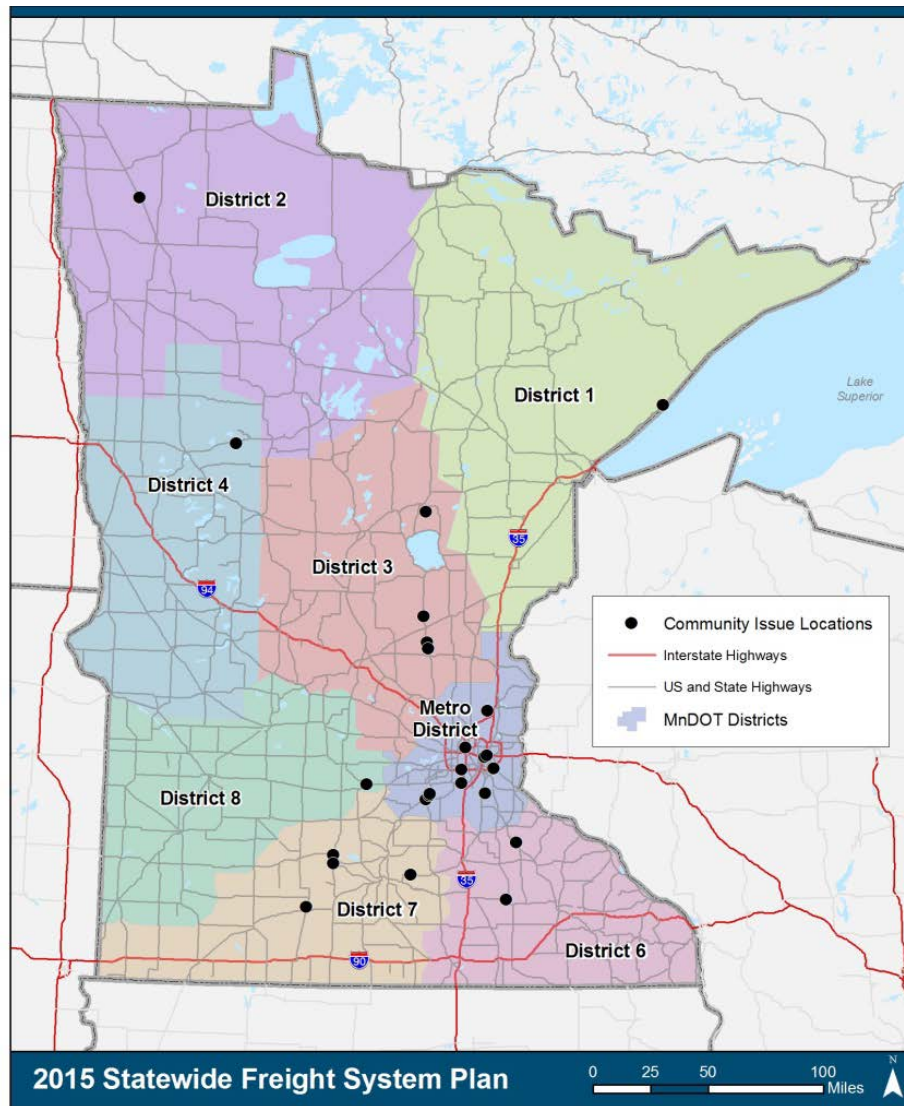
The highway system environmental and community issues were concerns about high crash intersections, and safety issues due high levels of traffic congestion. Figure C.7 shows the locations where survey respondents identified these issues.

U.S. Highway 169 both north and south of the metro area was identified as having high crash intersections. Respondents indicated that these intersection should be examined to see if they could be made safer.

Rail

The most common environmental and community concern related to the railway system was the number of stoppages across at-grade rail crossings. In Wadena and Benson respondents indicated this is a frequent occurrence that blocks access to the hospital or other emergency services in the community. The movement of crude oil by rail from North Dakota into Minnesota, due to its toxic nature and danger to the environment should it spill, as well as the age and condition of various railroad overpasses in the state were also cited as concerns.

Figure C.7 Identified Community Issue Locations: Highway System



Waterway

The waterway system environmental and community issues identified by survey respondents were conflicts over land use and concerns about dredging. Generally speaking land along waterways that are targeted for port and other waterborne freight improvements is desirable for a number of other uses. This land can be attractive for residential and commercial development as well as the creation of public parks and spaces. Survey respondents indicated that these types of land use are eroding the space available for port facility expansion. Respondents also indicated that various sections of the waterways south of the metro area were in need to dredging before being able to effectively support

modern freight vessels, at the same time expressing concern about the environmental impacts of dredging these areas.

Aviation

There were no specific environmental or community concerns related to aviation collected during the survey.

C.4 ECONOMY

Respondents identified a number of freight issues they felt impacted, or could impact, Minnesota's economy. These topics included the development of a pipeline infrastructure as cheaper alternative to existing freight movement methods, lack of system reliability and intermodal access limiting economic growth, and expanded use of aviation for high value and international shipments.

As previously mentioned survey respondents felt that the movement of crude oil by rail had a negative impact on levels of service as well as the safety of the system. As an alternative to movement of oil by rail the use of pipelines was proposed. The expansion of pipelines was proposed as a cheaper alternative to moving oil and other related commodities. This could reduce rail system congestion and free up capacity for other local commodities such as grain.

System reliability on the highways and rail systems and a lack of intermodal access was cited as an issue that was limiting economic growth in Minnesota. Both the rail system and highways system are feeling the strain of the current demand for the movement of freight goods. Survey respondents felt that increased intermodal access could allow goods to flow more efficiently on both systems allowing for greater reliability and opportunities for future economic growth.

Respondents indicated that improvement to regional airports could allow for expanded use when moving high value and international goods. This would reduce the amount of freight that must be moved by rail and along the highways, providing opportunities for economic growth.

C.5 ORGANIZATION AND POLICY

The organization and policy issues identified by survey respondents include weight limitations for trucks and funding needs for the waterway system. Respondents indicated that MnDOT should examine surrounding states to ensure that current weight limitations in Minnesota align with neighboring states. Respondents also felt that the current spring frost weight limitations should be examined, and potentially increased, in areas where the only alternative routes require a long detour.

In regards to the waterway system respondents stated that it was crucial to secure funding for updates to the infrastructure. They suggested this mode of transportation be considered in any long range planning at the state level. In particular the locks and dams along the Mississippi River and those providing access to the ports in St. Paul, Duluth, Winona, and Red Wing should be improved as their current infrastructure is unable to handle modern shipping vessels.