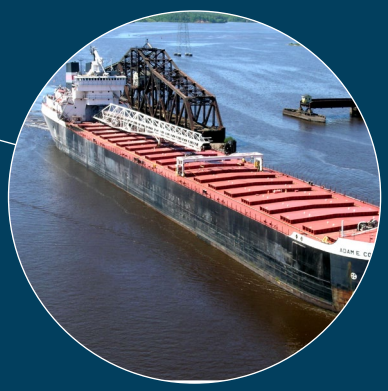
MinnesotaGO

A Collaborative Vision for Transportation

# Statewide Freight System Plan



FULL PLAN | MAY 2016

MINNESOTA DEPARTMENT OF TRANSPORTATION

MinnesotaGO
A Collaborative Vision for Transportation

# Statewide Freight System Plan

Dear Citizens and Freight Stakeholders of Minnesota,

I am pleased to share with you the 2016 Minnesota Statewide Freight System Plan. The development of this plan was undertaken by the Minnesota Department of Transportation in partnership with public and private sector freight stakeholders throughout the state.

This plan provides a framework to begin working on freight transportation challenges in Minnesota to maintain the state's economic competitiveness in the national and global marketplace. The plan describes Minnesota's freight transportation system and its role in the state's economy, current and emerging industry trends, the performance of the freight transportation system, and current and future issues and needs.

The plan also includes a Freight Action Agenda for MnDOT and its partners to advance strategies that will improve the efficiency, safety and reliability of the freight system.

The growing amount of freight transported on the multimodal transportation system – highway, rail, waterway, air and pipeline – is demanding improved performance. To keep pace with this growth, it is critical that we plan today for tomorrow's well-run, integrated multi-modal transportation system. An efficient and effective freight transportation system is vital to ensuring Minnesota's economic vitality.

I extend my gratitude to the many partners, freight stakeholders, MnDOT staff and others whose dedication and hard work developed this plan.

Sincerely,

Charles A. Zelle
Commissioner

Minnesota Department of Transportation
395 John Ireland Blvd.
Saint Paul, MN 55155

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# PURPOSE AND SCOPE

The 2016 Minnesota Statewide Freight System Plan (Plan) represents an update to Minnesota's first State Freight Plan developed in 2005. The development of this Plan was undertaken by the Minnesota Department of Transportation (MnDOT) in partnership with public and private sector freight stakeholders throughout the state.

This Plan describes Minnesota's freight transportation system and its role in the state's economy, current and emerging industry trends, the performance of the freight transportation system, and current and future issues and needs. This Plan also includes Minnesota's Freight Action Agenda for MnDOT and its partners to advance a number of strategies that will improve the efficiency, safety, and reliability of the freight system.

This 2016 Minnesota Statewide Freight System Plan aligns with Minnesota GO and the Statewide Multimodal Transportation Plan, which establish Minnesota's overall vision for transportation. In addition, the Plan meets the freight planning requirements of the federal Moving Ahead for Progress in the 21st Century (MAP-21) transportation legislation and aligns with the provisions of the federal Fixing America's Surface Transportation Act (FAST Act).

The 2016 Minnesota Statewide Freight System Plan includes the following chapters:

- Chapter 1 – The Importance of Freight to Minnesota provides an overview of the importance of freight industries and goods movement to the state of Minnesota, including trends that may affect goods movement in the future.
- Chapter 2 – Minnesota's Freight Assets and Use describes the state's existing multimodal freight system, including designation of Minnesota's Principal Freight Network.
- Chapter 3 – Minnesota's Freight Needs and Issues identifies freight system performance measures and describes the condition and performance of Minnesota's freight system. This chapter also identifies needs and issues to be addressed to achieve the goals of the Plan as well as national freight goals.
- Chapter 4 – Strategies to Address Minnesota's Freight Needs and Issues provides an overview of infrastructure projects and other supporting strategies to mitigate and address freight system needs and issues. Project details are included in Appendix A.
- Chapter 5 – Actions and Next Steps outlines the next steps for Minnesota's public and private sector freight stakeholders in Minnesota's Freight Action Agenda.

Additional information supporting the Plan is included in several appendices. These appendices are available in a separate document.

- Appendix A – Additional Resources provides an overview of the technical documents developed as part of this Plan, as well as resources developed by MnDOT and others that were utilized for Plan development.
- Appendix B – Outreach highlights the committees and public engagement activities employed during the Plan development process. This includes formation of an Advisory Committee and Technical Team, three Ad Hoc Working Groups focused on special topics, one-on-one interviews with industry, interviews with each of Minnesota's neighboring states and provinces, online surveys, and other outreach activities to public and private freight system stakeholders.
- Appendix C – Environmental Justice provides a general evaluation of how this Plan may impact Minnesota's environmental justice populations.

- Appendix D – Key Definitions is a glossary of freight terms and acronyms used in the Plan.

## Plan Structure

The 2016 Minnesota Statewide Freight System Plan is part of MnDOT's "Family of Plans," a collection of transportation documents that identify mode-specific strategies, establish performance measures and performance-based needs, and identify system priorities. Each Plan utilizes statewide planning guidance that was developed to ensure consistency between each effort and to ensure each plan is contributing to the same overarching vision. Key elements guiding the development of the 2016 Minnesota Statewide Freight System Plan include:

- Minnesota GO Vision. Provides general direction for all modes of transportation including highways, transit, rail, bikes, pedestrians, freight, and aviation.
- Freight Policy. This policy, developed as part of the 2005 State Freight Plan, provides a specific policy for the freight transportation system in Minnesota.
- Freight Plan Goals. As part of this plan, freight goals were established to provide Minnesota with a mechanism to gauge if the freight policy is being achieved.
- Freight Plan Objectives. As taken from the Statewide Multimodal Transportation Plan, these objectives provide an organizing mechanism for strategies and actions required to further advance the freight policy.

### MINNESOTA GO VISION

In 2011, MnDOT launched the Minnesota GO visioning process. As part of this, MnDOT asked Minnesotans to help shape a vision that answers the question, "What are we trying to achieve for transportation over the next 50 years?" The visioning effort collectively defined a desired future toward that state, regional, and local transportation planning could navigate. The result was the first long-range transportation vision adopted for Minnesota, a shared vision that aligns the transportation system with what Minnesotans expect for their quality of life, economy, and natural environment.

The Minnesota GO Vision does not answer the question "how will we do it?" This question is

### Minnesota Go Vision for Transportation

*Minnesota's multimodal transportation system maximizes the health of people, the environment, and our economy.*

The system:

- Connects Minnesota's primary assets – the people, natural resources, and businesses within the state – to each other and to markets and resources outside the state and country
- Provides safe, convenient, efficient, and effective movement of people and goods
- Is flexible and nimble enough to adapt to changes in society, technology, the environment, and the economy

To enhance quality of life, the system:

- Recognizes and respects the importance, significance, and context of place – not just as destinations, but also where people live, work, learn, play, and access services
- Is accessible regardless of socioeconomic status or individual ability

To support environmental health, the system:

- Is designed in such a way that it enhances the community around it and is compatible with natural systems
- Minimizes resource use and pollution

To promote economic competitiveness, the system:

- Enhances and supports Minnesota's role in a globally competitive economy as well as the international significance and connections of Minnesota's trade centers
- Attracts human and financial capital to the state

addressed in the subsequent statewide, modal, and regional planning efforts that constitute the Family of Plans. The 2016 Minnesota Statewide Freight System Plan is one of these plans.

## MINNESOTA FREIGHT POLICY

The 2005 Minnesota State Freight Plan clearly articulated the position of MnDOT with respect to freight transportation and introduced the following freight specific policy:

*Provide an integrated system of freight transportation in Minnesota – highway, rail, water, air cargo, and intermodal terminals – that offers safe, reliable, and competitive access to statewide, national, and international markets.*

This freight policy was adopted by MnDOT and underscores the importance of all modes for a balanced freight transportation system, the need for connections between modes, and the fact that efficient access to expanding markets is critical to Minnesota businesses operating in a global economy. This freight policy is carried forward to the 2016 Minnesota Statewide Freight System Plan.

## FREIGHT PLAN GOALS

The goals of the 2016 Minnesota Statewide Freight System Plan reflect those aspects of the multimodal freight system that are most important to the public and private sector freight stakeholders in the state. The following five goals were established to further articulate the components of the freight policy.

### Support Minnesota's Economy

The ability of businesses and industries in Minnesota to compete in the marketplace relies in part on an efficient freight transportation system that effectively moves goods and raw materials. The freight system that these businesses depend on is multimodal, transports products not only within Minnesota but also throughout the U.S., and provides connections to trading partners throughout the world. Minnesota's freight system needs to respond and adjust to changing state, U.S., and world economic conditions.

### Improve Minnesota's Mobility

Freight system mobility can be described in several ways. Delay, slow travel speeds, and congestion are ways to measure mobility, and each translates into a freight transportation system that may have limited maneuverability, be unreliable, have chokepoints, and not provide a competitive advantage to industry. A freight system that has limited mobility may be unattractive for industries, especially where "just-in-time" delivery is critical. Minnesota's freight system needs to offer access for all freight users and reliable service with minimal chokepoints.

### Preserve Minnesota's Infrastructure

In 2012, one billion tons of freight moved over Minnesota's transportation system, and by 2040 that volume is expected to rise to 1.8 billion tons – an increase of 80 percent overall. In 2012, trucks carried 63 percent of all freight tonnage, while rail (carload and intermodal) carried about 25 percent.[1] This growth in freight transportation will stress

[1] The data source for freight demand for modes other than rail was the Federal Highway Administration's (FHWA) Freight Analysis Framework (FAF) version 3.5. FAF utilizes a 2007 base year with synthesized 2012 values and a 2040 forecast. For rail, the data source was the STB 2012 Confidential Carload Waybill Sample.

Minnesota's transportation infrastructure. Strategic improvements in multimodal freight system infrastructure to ensure critical segments and connections are both available and in a state of good repair are essential for Minnesota to meet expected demand.

### Safeguard Minnesotans

Safety is a high priority for both public and private organizations involved in freight transportation. In Minnesota, a multifaceted approach to enhance safety has resulted in a historic trend of decreasing fatalities for both passenger and commercial vehicles.[2] However, there are increased safety concerns in some Minnesota communities due to increased transport of hazardous materials, in particular crude oil from the Bakken region of North Dakota transported by rail. Minnesota needs to enhance freight system safety and ensure plans are in place to protect areas where freight activity and the public interface.

### Protect Minnesota's Environment and Communities

Minnesota's residents and businesses rely on freight transportation to support their economies; however, freight facilities and services sometimes negatively impact communities and the environment. Some of these impacts relate to air quality and noise, the presence of trucks in neighborhoods, and land use conflicts. Freight may affect Minnesota's traditionally underrepresented communities, such as racial and ethnic minorities, households without vehicles, and persons who are low-income. It is necessary to plan, design, develop, and preserve the freight system in a way that respects and complements the natural, cultural, and social context and is consistent with the principles of context sensitive solutions.

## FREIGHT PLAN OBJECTIVES

The objectives of the 2016 Minnesota Statewide Freight System Plan are the same as those defined in the 2012 Statewide Multimodal Transportation Plan. These objectives are crosscutting and provide an organizing mechanism for strategies and actions required to further advance the freight policy. The types of strategies and actions in each category are briefly described below.

- Accountability, Transparency, and Communication. Make transportation system decisions through processes that are open and supported by data and analysis; provide for and support coordination, collaboration, and innovation; and ensure efficient and effective use of resources.
- Transportation in Context. Make fiscally responsible decisions that respect and complement the natural, cultural, and social context; and integrate land uses and transportation systems to leverage public and private investments.
- Critical Connections. Identify global, national, statewide, regional, and local transportation connections essential for Minnesotans' prosperity and quality of life; preserve and improve these connections by maximizing return on investment given constrained resources; and consider new connections.
- Asset Management. Strategically preserve and operate transportation assets; rely on system data, partners' needs, and public expectations to inform decisions; put technology and innovation to work to improve efficiency and performance; and recognize that the system should change over time.

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[2] Minnesota Toward Zero Deaths, http://www.minnesotatzd.org/

- Traveler Safety and System Security. Safeguard travelers, transportation facilities, and services; apply proven strategies to reduce fatalities and serious injuries for all travel modes; reduce system vulnerability; and ensure system redundancy to meet essential travel needs during emergencies.

## Federal Legislation

This Statewide Freight System Plan was developed in compliance with the guidance provided by MAP-21. The FAST Act of 2015 increased the federal focus on freight and provided additional requirements and resources related to state freight planning. This section details how each piece of this plan aligns with the requirements and recommendations of these Acts.

### FIXING AMERICA'S SURFACE TRANSPORTATION ACT

The FAST Act, a five-year, $300 billion surface transportation bill passed in 2015, provides the most comprehensive and coordinated provisions for freight of any prior national transportation bill. The first transportation bill with dedicated freight funding, the FAST Act includes both a $4.5 billion competitive grant program for nationally significant freight and highway projects and $6.3 billion in formula funding to improve the newly designated National Highway Freight Network (NHFN), which expands the Highway Primary Freight Network developed under MAP-21. Additionally, the U.S. Department of Transportation (U.S. DOT) is developing a National Strategic Freight Plan, which assesses the condition and performance of the nation's freight system and provides forecasts and improvement strategies. To guide resources and investment to the most critical pieces of transportation infrastructure for freight, the U.S. DOT is also developing a National Multimodal Freight Network (NMFN), which expands beyond the NHFN to include key multimodal facilities such as public ports, waterways, and Class I rail systems.[3]

The FAST Act establishes new requirements for state freight plans that build upon MAP-21. In order to receive formula funds for freight transportation projects, states are required to have FAST Act compliant freight plans by 2017. Many of the components of freight planning required under MAP-21 (described in the next subsection) are carried forward as part of the FAST Act. State freight plans will be required to align with National Highway Freight Program (NHFP) goals and National Multimodal Freight Policy goals.

In addition, FAST Act compliant state freight plans are required to include the following components:

- A fiscally-constrained, prioritized project investment plan
- A bottleneck analysis
- Identification of critical urban and rural freight corridors
- Identification of multimodal freight facilities and corridors

Although this current plan meets the requirements for a MAP-21 compliant plan, the above components must be addressed in order for Minnesota's Statewide Freight Plan to be FAST Act compliant. Minnesota has already taken steps towards the last two components, identifying critical corridors and multimodal freight facilities, through the

[3] Class I is a railroad designation by the Surface Transportation Board (STB) referring to the seven largest U.S. railroads. The four primary Class I rail operators in Minnesota are BNSF, Canadian Pacific (CP), Union Pacific (UP), and Canadian National (CN).

development of the state Principal Freight Network (PFN), described later in this document. MnDOT will adopt a FAST Act compliant plan by December 2017.

The U.S. DOT is expected to release specific guidance on updating MAP-21 compliant state freight plans to meet the FAST Act requirements in the first half of 2016.

## MOVING AHEAD FOR PROGRESS IN THE 21ST CENTURY ACT

MAP-21 was signed into law in 2012, providing federal transportation funding and guidance to state departments of transportation and Metropolitan Planning Organizations (MPOs). Under MAP-21, statewide freight plans must describe how the state will improve its ability to meet the National Freight Policy goals. The MAP-21 National Freight Policy goals are:

- 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 preserving the freight transportation system
- Reduce adverse environmental and community impacts of the freight transportation system

To demonstrate this Plan's compliance with MAP-21, Table 0.1 illustrates how these National Freight Policy goals are addressed.

Table 0.1 How MAP-21 National Freight Policy Goals are Addressed in this Freight Plan

| MAP-21 NATIONAL FREIGHT POLICY GOAL | HOW ADDRESSED IN FREIGHT PLAN |
|---|---|
| Improve the contribution of the freight transportation system to **economic efficiency, productivity, and competitiveness** | **Freight Plan Goal - Support Minnesota's Economy** |
| Reduce **congestion** on the freight transportation system | **Freight Plan Goal - Improve Minnesota's Mobility** |
| Improve the **safety, security, and resilience** of the freight transportation system | **Freight Plan Goal - Safeguard Minnesotans** |
| Improve the **state of good repair** of the freight transportation system | **Freight Plan Goal - Preserve Minnesota's Infrastructure** |
| Use **advanced technology, performance management, innovation, competition, and accountability** in operating and preserving the freight transportation system | The concepts of advanced technology applications, performance management, innovation, and accountability cut across all goal areas identified in this Plan; these concepts have been incorporated as strategies. |
| Reduce adverse **environmental and community** impacts of the freight transportation system | **Freight Plan Goal - Protect Minnesota's Environment and Communities** |

In addition to the National Freight Policy goals, MAP-21 also identified specific topics that must be addressed in statewide freight plans. U.S. DOT also identified recommended content. Table 0.2 highlights the required MAP-21 content and the U.S. DOT recommended content and where it can be found in this Plan or its supporting documents, including technical memos developed as part of the planning process.

Table 0.2 How MAP-21 National Freight Plan Requirements and U.S. DOT Recommendations are Addressed in this Freight Plan

| PLAN ELEMENT | MAP-21 REQ. | U.S. DOT REC. | FREIGHT PLAN CONTENT |
|---|---|---|---|
| Describe economic context (industries, supply chains) | - | ✓ | • Economic Context Technical Memo<br>• One-on-One Freight Industry Interviews |
| Describe freight trends, needs, and issues | ✓ | ✓ | • Freight System Needs, Issues, and Opportunities Technical Memo |
| Develop freight forecast | - | ✓ | • Freight System Assets and Use Technical Memo |
| Identify freight transportation assets | - | ✓ | • Freight System Assets and Use Technical Memo |
| Report on conditions and performance | - | ✓ | • Freight System Performance Measure Technical Memo<br>• Freight System Needs, Issues, and Opportunities Technical Memo |
| Identify strengths and weaknesses | - | ✓ | • Freight System Needs, Issues, and Opportunities Technical Memo |
| Inventory bottlenecks and develop freight improvement strategies. These strategies will:<br>• Consider innovative technologies and operational strategies, including ITS<br>• Describe improvements that reduce or impede the deterioration of roads due to heavy vehicles | ✓ | ✓ | • Freight System Needs, Issues, and Opportunities Technical Memo<br>• Strategies and Implementation Technical Memo |
| Describe freight policies, strategies, and performance measures | ✓ | ✓ | • Freight System Performance Measure Technical Memo<br>• Strategies and Implementation Technical Memo |
| Develop freight investment decision-making process | - | ✓ | • Strategies and Implementation Technical Memo |
| Develop implementation plan, including funding and revenue sources | - | ✓ | • Strategies and Implementation Technical Memo |
| Describe how Minnesota supports national freight goals | ✓ | ✓ | • The 2016 Minnesota Statewide Freight System Plan has developed goals similar to the national freight goals in order to show support. |

# 1.0 THE IMPORTANCE OF FREIGHT TO MINNESOTA

This chapter provides an overview of the importance of freight industries and goods movement to the state's economy and includes a description of trends that may affect goods movement in the future.

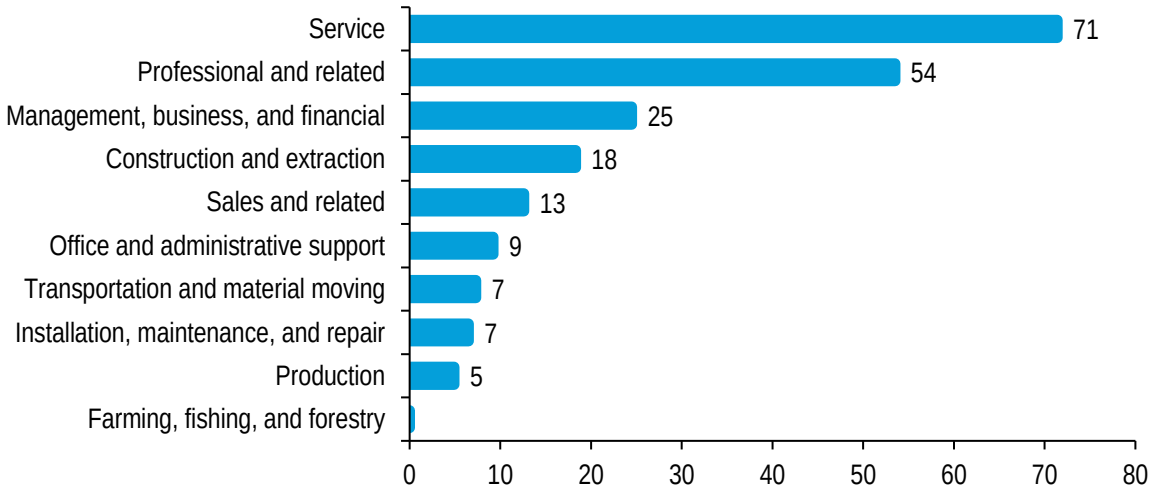
## Minnesota's Economy

The structure of Minnesota's economy—population; per capita income; employment; the type, size, and locations of businesses and industries—determines the volume of freight moving in the state.

Minnesota's State Demographics Center reports the population of the state as 5.4 million as of 2014. The population is expected to grow to 6.0 million by 2031 and to 6.5 million by 2065, at an annual rate of change of 0.5 percent.[4] Approximately 60 percent of Minnesota's population is centered in the Minneapolis-St. Paul metropolitan area. Hennepin, Ramsey, Dakota, and Anoka Counties are the most populous counties in the state. No other county in Minnesota has a population that exceeds 250,000. This concentrated nature of Minnesota's population, coupled with the large geographic size of the state, means that although both rail and highway networks serve wide rural areas, much of the freight and passenger activity is concentrated in key pockets within the state.

Minnesota's employment rate has historically been higher than the nation as a whole; however, Minnesota's employment is expected to grow at a slower rate (7.0 percent) than the nation (10.8 percent) between 2012 and 2022.[5] Much of the job growth in Minnesota will be focused on service, professional, and management jobs, suggesting a continued growth in demand for commuting and business travel (Figure 1.1). This reinforces the importance of connecting the Minneapolis-St. Paul metropolitan economy with other regional centers of commerce, such as Chicago.

Figure 1.1 Job Growth in Minnesota, in Thousands, by Major Occupational Group, 2012–2022



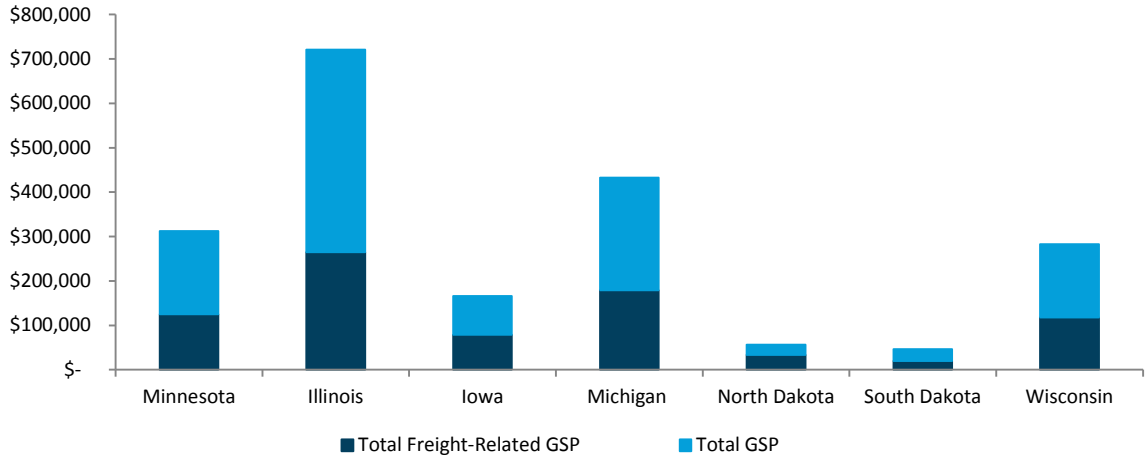

Source: Minnesota Department of Employment and Economic Development, 2014

[4] Minnesota State Demographic Center Population Data, 2014

[5] Minnesota Department of Employment and Economic Development, 2014

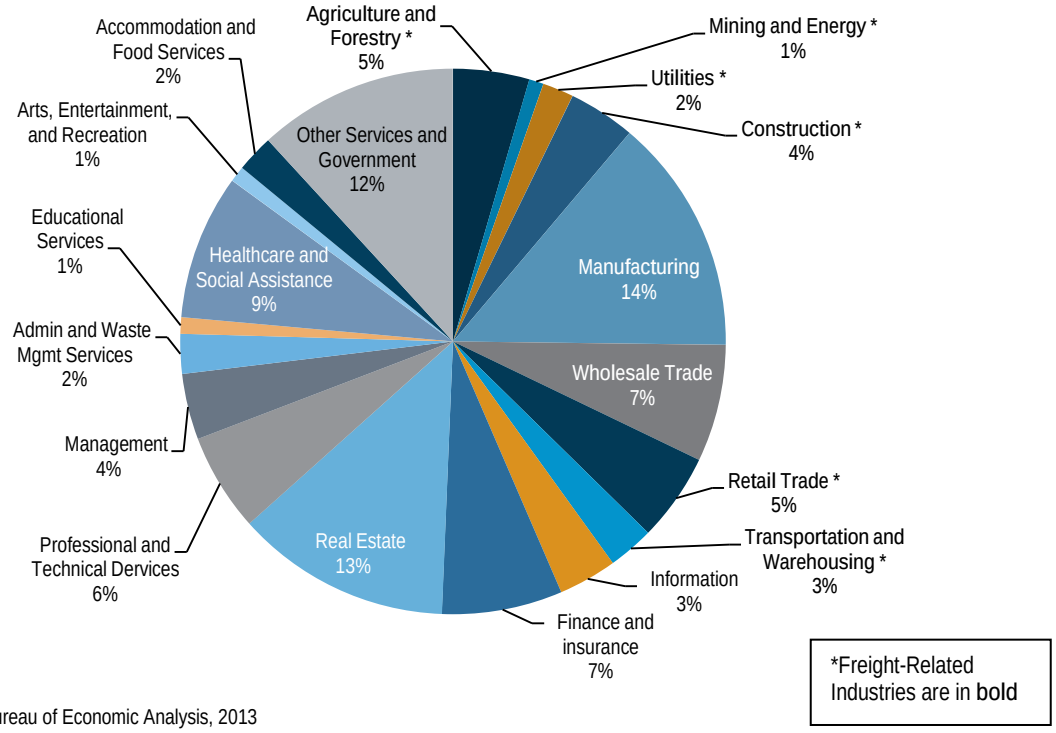
Minnesota's economy is diverse and is driven by business services, finance, and healthcare industries, as well as freight- or trade-related industries such as agriculture, mining, and manufacturing. Trade-related industries are key drivers of the economy. Figure 1.2 shows the contribution of freight-related and other industries to the Gross State Product (GSP) of Minnesota and neighboring states. Forty percent of Minnesota's GSP is dependent on freight-related industries, a higher percentage than many of its neighboring states. Figure 1.3 details the percentage contribution, by industry sector, to Minnesota's GSP.

Figure 1.2 Gross State Product, Minnesota and Neighboring States (Millions of 2013 $USD)




Source: U.S. Bureau of Economic Analysis, 2013

Figure 1.3 Industry Sectors as Percent of Minnesota GSP (with Freight-Related Industries in Bold Text)




Source: U.S. Bureau of Economic Analysis, 2013

## Minnesota's Freight-Related Industries

All industries are dependent on the transportation system, and freight- or trade-related industries depend upon multimodal connections and the option to ship goods via road, rail, water, or air. This is particularly true in Minnesota as it is the headquarters for 18 Fortune 500 companies, many of which are freight-related and specialize in a range of areas from medical devices and financial services to retail and food production. The list includes major manufacturers like 3M, General Mills, Medtronic, Land O'Lakes, Ecolab, and Mosaic. Agricultural commodities giant Cargill Inc., the largest privately held company in the country, is headquartered in Wayzata. Minnesota also hosts Best Buy and Target corporate headquarters and distribution centers.

Table 1.1 shows the relative importance of transportation modes to freight-related industries. Trucking is important to all industries, as even goods moving via other modes often use trucks for the first- and last-mile of the trip. Rail and water serve the agriculture, mining, manufacturing, and trade sectors, while air is mostly used for the transport of high-value manufactured goods and consumer products. Pipeline transport is important for moving crude oil and other energy sector goods.

Table 1.1 Importance of Transportation Modes to Minnesota's Freight-Related Industries

| INDUSTRY | TRUCK | RAIL | WATER | AIR | PIPELINE |
|---|---|---|---|---|---|
| (11) Agriculture, Forestry, Fishing, and Hunting | ● | ● | ● | ○ | ○ |
| (21) Mining | ● | ● | ◐ | ○ | ● |
| (22) Utilities | ● | ● | ◐ | ○ | ● |
| (23) Construction | ● | ◐ | ◐ | ○ | ○ |
| (31-33) Manufacturing | ● | ● | ○ | ◐ | ○ |
| (42) Wholesale Trade | ● | ● | ○ | ○ | ○ |
| (44-45) Retail Trade | ● | ◐ | ○ | ◐ | ○ |
| (48-49) Transportation and Warehousing | ● | ● | ○ | ◐ | ○ |

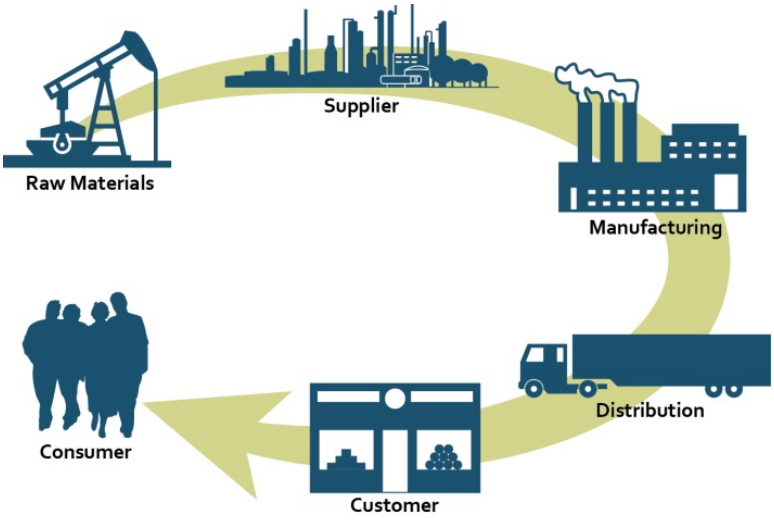
Key: Less important ○ ◐ ● More Important

Note: Industries are defined by NAICS code – North American Industry Classification System

Businesses in Minnesota have unique supply chains customized to their needs. Supply chains are essentially goods moving from producers to intermediate suppliers, manufacturers, distributors, and other businesses, and finally to the consumer or end recipient. Supply chains are closely related to the costs a business is able to bear. For this reason, access to reliable and cost-effective transportation networks and services can greatly impact a business's bottom line.

Figure 1.4 illustrates a conceptual supply chain where the connections between points can be made via truck, rail, water, air, or pipeline. As an example, an agricultural supply chain might begin with farmers in North Dakota who receive fertilizer via rail, and may then send grain to Minnesota's food processing and food manufacturing industry via truck. The food processing and manufacturing industries may also receive other inputs – manufactured equipment, packaging material, and other materials that are either shipped locally or travel via water, rail, and truck from international destinations such as Asia or Latin America. A food manufacturer might then truck finished goods (e.g., boxes of cereal) to a regional distribution center that distributes them to retailers within the state, or ship their products cross-country for export via rail or ship.

Figure 1.4 Visualization of a Supply Chain




## MINNESOTA'S INDUSTRIAL CLUSTERS

Minnesota's industries use the multimodal transportation system in various ways. A recent research effort[6] conducted by the University of Minnesota, sponsored by MnDOT, investigated various competitive industry clusters in the state. For twelve industry clusters located in regions around the state, one or more firms were interviewed on various aspects of their business, including their company's history and operations, customer base and suppliers, its use of transportation services, its plans for expansion in the near future, and whether transportation networks will be a necessary consideration in those decisions. The key industrial clusters in Minnesota include:

- Recreational Vehicles (Northwestern Minnesota)
- Hospitality and Tourism (Brainerd)
- Mining and Forest Products (Duluth)
- Production Technology (Alexandria)
- Construction Materials (St. Cloud)
- Water Technology, Medical Devices, and Robotics (Minneapolis-St. Paul-Bloomington)
- Processed Foods (Worthington)
- Heavy Machinery (Fairmont)
- Publishing and Printing (Mankato-North Mankato)
- Automotive/Glass (Owatonna)
- Footwear (Red Wing)

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6 *Transportation Planning to Support Economic Development: An Exploratory Study of Competitive Industry Clusters and Transportation in Minnesota*, Lee W. Munnich, Jr., Principal Investigator, Humphrey School of Public Affairs, University of Minnesota, January 2015

- Local Health Services (Rochester)

A critical, common theme that emerged from the interviews was the importance of the reliability of shipments. Businesses and customers alike need to know that their goods will arrive on time and in the condition expected. This issue quickly becomes complex as many freight movements have an origin or a destination not only outside the immediate region, but also outside the state and nation. While some sources of delay emerge at other locations within a firm's supply chain, many can be addressed and managed locally, such as recurrent delays due to construction projects, inclement weather, and traffic congestion. The respondents cited Minnesota's 511 information system as an important source of information to identify and respond to potential delays.

Other select findings from these interviews pertained to specific clusters or regions, and included:

- Need for airfreight service. Certain industries were more heavily reliant on air transportation for the movement of customers, products, or both. The Mayo Clinic in Rochester relies heavily on regional air services to deliver patients from around the country in addition to large shipments of laboratory test specimens at its test facilities. Likewise, the Medical Devices industry cluster in the Twin Cities region[7] relies heavily on express airfreight shipments to deliver its products in a timely fashion to national and international customers. In both cases, the reliability of air service as well as ground-side access is critical, as delays to either are considered costly.
- Desire for improved intermodal freight facilities. Firms in the Construction Materials (mostly granite) and Forest Products clusters, both of which ship heavy, bulky materials, noted shifting shipments to other modes (mostly trucking) in order to adapt to a lack of availability of freight rail facilities nearby. Some of these issues correspond to freight rail capacity issues due to an increase in shipments of oil supplies from North Dakota.
- Infrastructure condition. The need for smooth pavement was cited by several firms whose products were either breakable or perishable. Firms with breakable products include those in the Automotive/Glass cluster that move much of their products on flatbed trucks, along with firms in the Medical Device cluster that are highly sensitive to the integrity of their product during shipment and choose freight carriers with this criterion in mind. Firms with perishable products include those in the Processed Food cluster, which features a number of firms that must ship and receive large amounts of livestock on a daily basis, and the laboratory testing activities in the Local Health Services cluster, which has products that are both breakable and perishable and must be handled and shipped especially carefully.

The findings from this research provide industry insight for developing the 2016 Minnesota Statewide Freight System Plan, as well as information for public officials to consider as they plan the transportation systems of the future.

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[7] "Twin Cities region," or just "Twin Cities" refers to the portion of the state including and surrounding the cities of Minneapolis and St. Paul. Most commonly, this includes the seven-county area of Anoka, Carver, Dakota, Hennepin, Ramsey, Scott and Washington counties. Other similar, though different, "Twin Cities" boundaries also exist. In this Plan multiple terms are used to refer to the Twin Cities, including Twin Cities region, Twin Cities area, Twin Cities metropolitan area, Minneapolis-St. Paul, Minneapolis-St. Paul region, Minneapolis-St. Paul area, and greater Minneapolis-St. Paul. Unless otherwise specified, they all general refer to the seven-county area surrounding the cities of Minneapolis and St. Paul.

## Freight Trends: Minnesota and Beyond

Freight movements in Minnesota are increasingly national and global in scope and are sensitive to market forces as well as the supply chain decisions of businesses both within and outside the state. Businesses may make decisions based on these forces, which often result in local impacts on goods movement within the state. Regional or national decisions made by other transportation agencies and operators can also be felt locally. This section identifies trends that affect Minnesota's freight-related industries now and in the future.

### ENERGY

The changing nature of energy production and consumption in the U.S. and in Minnesota has been one of the largest factors influencing industrial growth and freight system demand over the past decade. A few of the major trends driving Minnesota's economy and use of the freight system relate to liquefied natural gas (LNG) and compressed natural gas (CNG) use, renewable energy sources, and hydraulic fracturing.

#### CNG/LNG

Liquefied natural gas and compressed natural gas are potential alternative fuel sources for commercial vehicles. While national trends such as an increasing supply of natural gas, higher diesel fuel and gasoline prices, environmental regulations, and growing natural gas fueling infrastructure may push the conversion of truck fleets to natural gas in the long-term, short-term conversions will likely remain limited. Heavier engines (which limit the potential commodity load), higher initial purchase price, lower fuel efficiency, higher maintenance costs, and limited infrastructure are other factors that currently inhibit conversion of the truck fleet to LNG or CNG. The U.S. Energy Information Administration predicts that natural gas will fuel 14 percent of heavy-duty vehicles by 2040, though this information is not available at the state level.

Though growing, current use of LNG and CNG for engine fuel in Minnesota is limited, accounting for less than one-thousandth of a percent of all fuel sold in the state. In addition to the constraints identified above, Minnesota also lags behind states such as Texas and California in offering financial incentives that could induce conversion. Of the 383 laws and incentives to encourage use of LNG and CNG throughout the U.S., Minnesota currently offers three: an alternative fuel tax and two laws that require state agencies to purchase alternative fuel vehicles when feasible.[8]

#### Renewable Energy

Minnesota ranks twelfth among states (as of 2010) in the amount of electricity produced by renewable energy resources with a net generation of 7.48 gigawatt hours.[9] By far, the largest renewable resource in the state is wind. Minnesota is among the nation's leaders in wind energy production, ranking in the top five by most measures. Over 60 wind farms are currently in operation across Minnesota, with a total wind energy capacity of over 2,700 MW – enough energy to supply over 600,000 homes. This wind energy requires substantial freight intensive movements to erect farms, including shipments of oversize and overweight loads from Great Lakes ports to western Minnesota. The Port of Duluth is especially critical to these shipments, handling nearly a million freight tons of wind energy cargo between 2005 and 2010. The generating units atop wind towers, called nacelles, require pre-fabrication off site and

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8 Minnesota Department of Transportation, Office of Transportation System Management Research Services and Library. "Future Impact on Minnesota's Transportation Revenue Collection of Commercial Fleet Conversion from Diesel Fuel to Natural Gas." TRS 1415. November 2014.

9 U.S. Energy Information Administration. http://www.eia.gov/renewable/state/. Accessed 10 February 2015.

are typically trucked to their final locations. Blades—reaching up to 150 feet in length—and tower pieces are also manufactured elsewhere and moved via the highway system to their final destinations within Minnesota.

Buffalo Ridge is a glacier-deposited rise that runs diagonally across southwestern Minnesota and is the primary resource for wind capacity in the state. Ten years ago, no production-scale wind farms existed in this area. Most of the land was traditional, typical farmland. Today over 470 wind generators are producing over 1,000 MW of power along Buffalo Ridge. Substantial infrastructure is required to facilitate the construction of these wind farms. Many areas have not yet reached capacity for wind generation; however, at this time it is unclear how many additional sites will be developed.

On the renewable fuels side, trucking relies nearly exclusively on diesel fuel. Continuing improvements in the viability of biodiesel fuels directly impacts trucking, and with Minnesota's vast agricultural resources, the biofuels industry remains critically important. The corn-derived ethanol industry is spread throughout the southwestern part of the state and has 21 production facilities that account for over 300 jobs and $500 million in economic activity.

### Hydraulic Fracturing

A new technique in the oil and gas industry that has emerged over the last ten years is hydraulic fracturing of rock. Induced fracturing, or fracking, allows for the recovery of "captured" gases and petroleum products. The technique is commonly applied to shale gases. The proliferation of shale gas exploration has resulted in substantial increases in associated freight-related movements across the Midwest.

In Minnesota, there have been two primary freight-related impacts of fracking: increased petroleum-related movements and the need for direct inputs to the fracking process, including sand, water, and other chemicals. As of 2014, there were over 10,000 wells[10] used for fracking in the Bakken region. A single horizontal well typically uses between 3,000 and 10,000 tons of sand. A typical railcar, which is the dominant mode for transporting frac sand, can hold around 100 tons. This translates into up to 100 railcars of sand for each well. Figure 1.5 highlights areas where sand mining is currently underway in Minnesota. The southeastern part of the state includes the edges of the premium sand deposits needed for hydraulic fracturing. Nine mines are in production in Minnesota.

Sand processing consists of moving sand through a series of steps to sift it into size groups for market. A single sand mine may produce several products for different markets across the country. Product differentiation requires separate trucks or railcars and different final destinations.

The Mid-America Freight Coalition (MAFC) completed a case study of Chippewa County, Wisconsin (east of the Minnesota border) for sand mining related to hydraulic fracturing and the related consequences for the freight transportation network. Heavy utilization of the roadway infrastructure by sand and gravel haulers, an increase in loaded train cars, and increases in noise were observed outcomes after the addition of a new sand mine.

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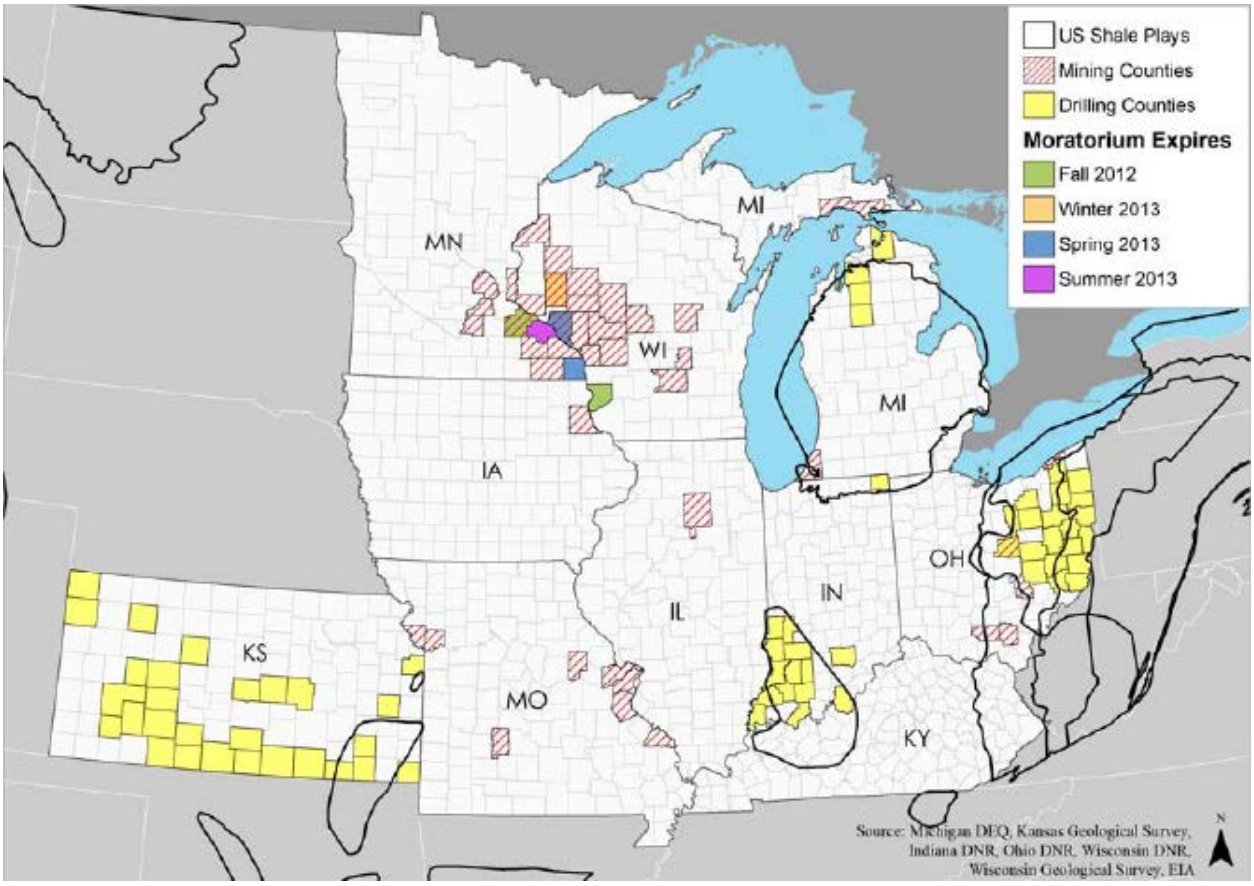
[10] North Dakota Department of Mineral Resources, https://www.dmr.nd.gov/

Figure 1.5 Sand Mining and Horizontal Drilling



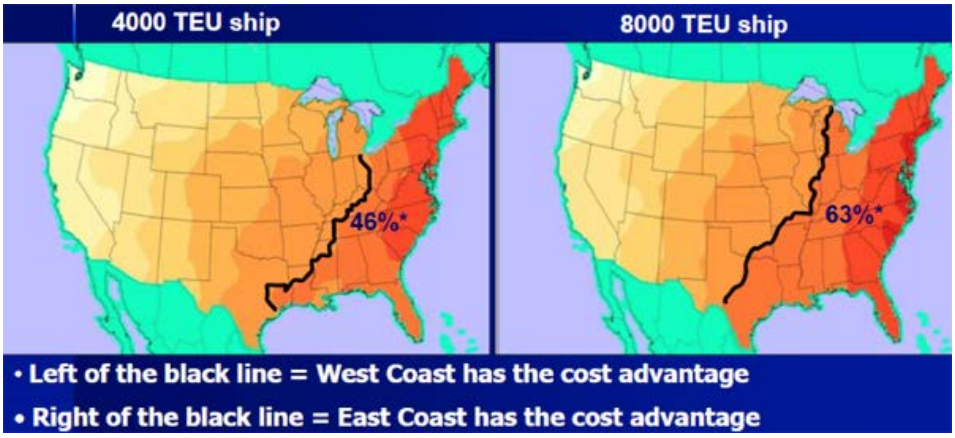

Source: Mid-America Freight Coalition

## GLOBAL SHIPPING TRENDS

Since opening in 1914, the Panama Canal has been a critical element of the global transportation network. A Panama Canal expansion project, projected to be complete in 2016, will allow larger ships to pass through the canal and will increase the canal's annual capacity by more than 75 percent. The effect of the expansion on U.S. ports and trade is a much debated topic and will affect future goods movement throughout the U.S.

Concerns remain about whether larger container ships can use U.S. East Coast ports due to draft and dredging requirements. Some container movements destined for the Eastern U.S. (which would have previously utilized U.S. West Coast ports and then been transferred to rail) will instead travel through the canal to U.S. East Coast ports, reducing the over-land distance travelled. Research findings suggest that the canal expansion may decrease overall shipping times to Midwest destinations, encourage export of grains and agricultural products to Asia via Gulf Coast ports, promote greater shipment of grain by containers, and increase the total energy costs of transportation. However, Minnesota's direct markets will likely retain their West Coast connections (Figure 1.6).

Figure 1.6 Cost Advantage Regions by Ship Size




Source: Worley Parsons, Richard West

The Suez Canal is the Panama Canal's primary competing route for serving the East Coast of the U.S. A recent Suez Canal expansion allows ships to sail in both directions at the same time over much of the canal length. This has decreased waiting time from 18 to 11 hours for most ships and doubled the capacity of the Suez Canal from 49 to 97 ships a day. Such improvements in efficiency may further drive down costs to serve the Asia-U.S. East Coast market.

Each of these canal expansion efforts has the potential to allow containerized barge movements from the Gulf of Mexico via the Mississippi River system. Minnesota may see specific companies that benefit from the all-water containerized movements. However, increased system maintenance and upgrades to the locks, dams, and landside infrastructure along the length of the Mississippi River network are likely necessary before any substantial container-on-barge operations would be available.

The possibility of increased trade through the Northwest Passage may also shift global supply chains. 2008 marked the first passage of a commercial vessel through this corridor. The route, illustrated in Figure 1.7, travels north of Alaska and Canada and reduces the travel time between China and Europe by two weeks or approximately 5,000 miles. It is also 30 percent shorter than the current route between Asia and the East Coast of North America. More analysis is needed to understand the impacts of this route on Minnesota.[11]

[11] MnDOT. Scenario Planning, 18.

Figure 1.7 Popular Northwest Passage Routes

Source: National Aeronautics and Space Administration via Wikimedia Commons

## ON-/NEAR-SHORING TRENDS

Although Canada is Minnesota's primary international trading partner, trade between Minnesota (and other states) and Mexico and Central and South America is increasingly important to both Minnesota and the overall U.S. economy and is changing supply chain structures. Increasing Inter-American trade as well as potential new trade agreements[12] between these countries increases the potential for additional import and export trade for Minnesota's businesses.

As manufacturers seek methods to reduce production costs and the total cost of goods, they have increasingly been turning attention to manufacturing closer to market, namely in Mexico, the Caribbean, and Central America (near-shoring) and the U.S. (on-/re-shoring). Mexico appears to have the most to gain from near-shoring activity in the near-term. As reported by industry, the main reasons for near-shoring are lower freight and inventory costs and improved speed to market.

Recently, some Minnesota companies have moved production to Mexico. IBM moved a production facility from Rochester to Mexico in 2013. Polaris operates a facility in Monterrey, Mexico with over 400 employees. Best Buy and Target both have increased sourcing through Mexico in the last five years. This trend is expected to continue, with a 2014 survey by BNP Market Research observing that, "nearshoring remains a strong part of company strategies with 92 percent of survey respondents saying they will increase or continue nearshoring."[13]

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12 *Miami Herald*. "U.S. Considering Deal to Expand Trade in the Americas." December 14, 2013. http://www.miamiherald.com/2013/12/14/3819165/andres-oppenheimer-us-considering.html

13 Perry A. Trunick, Dr. J. Paul Dittman. "Nearshoring on the Rise." World Trade, July 2014. http://digital.bnpmedia.com/article/Nearshoring+On+The+Rise/1745144/0/article.html

## PRODUCTION

3D printing has emerged as a viable option for geographically dispersed manufacturing and allows for new designs of engineered materials. Large-scale 3D printing has enabled entire houses to be printed in less than 24 hours. Bridges can be "printed" in place and assembled with minimal disruption to the traveling public. The implications for large manufacturing, roadway construction, and general architectural design are increasingly apparent. Cost savings from labor reduction, material recycling, and efficiency make this technology operational beyond the laboratory level.

Beyond highway construction, the emergence of 3D printing has substantial impacts for the production of goods. The proliferation of manufacturing sites, with on-site production capability, changes the dynamics of supply chains considerably. The ability of firms to "print" replacement pieces or detailed manufactured devices (including medical equipment and machinery) rather than relying on the movement of freight alters the reliance on shipments of these components. However, the movement of raw material to feed 3D printers and other advanced technology will require a robust transportation system—even if some parts of the system can be automated.

## DELIVERY

### The Movement of Crude Oil by Rail

With the increase of shale oil drilling in the Bakken Region of North Dakota, the Alberta tar sands, and other locations, Minnesota's rail system saw large increases in crude oil movements. According to the Association of American Railroads (AAR), in 2014 U.S. Class I railroads originated over 490,000 carloads of crude oil, a significant increase over the less than 75,000 carloads originated in 2011.[14] Although transportation costs for shipment by train are higher, rail offers competitive advantages over pipeline transfer. Rail serves major refineries on the coasts, as well as inland and Gulf markets, allowing companies the flexibility to ship their products to the highest-margin market. In addition, rail allows for uncontaminated shipment of different grades of petroleum, whereas pipeline shipments may result in mixing grades of oil. Finally, rail adds needed capacity to the system, as pipelines can only handle about a third of the 1.2 million barrels per day that the Bakken fields produce.

Safety and security issues are at the forefront of many minds in the aftermath of recent disasters involving unit trains of oil. Minnesota has responded to these trends and the unknown nature of future shipments by passing laws to increase the safety of crude oil by rail movements in the state. The State is requiring MnDOT to take action by conducting studies on highway crossings that have significant safety risks due to increased crude oil by rail activity and providing $2 million to make the first round of short-term improvements at rail grade crossings. Proposed federal rules regulating the shipment of crude oil may further affect state safety operations.[15]

Throughout 2013 and 2014, the increased crude oil traffic in North Dakota, in conjunction with a record harvest throughout the upper Midwest, drove up demand for rail service and led to significant railway congestion. The rail boom related to extraction of petroleum (rail movements of crude oil itself and the shipping of chemicals, drilling pipe, and sand components for hydraulic fracturing) limited the capacity of freight railroads to handle traditional industries in Minnesota. Grain shippers, paper manufacturers, ethanol manufacturers, and taconite and forestry industries have complained about the availability and access to rail shipping as a result of the capacity consumed by the oil and gas

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[14] Association of American Railroads, https://www.aar.org/Pages/Crude-Oil-Rail-Traffic.aspx

[15] Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation. Notice of Proposed Rulemaking, Hazardous Materials: Enhanced Tank Car Standards and Operational Control for High-Hazard Flammable Trains. Docket No. PHMSA-2012-0082 (HM-251). July 23, 2014.

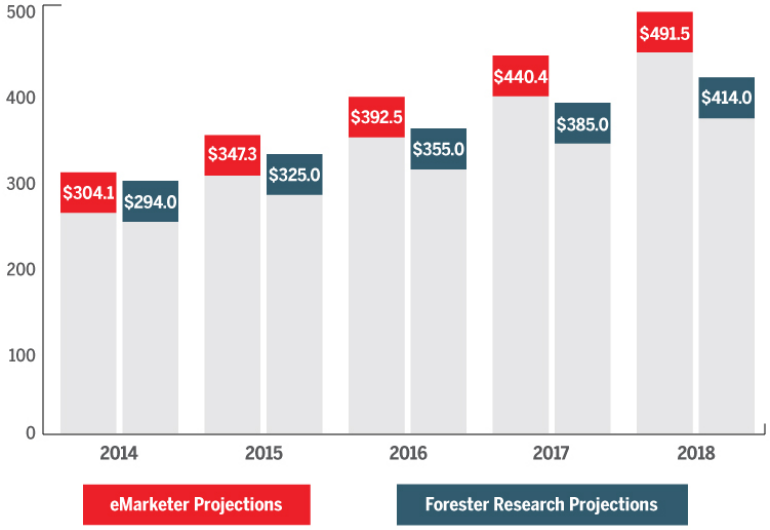
industry. Due to slower travel times and longer turn-arounds leading to a lack of railcars available for grain shipment, grain was stored on the ground at facilities for extended periods of time while waiting for shipments. A study by the University of Minnesota's Center for Farm Financial Management estimated delays in railroad shipping cost Minnesota's corn, soybean, and wheat farmers nearly $100 million due to lower prices.[16]

It is anticipated that crude oil shipments will continue; however, some recent trends have indicated that more of the production from these fields is being slated for export via West Coast ports. Approximately 50 oil trains per week transport Bakken crude oil across Minnesota. In addition, over 140,000 crude oil tankers were mixed in with other traffic on Canadian Pacific or Canadian National lines in 2013.[17] With the trend to export a higher percentage of Bakken crude oil, shipments through Minnesota for refining elsewhere in the U.S. may be reduced slightly.

## E-commerce

Electronic Commerce, commonly called E-commerce, is the purchase of goods or services online instead of at a brick-and-mortar store. E-commerce sales are expected to grow to more than $400 billion in the next several years, with Forrester Research estimating $414 million in sales in 2018 (over 40 percent growth in four years) and eMarketer estimating $491.5 million in 2018 (over 60 percent growth in four years), as shown in Figure 1.8. This is expected to result in larger quantities of goods moving through and to residential areas via trucks, increasing congestion and wear on local roads, with fewer personal trips to brick-and-mortar stores.[18]

Figure 1.8 U.S. E-Commerce Sales, 2014-2018




Source: eMarketer, Forrester Research

16 *Star Tribune.* "Rail shipping delays cost Minnesota corn, soybeans, wheat farmers nearly $100 million." July 10, 2014.

17 *Star Tribune.* "Canadian crude taking rail through northern Minnesota." August 4, 2014.

18 A transformation in brick-and-mortar stores, http://idahobusinessreview.com/2015/03/03/a-transformation-in-brick-and-mortar-stores/

### Autonomous Vehicles

Delivery mechanisms, including the limited use of autonomous vehicles and airborne, unmanned delivery vehicles, change the long-haul and last mile requirements of standard business to consumer delivery. Amazon has expressed interest in creating same day delivery options on goods that would require use of automated technologies. Due to the small geographic scope of the airborne movements needed, high initial costs, liability concerns, and the approval processes required of the Federal Aviation Administration, only limited changes to standard package delivery services can be expected in the near term.

With respect to truck freight vehicles themselves, there is an increased likelihood that convoyed road trains may find uses throughout the industry in the next decade. These trucks, currently under testing by equipment manufacturer Volvo, as shown in Figure 1.9, require a lead driver with tractors controlled behind it by electronic automation. Current laws regarding vehicle configurations would need to be reexamined in order to make use of these changes in vehicle technology.

The full automation of trucking could cause massive disruptions in the labor forces associated with the industry--or potentially serve as a solution to the truck driver shortage. Over 150 firms and more than 13,000 employees are currently associated with the trucking industry in Minnesota. These firms account for over $2.5 billion in economic activity plus the value of their goods. Associated industries, such as truck stops and truck repair services, would see secondary impacts of automation.

Figure 1.9 Volvo Road Train Premier

Source: Volvocars Global Newsroom

## Truck Driver and Workforce Shortages

The American Trucking Association (ATA) estimated a nationwide shortfall of 35,000 drivers in 2014. That number is projected to rise to 240,000 by 2020 if conditions remain the same.[19] The lack of qualified drivers constrains total truck fleet capacity even as market conditions have rebounded. It is also a contributing factor to higher transportation prices. Without surplus capacity at a trucking company, any increase in shipment volume must be met by hiring through the independent market where rates can be up to 30 percent higher than for a regular, contract lane. Many of the goods made and used in Minnesota are seasonal, which exacerbates this problem.

Government regulation, in the form of tighter Hours-of-Service regulations, also decreases the capacity of the truck fleet. Stricter reporting requirements combined with rest mandates and reduced total hours may cause some drivers to leave the profession, while limiting the productivity of those that remain.[20]

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19 *Reuters*. "Driver shortage makes capitalizing on low oil hard for truckers." February 6, 2015. http://www.reuters.com/article/2015/02/06/usa-truckers-railways-idUSL1N0VF1ZY20150206

20 *Fleetowner.* "HOS rules kick in, driving up fears of capacity crunch." July 1, 2013. http://fleetowner.com/regulations/hos-rules-kick-driving-fears-capacity-crunch

Reduced trucking capacity could increase pressure on other modes, some of which are facing capacity issues of their own. Airlines, which typically move high-value, low-volume freight, are dealing with labor problems, especially among the smaller regional carriers. While not yet an issue for the larger national carriers that handle the majority of freight service, if enough pilots leave the profession, capacity concerns could rise in the future as current pilots—many of whom are from the Baby Boom generation—retire.[21]

## ENVIRONMENTAL CONCERNS / AIR QUALITY

Some of the most critical issues surrounding freight movements are related to impacts of freight-related emissions. Emissions along freight corridors can impact the health and safety of local communities, which can experience some of the highest exposure levels to pollution that causes asthma and other respiratory ailments, heart disease, and other health problems. Through programs such as the Clean Air Act, states and regions are working to adopt strategies to improve air quality. Minnesota is in compliance with most measures in the U.S. Environmental Protection Agency's (EPA) National Ambient Air Quality Standards (NAAQS), although some pockets of non-attainment still exist.[22]

Minnesota also ranked 23rd out of the 50 states in terms of carbon dioxide emissions in 2014, according to the U.S. Energy Information Administration. Freight transportation is a key contributor to greenhouse gases such as carbon dioxide. For this reason, states, the EPA, and other agencies have begun to address environmental concerns related to heavy truck movements, bunker fuels in maritime trade, and vehicle emissions. The EPA and the National Highway Traffic Safety Administration (NHTSA) are working toward passenger and freight-vehicles that are more fuel-efficient and emit less greenhouse gas. The EPA is also developing and implementing regulations to increase the proportion of renewable fuels for transportation.

The need for a reliable and resilient freight system is closely tied to environmental concerns. Minnesota's aging infrastructure combined with the effects of global climate change—volatile weather patterns and an increasing number of severe weather events—highlights the need to develop alternative modes and routes that not only limit the environmental consequences of freight movement but also provide businesses with reliable options. Mode and route choice also reinforce an emerging trend in supply chain management, often referred to as "greening the supply chain." As companies look for ways to decrease costs, save money, and reduce waste, the availability of more energy efficient freight modes, such as water or rail, may drive further need for freight system redundancy and thus increase overall system resiliency.[23] Projects that support and develop system redundancy help protect the environment, increase capacity, and buffer the just-in-time supply chain model from disruptions. Finally, near-shoring (discussed on page 18) is partially a response to environmental challenges, as shorter supply chains reduce the risks associated with natural disasters.

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21 *The Atlantic*. "Turbulence ahead: The coming pilot shortage and how it came to be." July 14, 2014. http://www.theatlantic.com/business/archive/2014/07/turbulence-ahead-the-looming-pilot-shortage-and-its-decades-long-history/374171/

22 Minnesota Pollution Control Agency. http://www.pca.state.mn.us/index.php/air/air-quality-and-pollutants/general-air-quality/state-implementation-plan/minnesota-state-implementation-plan-sip.html

23 MnDOT. Scenario Planning, 13.

## PUBLIC-PRIVATE PARTNERSHIPS

Because of ongoing constrained fiscal environments at all levels of government, Public-Private Partnerships (PPPs) are an opportunity to leverage public and private sector resources through cooperative agreements to implement freight projects that benefit a variety of stakeholders. Strategies to do so were discussed by stakeholder groups at the Minnesota State Freight and Logistics Summit in 2014. With an aging multimodal infrastructure, repair and expansion work vital for the movement of freight to, from, and through the state will require investment from both public agencies and the private sector businesses that rely on that infrastructure to move goods. These partnerships can also benefit freight movement through collaboration and sharing of data, as performance measures increasingly become a criteria for funding in the public sector. Collaboration between public and private sector groups may also increase communication between different business sectors. As Minnesota's economy continues to globalize and integrate, freight issues in one industry will likely overlap with others. Working together towards mutually beneficial solutions to these issues will increase the effectiveness of Minnesota's freight movement infrastructure and raise the prospect for obtaining funding.

These partnerships are already occurring in Minnesota. As described in the 2016 Minnesota State Rail Plan, the Willmar Rail Connector and Industrial Access Project is an example of a PPP developed between the state, the railroad, and local partners. BNSF and MnDOT partnered with Kandiyohi County, the City of Willmar, and the Kandiyohi/Willmar Economic Development Council and were awarded a $10 million TIGER VII grant in 2015 for rail improvements to BNSF rail lines and highway improvements to Highway 12 and Highway 40 in the City of Willmar. The rail wye, which is a triangular junction, will connect the Marshall and Morris rail subdivisions and alleviate congestion in the downtown area of Willmar, which is also where BNSF's Willmar Yard is located. The project includes two highway bridges over the proposed rail line.

# 2.0 MINNESOTA'S FREIGHT ASSETS AND USE

This chapter describes Minnesota's multimodal freight system, how this system is used, and the designation of Minnesota's Principal Freight Network (PFN).

## Minnesota's Freight System Assets

The following sections briefly describe the modal sections of Minnesota's multimodal freight network – highways, railroads, ports and waterways, airports, and pipelines. Maps and data on Minnesota's multimodal freight system can be found in the Minnesota's Principal Freight Network and Freight System Assets and Use technical memos.

### HIGHWAY SYSTEM

The trunk highway system (Interstates, U.S. Highways, and Minnesota State Highways) is the only freight modal network under MnDOT's jurisdiction. It is the backbone for goods movement in Minnesota, and provides first- and last-mile connectivity to all industries. Minnesota's trunk highway system totals nearly 12,000 miles of roadway, and many of these highways average more than 5,000 truck trips per day. For long trips, trucks typically use designated highway networks to transport goods from point to point. In addition to these state and federally designated roadways, local roadways also serve as important connectors between freight generating and receiving facilities (farms, processing plants, manufacturing centers, and distribution centers) and the primary roadway network.

### FREIGHT RAIL SYSTEM

Minnesota's rail network has historically played a major role in supporting freight movements for key commodity groups and industries, particularly for the state's agricultural producers and shippers. In addition, the state's rail network supports regional and national goods movement between major shipping centers in Chicago and points west, including Pacific Northwest Ports. The four primary Class I rail operators in the state are BNSF with about 1,600 miles of track, Canadian Pacific (CP) with 650, Union Pacific (UP) with 500, and Canadian National (CN) with 450. In addition, 17 other short line or other regional railroads operate in Minnesota.

### PORTS AND WATERWAY SYSTEM

Minnesota has one of the more unique positions in the country for waterway movements as it is located on both the Mississippi River and the Great Lakes via Lake Superior. The Mississippi River provides access to river ports to the south as well as the Gulf of Mexico via New Orleans. The Great Lakes-St. Lawrence Seaway provides access to other ports along the Great Lakes to the Atlantic Ocean. Due to this, Minnesota has four public and four private port authorities in operation: four on the Mississippi River system and four along Lake Superior.

## AIRPORT SYSTEM

Minnesota is home to 97 airports listed in the Federal Aviation Administration's (FAA) National Plan of Integrated Airport Systems (NPIAS). This list is updated every two years to identify existing and proposed airports that are considered significant to national air transportation. Of these, seven are identified as primary airports. Seven other airports, all located near the Minneapolis-St. Paul International Airport, are identified as relievers. The seven primary airports are:

- Bemidji Regional Airport (BJI)
- Brainerd Lakes Regional Airport (BRD)
- Duluth International Airport (DLH)
- Falls International Airport (INL)
- Minneapolis – St. Paul International Airport (MSP)
- Range Regional Airport (HIB)
- Rochester International Airport (RST)

These seven are considered primary airports due to the volume of passenger boardings (at least 10,000 per year). With the exception of MSP, most would not meet the criteria for primary airport status based only on the air cargo threshold (at least 100 million pounds of total annual landed weight by cargo aircraft).

## PIPELINE SYSTEM

The National Pipeline Mapping System (NPMS), maintained by the Pipeline and Hazardous Materials Safety Administration, shows over 9,000 miles of pipeline in the state. Due to the sensitive nature of this mode, detailed maps of pipeline infrastructure are not available. The primary pipeline system in Minnesota is the Minnesota Pipe Line system. This pipeline receives crude oil from other pipeline systems (e.g., the Enbridge Pipeline System that carries crude from Alberta, Canada) at a terminal in Clearwater County. The Minnesota Pipe Line system has four lines running from Clearbrook to the Twin Cities and can transport about 465,000 barrels of crude oil per day.[24] Minnesota's pipeline system also includes two refineries and six refined asset terminals.

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[24] Minnesota Pipe Line, http://www.minnesotapipeline.com/

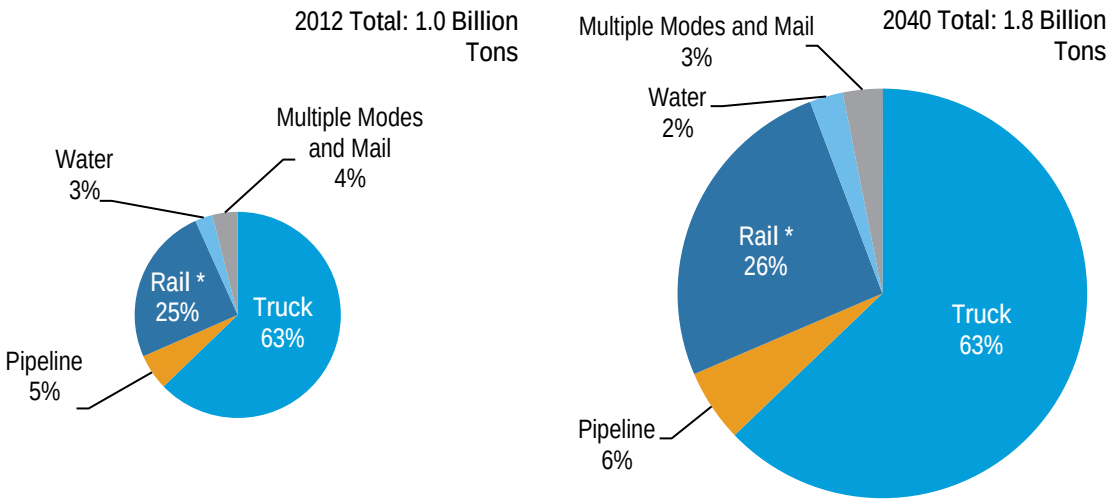
## Minnesota Freight System Demand

The needs of Minnesota's freight system are driven by freight demand – what and how much is traveling on the system, where it is coming from, and where it is destined. This section presents existing and future potential demand for freight in Minnesota. During the next few decades, there will be unanticipated changes in the economy, freight logistics, technology, public policy, and other factors that will greatly influence the general demand for goods movement and that of the individual modes. While these unanticipated changes are not reflected in this plan, they were considered in developing the plan's recommendations.

### FREIGHT MOVEMENTS BY MODE

In 2012, 1.0 billion tons of freight moved over Minnesota's transportation system, as shown in Figure 2.1. Trucks carried 63 percent of all freight tonnage to, from, within, and through Minnesota, while rail (carload and intermodal) carried about 25 percent. By 2040, the forecast indicates total volume of 1.8 billion tons, an increase of 80 percent overall.

Figure 2.1 Mode Share by Weight, 2012 and 2040

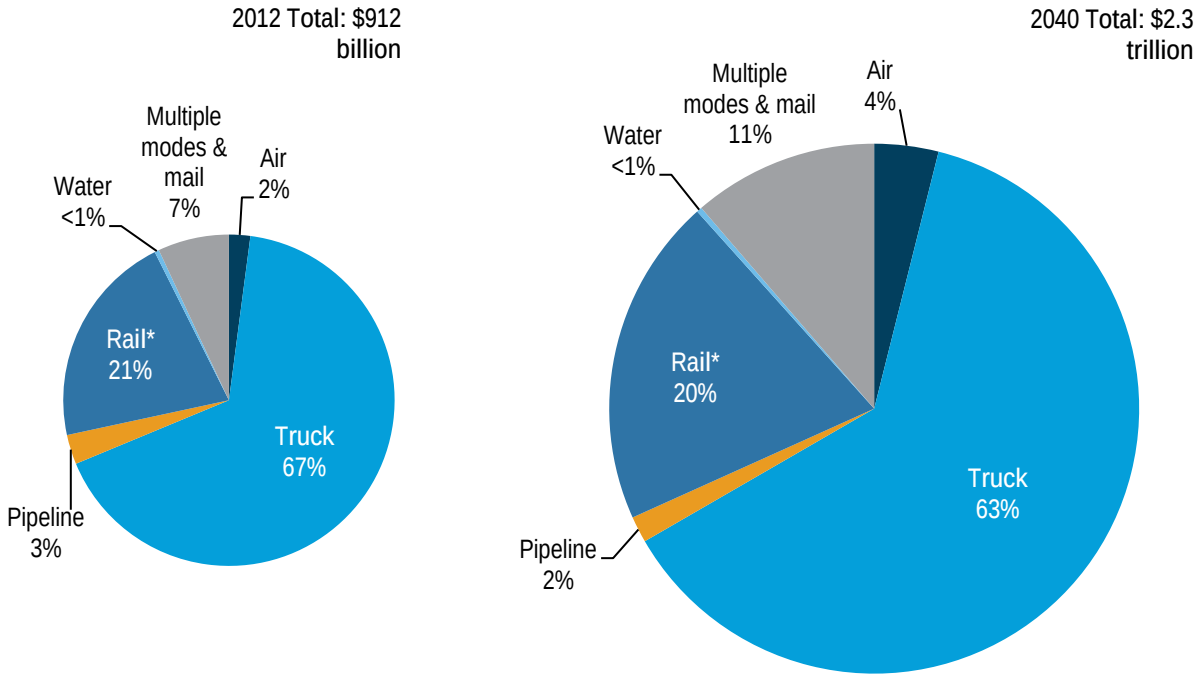



Source: Federal Highway Administration (FHWA) Freight Analysis Framework (FAF3) 2015 Provisional estimates and 2040 Forecast, and through truck traffic estimated by routing these data; and, STB 2012 Confidential Carload Waybill Sample and FHWA FAF 3.5 forecast for 2040 processed by Cambridge Systematics.

Note: *Rail intermodal was excluded from Multiple Modes and Mail and included in Rail. Multiple Modes and Mail includes overnight mail and package delivery services.

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.

Figure 2.2 Mode Share by Value, 2012 and 2040



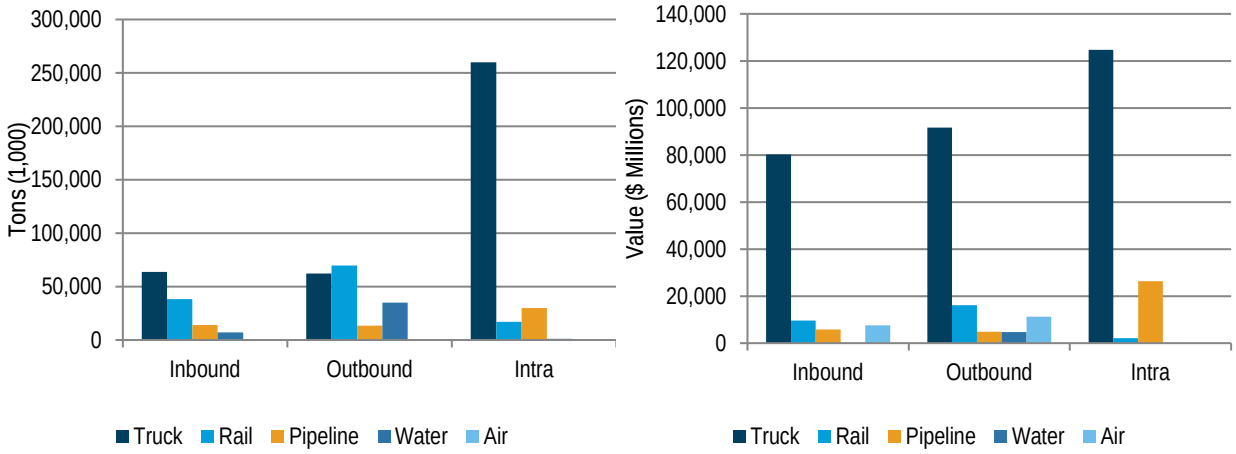

Source: FHWA FAF3 2015 Provisional estimates and 2040 Forecast, and through truck traffic estimated by routing these data; and, STB 2012 Confidential Carload Waybill Sample and FHWA FAF 3.5 forecast for 2040 processed by Cambridge Systematics.

Note: *Rail intermodal was excluded from Multiple Modes and Mail and included in Rail. Multiple Modes and Mail includes overnight mail and package delivery services.

## FREIGHT MOVEMENTS BY DIRECTION

The relationship between tonnage and value of goods shipped and how the nature of different transportation modes affect this relationship is well demonstrated in Minnesota. Figure 2.3 displays the tonnage and value of commodities by both mode and direction (inbound, outbound, and within Minnesota). As shown in the figure, air has an almost negligible effect on the overall state tonnage; however, for overall value, air represents almost five percent. This confirms that air cargo is typically comprised of lower weight and higher value goods. Rail is most economical over longer distances, explaining why it has a large share of outbound and inbound movements at 31 and 39 percent, respectively, and a relatively small share of within-state movements (six percent).

Figure 2.3 Statewide Tonnage (left) and Value (Right) of Commodities by Mode and Direction, 2012.



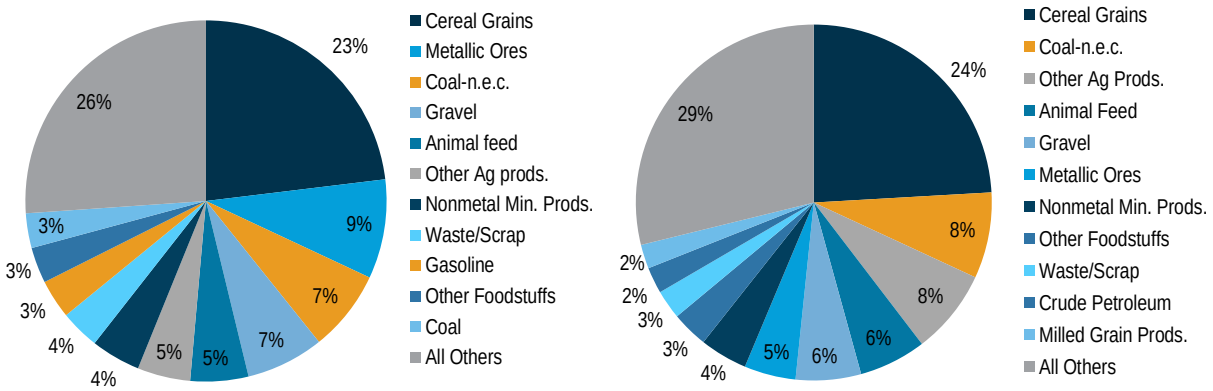

Source: FHWA FAF3 2015 Provisional estimates, Waterborne Commerce Statistics Center, Minneapolis – St. Paul International Airport Year End Operations Reports (2008-2013), Minnesota State Aviation System Plan.

## MAJOR FREIGHT COMMODITIES

At the statewide level, Cereal Grains are the prime commodity representing 23 percent of total tonnage, as displayed in Figure 2.4. The next largest commodity by tonnage is Metallic Ores at nine percent. This is primarily due to taconite mining in the northeast part of the state.

Looking ahead to 2040, tonnage is anticipated to increase at an annual rate of two percent, resulting in overall tonnage nearly doubling by 2040 (illustrated in Figure 2.1); however, the distribution of commodities remains steady. Figure 2.4 shows the large role that agricultural products play in the state's economy. Other Agricultural Products, Animal Feed, and Milled Grain Products are all anticipated to at least double in tonnage by 2040. Conversely, Metallic Ores will drop from the second highest commodity in the state to sixth. Some of this may be due to environmental concerns regarding mine operations or the overall capacity of the existing mines.

Figure 2.4 Major Freight Commodities by Tonnage, 2012 (left) and 2040 (right)



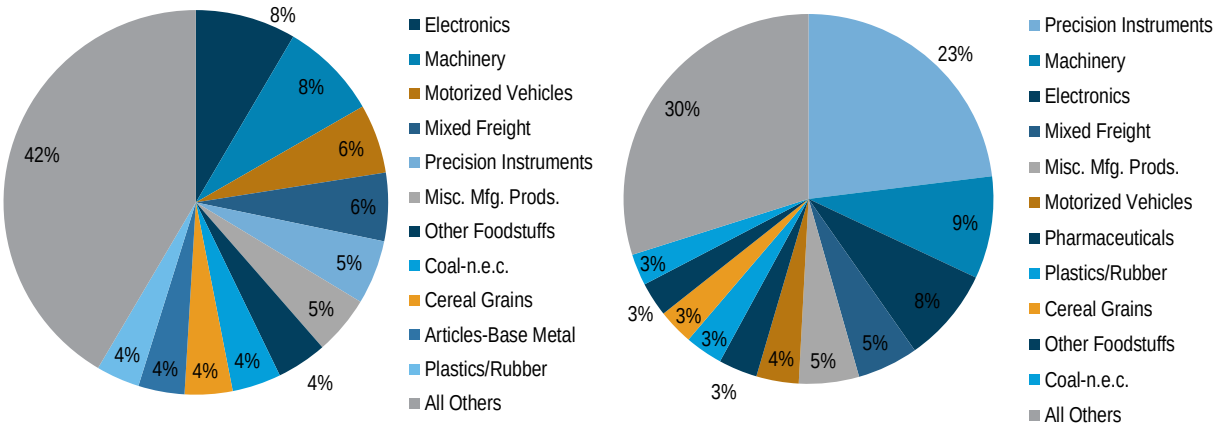

Source: FHWA FAF3 2015 Provisional estimates

Note: Coal-n.e.c. refers to coal and petroleum products not elsewhere classified, including natural gas.

By value, the list of major commodities changes significantly. Whereas Cereal Grains represent 23 percent of all tonnage, it only comprises four percent of the total value of commodities moved throughout the state. As shown in Figure 2.5, higher value goods such as Electronics and Machinery contribute more to the overall value of goods moved. At eight percent each, these commodities are not nearly as dominant as Cereal Grains are by tonnage. Each of these top ten commodities have a roughly equal share of value, ranging from four to eight percent of the total. Some low value goods, such as Cereal Grains and Coal-n.e.c., [25] only appear here due to the sheer volume of goods moved while many of the most valuable commodities do not appear on the list of top 10 commodities by tonnage.

By 2040, Precision Instruments are anticipated to have tremendous growth in Minnesota. With a growth of nearly 1,000 percent (nine percent annually), this commodity will represent 23 percent of the total value of commodities moved to, from, and within Minnesota. The next highest share of commodities will be Machinery and Electronics at nine percent and eight percent, respectively, similar to what they are today. As Figure 2.5 shows, most of the other commodities have more moderate growth between two and five percent annually. The other commodity with significant movement is Pharmaceuticals. Presently, these goods do not appear on the top 10 list by value yet move up to seventh place by 2040 due to an annual growth rate of five percent.

Figure 2.5 Major Freight Commodities by Value, 2012 (left) and 2040 (right)




Source: FHWA FAF3 2015 Provisional estimates

Note: Coal-n.e.c. refers to coal and petroleum products not elsewhere classified, including natural gas.

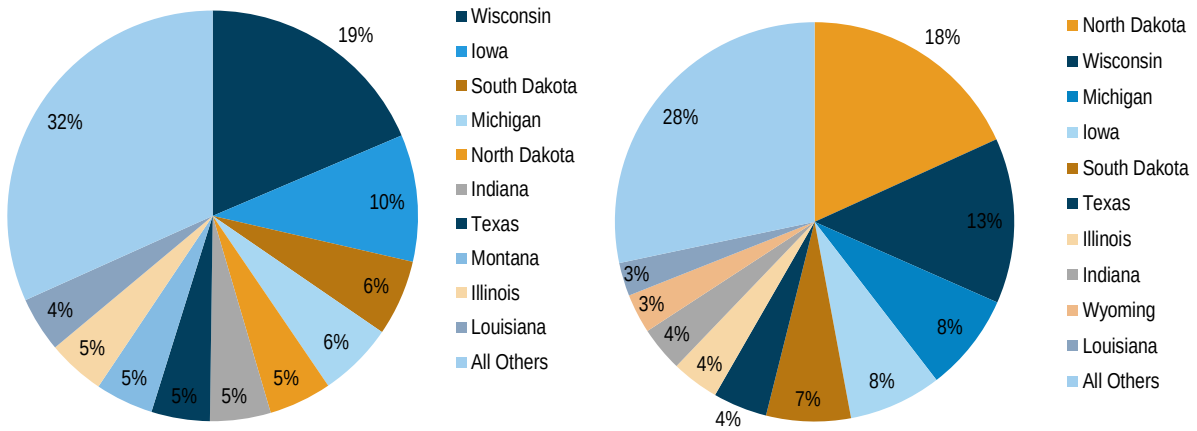
[25] The Coal-n.e.c category represents natural gas, selected coal products, and products of petroleum refining, excluding gasoline, aviation fuel, and fuel oil.

## MINNESOTA'S TRADING PARTNERS

Minnesota is well positioned to take advantage of a variety of trade partners. The most convenient partners are other states within the U.S. International goods also pass through Minnesota's ports of entry by land, air, and water. Minnesota's largest domestic trading partners, today and in the future, are neighboring states, as shown Figure 2.6. Today, those states sharing a border with Minnesota (Wisconsin, Iowa, South Dakota, and North Dakota) make up 40 percent of total trade with other states.

Looking ahead to forecasted growth, Wisconsin is expected to lose its number one spot on Minnesota's list of domestic trade partners to North Dakota. North Dakota is anticipated to experience a drastic increase in tonnage moved with the state. This growth is almost singularly related to a significant growth in cereal grains imported into Minnesota from North Dakota. Current volumes for this commodity are estimated at more than 1.7 million tons, and by 2040 this is expected to grow to nearly 59 million, representing an annual growth of 12 percent. While this growth seems large, crop developments are already underway to justify this expected growth. Winter wheat in North Dakota grew by 264 percent between 2013 and 2014 alone. Other types of grains, such as durum wheat, spring wheat, and flaxseed, are all anticipating significant growth.[26]

Figure 2.6 Major Domestic Trading Partners by Total Tonnage, 2012 (left) and 2040 (right)

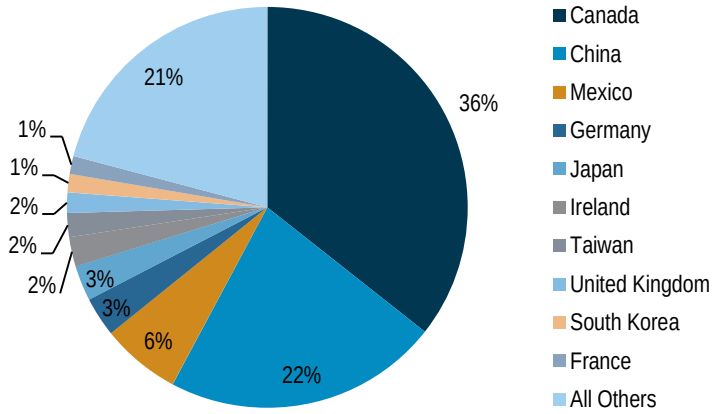



Source: FHWA FAF3 2015 Provisional estimates

Minnesota trades with a variety of foreign nations, particularly Canada; however, international movements are relatively low. Trade with Canada makes up 28 percent of total exports, 41 percent of total imports, and 36 percent of overall trade. The proximity of Canada to Minnesota, combined with the numerous ports of entry located on the border between Minnesota and Canada, allow for easy access between markets. Minnesota's top 10 foreign trading partners based on total imports and exports are shown in Figure 2.7. Each of these countries is in the top 25 for both imports and exports. Other countries not listed here, such as Belgium which is ranked sixth by exports, only represent significant movements in one direction.

26 http://www.farmandranchguide.com/news/crop/prospective-plantings-report-yields-no-big-surprises-for-cereal-grains/article_d4b9f6c4-b9e9-11e3-867e-001a4bcf887a.html

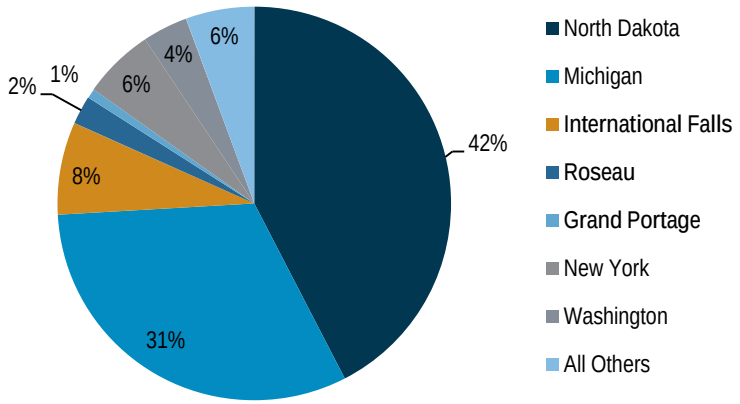
Figure 2.7 Minnesota's Major Foreign Trading Partners by Total Value, 2013




Source: U.S. Census Bureau.

Figure 2.8 details the top locations facilitating trade between Canada and Minnesota based on a combined total value of truck, rail, water, and air movements through gateways both inside and outside of Minnesota. The majority of goods moving between Minnesota and Canada travel through gateways in North Dakota or Michigan. Gateways in the top five states, North Dakota, Michigan, Minnesota, New York, and Washington, are conduits for 94 percent of all trade between Canada and Minnesota. Trade through Minnesota's border crossings makes up about a quarter of the total.

Figure 2.8 Top Border Crossings for Minnesota-Canada Trade Value ($1,000), 2013




Source: Bureau of Transportation Statistics.

## HIGHWAY DEMAND

Trucks are an important mode for moving all types of goods and account for the highest tonnage of goods in Minnesota and nationally. A wide range of commodities is shipped via the highway mode. Even goods shipped primarily using another mode utilize trucks for last-mile connections to and from their origins and destinations. Cereal Grains, Gravel, and Animal Feed reflect the largest tonnages of goods shipped via truck, consistent with the state's farm culture and raw material production. Looking ahead to 2040, agricultural products are anticipated to require even more use of the state's highway infrastructure. Table 2.1 details the major commodities anticipated to move over Minnesota's highway system in 2040. Cereal Grains maintain its position as the highest tonnage commodity moved via truck but lose some of its market share, decreasing from 27 percent to 25 percent. This is due to higher growth seen in other commodities. Animal Feed moves up from the third largest tonnage to second largest, with total tonnage more than doubling from 27.7 million in 2012 to 56 million in 2040. Other Agricultural Products overtake Gravel to round out the top three commodities, fueled by an annual growth of three percent.

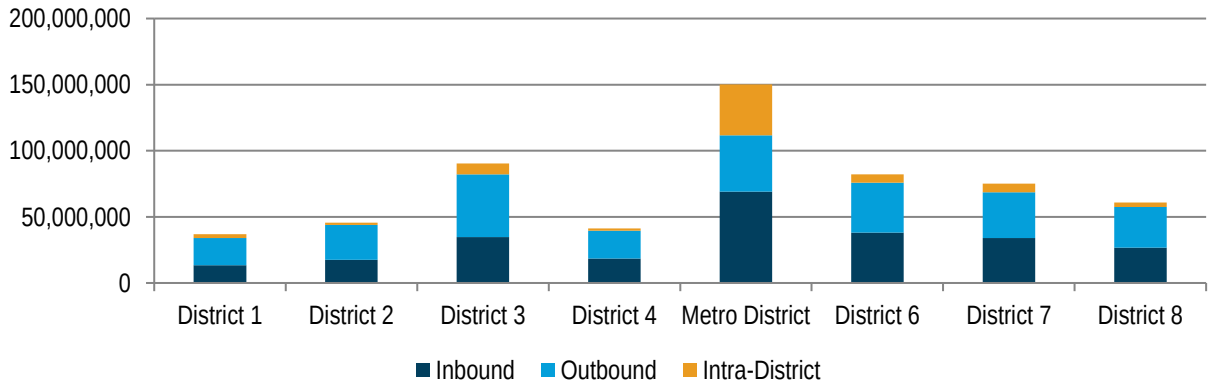
Table 2.1 Major Highway Commodities, Total, 2040

| COMMODITY | TONS | PERCENT | RANK CHANGE | TOTAL CHANGE | ANNUAL CHANGE |
|---|---|---|---|---|---|
| Cereal Grains | 159,337,502 | 25% | - | 56% | 2% |
| Animal Feed | 56,369,940 | 9% | +1 | 104% | 3% |
| Other Agricultural Products | 53,667,516 | 8% | +3 | 153% | 3% |
| Gravel | 44,214,491 | 7% | -2 | 21% | 1% |
| Nonmetal Mineral Products | 43,748,163 | 7% | -1 | 68% | 2% |
| Waste/Scrap | 28,309,040 | 4% | -1 | 32% | 1% |
| Other Foodstuffs | 26,844,150 | 4% | - | 79% | 2% |
| Milled Grain Products | 18,761,563 | 3% | +6 | 188% | 4% |
| Live Animals/Fish | 14,596,918 | 2% | +9 | 173% | 4% |
| Coal-n.e.c. | 14,361,904 | 2% | -2 | 2% | 0% |
| Mixed Freight | 13,835,631 | 2% | +6 | 136% | 3% |
| Gasoline | 13,174,338 | 2% | -3 | 9% | 0% |
| Machinery | 10,999,433 | 2% | +9 | 168% | 4% |
| Natural Sands | 10,898,664 | 2% | +2 | 83% | 2% |
| Wood Products | 10,563,900 | 2% | -5 | 21% | 1% |
| All Others | 121,564,450 | 19% | | | |

Source: FHWA FAF3 2015 Provisional estimates

MnDOT District tonnages for the highway system were also reviewed. Total tonnage movements were divided between inbound, outbound, and intra-district tonnages and do not include through movements. This data, shown in Figure 2.9, reflects the volume of commodities moving by truck that are produced and consumed in each District.

Figure 2.9 Truck Freight Flows by Direction, Tons, by District, 2012




Source: FHWA FAF3 2015 Provisional estimates, disaggregated by Cambridge Systematics.

## RAIL DEMAND

The railway network in Minnesota is comprised of 21 rail operators serving both passenger and freight traffic. Four of the seven Class I railroads maintain operations within the state: BNSF, Union Pacific (UP), Canadian National (CN), and Canadian Pacific (CP). There are also 17 regional, short line, terminal, and switching railroads in the state. Minnesota's rail system has some of the highest volumes in the nation, and these flows are projected to continue to grow through 2040. Table 2.2 presents the tons and units carried by class of railroad in Minnesota. In 2012, traffic originating, terminating, or going through Minnesota's Class I railroads accounted for 251 million tons carried in 3.9 million rail units—99 percent of the state's rail volume. Traffic on the short lines accounted for one percent (2.9 million tons carried in 24,000 rail units). By 2040, the Class I traffic is projected to grow faster than the short line traffic, accounting for 99 percent of the tonnage and rail units.

Table 2.2 Rail Freight Volumes by Minnesota Railroad (2012-2040, in Thousands)

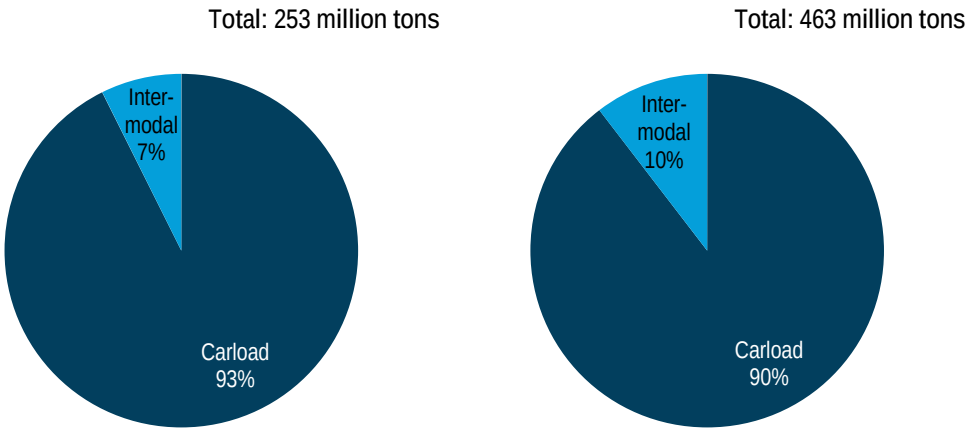
| RAILROAD CLASS | TONS 2012 | TONS 2040 | %CHANGE 2012–2040 | UNITS 2012 | UNITS 2040 | %CHANGE 2012–2040 |
|---|---|---|---|---|---|---|
| Class I | 251,349 | 460,613 | 83% | 3,898 | 8,106 | 108% |
| Short Line | 2,867 | 5,051 | 76% | 24 | 38 | 56% |
| TOTAL | 252,591 | 463,426 | 83% | 3,904 | 8,118 | 108% |

Source: 2015 Minnesota State Rail Plan, STB 2012 Confidential Carload Waybill Sample and FHWA FAF 3.5 forecast for 2040 processed by Cambridge Systematics.

Note: Numbers do no add up to the totals because there is tonnage that can go on both Class I railroads and Short Line railroads.

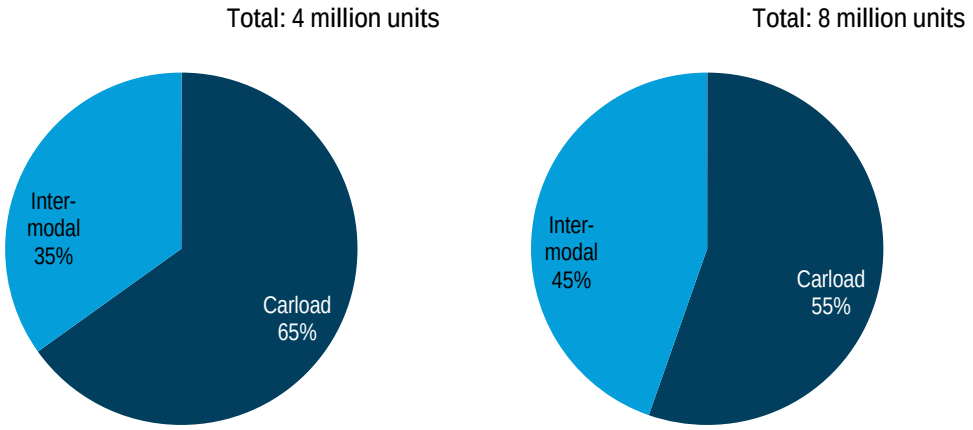
Figure 2.10 and Figure 2.11 show current and future rail system volumes. In 2012, 93 percent of tonnage (234 million tons) was carried in railcars, and seven percent (19 million tons) was carried in intermodal equipment (containers and trailers). When measured in units of railcars and intermodal equipment, in 2012 65 percent (2.5 million units) were railcars and 35 percent (1.4 million units) were intermodal equipment. Rail intermodal volume growth is expected to continue to outpace rail carload growth through 2040, with intermodal tonnage increasing to 10 percent and units to 45 percent of all traffic.

Figure 2.10 Total Rail Tonnage by Equipment Type, 2012 (left) and 2040 (right)




Source: 2016 Minnesota State Rail Plan, STB 2012 Confidential Carload Waybill Sample and FHWA FAF 3.5 forecast for 2040 processed by Cambridge Systematics.

Figure 2.11 Total Rail Units by Equipment Type, 2012 (left) and 2040 (right)




Source: 2016 Minnesota State Rail Plan, STB 2012 Confidential Carload Waybill Sample and FHWA FAF 3.5 forecast for 2040 processed by Cambridge Systematics.

Fewer products move over the railway network than the highway network, and fewer goods make up a larger percentage of overall tonnage. Table 2.3 details the major commodities moving over this system. Metallic Ores, Cereal Grains, and Coal are the three largest commodities moved via this mode. Representing 62 percent of the total tonnage moved by rail, these commodities are critical for maintaining a competitive rail service in the state. Pass-through rail movements are not included.

These three commodities are not projected to have high growth through 2040. While Cereal Grains are anticipated to grow at a rate of four percent annually, volumes for both Metallic Ores and Coal are expected to decrease slightly. Other commodities, such as Basic Chemicals and Nonmetallic Minerals, are anticipated to fill some of the void left by these commodities.

Table 2.3 Major Railroad Commodities, Total, 2040

| COMMODITY | TONS | PERCENT | RANK CHANGE (2012-204) | TOTAL CHANGE | ANNUAL CHANGE |
|---|---|---|---|---|---|
| Cereal Grains | 89,294,595 | 37% | +1 | 232% | 4% |
| Metallic Ores | 30,782,670 | 13% | -1 | -4% | 0% |
| Coal | 17,805,883 | 7% | - | -6% | 0% |
| Basic Chemicals | 15,411,006 | 6% | +3 | 355% | 6% |
| Fertilizers | 10,167,477 | 4% | - | 84% | 2% |
| Other Agricultural Products | 8,303,144 | 3% | +3 | 159% | 3% |
| Coal-n.e.c. | 7,698,022 | 3% | +5 | 159% | 3% |
| Nonmetallic Minerals | 6,578,648 | 3% | +5 | 255% | 5% |
| Animal Feed | 5,963,228 | 2% | +1 | 87% | 2% |
| Wood Products | 5,918,011 | 2% | -6 | 4% | 0% |
| All Others | 43,575,765 | 18% | | | |

Source: FHWA FAF3 2015 Provisional estimates

## PORT AND WATERWAY DEMAND

Minnesota has access to both the Great Lakes and Mississippi River systems. The state has eight ports: four along the Mississippi River System and four on Lake Superior. Commodities shipped via waterways are usually lower value, bulk materials. This is evident in the types of commodities shipped via Minnesota's waterways, detailed in Table 2.4. The largest commodity by tonnage is Iron Ore, Iron, and Steel Waste and Scrap at 68 percent of overall tonnage, and a majority of this is comprised of taconite shipping on the Great Lakes. Food and Foods Products are also among the top three commodities shipped via this mode, consistent with both highway and railway movements.

Table 2.4 Major Waterway Commodities, Total, 2012

| TOTAL | TONS | PERCENT |
|---|---|---|
| Iron Ore, Iron, and Steel Waste and Scrap | 29,431,604 | 68% |
| Unknown and Not Elsewhere Classified | 4,912,147 | 11% |
| Food and Food Products | 4,448,456 | 10% |
| Sand, Gravel, Shells, Clay, Salt, and Slag | 2,416,665 | 6% |
| Chemical Fertilizers | 1,633,038 | 4% |
| Primary Non-Metal Products | 129,223 | <1% |
| Chemicals Excluding Fertilizers | 106,413 | <1% |
| Primary Metal Products | 86,120 | <1% |
| Lumber, Logs, Wood Chips and Pulp | 71,352 | <1% |
| Manufactured Goods | 10,854 | <1% |
| Petroleum Products | 19 | <1% |

Source: U.S. Army Corps of Engineers Waterborne Commerce Data, 2012.

## AIR CARGO DEMAND

Air movements account for the lowest tonnage volumes in the state among the transportation modes. However, the commodities shipped via air are typically low weight but high value goods. As with waterway movements, the Freight Analysis Framework (FAF) does not accurately reflect the magnitude of air movements. However, in this case there are no additional data sources that detail the types of commodities moved via air.

Most air cargo in Minnesota moves through the Minneapolis-St. Paul International Airport, although other airports in the state do ship and receive smaller volumes of air cargo. The percent of total tonnage of each commodity was derived from FAF and scaled to the appropriate tonnage level as reported by the Minnesota airports. From this, it can be determined that Electronics, Precision Instruments, and Machinery are the dominant commodities moved via this mode, accounting for 62 percent of total tonnage.

To produce 2040 forecasts, data was scaled using the same methodology. In examining the results, the three dominant commodities moved via air today will be the largest contributors in 2040 as seen in Table 2.5. Each of these products is anticipated to at least double in tonnage, with Precision Instruments quadrupling, resulting in this commodity overtaking Electronics as the highest tonnage. Other products with significant growth are in the chemical industry with an 11 percent annual growth in Basic Chemicals and a five percent annual growth of Chemical Products.

Table 2.5 Major Air Commodities, Total, 2040

| TOTAL | TONS | PERCENT | RANK CHANGE (2012-204) | TOTAL CHANGE | ANNUAL CHANGE |
|---|---|---|---|---|---|
| Precision Instruments | 202,395 | 31% | +1 | 697% | 8% |
| Electronics | 134,068 | 21% | -1 | 125% | 3% |
| Machinery | 65,260 | 10% | - | 268% | 5% |
| Chemical Products | 37,974 | 6% | +3 | 327% | 5% |
| Miscellaneous Manufacturing Products | 35,808 | 5% | -1 | 224% | 4% |
| Basic Chemicals | 31,135 | 5% | +12 | 1623% | 11% |
| Articles-Base Metal | 19,081 | 3% | +4 | 193% | 4% |
| Plastics/Rubber | 18,661 | 3% | +4 | 190% | 4% |
| Motorized Vehicles | 14,749 | 2% | -1 | 74% | 2% |
| Mixed Freight | 14,105 | 2% | -1 | 79% | 2% |
| All Others | 79,142 | 12% | | | |

Source: FHWA FAF3 2015 Provisional estimates, Minneapolis – St. Paul International Airport Year End Operations Reports (2008-2013), Minnesota State Aviation System Plan.

## PIPELINE DEMAND

Due to the very nature of the pipeline infrastructure, only limited commodities can be shipped via this mode. The FAF details four commodities moving via Minnesota's pipeline network, as seen in Table 2.6. At 52 percent, Coal-n.e.c. is the dominant commodity utilizing this mode. The Coal-n.e.c category represents natural gas, selected coal products, and products of petroleum refining, excluding gasoline, aviation fuel, and fuel oil. Crude Petroleum and Gasoline have a relatively equal share at 22 percent and 18 percent, respectively.

By 2040, the total tonnage moved via this mode is anticipated to roughly double as seen in Table 2.6. Coal – n.e.c. and Crude Petroleum are anticipated to increase at a rate of three percent per year, resulting in the tonnages of these commodities to more than double. On the other hand, Gasoline and Fuel Oils are expected to decrease at a rate of one percent per year, reducing total tonnage by 20 percent and 17 percent, respectively. Due to the decrease in these commodities, Coal-n.e.c. will increase its share of tonnage via this mode from 52 percent to 63 percent.

Table 2.6 Major Pipeline Commodities, Total, 2040

| COMMODITY | TONS | PERCENT | RANK CHANGE (2012-204) | TOTAL CHANGE | ANNUAL CHANGE |
|---|---|---|---|---|---|
| Coal-n.e.c. | 64,674,269 | 63% | - | 117% | 3% |
| Crude Petroleum | 26,447,999 | 26% | - | 109% | 3% |
| Gasoline | 8,386,049 | 8% | - | -20% | -1% |
| Fuel Oils | 3,552,178 | 3% | - | -17% | -1% |

Source: FHWA FAF3 2015 Provisional estimates.

Note: Coal-n.e.c. refers to coal and petroleum products not elsewhere classified, including natural gas.

## Minnesota's Designated Principal Freight Network

Minnesota's Principal Freight Network (PFN) was designated as part of developing this Plan for several reasons:

- MAP-21 Transportation Legislation. MAP-21 required the U.S. DOT to designate a highway Primary Freight Network consisting of up to 27,000 miles on existing interstate and other roadways. The U.S. DOT Primary Freight Network helps states strategically direct resources toward improving freight movement; however, the network designated in Minnesota was not a holistic representation of the state's priority system.
- Need to knit together MnDOT "freight" networks. MnDOT has formally and informally designated several networks that have potential overlap with what this Plan defines as Minnesota's Principal Freight Network, such as the the Twin-Trailer Network, the 10-ton network, and an over-dimensional freight network, to name a few. These networks complement one another, and their roles as they relate to the Minnesota Principal Freight Network have been clarified.
- Need for a multimodal system. The U.S. DOT's Primary Freight Network is centered on the highway system, the traditional focus of state transportation planning and programming. However, Minnesota's freight system is multimodal. In order for supply chains to work efficiently, each component is critical. Key modal components, including the highway system, intermodal hubs, and connections to ports/airports, must be acknowledged in the Minnesota Principal Freight Network. Additionally, identifying priority networks was identified as a strategy in the Statewide Multimodal Transportation Plan.

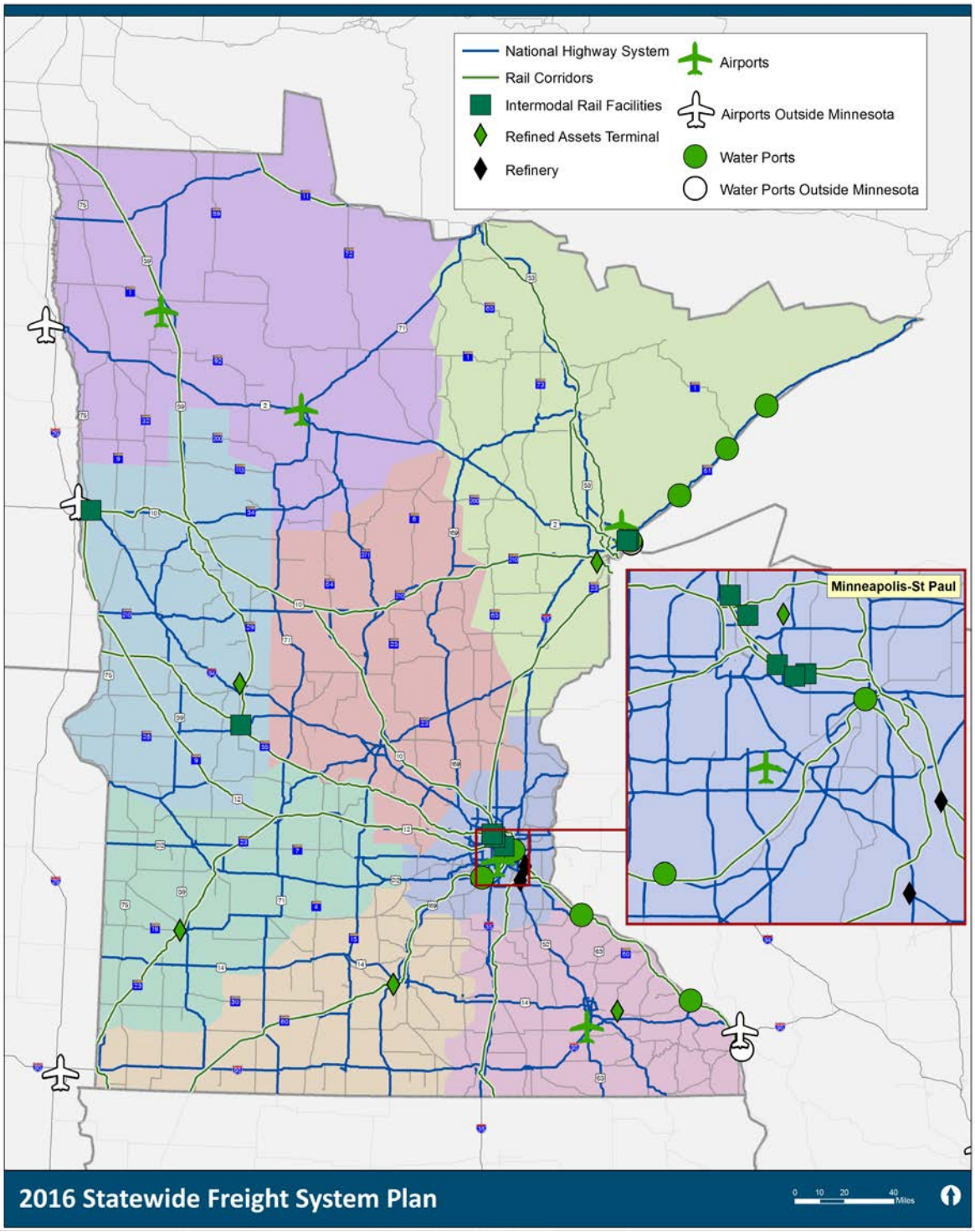
The designation of Minnesota's Principal Freight Network, a data–driven process, was guided by a Freight Network Ad Hoc Working Group with additional input received from other public and private stakeholders and the Minnesota Freight Advisory Committee (MFAC). The designation process is detailed in a supplemental Technical Memo – Minnesota's Principal Freight Network.

Shown in Figure 2.12, the collaborative approach resulted in designation of Minnesota's Principal Freight Network that includes the following:

- Highway System – over 5,200 miles
- Rail Corridors – 2,080 miles
- Rail Facilities – seven terminals
- Waterway Corridors – one Great Lakes corridor and two Inland Waterway corridors
- Waterway Ports –four Great Lakes ports and four Inland Waterway ports
- Airports – five airports
- Pipeline Facilities – two refineries and six refined asset terminals

This multifaceted network highlights the principal components of each modal system and the points of multimodal/intermodal connectivity. This network links to industries and provides access throughout Minnesota, the Upper Midwest, nationally, and to key international import/export ports.

Figure 2.12 Minnesota's Principal Freight Network




Note: Map does not reflect changes to the National Highway System (NHS) resulting from the 2014-2015 greater Minnesota functional classification review

# 3.0 MINNESOTA'S FREIGHT NEEDS AND ISSUES

The current condition and performance of Minnesota's freight system is generally good. However, there are significant needs and issues that should be addressed in the near term and others that will require attention in light of changing economic conditions. Freight system performance measures for system condition and performance will help guide resource investment to respond to these changing conditions.

This chapter describes the condition and performance of Minnesota's freight system and identifies freight system performance measures. This chapter also identifies needs, issues, and opportunities on the freight system and how each of these are linked to the goals of this Plan.

## Condition and Performance of the Freight System

The condition and performance of Minnesota's freight transportation system was assessed to identify critical needs and issues. Freight system performance measures are critical to accomplishing this task as they allow measurement of key attributes of the system and comparison across geography and time. This Plan identifies performance measures and uses them to understand the condition and performance of the highway system for freight. The condition and performance of the highway portion of the freight system was evaluated in three ways:

- Safety-related measures are designed to improve the safety, security, and resilience of the freight transportation system. Safety is at the forefront of planning and investment decision-making. Some specific efforts focus directly on rail safety.
- Infrastructure condition measures of freight system condition provide information about the suitability of physical infrastructure for freight transportation and can help inform system maintenance and preservation programs.
- Mobility measures cover a wide range of aspects of the system, including delay, congestion, and overall reliability of the highway system. These measures assess the length and dependability of freight trips.

Knowing where needs and issues (such as chokepoints and bottlenecks) exist on significant freight highway corridors can inform policy and investment decision-making. The success of Minnesota's economic engine relates to the ability of the multimodal freight system to convey goods safely and efficiently.

### FREIGHT SYSTEM PERFORMANCE MEASURES AND INDICATORS

As part of this Plan, measures and indicators that gauge the condition and performance of Minnesota's freight system were identified. This process was undertaken for several reasons:

- MAP-21 transportation legislation. MAP-21 requires the U.S. DOT to identify national-level performance measures for various performance management areas including Freight Movement and Economic Vitality, Safety, Pavement Condition, and Bridge Condition. State DOTs and MPOs will be required to implement these highway-focused performance measures.
- MnDOT is active in performance measurement. MnDOT has a well-developed, established set of performance measures and will be active in meeting the MAP-21 requirements when the Notice of Proposed Rulemaking and the Final Rule are released. This Plan provides an opportunity to help prepare MnDOT for upcoming freight performance measure requirements.

- Improved tracking of freight activity. While MnDOT has an aggressive performance measures program, the lens through which freight is examined is not as robust as other areas (e.g., state highway operations) due to historic federal requirements (or lack thereof) and the limited amount of available data with which to track freight system activity. Beyond federal requirements, this Plan explores ways existing MnDOT measures could be viewed through a "freight lens."

The process of identifying freight performance measures employed a Performance Measures Ad Hoc Working Group comprised of performance measure experts from MnDOT and other agencies. That group reviewed and recommended highway focused freight performance measures and indicators as shown in Table 3.1. The process is detailed in a supplemental Technical Memo – Freight Performance Measures.

These measures and indicators will move into broader consideration within MnDOT and be incorporated into MnDOT's Annual Transportation Performance Report. As part of this Plan, the measures were used to evaluate the condition and performance of the highway portion of the freight system in Minnesota.

Table 3.1 Freight System Performance Measures

| OBJECTIVE | PERFORMANCE MEASURES | FREIGHT PLAN GOAL AREA | MODE* | MNDOT MEASURE |
|---|---|---|---|---|
| Safety | Number of Fatalities | Safety, Environment/Community | T | Yes |
| Safety | Fatality Rate | Safety, Environment/Community | T | Yes |
| Safety | Number of Serious Injuries | Safety, Environment/Community | T | Yes |
| Safety | Serious Injury Rate | Safety, Environment/Community | T | Yes |
| Safety | Severe Crashes Involving Trucks | Safety, Environment/Community | T | Yes |
| Safety | Incidents at Highway/Railroad Crossings | Safety, Environment/Community | T, R | Yes |
| Asset Management | Interstate Pavement in Good and Poor Condition based on MnDOT's Ride Quality Index (RQI) | Infrastructure Condition | T | Yes |
| Asset Management | Non-Interstate National Highway System (NHS) Pavement in Good and Poor Condition based on MnDOT's Ride Quality Index (RQI) | Infrastructure Condition | T | Yes |
| Asset Management | Percent of Deck Area on Structurally Deficient Bridges | Infrastructure Condition | T | Yes |
| Asset Management | NHS Bridges in Good, Fair and Poor Condition based on Deck Area | Infrastructure Condition | T | Yes |
| State Highway Operations | Annual Hours of Truck Delay (AHTD) (Pending final U.S. DOT rulemaking) | Mobility | T | No |
| State Highway Operations | Truck Reliability Index (RI80) | Mobility | T | No |
| Freight Indicators | Total domestic shipments to, from or between Minnesota locations | Demand, Economy | T, R, W, A,P | Yes |
| Freight Indicators | Freight by Mode Minnesota (tons) | Demand, Economy | T, R, W, A,P | Yes |
| Freight Indicators | Freight by Mode Minnesota (value) | Demand, Economy | T, R, W, A,P | Yes |
| Freight Indicators | Freight by Mode Minnesota (ton miles) | Demand, Economy | T, R | Yes |
| Freight Indicators | Heavy Commercial Vehicle Miles Traveled | Demand, Economy | T | Yes |
| Freight Indicators | Heavy Commercial Average Annual Daily Traffic (HCAADT) by Corridor | Demand, Economy | T | Yes |

| OBJECTIVE | PERFORMANCE MEASURES | FREIGHT PLAN GOAL AREA | MODE* | MNDOT MEASURE |
|---|---|---|---|---|
| Freight Indicators | Annual Rail Shipments in Minnesota (tons) | Demand, Economy | R | Yes |
| Freight Indicators | Annual Container Lifts in Twin Cities (number) | Demand, Economy | R | Yes |
| Freight Indicators | Annual Port Shipment Tonnage (tons) | Demand, Economy | W | Yes |

*Modes – Truck (T), Rail (R), Water (W), Air (A), Pipeline (P)

## HIGHWAY SYSTEM CONDITION AND PERFORMANCE FOR FREIGHT

The condition and performance of the highway system and its suitability for use for freight transport was assessed using the measures identified in Table 3.1. Absent established targets/thresholds, data were reviewed related to each measure to flag "hot spots" related to safety, asset management, state highway operations, and freight indicators. A summary of the findings is shown in Table 3.2. A detailed description of the evaluation is found in a supplemental Technical Memo – Freight System Needs, Issues and Opportunities. Highlights of the evaluation are provided following Table 3.2.

Table 3.2 Overall Assessment of Multimodal Freight System

| OBJECTIVE | PERFORMANCE MEASURES AND INDICATORS | EXPECTED TREND | POSSIBLE IMPLICATION |
|---|---|---|---|
| Safety | Number of Truck Fatalities, Injuries | -- | It is unknown how this category will trend in the future absent historic data evaluation. Overall traffic fatalities experienced a slight increase in the most recent year but have generally been on a downward trend. MnDOT should take strategic actions to reduce highway and truck-related crashes. |
| Safety | Accidents/Incidents at Highway/Railroad Crossings | -- | Although previously declining, increases in rail traffic between 2012 and 2014 have led to increased accidents/incidents at highway/railroad crossings. MnDOT should take strategic actions to reduce these incidents. |
| Asset Management | Ride Quality Index | Decrease | The recent improving trend will cease in the future, and rough pavements will make Minnesota's roads less attractive for trucks to use. |
| Asset Management | NHS Bridge Decks in Poor Condition | Decrease | Similar to ride quality, the recent improving bridge condition trend will cease in the future, making Minnesota's bridges less attractive for trucks to use (and potentially unsuitable for larger, heavier trucks). |
| State Highway Operations | Annual Hours of Truck Delay (AHTD) (Pending final U.S. DOT rulemaking) | Increase | Nationally, annual hours of truck delay is increasing, adding cost to businesses and consumers. This delay is greatest in the largest urban areas in the U.S., including the Twin Cities. |

| OBJECTIVE | PERFORMANCE MEASURES AND INDICATORS | EXPECTED TREND | POSSIBLE IMPLICATION |
|---|---|---|---|
| State Highway Operations | Truck Reliability Index ($RI_{80}$) and Average Truck Speed (Pending final U.S. DOT rulemaking) | Decrease | Urban areas, including the Twin Cities, will have the most congestion and lowest travel speeds in the future. This will get worse as more passenger vehicles and trucks use these roadways, especially during peak hours, and trip times may become less reliable. |
| Freight Indicators | Freight by Mode in Minnesota (tons) | Increase | Increasing tons transported equates to the need for a truly multimodal system to serve industry needs. For example, more long haul rail movements will occur in the future and will require handling facilities in the Twin Cities. |
| Freight Indicators | Freight by Mode in Minnesota (value) | Increase | More trucks traveling on the system, in particular making first- and last-mile deliveries of high valued consumer goods, will require local connections. |

## Safety

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 freight movements have different risks is critical.

### TRUCK FATALITIES AND INJURIES

The Minnesota Department of Public Safety (Office of Traffic Safety) actively maintains a comprehensive crash database from police reports. The database indicates whether a commercial vehicle was involved. Year 2014 data for the trunk highway system is shown in Table 3.3, and the five-year trend is shown in Table 3.4. The number of crashes involving commercial trucks that involve only property damage is more than double crashes that involve personal injury. The number of commercial vehicle crash injuries and fatalities is split fairly evenly among Interstates, U.S. highways, and state highways in Minnesota.

Table 3.3 Crashes Involving Commercial Trucks on Major Roadways – 2014

| ROADWAY TYPE | FATAL CRASH | INJURY CRASH | PROPERTY DAMAGE ONLY CRASH | TOTAL BY HIGHWAY TYPE |
|---|---|---|---|---|
| Interstate Highways | 5 | 286 | 1,084 | 1,375 |
| U.S. Trunk Highways | 13 | 188 | 488 | 689 |
| State Trunk Highways | 22 | 213 | 679 | 914 |
| *Total Crashes* | *40* | *687* | *2,251* | *2,978* |

Source: Minnesota Department of Public Safety, Office of Traffic Safety[27]

[27] https://dps.mn.gov/divisions/ots/reports-statistics/Pages/crash-facts.aspx

Table 3.4 Trend in Crashes Involving Commercial Trucks on Major Roadways

| YEAR | FATAL CRASH | INJURY CRASH | PROPERTY DAMAGE ONLY CRASH | TOTAL CRASHES |
|---|---|---|---|---|
| 2014 | 40 | 687 | 2,251 | 2,978 |
| 2013 | 42 | 657 | 2,109 | 2,808 |
| 2012 | 34 | 571 | 1,604 | 2,209 |
| 2011 | 37 | 592 | 1,736 | 2,365 |
| 2010 | 47 | 661 | 1,779 | 2,487 |

Source: Minnesota Department of Public Safety, Office of Traffic Safety. Only inlcudes crashes on Interstates, US Trunk, or State Trunk Highways.

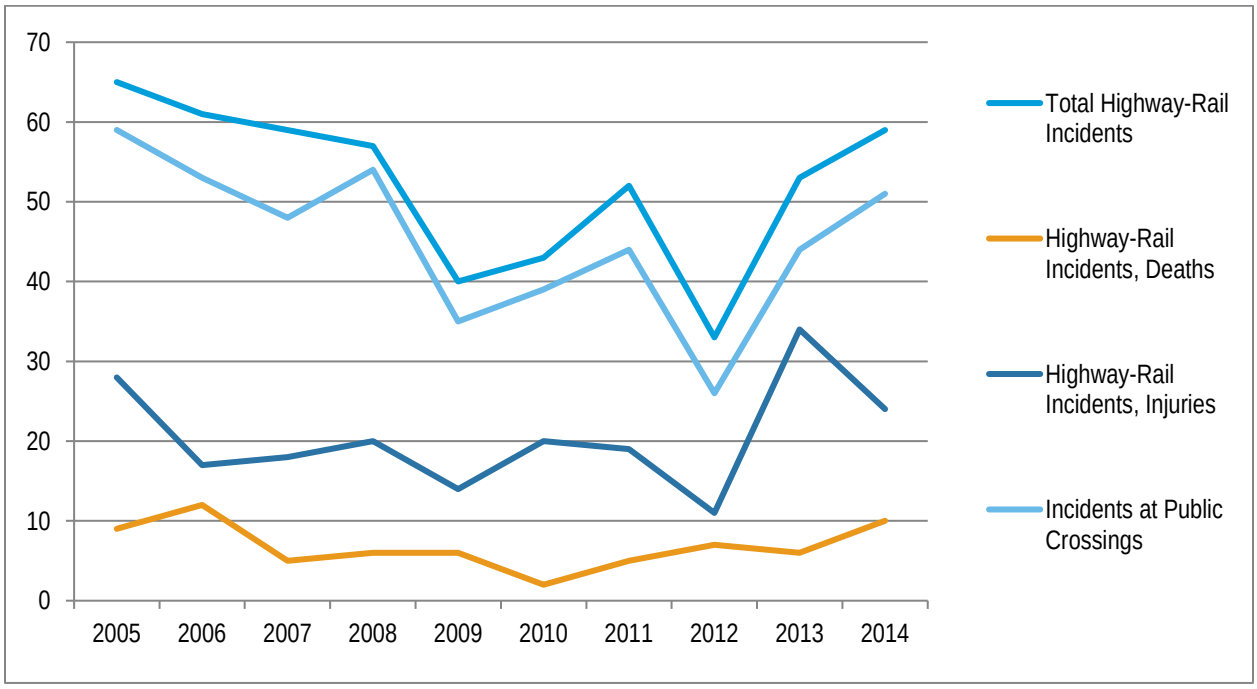
MnDOT's 2015 Annual Transportation Performance Report provides total vehicle fatality information dating back to 2006. According to the report, 2015 had the most fatalities since 2010, showing a sharp reversal of the previous three year trend of decreasing fatalities. While a substantial long-term reduction in fatalities has been realized, the stagnant trend over the past five years and the increase in 2015 fatalities are reasons for concern.

## RAILROAD CROSSINGS

Rail crossing safety is of increasing concern in large part due to the increase in crude-oil-by-rail movements traveling through the state from North Dakota. Rail crossing safety is addressed in the 2016 Minnesota State Rail Plan and assessed in more detail for crude-oil-by-rail corridors in the 2014 MnDOT 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 accident/incident data were extracted to determine whether rail crossing safety is improving or in decline. Figure 3.1 highlights this data.

Figure 3.1 10-Year Accident/Incident Overview by Calendar Year, Minnesota




Source: Federal Railroad Administration

In 2014, there were 59 highway-rail crossing incidents, resulting in 10 fatalities and 24 injuries in Minnesota. Of the 59 incidents, 51 occurred at a public at-grade road crossings of railroads. Minnesota has 4,300 public at-grade crossings throughout the state. The state has approximately an equal number of private grade crossings. The figure shows a downward trend in incidents for several years with a recent increase in overall incidents but a decline in injuries.

## Asset Management

Measures of freight system condition provide information about the suitability of physical infrastructure for freight transportation and can inform system maintenance and preservation programs. One of Minnesota GO's principles is to "strategically maintain and upgrade critical existing infrastructure," a key part of which is the highway portion of the designated Principal Freight Network.

### PAVEMENT CONDITION

MnDOT actively monitors the Ride Quality Index (RQI) on the Interstate system, the non-Interstate National Highway System (NHS), and on all state highways. RQI is measured on a scale of zero to five based on how pavement smoothness is perceived by a typical driver, with new projects having an index of over four. Indices of two or below are considered "poor."

The RQI for the 5,200 miles on the designated Principal Freight Network was reviewed, and it was found that 72.2 percent of the network rated "very good" (RQI > 3.0), 25.2 percent of the network rated "fair" ( 3.0 ≥ RQI > 2.0), and 2.6 percent of the system rated "poor" (RQI ≤ 2.0).

Minnesota's most recent Annual Transportation Performance Report provides ride quality information dating back to 2008. In recent years, ride quality has significantly improved on all state highways and has come close to reaching the target set by MnDOT. However, absent no new revenue, ride quality is expected to experience a long-term decline.

### BRIDGE CONDITION

MnDOT actively inspects bridge deck and structural conditions for the 3,600 NHS bridges throughout the state. Deck ratings and descriptions of conditions are based on the National Bridge Inventory (NBI) scale of zero to nine. Bridges with a rating of four or below are considered to be in poor condition, and there are 26 NHS bridges in "poor" condition, with the majority of those in the Metro District.

Minnesota's Annual Transportation Performance Report also provides bridge condition information dating back to 2008. That same report notes that bridge condition has also made a great improvement in recent years due to major rehabilitation efforts. MnDOT's own target of having two percent or less of its bridges in poor condition is close to being met; however, similar to ride quality discussed above, absent new revenue, the number of bridges in poor condition is expected to approach the federal target of 10 percent. The federal target is a proposed value under the Federal Highway Administration's (FHWA) National Performance Management Measures. Prior to MAP-21, state DOTs were not required to measure condition, establish targets, or assess progress towards targets. MnDOT's target for bridge condition is more stringent than the proposed federal target.

## State Highway Operations

Freight system operations can cover a wide range of aspects of the transportation system including delay, congestion, and overall reliability of the highway system. It is useful to understand how these issues affect the highway portion of the designated Principal Freight Network, which includes over 5,200 miles of roadways throughout the state and provides connections between key facilities and modes. Knowing where these issues, especially areas of congestion or bottlenecks, occur on freight-significant corridors can inform policy and investment decision-making.

### ANNUAL HOURS OF TRUCK DELAY (AHTD)

In the 2012 Urban Mobility Report, the Texas Transportation Institute calculated that transportation congestion costs U.S. residents about $121 billion in delay and fuel expenses and 5.5 billion hours of extra time spent in transit. Of this congestion cost, 22 percent ($27 billion) was attributed to the effect of congestion on truck operations, which in turn affects business operating expenses, supply chain reliability, and ultimately costs to consumers. This measure is based on the total amount of extra travel time (delay) for trucks, a per-truck hour cost of delay, and state-specific fuel costs. Of the regions evaluated, the Minneapolis-St. Paul area ranked 24th in the U.S. in annual truck delay, 17th in truck commodity value, and 19th in total annual delay. 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.

### TRUCK RELIABILITY INDEX (RI80) AND AVERAGE TRUCK SPEED

Minnesota's highway system, particularly in the Minneapolis-St. Paul area, is becoming increasingly congested. While congested segments are present throughout the state, all of the truck system bottlenecks based on either speed or reliability are in the Twin Cities metropolitan area. With a high concentration of freight-related businesses and multiple intermodal facilities, the Twin Cities area is a major hub for freight movement in the state. However, the high amounts of traffic through this area can often lead to congestion and safety issues. Many businesses noted to MnDOT that recurring congestion in the metro area has led them to modify their production and shipping timelines in order to avoid the most congested periods.

Using the National Performance Management Research Data Set (NPMRDS), the Truck Reliability Index (RI80) and average truck speed on the designated Principal Freight Network were 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 five minutes on the National Highway System. A series of analyses were 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. Findings are included as part of the Freight System Performance Measure Technical Memo described in Appendix A.

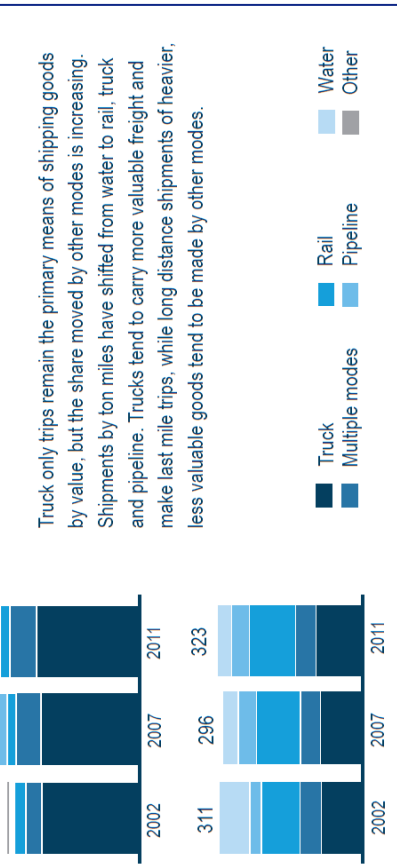
Minnesota's Annual Transportation Performance Report provides similar information dating back to 2008. The report notes that while congested miles decreased slightly during the recession, in recent years the percent of congested miles has been at historic highs on Twin Cities urban freeways. It is expected that as passenger and truck traffic increases in urban areas, so too will the percent of congested roadways.

## Freight Indicators

The link between transportation and the economy has become an increasingly large part of national conversations highlighted by the freight provisions included in MAP-21 and the FAST Act. The success of Minnesota's economic engine is related to the ability of the multimodal freight system to convey goods safely and efficiently. The level of freight activity (or demand) on that system, and whether it is increasing or decreasing, can help inform where investments are needed to ensure the system continues to perform at acceptable levels.

Freight system demand indicators such as tons, ton-miles, and value of goods provide a foundation for understanding how the system is utilized and context for other performance measures, such as safety or asset management measures. Minnesota's Annual Transportation Performance Report has provided this type of information since 2002, examining both value of freight and ton-miles of freight, by mode. The historic trends shown in Figure 3.2 reflect the forecasts discussed in Figure 2.1 and Figure 2.2, which provide current and projected future freight demand by weight (tons) and value, illustrating the continued use of truck traffic and the growth of rail traffic in the state.

Figure 3.2 Minnesota 2012 Transportation Results Scorecard (Freight)

| Measure | Target | Result | Score | Multi-year Trend | Analysis |
|---|---|---|---|---|---|
| FREIGHT | | | | | |
| | | **Value in 2007 dollars** | | | |
| **Freight Mode Share:** Total domestic shipments to, from or between Minnesota locations* | Tracking Indicator | $457** billion (2011) | N/A |   | Truck only trips remain the primary means of shipping goods by value, but the share moved by other modes is increasing. Shipments by ton miles have shifted from water to rail, truck and pipeline. Trucks tend to carry more valuable freight and make last mile trips, while long distance shipments of heavier, less valuable goods tend to be made by other modes. |
| | | **Ton Miles** | | | |
| | Tracking Indicator | 323 billion (2011) | N/A |   | |

* Excludes international shipments and "through" shipments (freight movements in which both trip origin and destination are outside Minnesota).

** Since some goods are moved multiple times through the supply chain, the total value of domestic freight movements is greater than the value of all goods and services produced in Minnesota as measured with GDP statistics.

Source: Annual Transportation Performance Report, MnDOT, 2012

## Freight System Needs and Issues

Both quantitative and qualitative data were analyzed to determine the needs of and issues with the multimodal freight system in Minnesota. This analysis included the performance assessment previously described, stakeholder feedback and other outreach conducted during Plan development, and review of previous freight related plans and studies developed by MnDOT. The needs and issues identified are organized in this section by Plan goals:

- Support Minnesota's Economy
- Improve Minnesota's Mobility
- Preserve Minnesota's Infrastructure
- Safeguard Minnesotans
- Protect Minnesota's Environment and Communities

The process used was intended to identify areas where Minnesota may have weaknesses related to the goals of this Plan and help generate a prioritized list of existing/future problem areas to be addressed. Additional detailed information is found in a supplemental Technical Memo – Freight System Needs, Issues and Opportunities.

### STAKEHOLDER OUTREACH

Some of the most useful information on freight system needs and issues came from stakeholders. Appendix B provides a description of outreach techniques used. 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: the 2014 freight summit and an online survey.

#### Freight Summit

Held December 5, 2014, 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 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.

#### Online Engagement

The Plan outreach included an interactive online survey (administered via MetroQuest) to gather information on the current state of the multimodal freight system in Minnesota. The survey was distributed to target audiences comprised of government and business freight stakeholders via email. It was also announced at various freight-related meetings and forums and available on MnDOT's website. The survey gave participants the opportunity to comment on issues they believed to be of importance to the freight industry. Participants were given an interactive

map and asked to identify specific locations on the multimodal transportation system where they experienced issues or felt there was a need for improvement.

Approximately 600 individuals participated in the survey, 234 of which are actively involved in the freight industry. Of the 234 freight industry respondents, approximately 63 percent worked in the private sector and the remainder worked in the public sector.

Using the interactive map, participants identified 476 specific locations where the freight system had an issue or needed improvement. In some instances, 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. The rail system had the second most issue locations identified, and the waterway and aviation system had the smallest number of issue locations identified.

## SUPPORT MINNESOTA'S ECONOMY

While making freight system investments is important, it is critical to identify and pursue the most strategic freight system investments that will produce the desired carrier, business, and public benefits. Done well, investment in the freight system will contribute to a more competitive economy. 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 as it relates to the type, quantity, and destination of many goods. For example, there will be demand for agricultural commodities in distant markets 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. As the state grows its advanced manufacturing industries, air cargo and specialized trucking services may play a larger role. 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.
- 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 its significance. Identifying infrastructure that provides (or could provide) a large return on investment is critical in Minnesota. Small improvements that help rural and 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 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 and communities bear the costs of goods movement while the state's economy reaps few of the benefits. Future actions should consider ways to attract

development that help minimize through trips, such as investments in transload or intermodal[28] facilities, so goods can stop and start in Minnesota.

- Need for improved and expanded intermodal services. The Minneapolis-St. Paul region is the only location in Minnesota where rail intermodal service (the haulage of containers and trailers) is available, 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 railroad 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. Identification of Minnesota's Principal Freight Network determined that the multimodal freight system requires seamless connections between modes to provide efficient access 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 better connected. Review of Minnesota's designated NHS intermodal connectors highlight that the majority of the 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, the lack of consistency between Minnesota and surrounding states on commercial vehicle size and weight regulations hinders efficient truck operations and may be a deterrent for business in Minnesota.

## IMPROVE MINNESOTA'S MOBILITY

Minnesota's freight system needs to offer access for all freight users and reliable service with minimal chokepoints. A number of needs and issues related to improving the mobility of Minnesota's freight transportation system were identified as part of this Plan and are summarized here.

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28 "Transload" is a general term for moving goods from one mode to another. Typically, it refers to bulk or other goods moving between truck, rail, and/or barge via trailers, hoppers, or flatbeds. "Intermodal" specifically refers to moving containerized goods (either international or domestic) via truck, rail, and/or ocean carrier (less commonly via barge).

- Need to recognize and adapt to evolving supply chain operations. Changing definitions of "value" have 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 are identified in the Freight System Needs, Issues, and Opportunities Technical Memo.

  Although rail trackage covers most 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 cause delays for both the Northstar Commuter Rail service and for freight shipments. The East Metro Rail Study,[29] 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 have 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, Illinois and at the BNSF La Crosse, Wisconsin complex, were cited as problems that create backups through Wisconsin, Minnesota, 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 also allows for options when a particular mode or route is unsuitable due to safety concerns or competing demands.
- Need to make better use of existing modes. Capacity over the entire multimodal freight network is stressed. Delays along one route or on one mode spread to other networks and affect both passenger and freight travel. For example, increased oil, gas, and agriculture rail shipments along BNSF's corridor from North Dakota to Minneapolis 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 in congested highway corridors. Redundancy across modes and system-wide capacity expansion are needed.

[29] https://www.ramseycounty.us/your-government/projects-initiatives/east-metro-rail-continuity-project

## PRESERVE MINNESOTA'S INFRASTRUCTURE

Growth in freight transportation will continue to stress the freight infrastructure in Minnesota. As noted in the performance assessment, pavement ride quality and bridge deck conditions will deteriorate 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, the Plan uncovered several needs and issues related to preserving the freight transportation infrastructure in Minnesota.

- Need to preserve and improve highway system condition. In an online survey distributed during Plan development, the most common highway infrastructure issues identified by freight industry respondents were poor pavement conditions, inefficient interchanges, and inadequate roadway capacity. Industry also noted the need for continued high-levels of winter roadway maintenance. 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, infrastructure issues include preservation needs such as inadequate and outdated interchanges. 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.

Winter Roadway Maintenance:
Minnesota's cold and snowy climate can often cause significant delays to the freight system in the winter months. MnDOT plows nearly 12,000 miles of state highways and interstates with a fleet of approximately 800 snowplows. During one-on-one meetings many freight businesses in Minnesota stressed their need to transport goods within a specified timeframe. Any delays directly affect their efficiency and profitability. Most businesses were complimentary of MnDOT's role in snow plowing operations.

- Need to achieve FRA Class 2 track or better on the rail system. One of the goals of the 2016 Minnesota State Rail Plan is to upgrade main line track (all Class I-III railroads[30]) to 25 miles per hour (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 (for instance, if the track is not well maintained or there is lighter weight rail, inferior tie and ballast conditions, and no active signaling system). As a result, mainline train 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 (rail equipment).
- Need to achieve 286,000-pound compliance on the rail system. Another goal of the 2016 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

[30] Class I, II, and III are railroad designations by the Surface Transportation Board (STB). In order to be considered a Class III railroad, the railroad's operating revenues must be between $0 and $20 million. For Class II, it is $20 million or more, and for Class I, it is $250 million or more.

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 railroads will be substantially compromised.

- Need to maintain adequate navigable depth. The need for periodic dredging – the removal of the built-up underwater sediment – is an ongoing issue both for the Mississippi River System and the port and harbor areas on the Great Lakes. The U.S. Army Corps of Engineers (USACE) bears the responsibility for preserving the waterways, including dredging. In 2012, the USACE spent $9.3 million for dredging the Minnesota Mississippi River System; 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. 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 network. Located at the head of both the Mississippi River and Great Lakes systems, Minnesota relies on lock and dam infrastructure 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 on the Mississippi River System as a whole, which impacts Minnesota shippers. Additionally, the Sault Ste. Marie locks in Michigan, which serve as the connector between the Port of Duluth and other destinations, need either repair or replacement. There is no redundancy for the largest lock, which handles 70 percent of the traffic. According to a Congressional estimate, the impact of a thirty day unscheduled outage of the Sault Ste. Marie locks would be $160 million.[31]
- 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 and 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 potential obstacles 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 features may be costly if additional right-of-way is required or if other site-specific characteristics make implementation difficult. These standards should be primarily considered on Minnesota's Principal Freight Network facilities.
- Need for enforcement of truck size and weight standards. MnDOT's Commercial Vehicle Office administers oversize-overweight (OSOW) 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 eight feet six inches, a height of 13 feet six inches, a length of 75 feet zero inches, 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 are fairly complex and

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

include a number of exceptions and provisions based on commodity types, truck configurations, and travel plans. One resulting issue is that unpermitted loads can cause significant amounts of damage to state and local roadways.

## SAFEGUARD MINNESOTANS

Safety is a high priority for both public and private organizations involved in freight transportation. The Plan identified several needs and issues related to safeguarding Minnesotans.

- Need for improved safety at highway-rail grade crossings. As shown in the performance assessment, highway crossing safety is a concern due to a history of incidents 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 need to be replaced by 2030.

  As noted in the 2016 Minnesota State Rail Plan, an analysis of grade crossing active warning devices estimated that approximately 270 signals are 20 years old or older (as of 2006), and the normal lifespan for an active warning device is 25 years. Aging active warning devices are increasingly difficult to maintain due to out-of-date technology, often requiring entirely new warning devices to be installed at a cost of $200,000 to $500,000 each. 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, with the capacity to install 70 major grade crossing devices each year. This does not include 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-oil-by-rail movements. As described in the 2016 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, crude-oil-by-rail unit train activity is expected to continue.

  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 these corridors where safety could be improved to reduce public exposure to derailments, spills, and fires. The study identified 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 geographic information system (GIS) population analysis near crossings, federal crossing safety standards, and frequency of crude oil traffic on the respective 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 included 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.

## 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. Needs and issues related to protecting Minnesota's environment and communities are summarized below.

- 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 had 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 industries that are dependent on goods movement to locations on the periphery of the region or out of the region altogether. 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 the most conflicts between trucks and other motor vehicles occur. The conflicts occur on the highway system and on the local roadway network where trucks travel to make pickups and deliveries. Truck route designation can benefit urban areas in several ways including focusing through truck trips, providing direct connections to freight generators, and minimizing neighborhood cut-through traffic.

  Two trends will influence how trucks deliver goods and the routes that they use. First, with more new distribution centers being built on large tracts of available land located further from consuming markets, the average trucking distance is likely to increase, often on commuter corridors already operating within congested areas. Second, in large metropolitan areas such as Minneapolis-St. Paul, smaller distribution centers are being sited in central locations to serve same-day and within the hour delivery windows. Each of these trends have trucks competing with passenger cars during peak delivery times. In order to operate safely and improve efficiency, truckers operate during off-peak hours whenever possible. The designation of truck routes can focus truck movements where they need to go and help minimize conflicts between passenger vehicles and other roadway users.

  The implementation of Complete Streets can also impact truck routes. In some cases, bike lanes and pedestrian pathways are being designated on truck routes, which create safety issues and concerns. Trucks may need to cross bike lanes to access on-street loading zones or double-park due to lack of sufficient on-street parking. This can create particular hazards for bicyclists and pedestrians.
- Need to preserve and manage abandoned rail corridors. Many unused rail corridors have been preserved as recreational 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 are 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.

## Freight System Opportunities

With proper investments and policies, Minnesota's residents and businesses can realize greater benefits from the freight system in the future than they do today. Technologies, operational strategies, and planning practices are available to ensure a world class freight system while providing residents – even those who live near major goods movement infrastructure – with a high quality of life and economic opportunity. There are several real-world opportunities that were identified as focus areas prior to constructing Plan recommendations. These opportunities have a high degree of overlap. A well-crafted plan of investments and policies will be mutually reinforcing for many of these opportunities briefly described below.

- Use the freight system in Minnesota as an economic driver. The freight system is a conduit for economic activity in the state. As transportation system funding is lacking nationwide, it is important to identify investments that preserve and improve those parts of the system that drive the economy. This Plan designates Minnesota's Principal Freight Network and makes suggestions for how the network should be used. Several of these 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 focus on communication, collaboration, and consensus building on actions to be taken. These actions may include needs identification and project development, as well as funding and implementation.
- Use advanced technology. There are many opportunities to utilize advanced technologies to 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 considerations in public agency decision-making. From strengthening and promoting interagency, multi-state, and public-private partnerships to using that information in planning and funding decisions, Minnesota's public agencies should more fully include "freight" in their ongoing activities. As an example, freight should be more thoroughly considered in the day-to-day activities throughout MnDOT, not just within the Office of Freight and Commercial Vehicle Operations. Freight can be incorporated by 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.

# 4.0 STRATEGIES TO ADDRESS MINNESOTA'S FREIGHT NEEDS AND ISSUES

This chapter identifies strategies to address freight system needs and issues and to seize opportunities for implementation. These strategies are actions the State and its public and private sector freight partners can take to move forward, including project recommendations, policy guidance, and next steps for planning. These freight project types described here will be taken under consideration by MnDOT with its public and private sector freight partners. It is not presumed that MnDOT will provide funding for all of these project types. Additional detail on Plan strategies is provided in a supplemental Technical Memo – Strategies and Implementation.

## What is a "Freight" Project?

One of the primary challenges in quantifying the impacts and benefits of investments in the freight transportation system is developing an understanding of what defines a "freight project." Currently, MnDOT does not specifically identify projects as freight projects, as it does with other kinds of projects (e.g., bicycle improvement projects), nor does it have a definition or standard for what constitutes a freight project. MAP-21 defines a "freight project" as:

> *"A surface transportation project that improves the safety and efficiency of freight movements."*

Until the passage of the FAST Act in 2015, there was no nationally dedicated funding source for freight projects. However, it can be argued that almost any transportation project has some benefit to freight. Many of the projects on MnDOT's funded surface transportation program have substantial carry-over benefits to the freight system. For example, repaving a segment of a state highway is a general improvement project intended to benefit all vehicles. While this may not primarily be considered a freight project, freight haulers derive a wide range of benefits from this traditional transportation investment, including:

- Lower operating costs since wheels, shocks, brakes, axles, and other vehicle parts are subject to less abuse, thus extending their useful life
- Greater fuel efficiency, and in turn, lower operating costs
- Reduced damage to goods in transport and reduced insurance costs
- Improved safety
- More efficient movement/route since freight haulers will not have to reroute to other roadways to avoid poor pavements and the risk to damaging goods or vehicles
- Reduced driver fatigue since drivers will be able to drive more direct routes at higher speeds
- Reduced travel time since drivers will be able to drive more direct routes at higher speeds

Other project types such as bridge replacements, improved signage, or guardrail enhancements provide their own set of freight benefits. For example, Intelligent Transportation System (ITS) projects that improve travel conditions for daily commuters can significantly benefit freight by reducing travel time and related shipping costs.

The location of a highway improvement project also determines its value to freight movements. For instance, road projects on identified routes with heavy truck traffic (e.g., Minnesota's Principal Freight Network) will likely benefit freight movements more so than projects on other routes.

During outreach focused on reviewing the Plan's recommendations, stakeholders were asked to prioritize where MnDOT should focus efforts, as well as where "new freight funds" should be allocated in the future. In both cases, private industry respondents overwhelmingly noted that focus should be placed on the highway system. Bridge and Pavement Maintenance projects and Roadway Corridor Improvements were the top two infrastructure investments recommended.

For the purpose of this Plan, a "freight project" has been defined as:

*"A transportation project that improves the safety and efficiency of freight movements."*

This definition is intended to apply to highway projects as well as other projects on other modal systems, which can include projects on the rail, air, water, and pipeline systems that fall within the public and private sector realms of ownership and operation.

## Infrastructure Investment Needs

Physical infrastructure investments are needed today on the highway and non-highway freight systems and will be required in the future. This section outlines where MnDOT is currently making freight system investments and identifies the types of freight projects that could provide benefits to Minnesota if pursued in the future. A detailed list of identified freight projects is included as part of Appendix A.

### HIGHWAY SYSTEM PROJECT TYPES

Highway project types were evaluated to identify the investments MnDOT is currently making that may benefit freight system operations and to identify which project types MnDOT should continue investing in in the future to improve freight system operations.

The evaluation of freight project types for the highway system was based on the categories defined in the Minnesota 20-year State Highway Investment Plan 2014-2033 (MnSHIP). MnSHIP is one of MnDOT's transportation investment plans and is responsible for directing a large portion of the agency's expenditures (i.e., highway investments).[32] There are currently 10 investment categories identified in MnSHIP. However, not all of these are related to freight. The categories of Pedestrian, Bicycle, and Project Support were excluded. The remaining categories have a direct impact on the movement of freight on the highway system. These categories are further described below and include:

- Pavement Condition
- Bridge Condition
- Roadside Infrastructure
- Interregional Corridor Mobility
- Twin Cities Mobility

[32] MnSHIP is currently being updated to reflect the 2018-2037 20-year planning horizon.

- Regional Community Improvement Program
- Traveler Safety

### Pavement Condition

MnDOT's largest and most widely used asset is its pavements. On an average day, there are more than 90 million vehicle miles traveled on Minnesota state highways. Most new pavements last approximately 20 years before deteriorating to a level that requires rehabilitation. Improved pavement conditions benefit freight by reducing the number of goods damaged in transit, improving operating and maintenance costs, and reducing driver fatigue.

MnDOT preserves the structural integrity and smoothness of its pavements through investment in the Pavement Condition category. It seeks to maximize the share of state highway pavement rated in "Good" condition and minimize the share in "Poor" condition by undertaking a balanced mix of preventive maintenance, rehabilitation, and replacement. Once pavements fall into Poor condition, the costs associated with effectively repairing them increase significantly. As a result, larger capital investments are necessary if MnDOT wants to achieve smooth pavement conditions and minimize the costs associated with preserving its pavements. Typical improvements to pavements include overlays, mill and overlays, full-depth reclamation, and reconstruction projects.

### Bridge Condition

More than 4,500 of the state's 20,000 bridges are on the state highway system and maintained by MnDOT. If maintained and invested at optimal intervals, bridges typically last 70 to 80 years before needing replacement. Freight movers rely on bridges as critical links in their supply chains. Bridges with reduced load restrictions may require freight movers to take alternate routes which may increase costs.

The inspection, maintenance, and construction of MnDOT bridges are the responsibility of MnDOT Districts under the general direction of the MnDOT Bridge Office. The Districts and the Bridge Office work together to identify both near-term and long-range investments that preserve bridges in a safe condition and extend their useful life. By planning its bridge investments in a timely and cost-effective manner, MnDOT is able to preserve the state's vital connections.

MnDOT tracks its performance in preserving bridge infrastructure by rating the structural condition of its bridges and measuring the percentage of bridge deck area in Good, Satisfactory, Fair, and Poor condition. Bridge investments are managed through MnDOT's Bridge Replacement and Improvement Management (BRIM) system. Typical improvements include replacement, rehabilitation, and painting. The Bridge Condition category does not include surrounding or supporting elements for bridges, such as signs, pavement markings, or lighting.

### Roadside Infrastructure

Roadside Infrastructure condition includes an array of assets found on the Minnesota state highway system that support the safe, informed, comfortable, and efficient movement of people and goods. Roadside infrastructure includes:

- Drainage and culverts that carry water away from or under the road
- Guardrails, including attenuators, cable-median barriers, and fencing that protect people and infrastructure
- Traffic signals, lighting, and ITS that enhance safety and provide information
- Overhead structures and other structures, such as noise walls, retaining walls, reinforced earth systems, and concrete barriers

- Rest areas
- Signage, including traffic and directional signs
- Pavement markings

Roadside infrastructure improves safety and the overall driving experience for freight movers. Improvements are often completed in conjunction with a pavement or bridge project, although MnDOT also conducts stand-alone projects, such as culvert replacement projects along segments of road with poor drainage or failing culvert structures.

### Interregional Corridor Mobility

Minnesota's Interregional Corridor (IRC) system is a subset of the NHS, connecting the largest regional trade centers in Minnesota with each other and with neighboring states and Canada. This system consists of Greater Minnesota's most heavily traveled roads, accounting for only 2.5 percent (3,000 miles) of the state highway system, yet carrying about 30 percent of all statewide travel.

The IRC system is an essential transportation network for moving freight and supporting businesses. Safe and efficient IRC connections provide access to markets and services and facilitate recreational travel, improving quality of life. Congestion on IRCs negatively impacts travel time, reliability, safety conditions, fuel costs, and the state's economic competitiveness. Typical improvements on these corridors include low-cost solutions, such as intersection improvements, as well as major projects, such as roadway capacity improvements.

### Twin Cities Mobility

The Twin Cities area is a major freight hub with multiple origins, destinations, and intermodal facilities related to freight movement. Congestion in the metro area is a major concern of many freight movers as well as the general public. Managing congestion improves quality of life, safety, and air quality. While the focus of MnSHIP is on identifying improvements in highway infrastructure, the Twin Cities area infrastructure accommodates many users, including passenger vehicles, freight carriers, transit providers, bicyclists, and pedestrians.

Roughly half of all roadway travel in Minnesota occurs within the Twin Cities metropolitan area, which contains just nine percent of the total roadway miles in the state. In 2015, the Metropolitan Council completed its 2040 Transportation Policy Plan. Due to constrained funding, this plan marks a shift away from a reliance on major capacity expansion projects toward more cost-effective strategies. MnDOT now pursues the following strategies to address regional mobility issues:

- Active Traffic Management (ATM). Operational improvements to help manage the effects of congestion, including variable message signs (traveler information systems), freeway ramp metering, dynamic signing and re-routing, dynamic shoulder lanes, reversible lanes, dynamic speed signs, and lane specific signaling.
- Spot mobility improvements. Lower cost, high-benefit projects that improve traffic flow and provide bottleneck relief at spot locations. These projects include freeway and intersection geometric design changes, short auxiliary lane additions, and traffic signal modifications to ease merging and exiting traffic.
- Priced managed lanes. Priced managed lane projects that provide a predictable, congestion-free travel option for transit users, those who ride in carpools, or those who are willing to pay. In the Twin Cities, the system is called MnPASS and currently operates on I-394, I-35E, and I-35W. During rush hour periods, MnPASS lanes are free for buses, carpools, and motorcycles; single-occupant vehicles are charged an electronic fee.

- Strategic capacity enhancements. Projects in the form of new interchanges, non-priced managed lanes, and limited general-purpose lanes that may be needed to address corridor congestion and/or provide lane continuity for an existing facility or to complete an unfinished segment of the Metropolitan Highway System. The unfinished connection between existing MN 610 and I-94 in Maple Grove is an example of a high-priority strategic capacity enhancement project.

### Regional Community Improvement Priorities (RCIP)

Regional and Community Improvement Priorities (RCIPs) are collaborative investments that respond to regional and local concerns beyond system performance needs. The RCIP investment category assists MnDOT in delivering a well-rounded transportation investment program that advances objectives for which MnDOT may not have statewide performance targets, such as improving multimodal connections, community livability, economic competitiveness, environmental health, and quality of life in Minnesota.

Typical improvements include intersection improvements that increase traffic flow or facilitate efficient freight movement, projects that support multimodal connectivity, bypass or turning lanes, access management solutions, improvements that support Complete Streets, and regional or spot capacity expansion projects.

### Traveler Safety

Vehicle crashes are the leading cause of death for people under the age of 35 and the fifth leading cause of death overall in the nation. Crash-related deaths and serious injuries create significant costs for individuals, families, and society. The Highway Safety Improvement Program (HSIP) is a federal program that was established in 2005 to fund programs that reduce fatalities and serious injuries on all roads. In Minnesota, these funds are distributed among MnDOT districts and local agencies. HSIP and state funds together represent MnDOT's Traveler Safety investments. MnDOT and its partners have made reducing fatalities and serious injuries a top priority through the following:

- The Toward Zero Deaths (TZD) initiative. MnDOT and its partners use a data-driven, multi-disciplinary "four Es" approach – education, engineering, enforcement, and emergency services – to target and reduce fatalities and serious injuries. The TZD approach has contributed to Minnesota's dramatic decline in traffic fatalities over the past decade.
- Proactive lower cost, high-benefit safety features. Lower cost safety improvements may be newly installed as part of a pavement project, including edge treatments (rumble stripes and rumble strips), guardrail, and pavement markings, or as stand-alone projects. MnDOT has also developed District Safety Plans (DSPs) for each MnDOT district. The DSPs refer to crash data to prioritize proactive strategies at high-risk locations and identify appropriate treatments that are proven to reduce fatal and serious injury crashes. They also serve as the engineering component to the TZD initiative.
- Improvements at sustained crash locations. These are locations with a consistently high crash rate over a five-year period compared to similar locations across the state. Improvements at these locations tend to be higher-cost intersection improvements and can be targeted for motorized and non-motorized modes. Projects in this category include improvements such as roundabouts and passing lanes.

Typical improvements in the Traveler Safety category include lower cost, high-benefit engineering solutions, such as rumble stripes, lighting, signage, new cable median barriers, and dynamic warning signs. MnDOT uses higher cost treatments, such as four-way stop signs, signals, and reduced conflict intersection improvements (for example, roundabouts, median refuges, and J-turns), to address sustained crash locations.

While the investment categories included in MnSHIP do not specifically identify freight, many of the outcomes from investments made in these investment categories provide significant benefit to freight movements. Examples of this include smooth pavements, which provide lower operating costs, greater fuel efficiency, less damage to goods, and improved safety; or improvements to critical connections, which will decrease delays and reduce travel times. Traveler safety improvements likewise reduce the frequency and severity of crashes, simultaneously decreasing risk and delay. All of these improvements have significant benefits for freight.

## HIGHWAY PROJECTS ON MINNESOTA'S PRINCIPAL FREIGHT NETWORK

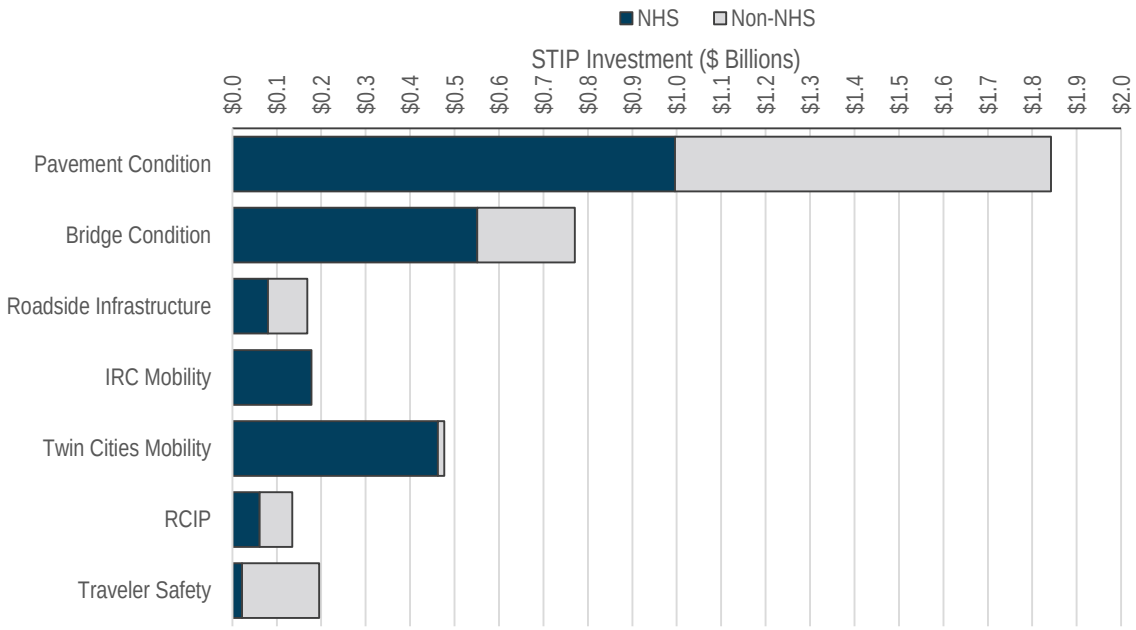
The State Transportation Improvement Program (STIP) is Minnesota's four-year transportation improvement program developed by MnDOT with approval from the FHWA and the Federal Transit Administration (FTA). The STIP is the statewide transportation program in which MnDOT, local governments, and community and business interest groups work together in eight District Area Transportation Partnerships (ATPs) to discuss regional priorities and reach agreement on priority transportation investments. It incorporates the Transportation Improvement Programs (TIP) developed by the state's metropolitan planning organizations by reference, without modification. Like the STIP, each TIP provides a prioritized list of projects for which federal, state, and, in some cases, local funds are anticipated to be used.

The STIP identifies the schedule and funding of transportation projects by state fiscal year (July 1 through June 30). It includes all state and local transportation projects with federal highway and/or federal transit funding along with 100 percent state funded transportation projects. These projects are for state trunk highways, local roads and bridges, rail crossings, and transit capital and operating assistance. The STIP is developed/updated on an annual basis.

The STIP for fiscal years 2015-2018 was approved in October 2014 and contains information such as project location/description, agency responsible for project implementation, program categories, funding categories, and project cost. This project list was reviewed to better understand the level and type of investments that are programmed for the highway portion of the designated Minnesota Principal Freight Network, defined as the extents of the National Highway System. Of the $3.9 billion allocated to infrastructure improvements, approximately 60 percent is programmed for projects on the NHS system.

The STIP includes two fields that categorize the primary and secondary work types of each project. The work type descriptions were used to guide the determination of the appropriate MnSHIP investment category for each project. The results of this analysis are shown in Figure 4.1, which displays the relative investment within each category toward NHS and non-NHS roadways.

Figure 4.1 STIP Funding by MnSHIP Investment Category




Source: 2015-2018 Minnesota STIP

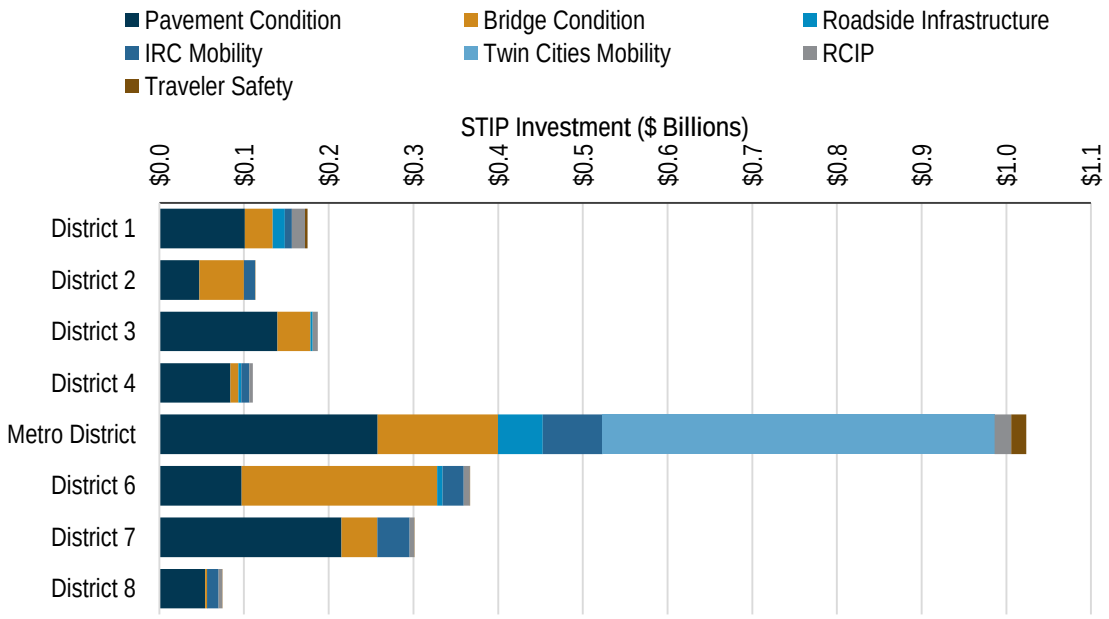
The results show that investment in Pavement Condition greatly exceeds the investment in any other category. Pavement Condition projects account for approximately 47 percent of infrastructure-related STIP funding. Over half of these investments are slated for roadways on the NHS.

Since all IRC roadways are also on the NHS, all investments under the IRC Mobility category are on the NHS. NHS investments also account for the majority of projects under Bridge Condition and Twin Cities Mobility and approximately half of the projects under Roadside Infrastructure and RCIP. Unlike the other categories, investments under the Traveler Safety categories are primarily on non-NHS roadways.

A subset of this list represents the freight projects identified in the STIP. This list is included in Appendix A and in the Strategies and Implementation Technical Memo. A freight project is defined as a project on the NHS network (which is part of the Minnesota Principal Freight Network) with its primary designation as one the project types described in the previous section. A total of 436 projects meet these criteria.

A summary of the freight-related investments on the NHS by District is shown in Figure 4.2 and mapped in Figure 4.3.

Figure 4.2 STIP Freight Project Funding by District

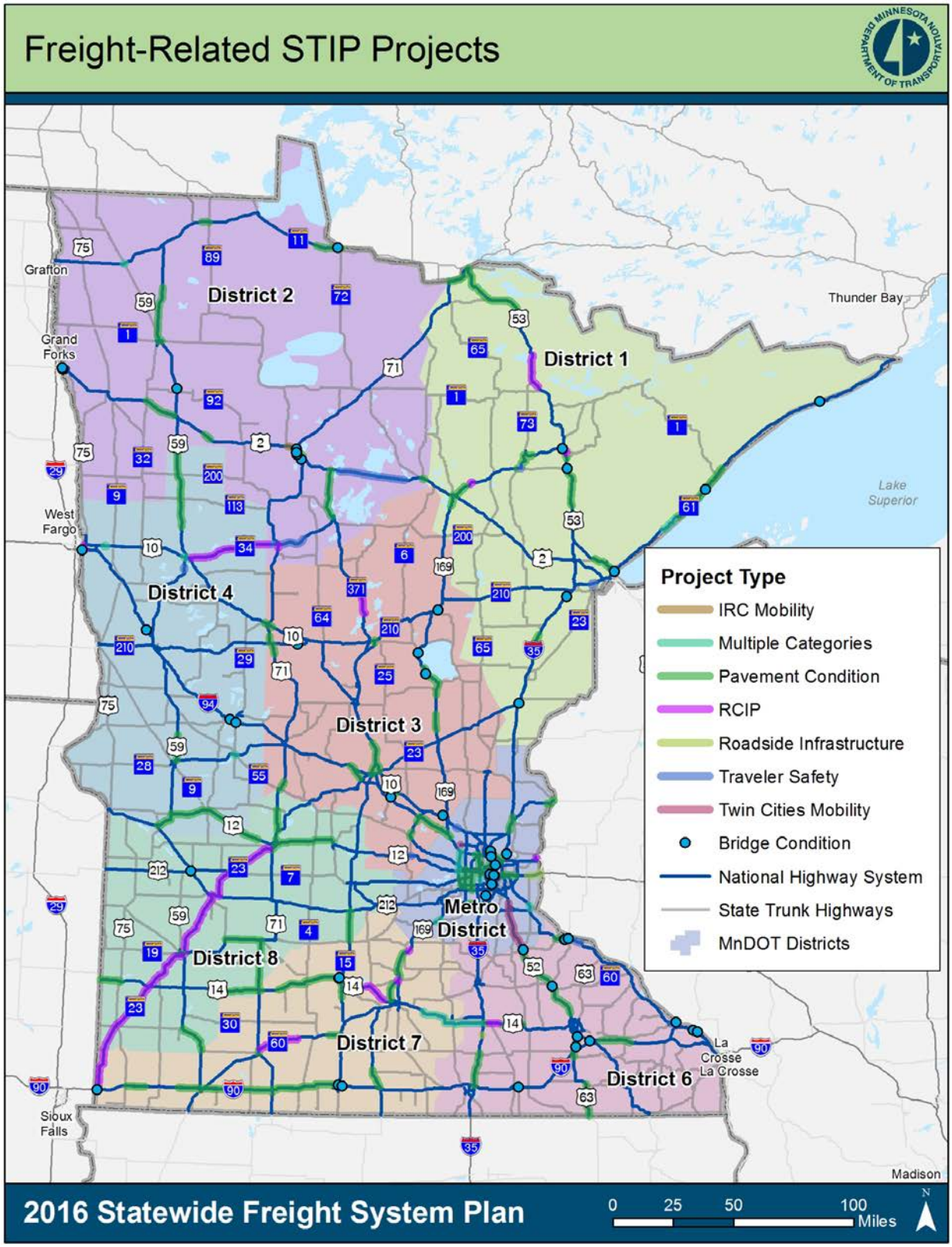



Source: 2015-2018 Minnesota STIP

A review of the funding for freight-related STIP projects on the NHS shows that the greatest amount of investment is planned for the Metro District. This is to be expected as the roadway traffic in the Twin Cities metropolitan area accounts for roughly half of all roadway traffic statewide. The Twin Cities Mobility funding category is also unique to the Metro District and accounts for nearly half of all freight project funding in the district.

Project funding in non-Metro districts is almost entirely dedicated to either Pavement Condition or Bridge Condition. While most of these districts dedicate more funding to Pavement Condition, two exceptions are District 2 and District 6, both of which have a substantially larger share of bridge condition projects relative to their total funding levels.

Figure 4.3 Freight-Related STIP Projects on the NHS Network



## NON-HIGHWAY SYSTEM INVESTMENTS

This section provides a summary of the currently proposed investments for the non-highway portions of the freight system. One mode that is not included in this section is pipelines. The pipeline system is privately owned and operated. MnDOT plays only a small role in the development and oversight of the pipeline system.

### Rail

The 2016 Minnesota State Rail Plan presented a $6.6 billion, 20-year project list, with $3.5 billion for freight rail-specific projects. In total, there are 62 freight projects (totaling $3.1 billion) and 45 crossing safety projects (totaling $441 million) identified, along with 57 passenger projects (not included here). Recommended freight project types include:

- Track Condition/Capacity. Projects focused on rail line condition and include projects that upgrade track or bridge condition, realign existing track, or add new track.
- Efficiency/Chokepoint. Projects where system efficiencies are lacking due to a physical system bottleneck or other capacity constraint. This includes new sidings or interchanges or improvements in and around rail yards.
- Signalization. Projects to upgrade signals on rail lines carrying high volumes of freight traffic. Centralized traffic control (CTC) is typically found on medium- to high-density rail lines and involves a series of interlockings that are controlled by a single operator that signals trains when they have the right-of-way to proceed.

  Although not included specifically in the list of freight rail projects, Positive Train Control (PTC) upgrades are also part of the Rail Plan. The Rail Safety Improvement Act of 2008 mandated the widespread installation of PTC systems by December 2015 on all lines handling passenger trains or hazardous materials.
- Grade Crossing Upgrades or Separations. Projects to upgrade grade crossing infrastructure or installing grade separations are necessary at a number of highway-rail crossings in Minnesota to achieve safety goals, including reduced crashes and mitigating challenges of shale oil and hazardous material transport. MnDOT continues to invest in grade crossing upgrades,; however, many of the currently installed warning devices will need replacement by 2030 due to age and out-of-date technology.

The list of recommended freight rail projects identified is included in Appendix A and the Strategies and Implementation Technical Memo. Due to the fact that rail serves both freight and passenger travel in Minnesota and that rail infrastructure, while owned and operated by private entities, provides significant benefits to the state and general public, many of these investments presume the need for multiple actors, methodologies, and years. Unlike the funded highway projects under MnSHIP, a range of financing tools is needed among the public sector stakeholders—federal, state and regional/local—and the private sector, including railroads and investor/developers, to advance these projects. State general fund and bond proceeds have been dedicated to the existing freight and safety programs. Minnesota counties and their Regional Railroad Authorities have committed significant local funding from both general funds and special purpose tax levies to advance these projects and support ongoing rail operations. Exploration of new funding opportunities are necessary to move rail development forward.

### Ports and Waterways

The Minnesota State Legislature funds the Port Development Assistance Program to address port needs. From 1996 to 2015, the program was allocated $30 million. Past projects included rehabilitation of roads or railways or improved truck access to ports; dock walls; building roofs; sprinklers and electrical systems; mobile handling

equipment; and increased warehouse capacity. The ports have identified close to $45 million of future development needs.

The 2014 Statewide Ports and Waterways Plan identifies several strategies that may result in future investment. One strategy is improving infrastructure conditions and expanding capacity. To do this, MnDOT will work to have a stable Port Development Assistance Program and compile an infrastructure needs assessment. Strategies such as assisting with adapting to new markets, adding capacity for containerization, and upgrading outdated systems to reduce maintenance costs support port infrastructure.

Another issue of growing importance is preservation of waterfront land. This is especially true for land that has strategic importance for the marine freight system in existing and new locations. Multimodal connections are also an important factor in creating an efficient freight system.

Over the last five years, the legislature has appropriated the following amounts to the Port Development Assistance Program: 2012, $4 million; 2014: $2 million; 2015: $3 million. Entities that are eligible for the program then compete for those funds. The legislature usually requires that any improvement made must be publicly owned.

The current investments being pursued in the port and waterway system are discussed below.

### DULUTH SEAWAY PORT AUTHORITY

The Duluth Seaway Port Authority (DSPA) used MnDOT appropriations, a $10 million TIGER grant from the federal government, and an almost $1 million grant from the Minnesota Department of Employment and Economic Development (DEED) to redevelop DSPA's Docks C and D. This 28-acre site has been unusable due to its deteriorated state. It will expand the Duluth Seaway Port Authority's capacity.

### RED WING PORT AUTHORITY

In recent years, there has been an increase in the number of riverboats that visit Red Wing. The Red Wing Port Authority applied for Port Development funds to construct a dock for improved riverboat passenger embarkation adjacent to Levee Park.

### ST. PAUL PORT AUTHORITY

The St. Paul Port Authority has received additional Port Development funds to expand upon an existing project to replace 790 feet of dock wall. The new project will expand the replacement to approximately 1,100 feet.

### PORT AUTHORITY OF WINONA

The Port Authority of Winona is using Port Development funds to prevent bolt breakage at one of their commercial docks by installing an 8,000 square foot concrete cap and creating a 1,200 square foot "Heavy-lift Zone." This will accommodate the heavy loads using cranes of up to 300 tons.

## Airports

Minnesota has 97 airports listed in the FAA's National Plan of Integrated Airport Systems (NPIAS). Currently, eight airports are identified in the NPIAS as primary airports. The 2013 Minnesota State Aviation System Plan estimates the need for $712 million in short-term projects, $326 in mid-term projects, and $1.1 billion in long-term projects for the aviation system. Of the estimated costs, 40 percent are for improvements to the airports and 22 percent are for miscellaneous costs. However, the Plan does not currently distinguish projects as significant to freight or passenger travel.

Of the Minnesota airports, five were identified as meeting the criteria for designation as part of Minnesota's Principal Freight Network. The Minnesota State Aviation System Plan also identified upgrades for each of these airports. This information helps guide MnDOT's Capital Improvement Plan (CIP). These CIP projects are outlined below.

### MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT

The Minneapolis-St. Paul International Airport is Minnesota's largest airport. Over the next 22 years, the airport has $63.6 million worth of projects listed in the CIP. Of that total, $44.4 million will be from local funds, $13.8 million from the FAA, and $5.4 million from the State. Of the 39 projects listed, 37 may have direct positive impacts on freight. Any project that specifically dealt with passenger operations (e.g., passenger terminal expansions, passenger bridge repairs, etc.) was not considered a freight project. Projects include runway pavement improvements, drainage improvements, and miscellaneous construction projects.

### DULUTH INTERNATIONAL AIRPORT

The Duluth International Airport identified $81 million in projects for the next 20 years. Of that total, $8.9 million will be from local funds, $67 million from the FAA, $1.4 million from other funds, and $4 million from the State. Of the 50 projects listed, 48 may have a direct positive impact on freight. Projects range from runway improvements, snow removal equipment, renovations to the Air Traffic Control Tower, land acquisition, hanger maintenance, and reconstruction of a runway.

### ROCHESTER INTERNATIONAL AIRPORT

The Rochester International Airport identified $38 million in projects for the next 15 years. Of that total, $4 million will be from local funds, $18 million from the FAA, $6.3 million from other funds, and $9.7 million from the State. Of the 21 projects listed, 19 may have a direct positive impact on freight. Projects include runway improvements, navigation systems upgrades, and equipment replacement.

### BEMIDJI REGIONAL AIRPORT

The Bemidji Regional Airport identified $24 million in projects for the next 14 years. Of that total, $1.6 million will be from local funds, $21 million from the FAA, and $1.4 million from the State. Of the 63 projects listed, 61 projects may have a direct positive impact on freight. Projects include runway maintenance, snow removal equipment, hanger upgrades, and road improvements.

### THIEF RIVER FALLS REGIONAL AIRPORT

The Thief River Falls Regional Airport identified $20 million in projects for the next 18 years. Of that total, $2 million will be from local funds, $15 million from the FAA, $1.2 million from other funds, and $1.1 million from the State. All of the 42 projects listed may have a direct positive impact on freight. Projects include runway maintenance, hanger construction, runway extension, and storm water management.

## FREIGHT PROJECT TYPES FOR MNDOT'S FUTURE SUPPORT

The previous sections identified various freight project types that MnDOT is currently investing in or that have been identified as being freight-related or freight benefitting as part of this Plan. These freight project types are consolidated here for MnDOT's future consideration of support, partnership, and advocacy with its public and private sector freight partners. It is not presumed that MnDOT will provide funding for all of these project types.

These projects are also included here as a step toward preparing MnDOT for eligibility for future freight project funding through the FAST Act. While this Plan does not provide a prioritized list of freight projects, it does identify

what types of projects MnDOT may consider a freight project. These projects could then be eligible for federal funding.

Projects have been roughly categorized into three groupings that align with Statewide Multimodal Transportation Plan objectives:

- Asset Management. Projects that focus primarily on the maintenance and/or reconstruction of existing infrastructure.
- Critical Connections. Projects that increase the capacity and performance of key freight system connections.
- Traveler Safety. Projects that improve safety for all users of the transportation system.

The following list provides various types of freight projects and freight benefitting projects for each project category described above.

### Highway Projects

- Asset Management
  - Pavement condition
  - Bridge condition
  - Roadside infrastructure (signage, guardrails/barriers, rest area upgrades)
- Critical Connections
  - Two to four lane conversions
  - Interchange improvements
  - MnPASS Lanes
  - Metro Congestion Management Program
  - First-/last-mile roadway improvements
  - Interchanges
  - Intersection upgrades
- Safety
  - Safety program projects
  - Intersection upgrades
  - Improved lighting
  - Signage

### Ports and Waterway Projects

- Asset Management
  - Dredging
  - Dock wall maintenance
  - Miscellaneous construction
- Critical Connections
  - First-/last-mile roadway improvements
  - Intermodal and multimodal facilities
  - Dock expansion
  - Warehouse expansion and mobile handling equipment investments

### Airports

- Asset Management
  - Airfield infrastructure improvements, including runway, taxiway, or apron pavement condition or expansion
  - Air traffic control tower reconstruction
  - Miscellaneous construction
- Critical Connections
  - First-/last-mile roadway improvements
  - Air cargo facilities
- Safety and Security
  - Communication, navigation, or surveillance systems

### Rail Projects

- Asset Management

- Rail/bridge condition improvements
- Capacity enhancements

- Critical Connections
  - First-/last-mile roadway improvements
  - Intermodal and multimodal facilities
  - Improvements in and around rail yards

- Safety and Security
  - Signalization – Centralized traffic control (CTC) and Positive Train Control (PTC)
  - Grade crossing infrastructure upgrades or separation

Again, this list is provided to give an indication of the various types of freight projects and freight benefitting projects. It is not presumed that MnDOT will be the sole funder of freight projects nor provide funding for each of these types.

## Supporting Strategies and Actions

Since physical infrastructure projects alone will not be sufficient to address the needs and issues identified in this Plan, this section outlines the supporting strategies that were developed to help achieve the goals of this plan. This section describes these strategies and supporting actions, which are organized by the 2012 Statewide Multimodal Transportation Plan objective areas:

- Accountability, Transparency, and Communication
- Transportation in Context
- Critical Connections
- Asset Management
- Traveler Safety
- System Security

The Freight Action Agenda in Chapter 5 provides a summarized list of each action, timeframe for implementation, and leading and supporting agencies. Additional information on how these strategies help meet Plan goals is presented in the supplemental Technical Memo – Strategies and Implementation.

The objectives and subsequent strategies/actions identified on the following pages are listed in no particular order. Their order is not meant to indicate priority; all are critical focus areas for the coming years.

### ACCOUNTABILITY, TRANSPARENCY, AND COMMUNICATION

The importance of accountability, transparency, and communication to the transportation decision-making process is recognized and supported in state and federal legislation. There are also specific requirements for state departments of transportation and Metropolitan Planning Organizations related to public involvement and collaboration. This Plan engaged public and private freight stakeholders as an important resource in identifying needs and determining next steps. A key next step, implementing Minnesota's Freight Action Agenda, also relies on the continued communication and coordination of activities with these stakeholders and agencies and making information available to them in a manner that is easy to find and understand.

## Strategies

### 1 - EDUCATION

Freight touches every Minnesota resident on a daily basis. Products purchased in a store or online are available because freight transported them to retail outlets and distribution centers. Unfortunately the public is often most familiar with the negative impacts of freight, and not the improved quality of life and access to goods that come because of freight. MnDOT has started sharing information on the importance of freight as part of developing this Plan. The public must continue to be educated on Minnesota's Freight Story: the critical role freight plays in the economy and everyday life of Minnesotans.

- Action. Educate the public on the importance and benefits of freight to Minnesota and Minnesotans

### 2 - PARTNERSHIPS

As evidenced by the engagement process undertaken during developing this Plan, there are numerous stakeholders in Minnesota's freight transportation system. These stakeholders represent the planners, owners, operators, users, and funders of the system, both in Minnesota and across state borders. Partnerships can be formal (as noted in the Ongoing Freight Forum section below) or informal. The intent of the partnerships is to ensure that a regular dialogue occurs and that MnDOT has the opportunity to listen to and understand freight stakeholder perspectives. When mutual understanding is achieved, opportunities for working together to address common needs and issues arise. These partnerships can lead to collaboration on education (noted above), planning, and investing. As projects of regional and national significance begin to receive federal funds, Minnesota's partnerships with its public and private sector freight stakeholders will be critical.

- Action. Partner with public and private sector freight stakeholders in Minnesota and neighboring states. See *Ongoing Freight Forum*.

### 3 - ONGOING FREIGHT FORUM

Parallel to Plan development, MnDOT, in partnership with the University of Minnesota's Center for Transportation Studies (CTS), convened an Ad Hoc Working Group to explore the existing structure and role of the Minnesota Freight Advisory Committee (MFAC). Historically, this group had been convened to facilitate an ongoing dialogue between public and private sector freight stakeholders to keep freight topics "front and center" and to hear private sector perspectives. Through Ad Hoc Working Group discussions it was determined that the MFAC should continue but be given a defined mission, which includes:

- Monitor and report on the implementation of the Statewide Freight System Plan and its Action Agenda, including the development of recommendations for any revisions and updates to the Plan
- Create an annual report for the MnDOT Commissioner that includes a "state of freight," an overview of trends and important issues, and reports on the activities of the Freight Advisory Committee from the past year
- Review significant MnDOT initiatives and activities and provide freight impact and benefits comments
- Direct the preparation and distribution of "white papers" on freight transportation issues important to Minnesota's economy
- Advocate for needs of freight transportation to the public, elected officials, and other public agencies and organizations
- Suggest research initiatives and tools supporting the economic vitality of the state

Refer to the MFAC Ad Hoc Working Group Recommendations Report for additional information on these recommendations and recommendations for modification of the MFAC structure/membership.

- Action. Partner and collaborate with the MFAC on fulfilling the recommendations of the Ad Hoc Working Group

### 4 - ADVOCACY

Stakeholder outreach conducted as part of this Plan, as well as the findings from MnDOT's previous freight studies, revealed that existing funding mechanisms are inadequate for making the levels of transportation investment needed on the freight system to accommodate current and projected future demand. Advocacy is required both to raise awareness of the funding issue and to begin to secure funds for freight projects in the state of Minnesota.

- Action. Use partnerships to raise awareness of financial needs; quantify Minnesota's freight funding needs; secure funding for needed freight projects

### 5 - TRAVELER INFORMATION

Freight-specific traveler information, such as truck parking availability, expected travel time, and roadway conditions, can help industry better plan when/where they travel on roadways and where they are able to stop safely for rest periods. See the *Truck Parking* strategy under Traveler Safety and System Security.

- Action. Incorporate freight-targeted traveler information into existing MnDOT traveler information resources; ensure freight is considered in future traveler information installations

### 6 - WORKFORCE DEVELOPMENT

In order to sustain the freight-related businesses and industries that operate in Minnesota and that the state relies upon for goods, it is essential that employers have access to a large pool of potential employees that are appropriately trained in the skills required for freight-industry jobs. In particular, the trucking profession has difficulty attracting the next generation of drivers due to many factors including long work days and the amount of time on the road away from home. Programs in cooperation with community colleges and other educational institutions, work training programs through the private sector, or other venues are important to ensure that an appropriate workforce is available for transportation needs.

- Action. Quantify and reach agreement of the issue among partners, further identify what is needed/what are the potential solutions and the appropriate lead entity

## TRANSPORTATION IN CONTEXT

Transportation projects do not occur in a vacuum; they are surrounded by context. Context refers to the things people care about—the people, places, and circumstances of their lives. While Minnesota residents and businesses rely on freight to provide their day-to-day needs, freight activity sometimes leads to unintended impacts. Understanding these impacts is an important part of freight project planning and policy development and making sure decisions are made that take land use, energy consumption, the environment, the economy, public health, and the needs of traditionally underserved populations into consideration. Considering context when making freight transportation decisions leads to projects that are safer, sustainable in scale, and tailored to the specific places in which they exist—projects that respect and complement the economy, environment, and quality of life of a place.

## Strategies

### 7 - CORRIDOR PRESERVATION

Rail corridors held in the State Rail Bank should be actively managed and regularly evaluated for possible future transportation uses. Many unused rail corridors have been preserved through uses such as bicycle trails. While converting these corridors back to active rail use is often difficult and costly due to encroachment, regulations, and public opposition, they provide opportunities to enable right-of-way for relocation and elimination of road or rail traffic in other parts of the region. A proactive approach to management includes the identification of potential future opportunities early on, so that changing use (e.g., a bike trail to a roadway) is minimized.

- Action. Proactively manage rail corridors and identify potential future uses

### 8 - TRUCK ROUTES

Urban areas are often where 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 focus through truck trips and minimize neighborhood cut-through traffic. With the current emphasis on Complete Streets (see below), 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. In order to operate safely and improve efficiency, truckers often work during off-peak hours whenever possible; however, it is the responsibility of local planners to consider/designate truck routes/routing in their jurisdictions.

- Action. Consider trucks in planning; designate truck routes to focus truck movements (and separate from conflicting transportation uses) especially in industrial and urban areas with restrictions/enforcement in adjacent residential areas

### 9 - COMPLETE STREETS

Similar to truck routes, above, Complete Streets planning principles are frequently used in urban settings where roadways must serve multiple purposes for sometimes conflicting transportation users. Complete Streets projects often focus on accommodating personal automobiles, transit, bicycles, and pedestrians, and sometimes do not fully include the needs of trucks. Complete Streets applications in Minnesota should consider truck movements as part of total vehicle traffic and propose treatments to create harmony between trucks and other users such as time-of-day delivery windows to reduce conflicts with other street users, design guidelines for curb pullouts that can be used at different times for bus pullouts, and truck parking.

- Action. Consider freight movements in Complete Streets planning activities

### 10 - LAND USE PLANNING AND POLICIES

Land near freight facilities and port areas is ideal for freight shipping purposes but is increasingly in competition with residential, commercial, and recreational land uses. In the Minneapolis-St. Paul area and other parts of the state, businesses and shippers have had difficulty obtaining land with rail and port access. In some cases, zoning has become restrictive toward industrial and commercial uses .In other cases, citizens have rallied to prevent expansion in rail traffic and operations due to noise and environmental concerns. Land use planning and policies must be developed to ensure freight development areas are designated and preserved. Additionally, these areas (and new freight-intensive uses) should be sited adjacent to existing infrastructure whenever possible.

- Action. Support land use policies that ensure freight development areas are designated and preserved, and that development occurs adjacent to existing infrastructure

### 11 - FREIGHT AS A GOOD NEIGHBOR

Minnesotans enjoy a high quality of life; however, sometimes freight activities can have negative effects on local areas. Programs and projects that support and encourage freight activities and help mitigate local impacts of freight should be pursued. These strategies include encouraging cleaner trucks, "green" locomotives, alternative fuels use, shifting to lower emitting modal uses, idle reduction technology, and others. MnDOT has a role in encouraging private businesses/carriers to install these green technologies on their fleets. MnDOT can also serve as a conduit for grant funding to accomplish this.

- Action. Encourage private businesses to implement "green" technologies on fleets; identify grant funding for implementation

### 12 - ADVANCED TECHNOLOGY

The deployment of advanced technology has the potential to increase freight system efficiency, improving the flow of goods and reducing the cost to move them. FHWA's Office of Freight Management and Operations promotes the deployment of technology and the adoption of best practices by state DOTs. Their Intermodal Freight Technology program conducts operational tests of ITS technologies, supports the development of tools to evaluate infrastructure and operational needs at border crossings, and develops standards for exchanging electronic freight data. While much of their work has been "cutting edge," technology is catching up, and the future holds promise of "real world" applications for state DOTs to consider. As noted in the section above, emissions reduction technology is a proven application that has widespread deployment. Also, MnDOT is conducting a truck parking pilot using advanced technologies in partnership with freight carriers and other Midwestern states.

Looking to the future, MnDOT should monitor development of advanced technologies and their applications for freight. One area of particular promise is that of connected and autonomous vehicles (i.e., in-vehicle, vehicle-to-vehicle, and vehicle-to-infrastructure technologies to reduce human error, avoid collisions, and automate vehicle operation). Vehicle technology is mature and widely deployed but is not yet in active use by the public. It is anticipated that some of the first autonomous vehicle "self-driving" applications will be by large trucking companies. Autonomous trucks are being tested in the U.S. and could provide a solution to the workforce shortage in that industry.[33]

- Action. Monitor advanced technology development and applications for freight; consider advanced technology as part of freight planning and project development; explore pilot programs as a way to test implementation of advanced technologies

## CRITICAL CONNECTIONS

Freight is unique in that it is multimodal, crosses state and national boundaries, and has a myriad of public and private sector stakeholders with distinct operational and jurisdictional perspectives. While many types of connections are important to freight, there are critical connections that serve as the backbone for movement across and within Minnesota and to points beyond. The Principal Freight Network (designated as part of this Plan), connections between modes of transportation, first- and last-mile connections, and urban area connections are all essential. Identifying, preserving, and enhancing these priority connections are sometimes shared responsibilities.

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[33] http://www.wired.com/2015/05/worlds-first-self-driving-semi-truck-hits-road/

All freight connections, regardless of jurisdiction, location, or mode, need to be developed in coordination with one another to ensure a truly connected Minnesota.

## Strategies

### 13 - INTEGRATE FREIGHT INTO ALL PLANNING PROJECTS

Freight is an important part of the entire transportation system. While it is vital to plan specifically for freight, freight should be considered in project planning across modes (highway, rail, water, and air). A case study in District 4 was conducted as part of Plan development to understand how freight is currently being integrated into planning and programming activities at the District level and to identify additional tools, resources, and information that may further help to include freight considerations in their approach to planning.

MnDOT currently uses a number of project scoping worksheets during the project development and planning stages. The purpose of these worksheets is to provide functional groups with a tool to investigate and record potential items that could be included in the scope of the project. The many varieties of worksheets cover topics such as business impacts, state aid scoping, environmental documentation, and maintenance, and provide opportunities for Districts to consider "freight" in their day-to-day activities. While the planning section scoping worksheet specifically calls out freight as an item for consideration, additional information is required by the District to fill out the worksheet appropriately. For example, while the question "Is the project occurring near significant freight or truck traffic generators, or near a significant freight route?" is a good question, District 4 staff noted that the identification of "significant freight routes" or "significant freight or truck traffic generators" is not always obvious.

This plan identified Minnesota's Principal Freight Network as the NHS system. While this system may be used to identify significant freight routes at the state level, there are many other non-NHS roadways that play a critical role in freight movement at the local level. District 4 staff also noted that guidance on design criteria can sometimes be contradictory. For example, the worksheet guide encourages the use of traffic calming measures such as narrow travel lanes and curb bump-outs on roadways with mixed users (e.g., pedestrians, bicycles, passenger traffic, freight). While these measures may be especially beneficial to non-motorized users, they often make truck movements more difficult. District planners noted that guidance on which set of design criteria should take priority would be valuable.

The scoping worksheets and worksheet guides are intended to be living documents that are updated and revised periodically. MnDOT will continue to coordinate with District planners to ensure that freight is being integrated into project planning as much as possible. Additionally, as part of project planning, each MnDOT District should conduct outreach to freight stakeholders to consider their perspectives and ensure that project alternatives do not cause detrimental impacts to businesses/goods movement.

- Action. MnDOT Central Office should coordinate with MnDOT District planners to identify the best ways to integrate freight into the planning process, monitor the effectiveness of the project scoping worksheet and guides and revise accordingly, and encourage Districts to regularly engage public and private sector stakeholders in project planning

### 14 - INVESTMENTS ON THE PRINCIPAL FREIGHT NETWORK

This Plan undertook a rigorous, data-driven process with oversight from a cross-agency Ad Hoc Working Group to identify Minnesota's Principal Freight Network. This designated network identifies the key infrastructure assets in the state on the highway, rail, waterway, and aviation systems and identifies key facilities where modal systems intersect. As this network represents the backbone of industry supply chains, freight-related investments on Minnesota's Principal Freight Network should be given priority over other freight investments. Investments onthe

highway system should consider "freight friendly" design principles, including items such as generous turning radii, minimal/improved roundabouts, truck lanes, truck bypasses, and other features.

MnDOT is already making significant investments in the freight system. This Plan identifies the highway projects on the Principal Freight Network to which MnDOT has committed funding in the 2015-2018 State Transportation Improvement Program. It also identifies the project types that should be considered on the highway system in the future. This Plan also notes the projects identified on the freight rail system during development of the 2016 Minnesota State Rail Plan. These and all future freight investments should consider multimodal solutions, ensure a high return on investment, and complement the social, natural, and economic features of Minnesota. When appropriate, private sector funds should be sought and used to leverage public dollars, and private sector funds should be given in an amount commensurate with benefits received.

Neither the Statewide Ports and Waterways Plan nor the State Aviation System Plan specifically identify freight projects on those modal systems. In the case of air cargo, the Office of Aeronautics and the Office of Freight and Commercial Vehicle Operations (OFCVO) have both indicated the need for an air cargo assessment study to more fully understand the use of the state aviation system by industry, needs on the system related to freight, and future investments.

As business practices and locations change over time, regular review and updates (every five years) should be made to the Principal Freight Network to ensure that projects/investments that move forward are providing freight benefits.

- Action. Regularly update the Principal Freight Network; review design standards for highway projects on the network; conduct project planning and funding selection based on location on the network; conduct an air cargo assessment to determine investment needs

### 15 - FIRST-/LAST-MILE CONNECTIONS

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 about 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. 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). MnDOT should work with the local agencies who have jurisdiction over these roadways to determine whether intermodal connector designation is something they would like to pursue. In the event connectors are designated, MnDOT can provide assistance to regional and local planning and economic development agencies to ensure that roads are designed and preserved at a level that enables them to best serve freight.

- Action. Determine designation of new intermodal connectors and provide local agencies with design and maintenance guidance

### 16 - TARGETED FREIGHT SYSTEM INVESTMENTS

Targeted infrastructure investments should be pursued to make the best use of limited transportation dollars. MnDOT has designated a number of corridors, most recently the Principal Freight Network, that are key for freight and commercial connectivity within the state. Focused improvements on these roadway corridors can combine infrastructure (e.g., mainline, auxiliary lanes, truck bypasses, and geometric improvements), ITS technology, safety programs, and other actions to mitigate congestion and ensure reliable routes for freight. Spot roadway and railroad projects, such as interchange improvements, lane/siding additions, ramp improvements, traffic signal coordination,

or other improvements, can mitigate chokepoints and reduce congestion at spot locations. For both corridor and spot improvements, freight performance measures can be used to identify and target locations most in need of improvement, allowing MnDOT to conduct advanced planning and construct solutions to the state's most critical network bottlenecks.

Two goals of the 2016 Minnesota State Rail Plan are to upgrade main line track (all Class I-III railroads) to 25 mph minimum speed (FRA Class 2 track), as warranted, and to improve the freight rail network (all Class I-III railroads) to support the use of 286,000 pound railcars throughout the state. These improvements are 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. These are primarily issues for short line railroads where infrastructure conditions tend to be inferior to those of the large railroads. MnDOT administers the Minnesota Rail Service Improvement (MRSI) program that can be used to improve line condition. As a condition of funding, MnDOT should require the rail owner to update the rail line to these modern standards.

- Action. Use performance measures to determine locations for spot improvement and implement improvement activities. Consider requiring MRSI funding recipients to upgrade rail on the portion of the line where project funding is given.

### 17 - INTERMODAL AND MULTIMODAL FACILITIES

Intermodal and multimodal transload facility development allows goods to shift between modes such as truck, rail, and water. The Minneapolis-St. Paul region is the only location where rail intermodal service (the haulage of containers and trailers) is available in Minnesota, and Chicago and the Pacific Northwest/Western Canada are the only markets that are directly served. Stakeholders have remarked that containers are often unavailable for loading in Minnesota, limiting service availability. Sometimes it is more cost effective to truck goods to Chicago for loading into containers or rail cars. 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.

- Action. Conduct a feasibility study to determine the need for intermodal/transload facilities and identify potential locations; identify solutions to equipment shortages

### 18 - URBAN GOODS MOVEMENT PROGRAMS

The assessment of the condition and performance of the freight system noted that the top 10 highway bottlenecks in the state related to travel time and delay are in the Twin Cities. This urban area is the center of passenger activity as well as goods movement. Highway congestion is also experienced by truck drivers, often at a higher cost due to the need for just-in-time delivery of goods. Projects and programs in urban centers focused on mitigating congestion caused by rush hour traffic, incidents, work zones, or other factors should be advanced where high volumes of freight and passenger traffic coexist. Many of these types of projects are already being implemented (e.g., MnPASS lanes, 511 traveler information and other ITS technologies). These projects should also consider the benefits they provide to the freight community. In addition, as noted earlier, planning for truck routes and accounting for trucks in Complete Streets planning should be undertaken in urban areas to benefit goods movement.

- Action. Continue advancing congestion management solutions in urban areas; consider impacts/benefits to freight in congestion management solutions and Complete Streets planning.

### 19 - TRUCK SIZE AND WEIGHT

The Commercial Vehicle Operations Section of MnDOT's OFCVO administers OSOW 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 eight feet six inches, a height of thirteen feet six inches, a length of 75 feet zero inches, and a gross vehicle weight of 80,000 pounds require a 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 regulations are 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 significant amounts of damage to state and local roadways.

There is also a 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. During one-on-one meetings many freight business noted frustration with the discrepancies between size and weight restriction in Minnesota and neighboring states and territories. Minnesota's size and weight regulations are more restrictive than other states, particularly North Dakota and Canada. These disparities make for more challenging freight logistics for interstate travel.

- Action. Work with neighboring states to identify truck size and weight mismatches and develop a plan for harmonization; work with state and local enforcement departments to determine how OSOW movements can be better enforced

### 20 - MODAL OPTIONS/SYSTEM REDUNDANCY

Some corridors and locations on the multimodal freight network are stressed to or over capacity. Delays along one route or on one mode can spread to other networks and affect both passenger and freight travel. For example, in the recent past increased oil, gas, and agriculture rail shipments along BNSF's corridor from North Dakota to Minneapolis negatively impacted the on-time performance of other freight and passenger rail movements.

In addition, infrastructure across all modes is aging, raising the likelihood 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 integrated into freight system planning to ensure the freight system has resiliency. Redundancy will also allow for the flow of goods to continue when a particular mode or route is unsuitable due to safety concerns or competing demands. Redundancy and choice are key to alleviating captive shipper concerns (which is an issue predominantly on the rail system).

- Action. Develop a freight system resiliency plan to identify potential freight system threats, locate key parallel multimodal routes, locate critical gaps in modal/system redundancy, and identify contingency alternatives to ensure freight disruptions are minimized

### 21 - EVALUATE AND RESTRUCTURE EXISTING FREIGHT FUNDING PROGRAMS

As noted in the 2016 Minnesota State Rail Plan, MnDOT's funding programs should be evaluated and restructured to more adequately address needs. For example, the MRSI program should be restructured to allow for larger projects, and the Rail/Highway Grade Crossing program should expand to consider strategies beyond active warning devices. The existing MRSI program should continue to be built upon, including raising the maximum loan amount beyond the current $200,000 ceiling.

- Action. Evaluate existing funding programs and structure; adjust programs, as needed, to better meet funding needs

## ASSET MANAGEMENT

In many cases, the same infrastructure is used for both freight and passenger travel, creating potential synergies in asset management for both forms of transportation. Keeping individual assets viable and managing them for long-term system needs are important. However, there are key differences in terms of performance goals, time horizons, and maintenance needs among corridors that are heavily utilized by freight in contrast to those that serve primarily passenger travel. Routes that serve heavy-haul equipment or see high levels of truck traffic are more vulnerable to pavement deterioration and may need higher levels of maintenance. One of the key applications of the Principal Freight Network is to support improved asset management. This includes identifying and prioritizing system needs on the highway system that are most important for freight.

### Strategies

#### 22 - FREIGHT DATA

Planning for the freight system can often be a challenge due to the private sector freight community that owns and operates a large portion of the freight system and maintains proprietary data. In order to do better planning and align resources to where they can provide the most benefit, improved freight data is required. Although the private sector has historically not shared data and is unlikely to do so in the future, there are steps that MnDOT can take to improve its own data collection efforts (e.g., regularly taking classification counts when traffic counts are required so that the state's repository of truck count information is gradually improved). MnDOT should also continually evaluate innovative data collection technologies and sources to determine cost effect approaches for future freight data collection. For example, the FHWA has recently provided the National Performance Management Research Data Set (NPMRDS) to state DOTs for understanding truck travel time and delay.

- Action. Expand data collection practices to include truck/classification counts; explore innovative sources for freight data

#### 23 - FREIGHT SYSTEM PERFORMANCE MEASURES

Freight system performance measures and indicators were developed as part of this Plan. In conjunction with designating Minnesota's Principal Freight Network, performance measures allow documentation of key attributes of the system and comparison across geography and time. Establishing a baseline and/or goal, tracking progress or managing performance, and communicating results are all ways in which performance measures are a valuable part of the project development process. Freight system performance measures should be used to monitor and report system condition and identify investment needs for key transportation infrastructure that is owned and operated within the public and private sectors.

- Action. Regularly collect data and apply freight performance measures and indicators, in particular those that apply to the Principal Freight Network; include freight performance measures as part of annual performance measure reporting

#### 24 - FREIGHT SYSTEM INVESTMENT PLAN

Minnesota has a 20-year investment plan for state highway system assets, called the Minnesota 20-year State Highway Investment Plan (MnSHIP). The most recent plan, which covers the years 2014-2033, supports the Minnesota GO vision and links to the policies and strategies laid out in the 2012 Statewide Multimodal Transportation Plan. MnSHIP guides future capital improvements on Minnesota's state highway system over the next twenty years; it does not guide investments on local or county roads.

While project investments have been identified in this Plan, how these investments should be implemented and which should come first have not been identified. The passage of the FAST Act in 2015 requires that states include a prioritized freight investment plan as part of a compliant freight plan. Although detailed guidance from the U.S.

DOT is not yet available, a freight system investment plan in Minnesota could potentially be developed under a similar framework as the MnSHIP. In this case, the freight system investment plan would cover 20 years and be divided into three periods:

- Years 1-4, Freight Transportation Improvement Program (FTIP): The FTIP identifies projects on the multimodal freight system that MnDOT and partners intend to carry out in the next four years. The investments on the highway side will be included in Minnesota's State Transportation Improvement Program (STIP), the four year program of funded projects.
- Years 5-10: A general plan of multimodal freight system improvements and identification of specific projects, though project timing and scope may change.
- Years 11-20: Specific projects are not identified, but broad investment priorities based on direction from the Minnesota Statewide Freight System Plan are identified, and associated funding sources and allocations are determined.

The freight system investment plan will be fiscally-constrained as prescribed by the requirements of the FAST Act. Additional projects or aspects of the investment plan may be developed to align with the MnSHIP process or for needs such as to assess the amount of additional and freight-specific funding required to advance Minnesota's freight vision.

- Action. Develop a FAST Act compliant prioritized freight investment plan

### 25 - PRIORITIZE PRESERVATION OF THE PRINCIPAL FREIGHT NETWORK

The Principal Freight Network routes should be used as a prioritization tool when assessing system-wide needs in other highway/statewide investment plans, especially when considering other types of systems (i.e., super-load corridors, OSOW, etc.). For example, prioritizing bridge/pavement maintenance so that pavements are free of potholes and roadway and railway bridges are able to handle heavy loads.

- Action. Review priority criteria and develop strategies to prioritize maintenance on the Principal Freight Network

## TRAVELER SAFETY AND SYSTEM SECURITY

Freight safety and security involves making travel safer for freight vehicles and also for the passenger vehicles that share the roadway, rail, air, and waterway systems. This is the case in daily operations as well as during emergency situations. The "4Es" of safety in Minnesota – education, enforcement, engineering, and emergency services – all have a place in the supporting strategies of this Plan and align with the idea that the freight system should be resilient, reliable, and have alternatives available for critical connections.

### Strategies

### 26 - DESIGN FOR FREIGHT SAFETY

Interstate highways were designed and built to standards that safely accommodate travel by large trucks. State and local roadways in particular may present safety challenges to trucks due to narrower lanes, non-paved shoulders, or intersection design. Especially on the Principal Freight Network and routes heavily used by truck traffic, MnDOT should employ a strategy, where context appropriate, to design and build features that improve vehicle safety, such as rumble strips/stripes, center rumble strips, guardrails, wider shoulders, turn lanes, barrier wall/cable median barrier, and other features.

- Action. Develop and implementof design guidance to accommodate large trucks on state and local roadways

### 27 - TRUCK PARKING

Truck parking is an issue nationwide. Trucks need parking availability to comply with federal hours of service regulations and pull off the road to rest or avoid congestion. MnDOT recently conducted a study to demonstrate an automated truck stop management system that can determine the number of occupied parking spaces at MnDOT safety rest areas. The data from the project can be used by MnDOT and private site owners to determine if existing facilities are suitable for demand, and if needed, should be used to plan improvement or expansion projects.

- Action. Conduct comprehensive assessment of truck parking needs and plan for improvement and expansion of truck parking facilities, as warranted

### 28 - INCIDENT MANAGEMENT AND EMERGENCY RESPONSE PLANS

Emergency response and incident management plans are necessary to ensure the highest level of emergency response and incident management possible during catastrophic events. These plans can help address both day-to-day and long-term connectivity and operational challenges due to extreme weather, incidents, or other catastrophic events. Planning should involve identifying the region's critical supply chains and bottlenecks so that actions are effective, such as proactive rerouting of hazardous materials.

- Action. Determine the appropriate scope of statewide and/or local emergency response plans needed; identify critical supply chains and bottlenecks and hazardous materials routes; develop emergency response plans in cooperation with partner agencies

### 29 - RAIL CROSSINGS

Rail-highway 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. Some locations will need improvements beyond active warning devices.

- Action. Continue to assess grade crossing safety and identifying solutions including improving grade crossing protection, highway/rail grade separations, crossing closures, and geometric improvements; seek alternative sources of funding to accelerate rail safety implementation

### 30 - RAIL SYSTEM VULNERABILITIES

Safety and security on the rail system is of paramount concern to Minnesota. A series of recent disasters involving unit trains of oil have occurred across North America. The Minnesota legislature passed laws to increase the safety of rail movements in the state and charged MnDOT with studying the risks of highway grade crossings that have significant crude-oil-by-rail activity and provided funding for improving rail grade crossings and hiring additional rail inspectors. This is a key step in a long-term strategy to develop and implement a comprehensive plan that addresses key safety vulnerabilities across Minnesota's rail network.

- Action. Develop a comprehensive plan that identifies and addresses vulnerabilities on Minnesota's rail network

# 5.0 ACTIONS AND NEXT STEPS

This chapter outlines the actions and next steps for Minnesota's public and private sector freight stakeholders—the cornerstone of which is the Minnesota Freight Action Agenda. This Plan made recommendations based on the analysis conducted and findings presented in this document. These recommendations require much work to be done in the coming years. This Plan was not developed as a resource constrained Plan, and it will be up to MnDOT and its partners to determine what, of all the necessary actions identified, can be realistically accomplished in the coming years.

## Minnesota's Freight Action Agenda

The Freight Action Agenda outlines next steps for MnDOT and the state's public and private sector freight partners, all of whom had a role in developing this Plan. From the beginning, the public-private Plan Advisory Committee that guided its development made it clear that the objective was a realistic action plan.

The Agenda delivers a set of actions needed to advance freight performance in Minnesota. Each action item listed identifies the lead agency/organization responsible and the timing of each action. It is a guide for implementation that will be regularly updated, and it serves as a tool for monitoring progress and fostering continued collaboration. Table 5.1 describes Minnesota's Freight Action Agenda, including the following components:

- ID. Thirty strategies have been identified and are represented with an ID number.
- Strategy Name. Short name of strategy.
- Description. Short description of strategy.
- Action. A variety of actions have been aligned to each strategy. These are described in more detail in Chapter 4 and identified in the table, as follows:
    - (P) Partnerships/outreach. Indicates that partnerships will be required outside of MnDOT to accomplish action.
    - (S) Study required/planning related. Indicates that a follow-up study or further planning-related activities will be required.
    - (D) Design. Indicates that action requires design modification of adjustment of design standards.
    - (O) Operations. Indicates that action relates to operational modifications.
    - (F) Funding. Indicates that action relates to funding whether review, allocation or advocacy for funding by MnDOT.
- Lead Agency. Entity to take the lead in actions identified.
- Partners. Partners with varying levels of involvement in the action.
- Timeframe. Generally the actions should be initiated (not necessarily completed) within the following timeframes:
    - Short-Term. 2016-2017 (0-2 years)
    - Mid-Term. 2018-2020 (3-5 years)

## The Role of the Minnesota Freight Advisory Committee (MFAC)

Partnerships were key to developing this Plan, and they will also be key to implementing and maintaining it. This Plan and the Freight Action Agenda are not intended to be static documents, but rather modified as stakeholder needs change. As such, continuous outreach and communication with public and private sector freight stakeholders will be critical to Plan implementation.

Leading the charge will be the MFAC, the nation's first state DOT Freight Advisory Committee. MFAC was created in 1998 to provide a forum for the exchange of ideas and addressing of issues between MnDOT and the private sector to develop and promote a safe, reliable, and efficient freight transportation system. MFAC, repurposed in the course of this Plan's development, will:

*Monitor and report on the implementation of the Statewide Freight System Plan and its Freight Action Agenda, including the development of recommendations for any revisions and updates to the Plan.*

As the Plan or the Freight Action Agenda are updated (e.g., adjustments to the implementation timeframe), the MFAC will work with MnDOT to ensure that the documents are revisited and modifications are made on a regular and timely basis. Several other recommendations of the MFAC Ad Hoc Working Group are also key to implementation of this Plan. These recommendations include:

- Create an Annual Report for the MnDOT Commissioner that includes a "State of Freight," an overview of trends and important issues, and reports on the activities of the MFAC from the past year
- Review significant MnDOT initiatives and activities and provide freight impact and benefits comments
- Direct the preparation and distribution of white papers on freight transportation issues important to Minnesota's economy
- Advocate for needs of freight transportation to the public, elected officials, and other public agencies and organizations
- Suggest research initiatives and tools supporting the economic vitality of the state

With MFAC's oversight, this Plan positions the state to better integrate freight within MnDOT and prepares the agency and its public and private sector freight partners for the future, including opportunities to plan better and capture freight project funding collaboratively.

Table 5.1 Minnesota Freight Action Agenda

| ID | FREIGHT PLAN OBJECTIVE | STRATEGY | DESCRIPTION | ACTION(S) | LEAD | PARTNER | TIMEFRAME |
|---|---|---|---|---|---|---|---|
| 1 | Accountability, Transparency, and Communication | Education | Educate the public on the critical role freight plays in the economy and every-day-life of Minnesotans | P | MnDOT | Public and private sector freight stakeholders | Short-term |
| 2 | Accountability, Transparency, and Communication | Partnerships | Engage and partner with Minnesota's public agencies and with producers, shippers/receivers, carriers and other private sector freight stakeholders to address Minnesota's freight issues together. Engage and partner with neighboring states to address regional freight issues together. | P | MnDOT | | Short-term |
| 3 | Accountability, Transparency, and Communication | Ongoing Freight Forum | Convene an ongoing dialogue between public and private sector freight stakeholders to keep freight topics front and center | P, S | MnDOT | CTS and members of the MFAC | Short-term |
| 4 | Accountability, Transparency, and Communication | Advocacy | Public and private freight stakeholders advocate together for advancing critical freight partnerships, strategies, investments, and continued funding for freight investments. The FAST Act established the first dedicated source of funding for freight infrastructure at the national level. | P, S, F | MnDOT | Public and private sector freight stakeholders | Short-term |

| ID | FREIGHT PLAN OBJECTIVE | STRATEGY | DESCRIPTION | ACTION(S) | LEAD | PARTNER | TIMEFRAME |
|---|---|---|---|---|---|---|---|
| 5 | Accountability, Transparency, and Communication | Traveler Information | Provide freight-specific traveler information, such as truck parking availability, expected travel time, and roadway conditions | P, S, O | MnDOT | Public and private sector freight stakeholders | Short-term |
| 6 | Accountability, Transparency, and Communication | Workforce Development | Programs in cooperation with community colleges and private sector to ensure workforce is available for industry needs (e.g., truck drivers) | P | DEED, Minnesota Trucking Association | Public and private sector freight stakeholders, community colleges and other educational institutions | Short-term |
| 7 | Transportation in Context | Corridor Preservation | Actively manage preserved rail corridors held in the State Rail Bank and evaluate for possible future transportation uses | P, S | MnDOT | State, regional, and local planning agencies | Short-term |
| 8 | Transportation in Context | Truck Routes | Coordination of truck routes/planning in industrial and urban areas with restrictions and enforcement in adjacent residential areas | P, S, D, O | Various state, regional, and local planning agencies | MnDOT | Mid-term |
| 9 | Transportation in Context | Complete Streets | Treatments that consider truck movements as part of total vehicle traffic, which can include time-of-day delivery windows to reduce conflicts with other street users, design guidelines for curb pullouts that can be used at different times for bus pullouts, truck parking, and others | P, S, D, O | Various state, regional, and local planning agencies | MnDOT | Mid-term |

| ID | FREIGHT PLAN OBJECTIVE | STRATEGY | DESCRIPTION | ACTION(S) | LEAD | PARTNER | TIMEFRAME |
|---|---|---|---|---|---|---|---|
| 10 | Transportation in Context | Land Use Planning and Policies | Land use planning and policies to ensure freight development areas are designated and preserved and that development occurs adjacent to existing infrastructure | P, S | Various state, regional, and local planning agencies | MnDOT, DEED | Mid-term |
| 11 | Transportation in Context | Freight As A Good Neighbor | Programs and projects that preserve Minnesota's high quality of life by balancing the local negative impacts of freight transportation with the national benefits provided | P, S, D, O | MnDOT | Various state, regional, and local planning agencies, freight shippers and carriers | Mid-term |
| 12 | Transportation in Context | Advanced Technology | Monitor development of advanced technologies and their applications for freight. Apply and fund as appropriate. | P, S, O | MnDOT | FHWA | Mid-term |
| 13 | Critical Connections | Integrate Freight into all Planning Projects | Consider freight in overall project planning across modes (highway, rail, water, and air). Regularly engage the private sector and consider their perspectives during freight system planning. | P, S | MnDOT | State, regional, and local planning agencies | Short-term |
| 14 | Critical Connections | Investments on the Principal Freight Network | Apply multimodal solutions that ensure a high return on investment, given constrained resources, and that complement the unique social, natural, and economic features of Minnesota | P, S, D, O | MnDOT | Public and private sector freight stakeholders | Short-term |

| ID | FREIGHT PLAN OBJECTIVE | STRATEGY | DESCRIPTION | ACTION(S) | LEAD | PARTNER | TIMEFRAME |
|---|---|---|---|---|---|---|---|
| 15 | Critical Connections | First-/Last-mile Connections | Freight connections like highway access and rail spurs to local businesses | P, S | MnDOT | Various state, regional, and local planning and economic development agencies | Short-term |
| 16 | Critical Connections | Targeted Freight System Investments | Make targeted infrastructure investments (corridor and spot improvements) to support and enhance the multimodal freight system | P, F | MnDOT, public and private sector freight system owners and operators | | Short-term |
| 17 | Critical Connections | Intermodal and Multimodal Facilities | Intermodal and multimodal facility development to allow goods to shift between modes such as truck, rail, and water. Includes making equipment available. | P, S | MnDOT | DEED, railroads in Minnesota, regional and local planning and economic development agencies where a new facility may be cited | Mid-term |
| 18 | Critical Connections | Urban Goods Movement Programs | Projects and programs in urban centers focused on mitigating congestion caused by rush hour traffic, incidents, work zones, or other factors where high volumes of freight and passenger traffic must coexist | P, S, D, O | MnDOT, various state, regional, and local planning agencies | | Mid-term |

| ID | FREIGHT PLAN OBJECTIVE | STRATEGY | DESCRIPTION | ACTION(S) | LEAD | PARTNER | TIMEFRAME |
|---|---|---|---|---|---|---|---|
| 19 | Critical Connections | Truck Size and Weight | Improved routing for overdimensional and overweight vehicles. Consistency of regulations between Minnesota and neighboring states. | P, S, O | MnDOT, state and local departments of public safety and enforcement | Local permitting agencies | Mid-term |
| 20 | Critical Connections | Modal Options/ System Redundancy | Modal alternatives (e.g., truck, rail, and water) in spot locations and modal redundancy within key corridors so companies have access to a variety of cost effective and competitive freight modes to ship their goods. Address captive shipper issue. | P, S | MnDOT | Public and private freight system stakeholders | Mid-term |
| 21 | Critical Connections | Evaluate and Restructure Existing Freight Funding Programs | MnDOT's programs should be restructured to more adequately address freight needs | P, S, F | MnDOT | Public and private freight stakeholders that receive funds from MnDOT administered funding programs | Mid-term |
| 22 | Asset Management | Freight Data | Improved data collection (e.g., truck counts) and use of innovative sources to help the public sector do better freight planning | P, S | MnDOT | | Short-term |

| ID | FREIGHT PLAN OBJECTIVE | STRATEGY | DESCRIPTION | ACTION(S) | LEAD | PARTNER | TIMEFRAME |
|---|---|---|---|---|---|---|---|
| 23 | Asset Management | Freight System Performance Measures | Utilize freight system performance measures to monitor and report system condition and identify investment needs for key transportation infrastructure | S, O | MnDOT | | Short-term |
| 24 | Asset Management | Freight System Investment Plan | Develop a detailed FAST Act compliant prioritized investment plan that aligns multimodal freight system projects and available sources of funding so they can be implemented | P, S, F | MnDOT | Public and private freight system stakeholders, system owners and operators | Short-term |
| 25 | Asset Management | Prioritize Maintenance on the Principal Freight Network | Prioritize bridge/pavement maintenance on these shared routes to ensure ability to handle freight rail, truck, and passenger traffic | O | MnDOT | | Short-term |
| 26 | Traveler Safety and System Security | Design for Freight Safety | Design and implement geometric features that improve vehicle safety, such as the use of rumble strips/stripes, wider shoulders, and other features, where appropriate | D | MnDOT | | Short-term |
| 27 | Traveler Safety and System Security | Truck Parking | Conduct assessment of truck parking and plan for expansion, as warranted | P, S, O | MnDOT | Public and private sector freight stakeholders, neighboring states | Short-term |
| 28 | Traveler Safety and System Security | Incident Management and Emergency Response Plans | Develop emergency plans to ensure critical supply chain connectivity and proactively route hazardous materials | P, S | Minnesota Office of Public Safety | MnDOT, public and private sector freight stakeholders | Short-term |

| ID | FREIGHT PLAN OBJECTIVE | STRATEGY | DESCRIPTION | ACTION(S) | LEAD | PARTNER | TIMEFRAME |
|---|---|---|---|---|---|---|---|
| 29 | Traveler Safety and System Security | Rail Crossings | Assess grade crossing safety and implement policies, programs, and investments related to safety of at-grade crossings and seek funding for implementation | P, S, F | MnDOT | Public and private sector rail stakeholders | Short-term |
| 30 | Traveler Safety and System Security | Rail System Vulnerabilities | Develop and implement a comprehensive plan that addresses key safety vulnerabilities across Minnesota's rail network | P, S, O | MnDOT | Public and private sector freight stakeholders, Minnesota Department of Public Safety | Short-term |