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District 1 Freight Plan

Working Paper 2: Freight System Profile – Economy, Inventory, Demand and Performance

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Solutions for growing economies

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District 1 Freight Plan

The objective of the District 1 Freight Plan (Plan) is to provide a clear understanding of the multimodal freight system, how local industries use the system and their needs and issues, so MnDOT's policy and programming decisions can be better informed in the District.

Working Paper

This Working Paper is the second in a series of five that together inform the Plan. This Working Paper provides an overview of freight-related studies that have been conducted in the past, District 1's economic and industrial profile, identification of its infrastructure including key assets and corridors, and the condition and performance of those key assets and corridors.

Acknowledgments

The CPCS Team acknowledges and is thankful for the input of those consulted in the development of this Working Paper, as well as the guidance and input of representatives from MnDOT and their study partners.

Opinions

Unless otherwise indicated, the opinions herein are those of the authors and do not necessarily reflect the views of MnDOT.

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Cover image source: CPCS

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Acronyms and Abbreviations

AADT	Annual Average Daily Traffic
ARDC	Arrowhead Regional Development Commission
BJI	Bemidji Regional Airport
BNSF	Burlington Northern Santa Fe
BRD	Brainerd Lakes Regional Airport
CEDS	Comprehensive Economic Development Strategy
CN	Canadian National
CP	Canadian Pacific
CRSP	County Road Safety Plan
CTRR	Cloquet Terminal Railroad
CRFC	Critical Rural Freight Corridor
CUFC	Critical Urban Freight Corridor
DLH	Duluth International Airport
DOT	Department of Transportation
DSMIC	Duluth-Superior Metropolitan Interstate Council
EAS	Essential Air Service
EDA	Economic Development Administration
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
GDP	Gross Domestic Product
GIS	Geographic Information System
GRP	Gross Regional Product
GPS	Global Positioning System
HCAADT	Heavy Commercial Annual Average Daily Traffic
HIB	Range Regional Airport
HGL	Hydrocarbon Gas Liquid

LQ	Location Quotient
INL	Falls International Airport
IRRRB	Iron Range Resources and Rehabilitation Board
MN	Minnesota
MnDOT	Minnesota Department of Transportation
MSP	Minneapolis-St. Paul International Airport
NAICS	North American Industry Classification System
ND	Not Disclosable
NMCZ	Northshore Mining
NSSR	North Shore Scenic Railroad
ORD	O'Hare International Airport
OSOW	Oversize Overweight
PHFS	Primary Highway Freight System
RST	Rochester International Airport
SCXY	St. Croix Valley
TTI	Travel Time Index
TTR	Travel Time Reliability
UP	Union Pacific
UPS	United Parcel Service
US	United States
USACE	United States Army Corps of Engineers
USDOT	United States Department of Transportation
UW-S	University of Wisconsin Superior
WI	Wisconsin

Executive Summary

Minnesota Department of Transportation (MnDOT) District 1 holds nearly one-quarter of Minnesota's land area and is made up of eight counties: Aitkin, Carlton, Cook, Itasca, Koochiching, Lake, Pine, and St. Louis. The District 1 Freight Plan will provide MnDOT with a clear understanding of the multimodal freight system, how local industries use the system and their needs and issues, so MnDOT's policy and programming decisions can be better informed in the District.

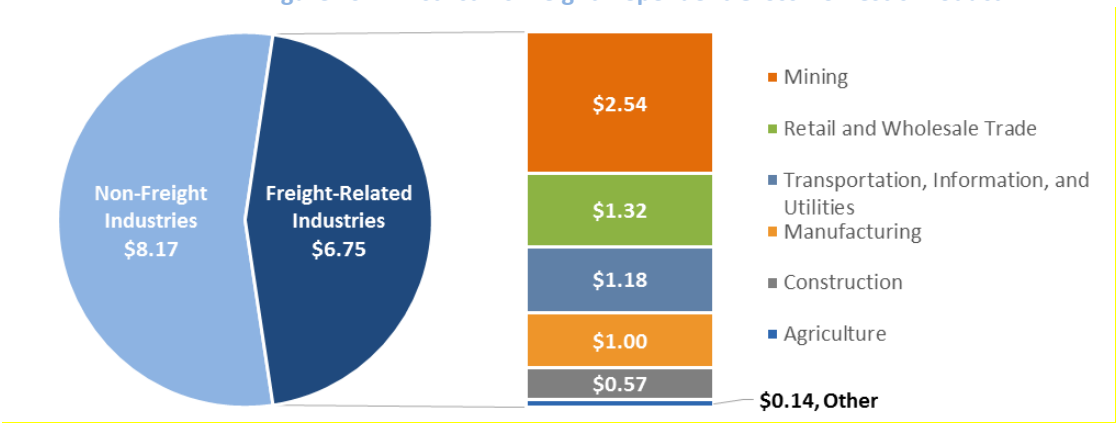
The District 1 Freight Plan will provide MnDOT with information and guidance so MnDOT's policy and programming decisions can be better informed.

This Freight Plan is important for two key reasons. First, it will provide an up-to-date assessment of freight needs and issues specific to District 1, and second, it will produce a list of strategies and projects to improve freight mobility in the District. The Minnesota Statewide Freight System and Investment Plan (State Freight Plan) provides a framework for District 1 freight planning activities; the findings and recommendations of the District 1 Freight Plan will be linked to this overarching state-level guidance.

District 1 Economic Context

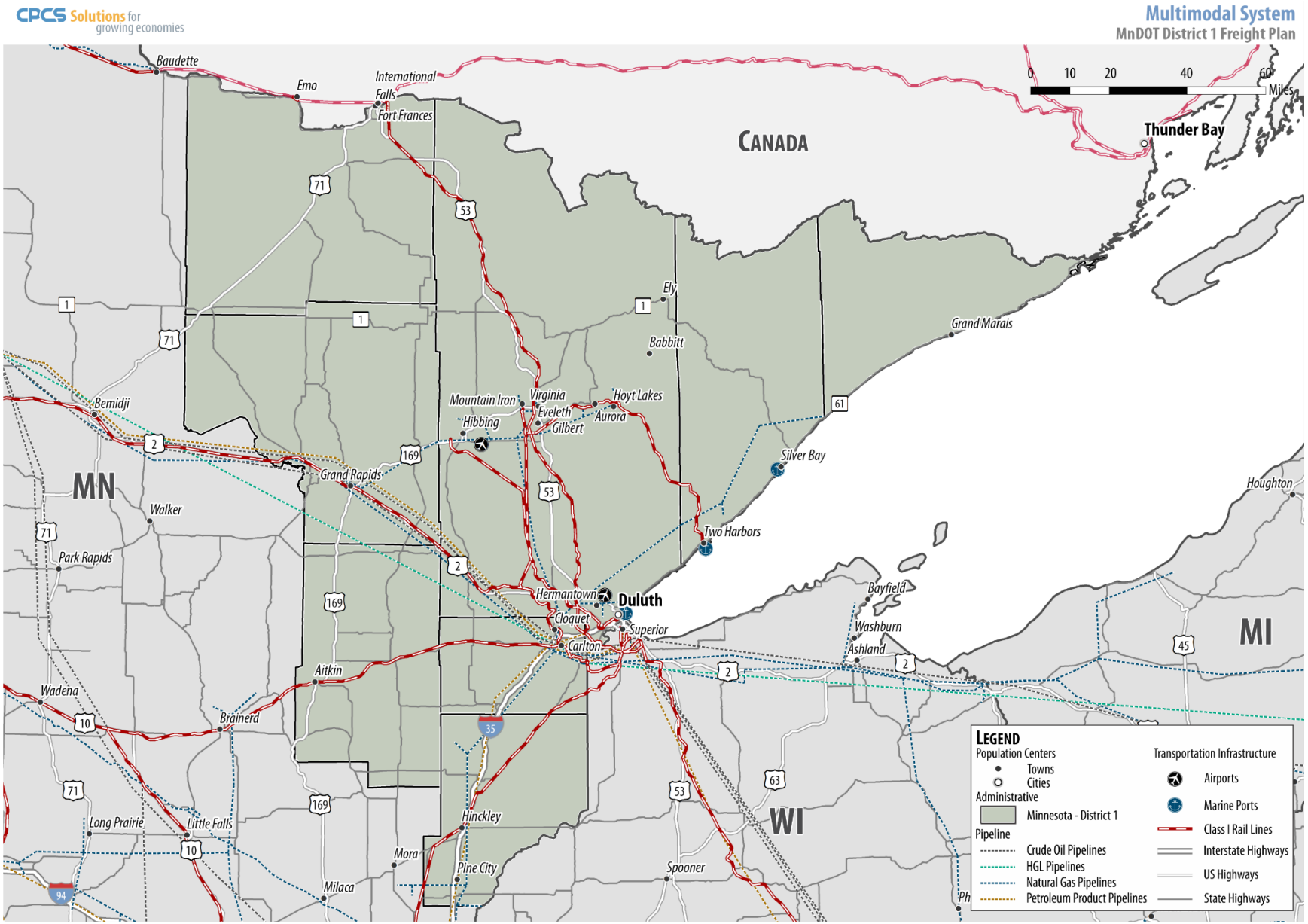
Freight-dependent businesses that rely on the transportation of physical goods to support their operations comprise about 29 percent of District 1's employment and 45 percent of the District's Gross Domestic Product. In particular, mining, manufacturing, and forestry stand out as important freight-dependent industries in the District. An aging population and shrinking workforce are potential economic challenges that could affect the District's transportation system and freight-dependent industry in the future, as skilled and semi-skilled employees may be difficult to find.

Figure ES-1: District 1's Freight-Dependent Gross Domestic Product



Source: University of Minnesota Duluth, IMPLAN 2014 Data Reported in 2016 Dollars

Figure ES-2: District 1's Multimodal Freight System



Source: CPCS Analysis of National Transportation Atlas Database. 2018.

District 1 Multimodal Freight System

Generally, District 1's freight transportation systems are aligned for the movement of bulk goods on Lake Superior and freight activities around Duluth-Superior metro area. Figure ES-2 highlights District 1's multimodal freight system assets. As only one interstate highway (I-35) serves the District, trucking operations are highly reliant on the trunk highway to move goods. The District is served by four Class I railroads operating on more than 860 miles of tracks that provide inter-district, inter-state, and cross-border connections. Waterborne freight in the District is served by three ports on Lake Superior and consists primarily of iron ore, grain, coal, and other bulk goods. In addition, there are three commercial airports in the District that provide air cargo service, and pipelines carrying a variety of petroleum products. Thanks to its unique connections, District 1, and Duluth-Superior in particular, serve as a crucial regional freight hub.

District 1 is a freight hub for northern Minnesota, Wisconsin, the Upper Peninsula, and parts of Ontario.

District 1 Freight System Condition and Performance

District 1's freight system performance is mixed. While District 1 does not suffer from traffic congestion problems like larger metropolitan areas, road safety and truck collisions are a concern. In particular, the District had the third highest severe crash count of all MnDOT districts between 2009 and 2013, and 73 percent of the district's total traffic incidents between 2009 and 2013 were truck-involved. While most of these truck-involved incidents resulted in property damage only or minor injuries, it is clear that safety improvements can be made. On a more positive note, grade crossing safety and incident rates in the District compare favorably to Minnesota as a whole.

The condition of the network is also mixed: District 1 lags behind the rest of Minnesota in terms of bridge age and sufficiency, but bridges on the District's core freight network of interstates and trunk highways are better-maintained than county, township, or other local bridges.

Highway safety and bridge condition are two potential areas for improvement for District 1's freight system.

Next Steps

This Working Paper provides a baseline for all future phases of the District 1 Freight Plan. The data analysis presented in this Working Paper will be complemented by insights from stakeholder consultations and a review of previous plans and studies, and will inform a comprehensive assessment of District 1's freight system needs, issues, and opportunities in the next Plan deliverable.

1 Freight Planning Context

Key Findings

The District 1 Freight Plan will provide MnDOT with a clear understanding of the multimodal freight system, how local industries use the system and their needs and issues, so MnDOT's policy and programming decisions can be better informed in the District. In order to provide this understanding, a review of previous literature on District 1's freight operations, needs, and issues was conducted. The results of this review were used to guide discussions during an updated set of stakeholder consultations, and inform the discussion of economy, freight modes, and system performance in Working Paper 2.

Some key findings from the review include: the transportation system is a foundational asset for the region's economy, complications are common with heavy truck operations on the District's two-lane roads, and firms outside of Duluth have concerns about access to and quality of rail service.

1.1 Introduction

Minnesota Department of Transportation's (MnDOT) District 1 covers almost one-quarter of Minnesota's land area and includes eight counties: Aitkin, Carlton, Cook, Itasca, Koochiching, Lake, Pine, and St. Louis.[1] The region owes its historical development and continued economic well-being to a multimodal freight transportation system that supports the safe and efficient movement of bulk freight products such as iron ore, timber, and manufactured goods such as metal and paper products. This system includes interstate, state, and local highways, as well as major railway lines, multiple pipelines, two commercial service airports, and three ports.

In order for MnDOT and its partners to provide a transportation system that attracts new businesses while enabling existing ones to maintain and grow their presence in the region, it is essential that MnDOT and its local partners have access to recent, relevant, and easily-updated data and tools that provide insights into the Districts' key industries.

The District 1 Freight Plan will provide MnDOT with a clear understanding of the multimodal freight system, how local industries use the system and their needs and issues, so

[1] Aitkin, Itasca, and Koochiching counties are divided between Districts 1 and 3. Some data sources used cannot be broken down on a District level, so for the purpose of analysis and mapping, this Working Paper uses the full area of these counties.

MnDOT's policy and programming decisions can be better informed in the District.

In addition to informing planning, investment and operations at the District level, findings from the District 1 Freight Plan will help MnDOT create the next iteration of the State Freight Plan.

Why does the District 1 Freight Plan Matter?

The District 1 Freight Plan is important to the region's public and private freight stakeholders for two main reasons:

- **The District 1 Freight Plan will provide an up-to-date assessment of freight needs and issues specific to District 1.** The freight plan most relevant to the District, the Northern Minnesota / Northwestern Wisconsin Regional Freight Plan was completed nearly 10 years ago, and no major District 1-specific plans have been completed since. MnDOT has completed a recent qualitative assessment of freight needs and issues in the District, with the 2017 Manufacturers' Perspective on Minnesota's Transportation System – District 1 report. However, there are gaps in understanding: neither the Manufacturers' Perspectives report nor the Minnesota Statewide Freight System Plan provide a quantitative evaluation of needs and issues centered on District 1. The District 1 Freight Plan will fuse the insight from previous plans and studies along with newly-conducted consultations and data analyses to produce a comprehensive and up-to-date assessment for the region.
- **The District 1 Freight Plan will produce a list of strategies to improve freight mobility in the District.** Once freight needs, issues, opportunities, and challenges are identified, the District 1 Freight Plan will identify a set of specific strategies to address District needs and issues which could include projects, policies, or other supporting actions. This work will include a feasibility assessment and pre-scoping exercise for select top projects. In turn, these evaluated projects may be eligible for further funding through MnDOT or other sources.

The ultimate outcome of this plan will be an improved ability for MnDOT and its local partners to make informed policy and investment decisions for District 1 in line with MnDOT's vision, goals, and objectives.

1.2 Vision, Goals, and Objectives for the Freight System

Some of MnDOT's previous plans and studies are being used to provide guidance for the development of the District 1 Freight Plan. In particular, the Minnesota Statewide Freight System and Investment Plan (State Freight Plan) provides a guiding framework for evaluating needs and issues and making recommendations. The statewide freight vision (policy) and goals are being applied at the District level to ensure that the District assessment is in sync with statewide guidance. Figure 1-1 shows the process being used to develop the District 1 Freight Plan, and this

process will ensure District 1 freight recommendations are linked to overarching state-level guidance.

Figure 1-1: "Connecting the Dots" between Statewide Guidance and District 1 Freight Plan Recommendations

The State Freight Plan statewide freight vision is to:

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.

The State Freight Plan also identified five goals to reflect those aspects of the multimodal freight system that are most important to the public and private sector freight stakeholders in the state. These goal areas remain the focus for the District 1 Freight Plan:

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

To support these goals, the statewide plan identified three key areas, and proposed measures, for monitoring the condition and performance of the freight system.

- **Safety.** These measures are aimed at improving the safety, security, and resilience of the freight system.
- **Mobility.** These measures are aimed at assessing transportation system delay, congestion, and reliability for freight users.
- **Infrastructure Condition.** These measures are aimed at assessing the suitability of the transportation system for handling freight.

1.3 Previous Findings and Recommendations

In addition to providing guidance for planning processes, previous plans and studies have been reviewed to collect qualitative and quantitative information specific or relevant to District 1. Information from these plans and studies are being used to inform the District 1 Freight Plan's

assessment of needs and issues and to identify how freight needs and issues in the District have (or have not) changed over time. Figure 1-2 shows the full breadth of plans and studies reviewed. Documents considered to be particularly relevant to District 1 are noted in bold. A more detailed profile of each plan or study is provided in **Appendix A**. In addition to these reviews, the project team conducted consultations with transportation system stakeholders, and a list of organizations consulted is provided in **Appendix B**.

Figure 1-2: Previous Plans and Studies Relevant to the D1 Freight System

Agency	Year	Plan or Study Name
MnDOT	2018	Statewide Freight System and Investment Plan
MnDOT	2017	State Highway Investment Plan, 2018-2037
MnDOT	2017	State Transportation Improvement Plan, 2018-2021
MnDOT	**2017**	**Manufacturer's Perspectives on Minnesota's Transportation System, District 1**
ARDC	**2017**	**Northeast Minnesota Comprehensive Economic Development Strategy**
MnDOT	2016	Annual Minnesota Transportation Performance Report
DSMIC	**2016**	**Duluth-Superior Port Land Use Plan**
MnDOT	2016	Evaluation Criteria for the Minnesota Highway Freight Program
UW-S	**2015**	**Duluth Airport Authority Air Cargo Study**
MnDOT	2015	Statewide Rail Plan
U of M	2015	Exploratory Study of Competitive Industry Clusters and Transportation in Minnesota
MnDOT	2014	Minnesota Statewide Ports & Waterways Plan
DSMIC	**2014**	**Connections 2040 Long-Range Transportation Plan**
DSMIC	**2009**	**Northern Minnesota / Northwestern Wisconsin Regional Freight Plan**

These plans and studies have a number of common findings and recommendations, which can be grouped into three primary categories or "lenses" through which freight needs and issues can be examined. These three categories are:

Transportation. The characteristics of the transportation system (assets, condition, quality of service, etc.) are important because the safe, reliable, and affordable movement of freight supports the day-to-day activities of businesses that produce, distribute, or sell goods. Furthermore, cost and availability of transportation options will influence how firms choose to ship their goods.

Economy. The economic characteristics of a region (including demographics and natural resources) will influence what types of businesses are likely to operate in a region. In turn, the characteristics of these firms will also influence what types of transportation services they choose.

Land Use and Development influences the specific location of business establishments. The location of business establishments on a network will influence freight-related transportation patterns. At the same time, land use and development may be affected by the regional economy, and freight may be "priced out" of some areas by relatively higher land values.

1.3.1 Transportation – Prior Findings and Recommendations

Many of District 1's regional stakeholders already have a firm understanding of the importance of the transportation system for freight. For example, the Arrowhead Regional Development Commission's (ARDC) 2017-2022 Comprehensive Economic Development Strategy (CEDS) notes that transportation infrastructure is a foundational asset for the District. However, the transportation system's importance as a key asset also means that the persistent need to maintain the system is a key threat to the region's well-being. This theme of transportation infrastructure as a key asset and sometimes liability can be found in many of the plans and strategies reviewed for the District 1 Freight Plan. A summary of major and common findings and recommendations is presented below, organized by mode. Findings and recommendations are also grouped into general categories of **Operations, System Condition,** and **Policy.**

District 1's transportation infrastructure is a foundational asset for the region's economy.

Road Network

In general, the greatest number of issues and findings relevant to the region were related to the road network. This relatively higher number of insights for roads compared to railroads and ports reflects the fact that roads are Minnesota's most heavily-used mode for freight, and the fact that MnDOT has the most influence over highway investment. By comparison, MnDOT and local road authorities have limited influence over railroad and port operations. Findings about issues at specific locations are discussed later in the **District 1 Multimodal Freight System** section of this Working Paper, and in Working Paper 3 – Needs, Issues, and Opportunities.

Operations

- **Finding:** Rough terrain such as hills, rivers, and swamps creates challenges for roadway design, and bottlenecks for traffic, such as hills without climbing lanes, and 2-lane roads without passing lanes. These bottleneck problems can be exacerbated by the relatively slower movement of trucks.
- **Finding:** At transportation bottlenecks, and in general across the system, there is potential for freight conflicts and congestion with the large volume of tourist traffic that is also present in the District.
- **Finding:** Some areas of the transportation system need improved geometry to accommodate the movement of trucks, especially for OSOW loads.
- **Recommendation:** Incorporate truck and OSOW-related needs into designs for new infrastructure, such as roundabouts.
- **Recommendation:** Identify, create, or designate super-heavy OSOW corridors, particularly for cargo traveling to or from the Port of Duluth.
- **Recommendation:** Implement specific roadway improvements:
    - Stoplights at busy intersections.

- Warning lights for approaches to stoplights and intersections.
- Paved and/or wider shoulders.
- Bypass, passing, and acceleration lanes to allow traffic to pass slower moving trucks, and reduce bottlenecks.

Complications with heavy truck operations such as passing, turning, and accelerating on two-lane roads were commonly-mentioned as problems in the District.

System Condition

- **Finding:** The condition of the District's freight system will be more difficult to maintain in the future, as revenue will grow more slowly than increases in maintenance costs.
- **Finding:** Poor condition of some road segments is damaging vehicles and cargo.
- **Recommendation:** Management of the road network should focus on maintaining good condition of existing assets, rather than expanding capacity of the system.

Policy

- **Finding:** Minnesota's truck weight policies differ from Wisconsin, Ontario, and Michigan, and these policy differences can lead to inefficient truck trips. For example, trucks in Ontario and Wisconsin may be allowed to carry heavier loads than in Minnesota. If trips must travel into Minnesota, trucks will be forced to carry less than their full capacity.
- **Finding:** Freight-dependent businesses requested better or clearer communication about road closures so that they adequately plan their truck operations to avoid delays in deliveries and shipments.
- **Recommendation:** Harmonize Minnesota's truck weight policies to more closely match Ontario and Wisconsin's policies.

What Prior Findings and Recommendations Mean to the District 1 Freight Plan

Road Network

Based on these findings and guidance from MnDOT planning staff, this Working Paper provides an analysis of the District's truck speeds and congestion, and an analysis of potential barriers to overweight freight – including weight limits, bridge conditions, and bridge clearances. In turn, these analyses and stakeholder feedback will be used to inform trucking-related discussions Working Paper 3 – Needs, Issues and Opportunities. A condition assessment for the District's road surfaces is not included, as MnDOT staff indicated that pavement improvements are already addressed in existing funding programs.

Railroad Network

Previous studies related to District 1's railroads resulted in the identification of multiple problems, but relatively few recommendations. This imbalance between findings and recommendations reflects the fact that railroads are privately owned and operated and thus

public agencies have relatively little influence over operational or infrastructure changes or improvements. Overall, the presence of multiple railroads in the region, particularly around Duluth is seen as a competitive advantage by local firms and economic development officials. However the quality of rail service can vary over time, especially in areas outside of Duluth, and this fluctuation in service quality represents a threat to the District's rail-reliant businesses.

The quality and availability of rail service in District 1 has been a frequent concern, particularly outside of the Duluth area.

Operations

Common findings for the rail network focused heavily on problems related to operations, such as rail access and service, and the need for an intermodal container facility. Rail recommendations were more generalized than road- and trucking-related recommendations.

- **Finding:** Access to rail service was seen as desirable thanks to its higher capacity to handle heavy or bulky loads, including loads that would be considered oversize or overweight on the road network.
- **Finding:** The operation of four Class I railroads in the District is seen as a competitive advantage because the presence of multiple railroads creates competitive pressure to keep rail rates relatively low.
- **Finding:** Rail service quality is a major concern, as declines in the reliability or availability of rail service threaten the competitiveness of firms and force freight onto the road network. For example, the University of Minnesota's economic cluster report noted that rail lead times for certain trade lanes had doubled over the past 25 years. The District's firms have had problems with rail service in the past, particularly during the North Dakota oil boom. During that period, rail service times for some industries in the District doubled, and a shortage of locomotives forced iron producers to move some ore by truck, rather than rail.
- **Finding:** Multiple studies made specific mention of the need for a rail-truck intermodal container facility in or near the District, as intermodal service in the Twin Cities was too far away to be an option for some firms. Creation of an intermodal facility was seen as a potential solution to increasing rail service times and unreliable service because loads could be aggregated at one central point, making service easier and cheaper for railroads.
- **Finding:** Grade crossing safety is a general concern, although it is not unique to District 1, and District 1's grade crossing incident is relatively low compared to the rest of Minnesota.
- **Recommendation:** Explore the potential to expand rail service in more areas outside of Duluth-Superior
- **Recommendation:** Establish an intermodal facility in the District – this recommendation has been fulfilled by the Duluth Cargo Connect service.

What Prior Findings and Recommendations Mean to the District 1 Freight Plan

Railroad Network

Based on the findings above, this Working Paper includes an assessment of grade crossing accidents and risk factors and a description of current service and market effects of the new Duluth Intermodal Terminal. Additionally, the project team included questions about rail access and rail service quality during the consultations with local freight stakeholders. Rail-relevant insights are included in this Working Paper. Together, these insights and the quantitative assessment of rail service will inform rail-relevant portions of Working Paper 3 – Needs, Issues and Opportunities.

Ports and Waterway Network

Issues and recommendations for the ports and waterway network were limited, mostly specific to Duluth-Superior, and generally less-relevant to the remainder of District 1. Recommendations were similarly limited in scope.

Operations

- **Finding:** Water transportation is particularly important for bulk commodities in the region, especially iron ore.
- **Finding:** Waterborne tonnage in the District, and across the Great Lakes has been declining.

System Condition

- **Finding:** A dredging backlog for the US Army Corps of Engineers is a threat to the performance of the maritime system.
- **Recommendation:** Lobby the federal government to reduce the dredging backlog.

Policy

- **Finding:** There is a need to preserve port land in Duluth for maritime uses.
- **Recommendation:** Continue port land use planning efforts and engagement with the Duluth-Superior Harbor Technical Advisory Committee.

What Prior Findings and Recommendations Mean to the District 1 Freight Plan

Ports and Waterway Network

Based on previous findings about the importance of the maritime system, this Working Paper provides a profile of the major port assets in the District, as well as key maritime commodities. This maritime profile will inform if and how consideration of the dredging backlog and need to preserve port land are incorporated into Working Paper 3 – Needs, Issues and Opportunities.

1.3.2 Economy – Prior Findings and Recommendations

Relative to transportation, economic findings and recommendations were more generalized. The most relevant economic findings came from the Arrowhead Regional Development Commission and the University of Minnesota's cluster analysis. Of note:

- **Finding:** Transportation assets were identified as a "foundational strength" of the region's economy, but reports also noted that a lack of maintenance represented a "foundational threat."
- **Finding:** The ARDC's CEDS indicates that freight-related industries make up nearly half of the region's Gross Domestic Product, but employment in freight-related industries makes up a smaller proportion of the workforce. This is discussed in **Chapter 2 – District 1 Regional Economy**.
- **Finding:** Manufacturing's importance for District 1's employment and GRP has declined since the 1990s.
- **Finding:** Access to the St. Lawrence Seaway is an economic development asset.
- **Finding:** Ballast water regulations are a potential threat to the economic competitiveness of water-related industries because of the complex, uncertain regulations and requirements to treat ballast water.
- **Recommendation:** Market the region's competitive location and assets: attract new business by emphasizing the presence of four Class I railroads and access to St. Lawrence Seaway as major competitive assets.
- **Recommendation:** Emphasize and encourage the development of key freight facilities, such as an intermodal terminal.
- **Recommendation:** Local governments should advocate for the development of stable transportation funding policies and sources.
- **Recommendation:** State government should offer assistance to local governments with long-range transportation planning, which could benefit the movement of freight.

What Prior Findings and Recommendations Mean to the District 1 Freight Plan

Economy

Based on findings related to the District's economy, this Working Paper includes a new analysis of freight-reliant industries in the District, and this information is used to provide context for the freight system inventory and performance assessment. It will also provide context for discussions in Working Paper 3 – Needs, Issues and Opportunities.

1.3.3 Land Use and Development – Prior Findings and Recommendations

Land use issues usually arise at the local level and are usually focused on specific transportation facilities or network segments. Therefore, the topic of land use has the most limited set of findings and recommendations, as most previous plans reviewed were focused on a regional or statewide level of study. However, one specific plan, the Duluth-Superior Port Land Use Plan

specifically addresses the development of working lands on the waterfronts of Duluth and Superior. The plan found that the majority (60%) of port stakeholder respondents were directly dependent on access to a shipping channel, and 64% believed that "gentrification" of the waterfront was an obstacle to efficient maritime commerce. In general, the port land use plan recommended that waterfront industrial properties and other properties with multimodal connections be given preference for future maritime development.

What Prior Findings and Recommendations Mean to the District 1 Freight Plan

Land Use and Development

The project team conducted consultations with port stakeholders to discuss the continued issue of port land use preservation, and the results of these consults inform the maritime modal profile, and needs and issues discussions in Working Paper 3 – Needs, Issues and Opportunities.

2 District 1 Economic Context

Key Findings

District 1's economy has rebounded from the 2008 recession over the last ten years and is trending upwards in employment and income levels. However, some counties are classifies as being in "economic distress" according to the US Economic Development Administration, and continue to struggle with higher unemployment rates and lower incomes than the rest of the country.

District 1's historic development and continued economic well-being is tied to a freight transportation network that supports its robust natural resources industries in mining and forestry, along with manufactured goods associated with these industries such as metal and paper products. While some freight-related industries have declined in regional competitiveness in recent years such as construction and wholesale trade, mining, forestry, and transportation/warehousing have increased in competitiveness relative to the rest of the country.

2.1 District 1's Economy

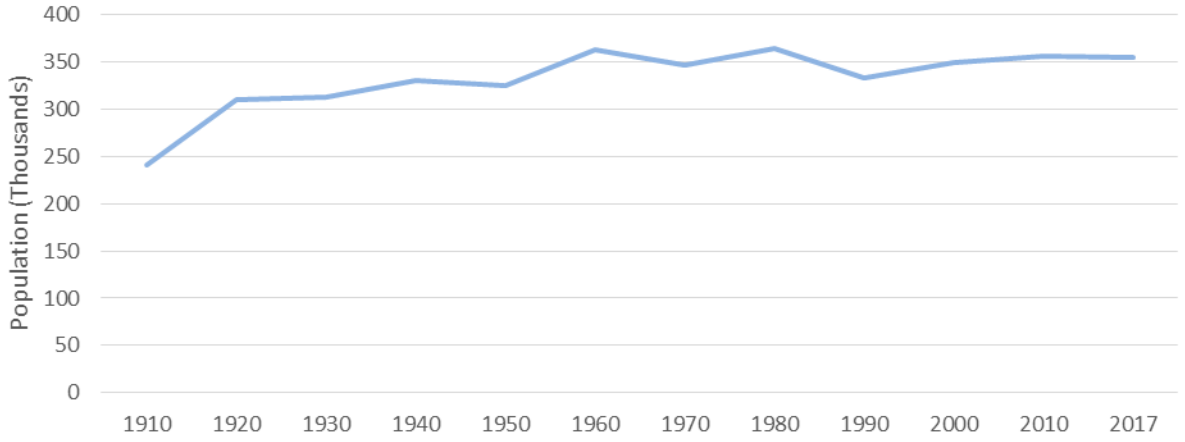
District 1 has a unique economy relative to the rest of Minnesota, thanks in part to its wealth of natural resources such as iron ore and forest products. This chapter provides a review of the social and economic characteristics of the District and then dives deeper into District 1's "freight-dependent" industries and their general transportation needs. This understanding of the economy and freight-dependent industries provides an important foundation that will inform later discussions of freight transportation needs and issues.

2.1.1 Population

Population trends influence how the District's economy and workforce may develop, and how the transportation system may be used in the future. Since 1980, D1's population has generally remained stable. In the last seven years, the population declined by 0.5%, although Carlton, Cook, and Itasca counties posted overall population increases. Compared to Minnesota as a whole, District 1 has lower population growth, which could pose challenges for businesses that require a large, skilled workforce.

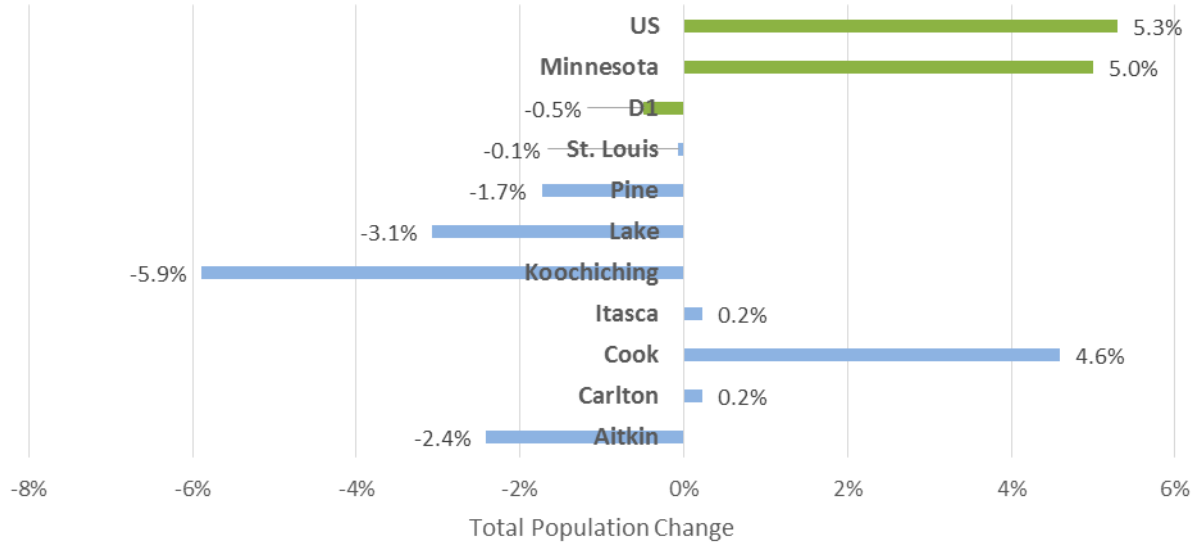
As of 2017, District 1 had a total population of 354,117 people in 204,747 households. The least populous county was Cook County, with 5,398 residents, and the most populous was St. Louis County, with 200,000 residents. D1's population peaked at 363,215 in 1980 and has trended downwards to 354,117 in 2017. This decline is due primarily to a fall in St Louis County, the largest county and home to a number of mining and manufacturing establishments. Figure 2-1 shows the District's population levels from 1910 to 2017, and Figure 2-2 illustrates county-specific population changes more recently, from 2010 to 2017.

Figure 2-1: District 1 Population Trends (1910 to 2017)



Source: CPCS Analysis of US Census Bureau Historical Population by County 1850-1990, Minnesota State Demographic Center Population Estimates by County. Note: this chart begins in 1910 as Koochiching County was founded in 1906 with no population data available prior to 1910.

Figure 2-2: Population Trends (2010 to 2017)



Source: CPCS Analysis of US Census Bureau Population Estimates for July 1, 2010-2017

2.1.2 Income and Education

Income and education are often closely connected, as an individual's level of education influences their career opportunities and earning potential. The education level of the District's population as a whole will also determine what industries can be supported by its workforce. By examining both income and education, we can develop a better understanding of the economic well-being of the District, as well as the ability of the District's workforce to support relatively higher-paid medium- and high-skill jobs. A workforce with both medium and high-skilled labor may be necessary to support some freight-relevant industries like manufacturing. This relationship between industries and freight is discussed in Section 2.4.2.

District 1's household incomes are below the US's and Minnesota's median and average, and highest educational attainment is more concentrated in the "Some college or an Associate's degree" level than the rest of the country. As a result, the labor market is suitable for middle-income jobs, many of which are concentrated in freight-relevant industries such as agriculture, forestry, fishing, mining, and manufacturing.

Household income in the District increased between 2010 and 2016. The greatest income increases occurred in Koochiching and Lake Counties. Koochiching saw the largest increase at 13.5%, roughly $5,358 between 2010 and 2015, although the county has a very small population of 12,528 estimated in 2017. Average household income for the District in 2016 was $62,885, which is lower than the average household income for the US ($77,866) and Minnesota ($83,100). On the aggregate, this income level is 19.3% lower than the national average, which is close to an "economic distress" qualification for US Economic Development Administration (EDA) Public Works or Economic Adjustment investment eligibility.[2] This criteria is met if income levels are 80% or less than the national average over a 5-year period. However, the District's median income of $49,391 is closer to the national median ($55,322) and that of Minnesota ($63,217).

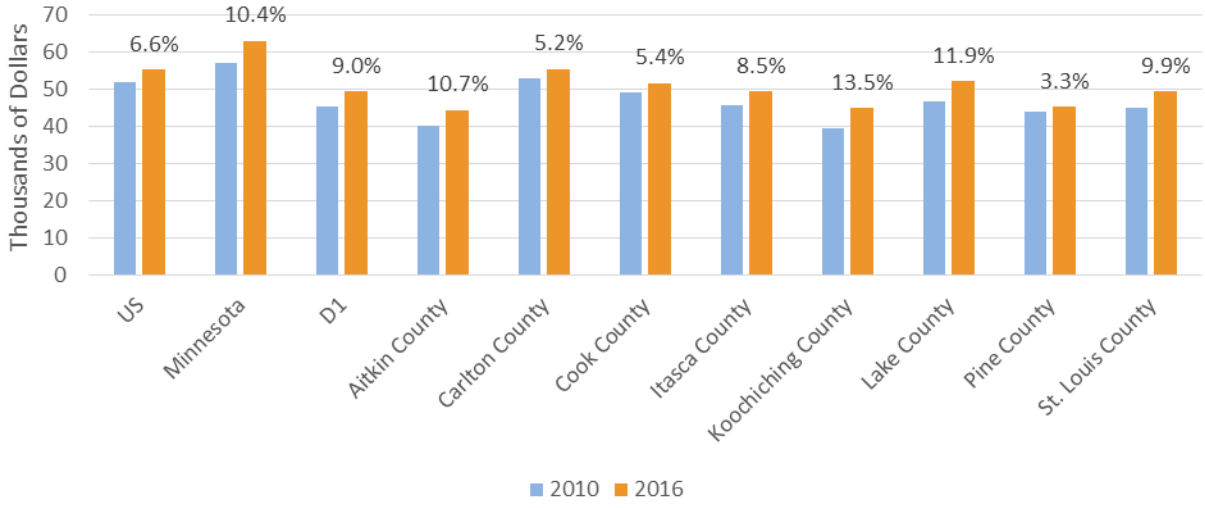
The District's educational attainment has improved over the last six years and is higher than the rest of the country for graduating high school and achieving some college or earning an associate's degree. However, the District has less bachelor's degrees than the rest of the country. Between 2010 and 2016, the percentage of residents without a high school degree dropped from 9.2% percent to 7.4% percent. In that same period, the percentage of residents with a bachelors' degree increased from 20.8% percent to 22.6% percent.

Figure 2-3 shows the estimated median household income trends for each county, and Figure 2-4 lists the highest level of education attained by the District's residents in 2010 and 2016 and shows how educational attainment is improving.

The majority of District 1's residents have an education of at least some college or more.

[2] Comprehensive Regional Economic Development Strategy 2017-2022, Arrowhead Regional Development Commission http://ardc.org/wp-content/uploads/2016/12/Northeast-Minnesota-CEDS-2017-2022-1.pdf

Figure 2-3: Median Household Income



Source: CPCS Analysis of 2016 American Community Survey Data, US Census Bureau. All amounts in inflation-adjusted 2016 dollars.

Figure 2-4: Educational Attainment

Highest Level of Education Attained	D1 (2010)	D1 2016	Nation (2016)
No high school diploma	9.2%	7.4%	13.1%
High school graduate (includes equivalency)	32.6%	31.2%	27.8%
Some college, or an Associate's degree	37.5%	38.9%	31.3%
Bachelor's degree or higher	20.8%	22.6%	27.7%

Source: CPCS Analysis of 2016 American Community Survey Data, US Census Bureau.

2.2 Employment and Industries

Employment is another measure of the District's economic well-being and helps reveal which industries are especially important to the District's workforce. The District's unemployment rate was 8.6 percent in 2010 and 5.1 percent in 2017.[3] According to the Federal Reserve, a rate between 4.1 percent and 4.7 percent represents the natural rate of unemployment as a certain number of workers switch jobs and as workers enter or leave the labor market.[4]

The main threat to the District's workforce is a shrinking size due to people moving out of the Region, retiring, and leaving the workforce.

[3] Local Area Statistics, Bureau of Labor Statistics, Labor Force Data by County Annual Averages https://www.bls.gov/lau/

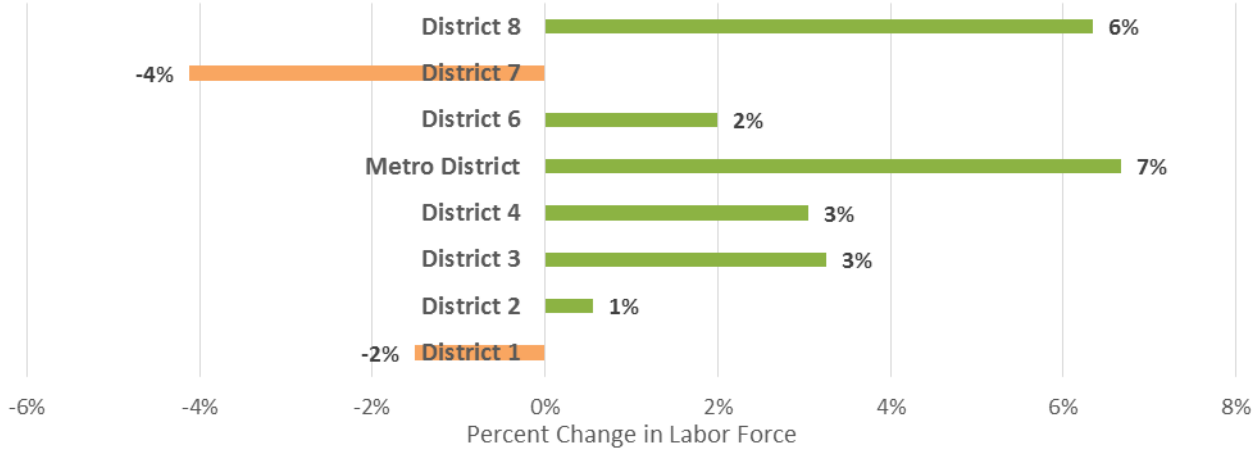
[4] Federal Reserve, June 2018 Projections https://www.federalreserve.gov/faqs/economy_14424.htm

2.2.1 Labor Force

District 1's labor force is declining and is expected to continue to decline as the population continues to age between 2015 and 2045. This is in contrast with all other Minnesota districts other than District 7. These trends may pose challenges for the District's businesses due to both a declining labor force and declining consumption of goods and services. While this "graying" population may result in declined use of the transportation system by people living in District 1, freight-related industries will continue to require an adequate transportation system to remain competitive. For example, workforce shortages may also aggravate the prevalent truck driver shortage that currently exists across the country and in local communities such as Carlton County. Training over-the-road drivers are needed in this instance in order to ensure a healthy freight system.

Between 2010 and 2017, the labor force decreased by 2,741 people. The number of employed residents increased by 3,788 people, while those considered unemployed decreased by 6,529. These numbers suggest that the decline in the Region's unemployment rate was partly a result of a decline in the regional labor force, and partly due to an increase in employment.

Figure 2-5: Labor Force Comparison between Districts, 2010-2017



CPCS Analysis of Local Area Statistics, Bureau of Labor Statistics.

Note, Aitkin County is included in both District 1 and 3 due to whole county overlap between the two districts. District 2 does not include parts of Cass, Mahnomen, and Koochiching counties due to their inclusion in other districts.

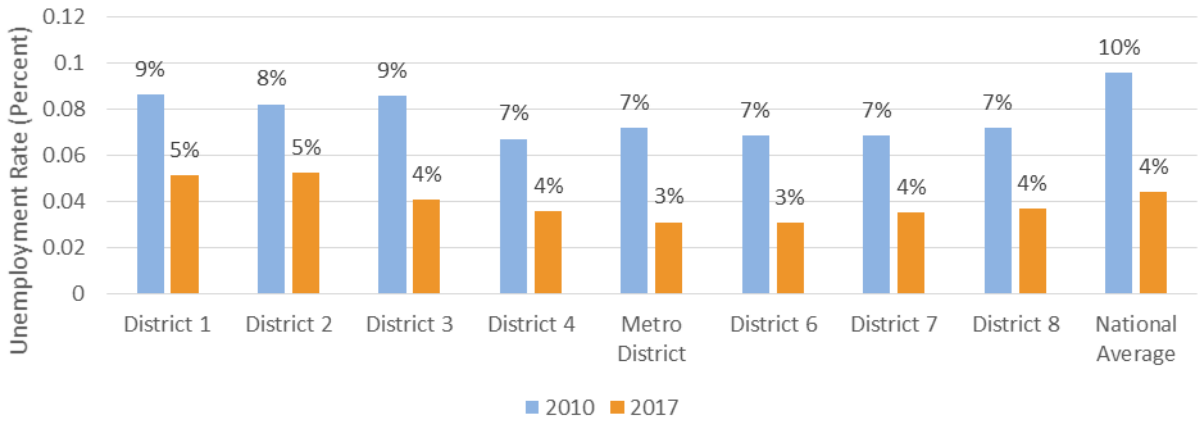
2.2.2 Unemployment Rates

District 1's unemployment rate has declined dramatically in recent years in line with the rest of the state and country. However, this decline is not evenly spread across all eight counties. Itasca and Koochiching counties had an average unemployment rate of 7.0 percent in 2017. Some of District 1's counties classify as in "economic distress" based on the US EDA's criteria of a 24-month unemployment rate that is at least 1 percent higher than the national average.

In 2017, District 1 had an average unemployment rate of 5.1%. Itasca and Koochiching counties had the highest average unemployment rates at 7.0 percent, while Cook County had the lowest unemployment rate at 3.7 percent. Figure 2-6 compares District 1 against the other districts in

Minnesota and illustrates how all districts have experienced declines in unemployment between 2010 and 2017.

Figure 2-6: Unemployment Rate Comparison between Districts (2010 and 2017)



CPCS Analysis of Local Area Statistics, Bureau of Labor Statistics.

Note, Aitkin County is included in both District 1 and 3 due to the whole county overlap between the two districts. District 2 does not include parts of Cass, Mahnomen, and Koochiching counties due to their inclusion in other districts.

Some District 1 counties are considered to be in "economic distress" according to the US EDA, based on a 24-month unemployment rate that is at least 1 percentage point higher than the national average.

2.2.3 Employment by Industry

The largest industry in the District by employment is Government which employs about 33,946 people, or 17.1 percent of the Region's workforce. The next largest industry is Health Care and Social Assistance, which employs about 31,450 people, or 15.8 percent of the workforce. The following section provides an overview of District 1's freight-related industries (highlighted in bold in the figure below).

Figure 2-7: Regional Employment by Industry

Industry	Employment	Percentage of Total Employment
Government and Government Enterprises (92)	33,946	17.1%
Health Care and Social Assistance (62)	31,450	15.8%
Retail Trade (44-45)	**22,994**	**11.6%**
Accommodation and Food Services (72)	16,778	8.4%
Other Services (81)	11,859	6.0%
Construction (23)	**10,285**	**5.2%**
Manufacturing (31-33)	**9,730**	**4.9%**
Finance and Insurance (52)	7,674	3.9%
Professional, Scientific, and Technical Services (54)	7,532	3.8%

Industry	Employment	Percentage of Total Employment
Real Estate, Rental, and Leasing (53)	6,174	3.1%
Administrative, Support, and Waste Remediation (56)	5,303	2.7%
Transportation and Warehousing (48-49)	**4,304**	**2.2%**
Agriculture, Forestry, Fishing, and Related Activities (11)	**4,258**	**2.1%**
Arts, Entertainment, and Recreation (71)	4,172	2.1%
Mining, Quarrying, and Oil and Gas Extraction (21)	**3,698**	**1.9%**
Educational Services (61)	3,078	1.5%
Information (51)	2,021	1.0%
Wholesale Trade (42)	**1,393**	**0.7%**
Management of Companies and Enterprises (55)	951	0.5%
Utilities (22)	**157**	**0.1%**
Total	187,757	94.4%

Source: CPCS Analysis of Full-Time and Part-Time Employment by NAICS Industry 2016, Bureau of Economic Analysis.

Note: 5.6% of regional employment (11,096 people) is unavailable to avoid disclosure of confidential information.

2.3 Freight-Dependent Industries

Freight-related industries are industries that rely heavily on the shipment of physical goods to support their operations. These industries include natural resources (agriculture and mineral extraction), manufacturing, retail, construction, transportation, and warehousing. Many of these industries, particularly, natural resources, agriculture, and transportation are often location-dependent (farms, mines, railroads, and rivers cannot be moved like factories), and thus are dependent on the performance of the freight system to remain competitive.

45%
District 1 GDP generated by freight-relevant industries

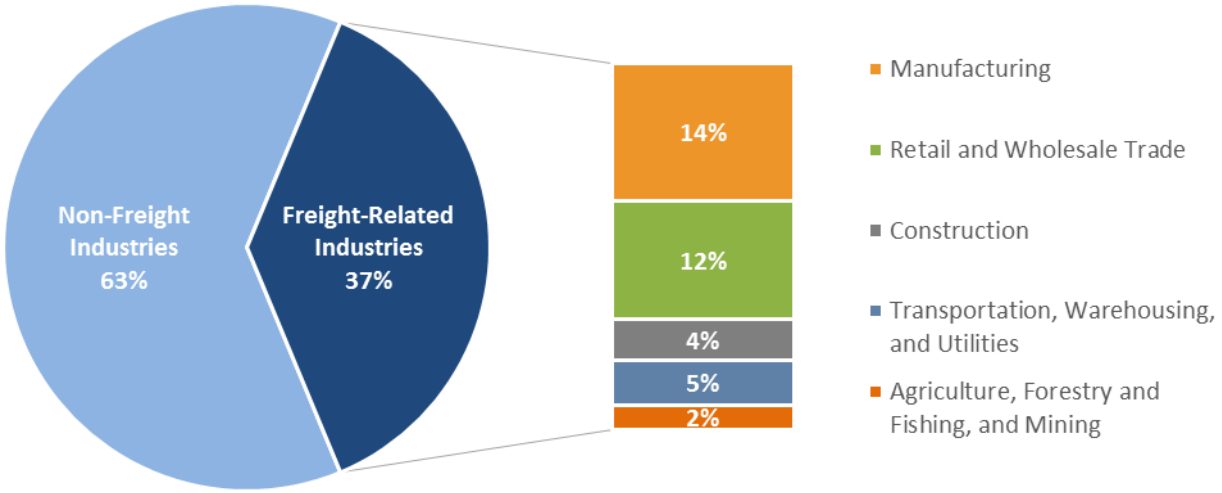
$6.75b
District 1 GDP generated by freight-relevant industries

29%
District 1 workers employed by freight-relevant industries

2.3.1 Minnesota's Gross Domestic Product (GDP)

Figure 2-8 provides a breakdown of Minnesota's gross domestic product (value-added to the state's economy) by industry. As a state, non-freight industries represent 63 percent of Minnesota's GDP and freight-related industries represent 37 percent of GDP.

Figure 2-8: Minnesota Gross Domestic Product Share by Industry

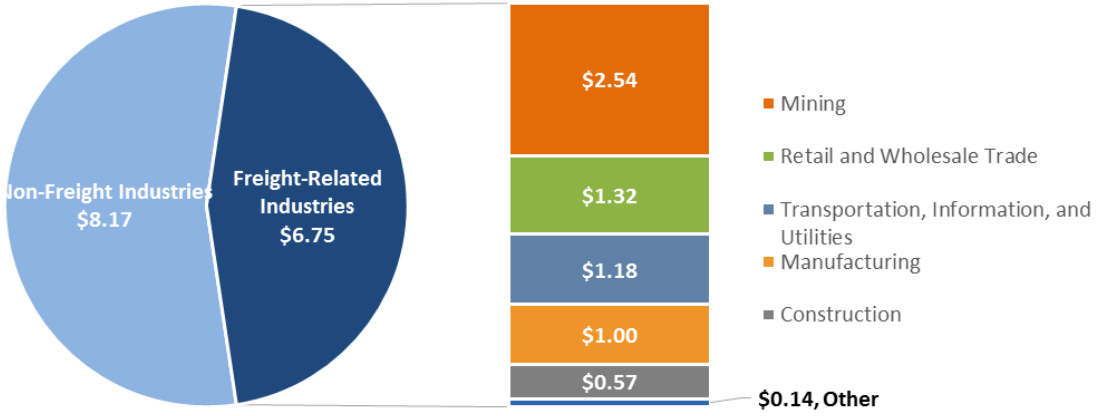


Source: CPCS Analysis of GDP by State in Current Dollars by NAICS Industry 2016, Bureau of Economic Analysis.

2.3.2 District 1 Gross Domestic Product (GDP)

Value-added (GDP) is not disaggregated by the US Census on a county-level basis, because some companies are the only presence in that county for a particular industry, and disclosing information about the company's size or value could compromise their competitive advantage. However based on an IMPLAN economic impact study by the University of Minnesota – Duluth, the Arrowhead region (District 1 counties excluding Pine County) generated $14.9 billion GDP in 2014.[5]

Figure 2-9: Arrowhead Region's Gross Domestic Product by Industry (in $ Billions)



[5] "The Economic Impact of the Canada/Northeastern Minnesota Relationship on the Arrowhead Region of Minnesota", University of Minnesota Duluth, IMPLAN 2014 Data Reported in 2016 dollars. https://lsbe.d.umn.edu/sites/lsbe.d.umn.edu/files/canada_minnesota_connection_report_final.pdf

Source: University of Minnesota Duluth, IMPLAN 2014 Data Reported in 2016 Dollars

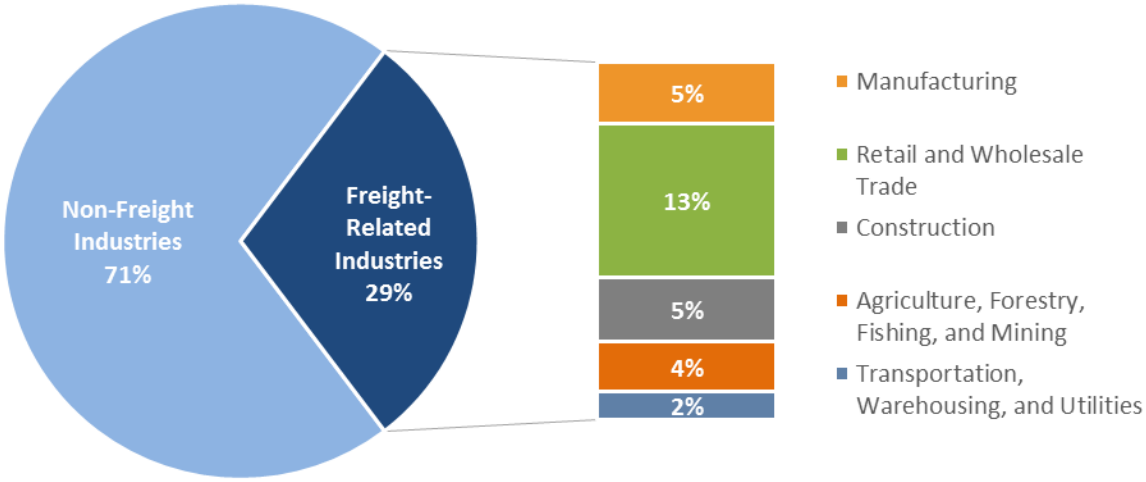
Among freight-related industries, mining is the single largest contributing industry, generating about 17.0 percent or $2.54 billion in value-added. The second largest contributor is Retail and Wholesale Trade making up 8.9 percent or $1.32 billion in value-added.

Freight-related industries make up 45% of District 1's GDP, and 37% of Minnesota's GDP.

2.3.3 Freight-Related Employment

Freight-related industries employ about 56,819 people, approximately 29 percent of the Region's workforce. Figure 2-10 shows the relative employment by industry for the Region based on freight-related and non-freight jobs.

Figure 2-10: Relative Employment by Industry



Source: CPCS Analysis of Full-Time and Part-Time Employment by NAICS Industry 2016, Bureau of Economic Analysis.

2.3.4 Freight-Related Industry Competitiveness

Figure 2-11 lists the most "unique" freight-related industries in the District. This list provides the Location Quotient (LQ) of each freight-related industry in the region, as well as select sub-industries. LQs measure the proportion of the workforce employed in a certain industry relative to other areas or industries and provide a quick way to understand a local region's economic base specialization relative to the national norm. This measure is intended to categorize economic activities that a local region exports, is self-sufficient in, or must import. LQ values greater than 1.0 indicate an employment proportion in a specific industry higher than the national average. For example, the region has a much higher proportion of people employed in mining than the US as a whole. For more information on LQ assumptions and more detailed LQ tables, please see **Appendix C.**

Figure 2-11: Freight-Related Industry Employment Concentration Relative to the Nation

Freight-Related Industry Group	Location Quotient
Mining, Quarrying, and Oil and Gas Extraction (21)	**6.8**
Mining (except Oil and Gas) (212)	23.4
Agriculture – Farm-based Employment (11)	**4.2**
Forestry, Fishing, and Related Activities (11)	**2.3**
Forestry and Logging (113)	11.5
Fishing, Hunting, and Trapping (114)	3.1
Utilities (22)	**3.0**
Construction (23)	**1.6**
Retail Trade (44-45)	**1.6**
Transportation and Warehousing (48-49)	**1.0**
Water Transportation (483)	2.7
Pipeline Transportation (486)	2.3
Air Transportation (481)	1.6
Transit and Ground Passenger Transport (485)	1.4
Manufacturing (31-33)	**0.9**
Paper Manufacturing (322)	6.4
Leather and Allied Product Manufacturing (316)	2.2
Wood Product Manufacturing (321)	1.9
Nonmetallic Mineral Product Manufacturing (327)	1.8
Machinery Manufacturing (333)	1.3
Wholesale Trade (42)	**0.3**

Source: CPCS Analysis of Full-Time and Part-Time Employment, US Census Data 2016 and County Business Patterns, US Census Data 2016.

Note: Employment information relies on approximations due to company confidential information. Employment data is estimated based on the median of each employment range. Employment figures do not include government employees, railroad employees, and self-employed persons.

The Region is highly specialized in mining, agriculture, and forestry/fishing products compared to the national average, despite these industries only providing 4% of regional employment.

District 1 is a large region, so breaking LQ analysis down on a county-by-county basis can provide insight into each county's unique freight-related specialties. Figure 2-12 highlights the major freight-related industry sectors in each county. Some entries in each table are marked "ND," which means the Bureau of Labor Statistics does not release data on LQs for that specific industry/county combination. This withholding of data is done to preserve the confidentiality of specific businesses, and publication of workforce data such as LQs could allow companies to make educated guesses about their competitor's operations.

Figure 2-12: Location Quotients of Freight-Related Businesses (2 Digit Industry Codes)

	Aitkin	Carlton	Cook	Itasca	Koochiching	Lake	Pine	St. Louis
Natural Resources and Mining (21-22)	1.56	0.49	ND	2.73	2.18	5.65	2.05	2.72
Construction (23)	0.87	1.25	1.00	0.92	0.78	0.22	1.17	0.79
Manufacturing (31-33)	1.12	1.20	ND	0.68	1.78	1.58	0.32	0.53
Trade, Transportation, and Utilities (42, 44-45, 22)	1.14	0.79	0.83	1.08	1.08	0.62	0.83	0.93

Source: CPCS Analysis of Bureau of Labor Statistics, 2016. Location Quotients reflect annual averages based on employment level

District 1 has high concentrations of employment in freight-related industries, and the condition and performance of the freight transportation system will influence future economic development. Careful stewardship of the freight system assets such as roads, barge terminals, airport, and intermodal facilities will be necessary to support growth in these industries.

2.3.5 Freight-Related Industry Competitiveness Over Time

While Location Quotients report economic competitiveness at a particular point in time, Shift Share Analysis is a more dynamic economic indicator used to understand changes in a region's industrial competitiveness over time compared to the national norm. The shift share formula is:

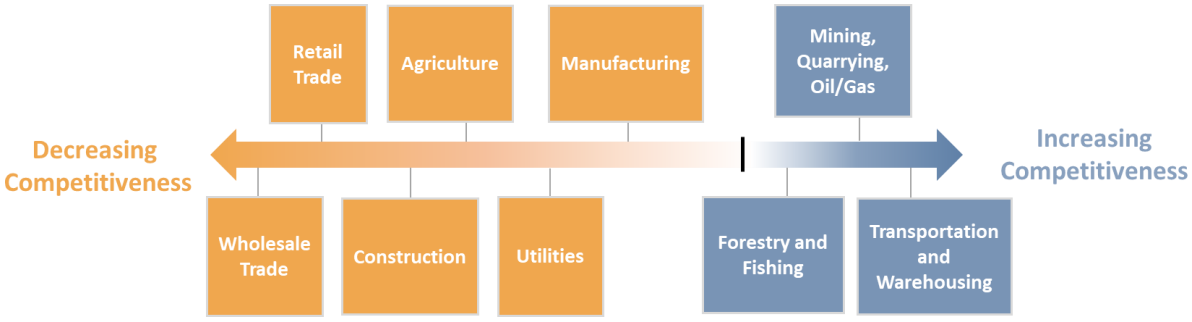
Actual Employment Change = National Share + Industrial Mix + Regional Shift

National Share and Industrial Mix both represent national trends, while Regional Shift indicates regional trends. For further analysis of national trends, see **Appendix D**.

Regional Shift indicates the amount employment change due to shifts in regional competitiveness for a specific industry. This analysis shows that District 1's Transportation and Warehousing, Mining/Quarrying/Oil and Gas, and Forestry and Fishing sectors have grown more competitive between 2010 and 2016, independent of national trends. Meanwhile, Manufacturing, Utilities, Agriculture, Construction, Retail and Wholesale Trade have grown less competitive.

Figure 2-13 illustrates a spectrum of the rate of change in competitiveness for District 1's industries. In blue are industries that are increasing in competitiveness, and orange indicates industries that are declining in competitiveness within District 1. Over the last 7 years in District 1, transportation and warehousing have increased the fastest in competitiveness while wholesale trade has seen the fastest decline in competitiveness.

Figure 2-13: Regional Shift by Freight-Relevant Industries (2010 to 2016)

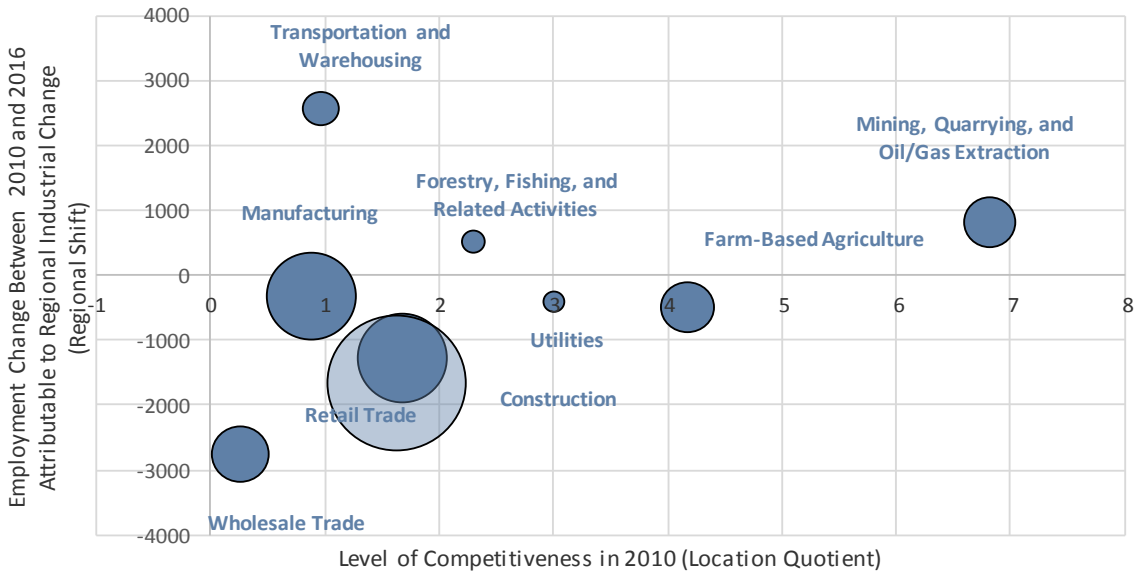


Source: CPCS Analysis of County Business Patterns, US Census Bureau 2010 and 2016.

Note: Employment information relies on approximations due to company confidential information. Employment data is estimated based on the median of each employment range. Employment figures do not include government employees, railroad employees, and self-employed persons.

Figure 2-14 provides a comparison of District 1's industries by how competitive they were in 2010 (X-axis) and how much employment has increased or declined independent of national trends (Y-axis). Industries with a Location Quotient greater than 1.0 on the X-axis indicates that they were more competitive than the US average in 2010, while industries lower than 1.0 on the X-axis indicates that they were less competitive. On the Y-axis, positive values indicate that the industry has improved in competitiveness since 2010, while negative values indicate that the industry has declined in competitiveness. The employment size of the industry in District 1 is indicated by the size of the circle for each industry.

Figure 2-14: District 1 Regional Competitiveness Change from 2010 to 2016



Source: CPCS Analysis of Full-Time and Part-Time Employment by NAICS Industry 2010 and 2016, Bureau of Economic Analysis.

Location Quotients and Shift Share Analysis provide information about regional competitiveness and its changes over time against the national norms. While they do not explain the reasons for

regional competitiveness nor forecast the future, they are helpful indicators to understand a region's economic base. However, the role of transportation investment in potentially lowering logistics costs or improving competitiveness will be discussed in Working Paper 3.

Mining and Forestry/Fishing are both competitive industries and have grown in competitiveness in the last 7 years when compared to the US as a whole.

2.4 District 1 Industrial Profiles

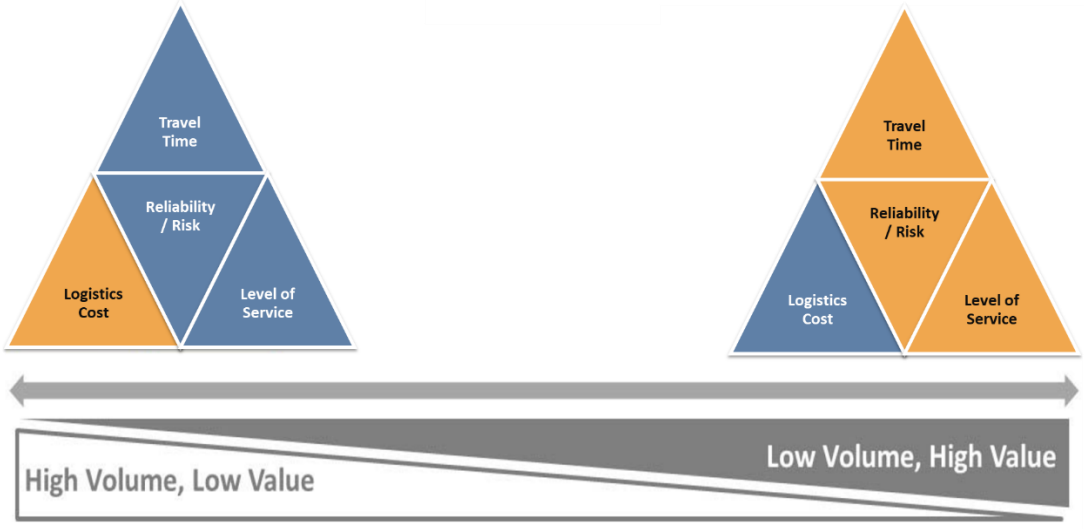
2.4.1 District 1 Freight-Related Industry Locations

Figure 2-16 provides shows the location freight-related businesses with more than 20 employees in District 1. Most of these businesses are congregated in the center of St. Louis County (mining, wholesale trade, transportation, and warehousing) as well as in the Duluth-Superior metropolitan region (construction, transportation and warehousing, and manufacturing). Some business concentrations also exist in the cities of International Falls (transportation and warehousing) and Grand Rapids (utilities, construction, and transportation and warehousing).

2.4.2 Freight-Related Industry Transportation Requirements

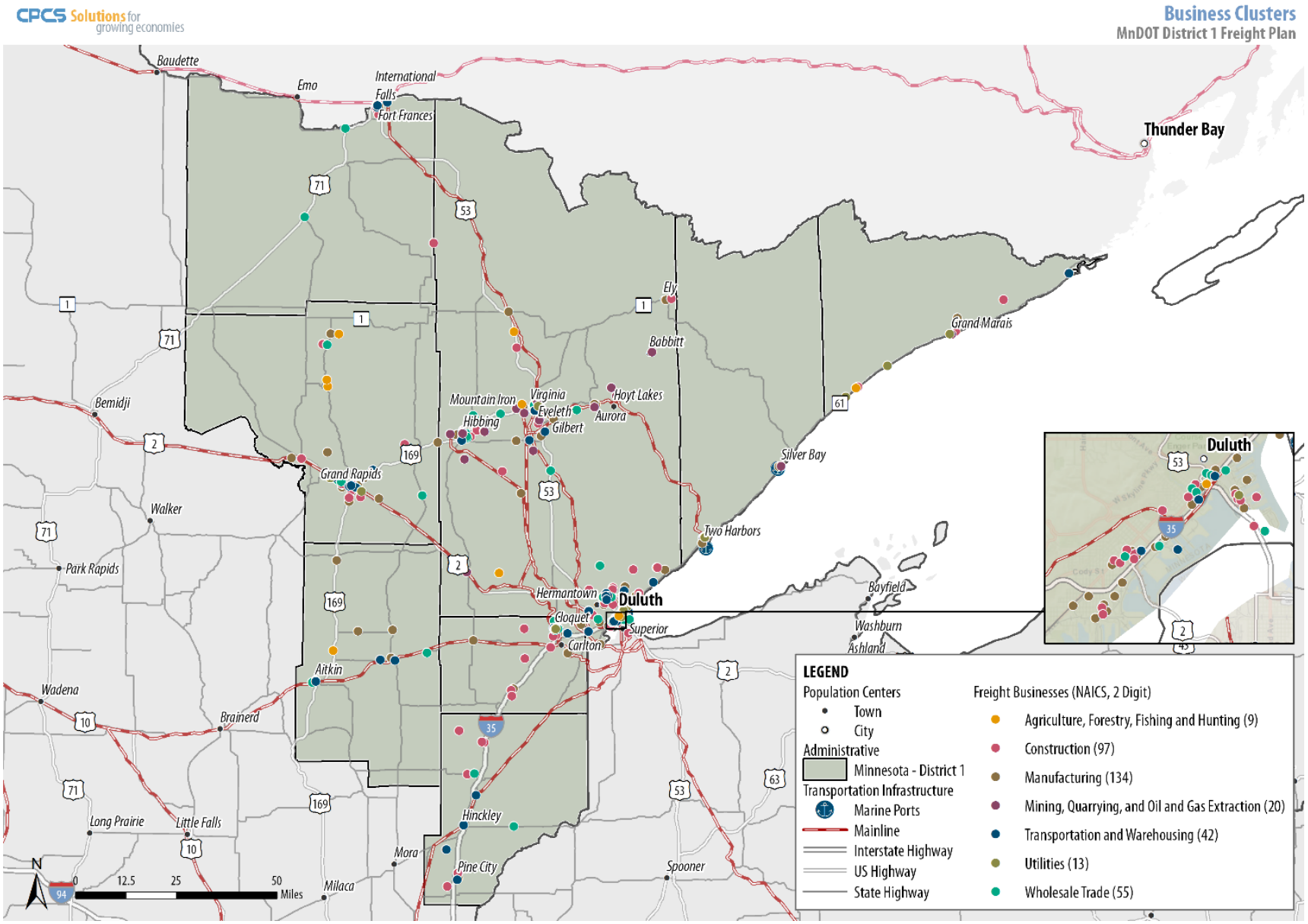
Freight transportation options exist on service "spectrum" based on service needs and cargo characteristics. This spectrum is illustrated in Figure 2-15. A freight shipper considers these two service and cargo characteristics when determining what mode to transport cargo. For example, when moving high volume, lower value cargoes (like grain or coal), shippers are most concerned with logistics cost. However, transit time and reliability of service are often more important with smaller, higher value shipments, such as medical devices, or just-in-time components.

Figure 2-15: Freight Transportation Service Spectrum



Source: CPCS

Figure 2-16: District 1 Freight-Related Business Clusters



Source: CPCS Analysis of Reference USA Data 2016

On the right side of the spectrum – where reliability/risk, transit time, and level of service are most important – shippers use air cargo and premium trucking services. However, shippers must pay relatively higher shipping rates for these services. On the left side of the spectrum, where logistics cost is more important, shippers may favor barge or bulk rail to move heavy and low unit-cost materials such as mining, agriculture, and forestry products. In this case, shipments may move more slowly. In the middle, shippers use truck and rail, which are well-suited for transporting a variety of middle-priced freight such as manufactured goods, bulk goods, and a variety of consumer products.

Freight shippers must balance shipping costs against faster or more reliable service.

2.4.3 Mining

District 1 is a major center for the mining industry in Minnesota, the largest producer of iron and taconite in the US. Mining production appears to be holding steady, although political debate over environmental issues creates uncertainty for the future of mining in District 1. Nevertheless, a robust multimodal freight system is needed to accommodate the transport of these mining products each year.

Minnesota produces the most iron ore and taconite in the US.[6] The naturally-formed Iron Range (Vermillion and Mesabi Iron Ranges) cuts diagonally across the center of District 1 where iron was historically mined. Most high-grade natural iron ore has been removed from the ground, but taconite, a lower grade iron ore, continues to be extracted.

Mines in District 1 extract the following top minerals: taconite and iron ore, horticultural peat, and some dimensional granite. There are also deposits of titanium and sulfur in the center of the District, and pockets of dimension stone in the North. Figure 2-18 shows where mining establishments are located in District 1. It also shows critical transportation links between mining establishments and further shipping points. Once taconite is extracted and processed, it is usually shipped by rail to one of three ports: Duluth-Superior, Two Harbors, or Silver Bay. From these ports, it is shipped across the Great Lakes to steel mills in other Great Lake states and provinces, or to Quebec for further export.

District 1's rail and port system are well-suited to handle the heavy, high volumes of taconite exported from the District. Figure 2-17 lists the key modes utilized by the mining industry. While the rail and maritime system play a key role in the outbound shipment of mined products, the

[6] Minnesota Department of Natural Resources, https://www.dnr.state.mn.us/education/geology/digging/mining.html

road network is a critical asset for the inbound movement of materials supporting the mining industry, including equipment and fuel.

Figure 2-17: Key Transportation Links for District 1's Mining Industry

Mining equipment carried to mines by truck

Taconite moves from mines to ports by rail

Taconite shipped out to mills by vessel.

Source: ArcelorMittal, Shawn Christie, Duluth Shipping News

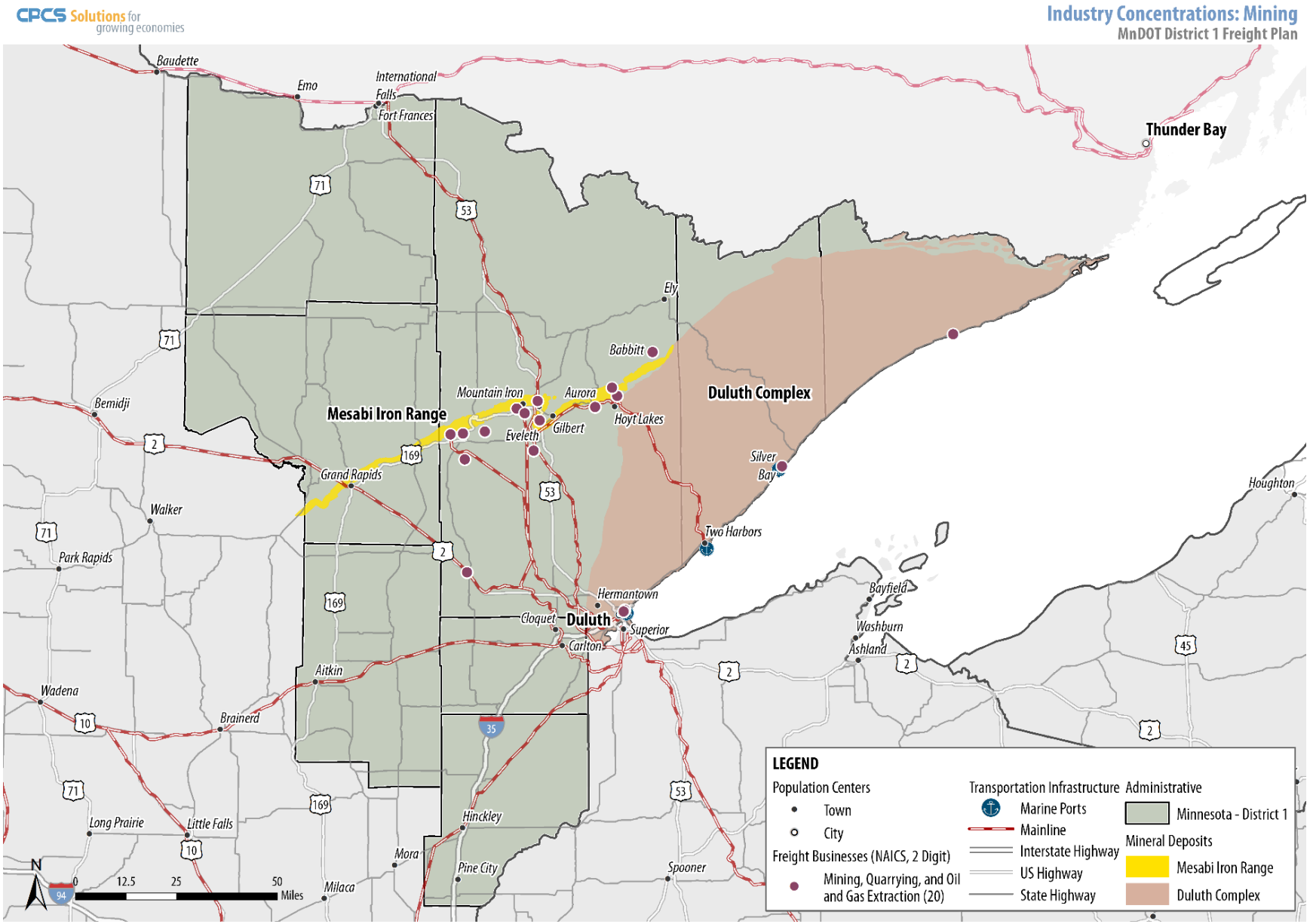
District 1 mining establishments are concentrated along the Mesabi Iron Range, the largest of the four iron ranges in Minnesota, located in the Itasca and St. Louis counties. These establishments are mainly connected to the freight system by rail and highways. A few mining establishments also exist in the Duluth Complex along the northeast side of the District which is made up of volcanic rock formations. These establishments are located near ports where they benefit from maritime transportation. Figure 2-18 provides a map of where these mining establishments are located in the District.

A third of Duluth-Superior's taconite is transported to Quebec, while taconite from Two Harbors and Silver Bay is typically transported to areas within the US. Within the Iron Range, there are 12-14 trains a day dedicated to carrying mining products. However, it has been difficult to obtain clear and timely answers from railroads on business transportation.

Supporting businesses for the mining industry transport most equipment by trucks, much of which is oversized/overweight. Extra acceleration and deceleration/turning lanes are needed as there is a safety issue for these trucks to enter into traffic at speeds of 65 mph and higher. Additionally, roundabouts with mountable curbs are difficult for trailers and side-by-side oversize/overweight loads, especially as roundabouts are typically single-lane. Also, due to shift changes at iron mines, some oversize/overweight vehicles run into traffic congestion, especially near metro areas. The use of oversize/overweight vehicles also leads to more frequent repaving needs. Mining industry stakeholders also commented that the state patrol is working well for heavy-hauling and supports a focus on safety along these roads.

While mining is a very small portion of the US and the state's total GDP, mining is the single largest contributing industry to District 1's GDP.

Figure 2-18: Mining Establishments



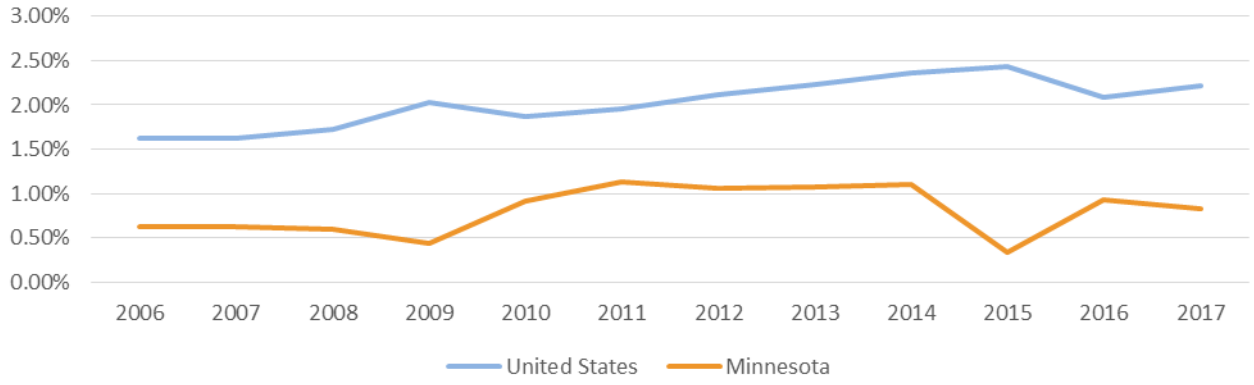
Source: CPCS Analysis of Reference USA Data and Minnesota DNR data, 2018.

Mining's share of District 1's GDP is significant, representing approximately 17.0 percent or $2.54 billion in value-added in 2014, excluding Pine County.[7] Minnesota's GDP, by contrast, has been small, hovering between 0.3 percent and 1.1 percent.

Nationally, mining represents between 1.6 and 2.4 percent of the US's GDP. Mining's contribution to the state economy has remained relatively stable with the exception of 2015 when mining's value-added to Minnesota fell 69 percent. This was primarily due to the capital costs of new mining projects. Mining in the state has since recovered back to historical levels.

Figure 2-19 compares the US and Minnesota's mining share of GDP.

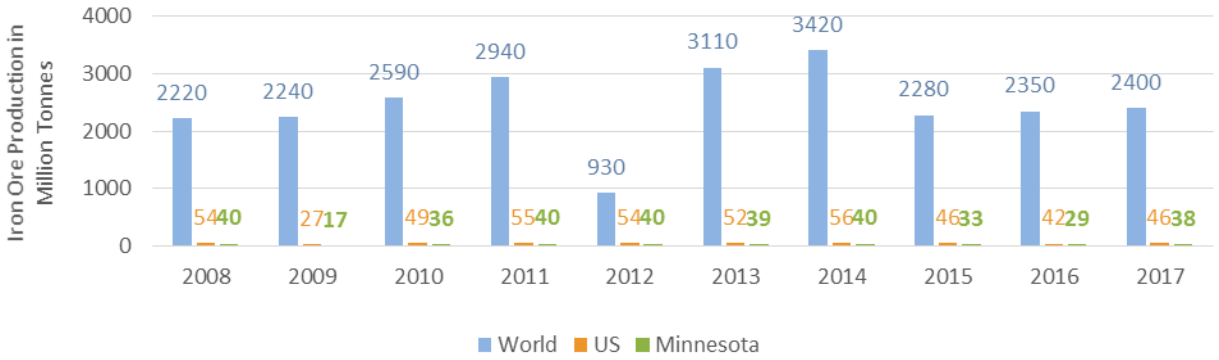
Figure 2-19: Mining Share of the US and Minnesota GDP (2006 – 2017)



Source: BEA GDP Data 2006-2017, chained to 2009 dollars

Figure 2-20 provides the changes in iron ore production from 2008 to 2017 across the world, US, and Minnesota. Figure 2-21 shows Minnesota's taconite production from 2008-2017.

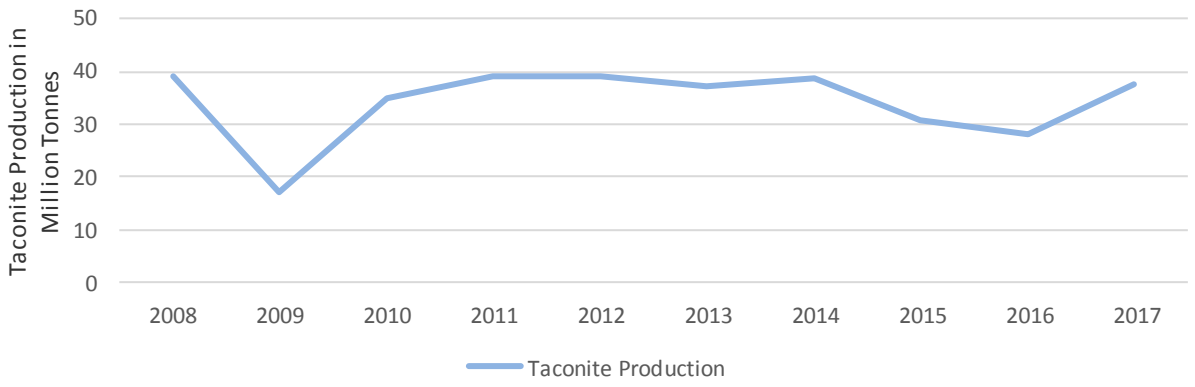
Figure 2-20: Iron Ore Production Comparison



Source: Minnesota Department of Revenue 2018 Mining Tax Guide, world estimates from 2015-2017 are estimates and reflect China reporting usable ore production instead of crude ore production.

[7] University of Minnesota Duluth, IMPLAN 2014 Data Reported in 2016 Dollars

Figure 2-21: Minnesota Taconite Production Summary (2008-2017)



Source: Minnesota Department of Revenue 2018 Mining Tax Guide

Gross Domestic Product information is not available at the county level, but other measures like employment and payroll expenditures can provide an estimate of a particular industry's importance to a region. Figure 2-22 provides Minnesota's mining employment by company, and demonstrates the value of mining for the District's economy.

Figure 2-22: Minnesota Employment and Mine Value by Mine (2017)

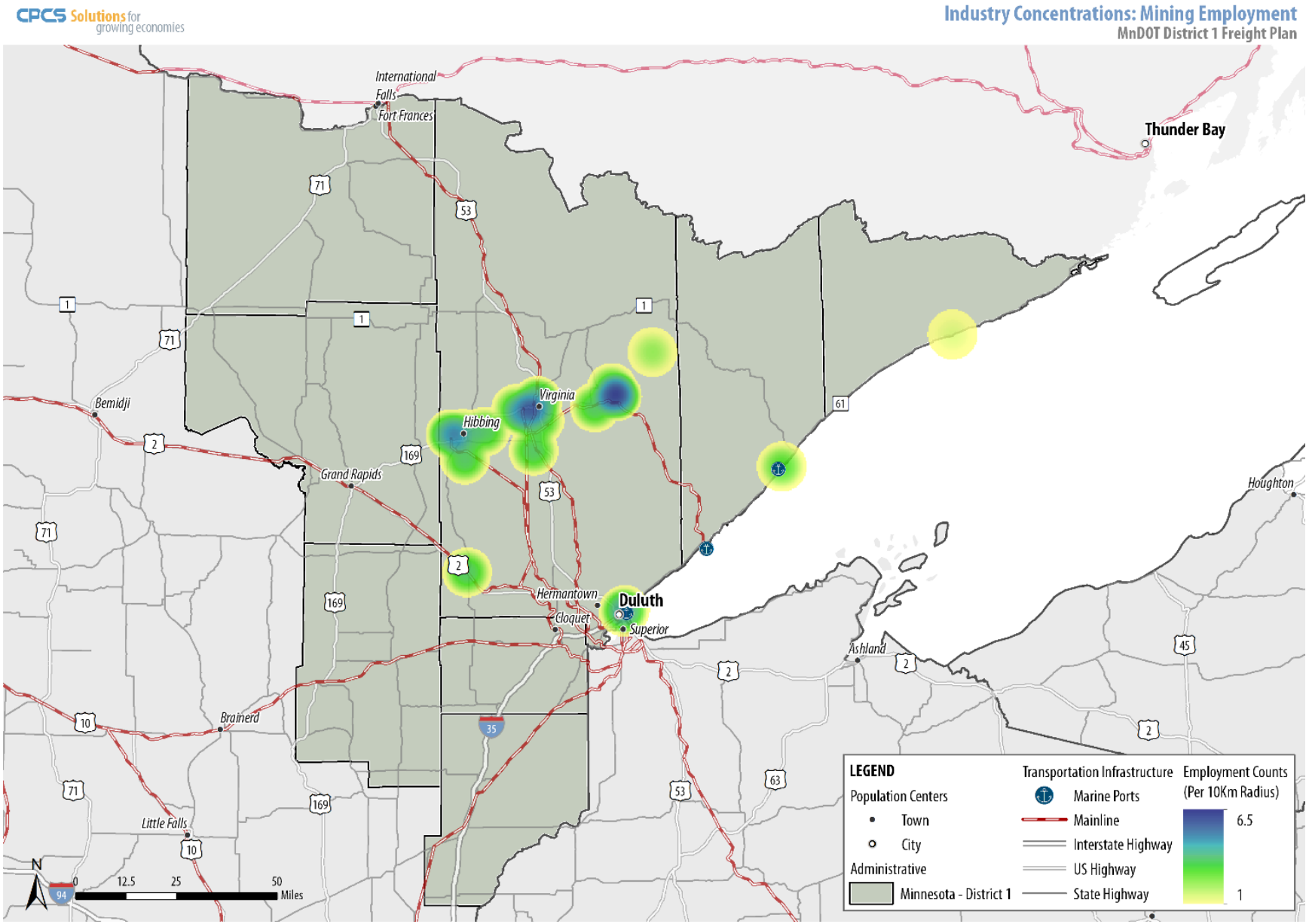
Company	Employment	Taconite Tons Produced	Mine Value ($)
ArcelorMittal	356	2,748,139	211,8330,175
Hibbing Taconite	726	7,480,160	584,477,262
Northshore	550	5,189,737	397,950,379
US Steel – Keewatin Taconite	415	4,550,714	353,383,468
U.S. Steel – Minntac	1,397	13,971,816	1,073,497,802
United Taconite	500	4,739,817	365,198,505
Total	**3,944**	**38,680,383**	**2,985,837,591**

Source: Minnesota Department of Revenue, 2018 Mining Tax Guide. Mine Values based on product values set by the Minnesota Department of Revenue.

U.S. Steel's Minntac location is Minnesota's most important taconite mine by employee count (1,397), tons produced (14 million), and total mine value ($1.07 billion). This mine generates over a third of taconite jobs, tons, and value in the state alone. Hibbing Taconite is the second largest contributor to Minnesota's taconite mining economy and provides 726 taconite jobs, 7.5 million tons, and $584 million in value.

Figure 2-23 displays the concentration of mining jobs across District 1. St Louis County stands out as a particularly important center for mining employment, with towns such as Hoyt Lakes, Hibbing, Virginia, and Mountain Iron hosting concentrations of mining jobs.

Figure 2-23: Mining Employment Concentration



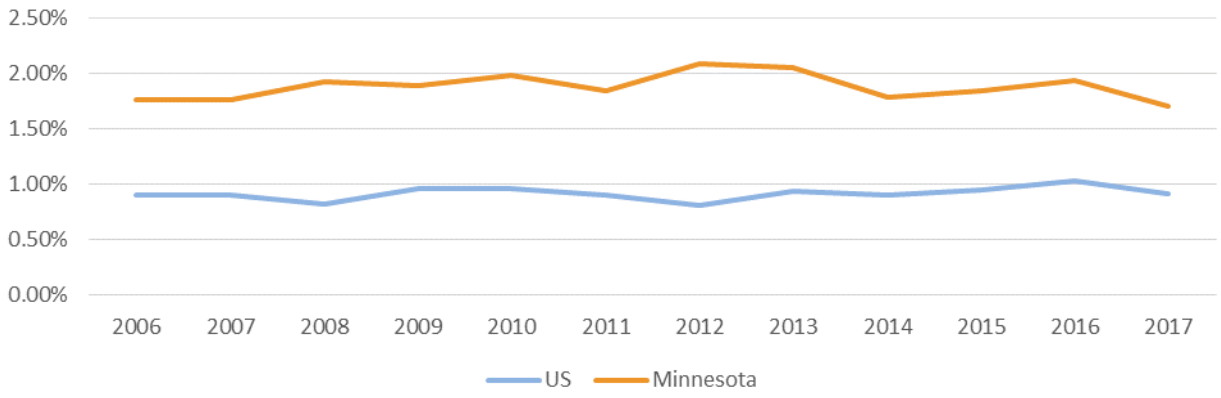
Source: CPCS Analysis of Reference USA Data, 2016

2.4.4 Forestry

Like mining, forestry was one of the key industries that drove the growth of District 1's economy in the 19th and 20th centuries. Today, forestry remains an important industry for the region, which is home to a large number of paper and other forest product manufacturers. Furthermore, the presence of both forest resources and forestry products companies means that wood products are one of the key commodities moving on the District's road network. Figure 2-25 provides an overview of the location of forestry-related firms in District 1, and Figure 2-27 shows where employment in forestry-related firms is concentrated. Wood product and paper manufacturing firms are not shown, as they are discussed in the Manufacturing section.

Although county-level GDP data is not available, Minnesota's forestry industry is primarily concentrated in District 1. Figure 2-24 shows how forestry is important to Minnesota's overall economy, as its share of Minnesota's GDP has remained relatively steady between 1.7 and 2.1 percent since 2006. The US forestry industry as a whole represents slightly less than 1 percent of national GDP. Since 2000, forestry employment in the state has ranged from 2,073 to 2,829 jobs, which is less than 0.1 of Minnesota's workforce.[8]

Figure 2-24: Forestry Share of GDP (2006 – 2017)



Source: BEA GDP Data 2006-2017, chained to 2009 dollars

Despite forestry's relatively low employment share, its importance in District 1 will likely remain high as long as the District and neighboring regions are home to wood product manufacturers. Figure 2-25 provides approximate establishments, employment, and average annual wages by county. Cook County information is not available due to corporate confidentiality.

[8] Source: BEA Employment Data 2000-2017

Figure 2-25: District 1 Forestry and Logging (2017)

County	Annual Establishments	Annual Average Employment	Annual Average Wage Per Employee
Aitkin County	5	13	$41,512
Carlton County	9	48	$49,807
Cook County	ND	ND	ND
Itasca County	23	174	$46,208
Koochiching County	24	127	$44,369
Lake County	7	27	$31,508
Pine County	5	72	$43,676
St. Louis County	24	98	$37,391
District 1 (excluding Cook County)	97	559	$42,067

Source: US Bureau of Labor Statistics, Quarterly Census of Employment and Wages, NAICS 113

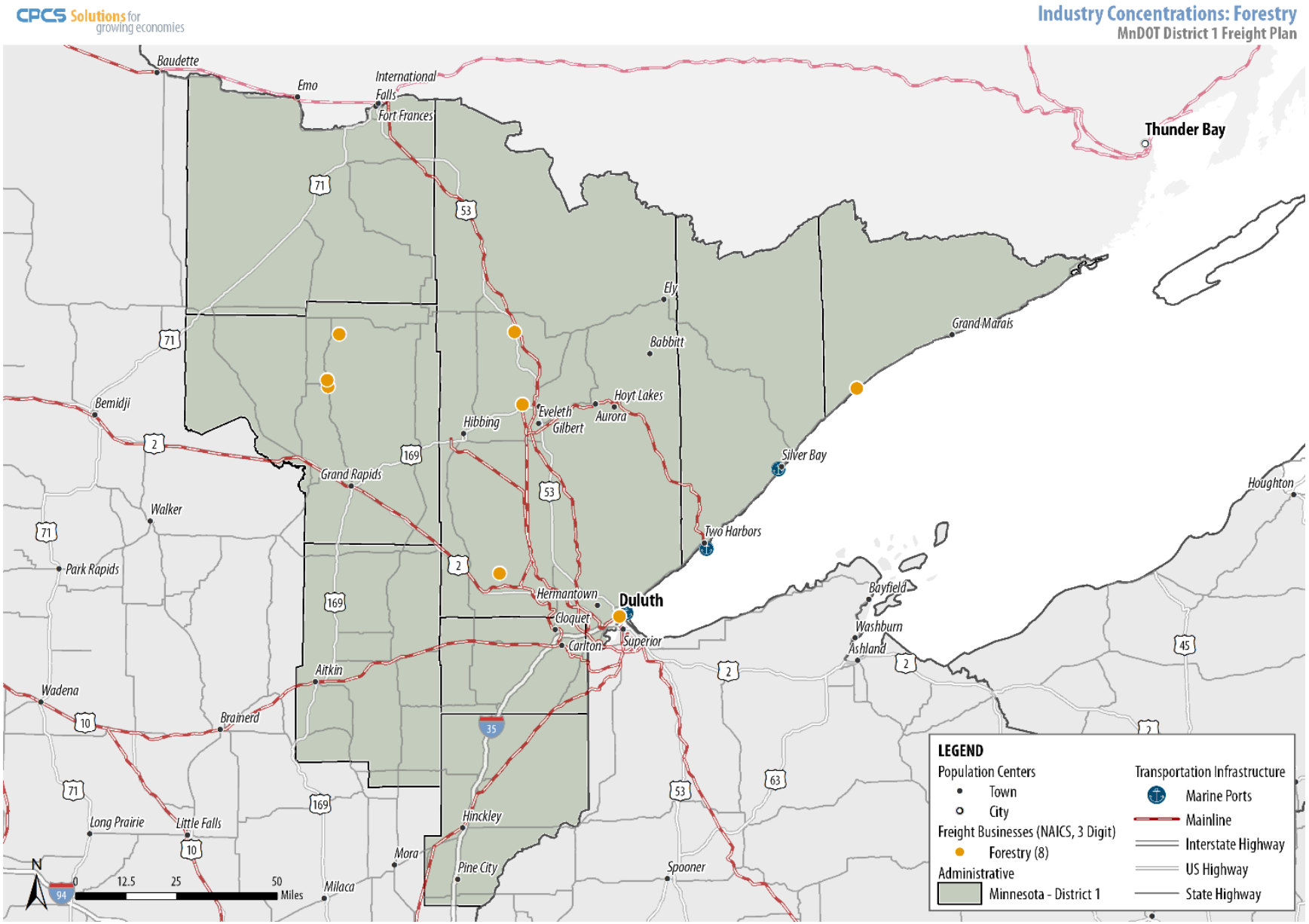
Figure 2-26 provides a map of where forestry establishments are located, and Figure 2-27 shows where forestry employment is concentrated in District 1.[9] Forestry tends to occur in St. Louis County in the center and around Duluth-Superior, with some forestry occurring in Itasca county as well.

The forestry industry's freight needs involve rail, truckload, and maritime modes of transportation. Logging companies tend to be smaller firms whose bulk goods contribute to robust paper manufacturing and home construction industries. Oversized/overweight shipments for mobile homes travel along District 1's roads. As stated in the mining section, extra acceleration and deceleration lanes are needed, along with roundabouts that cause safety issues in moving oversized/overweight commodities.

Additionally, District 1's freight system consists of many narrow one-way roads that drivers must use for both directions with no easy way to pull-over. This forces businesses to be very thoughtful about how much traffic they introduce onto the roads. Double tracks for railroads could be helpful, as would expansion of longer-sightings. Industry stakeholders are also interested in the state easing permitting and regulatory burdens of the railroads or promoting the expansion of railroad tracks. In the wintertime, it is difficult for locomotives to release air all the way back to the cars, so railroads must shorten the length of their cars which creates a shortage in available rail solutions for forestry products

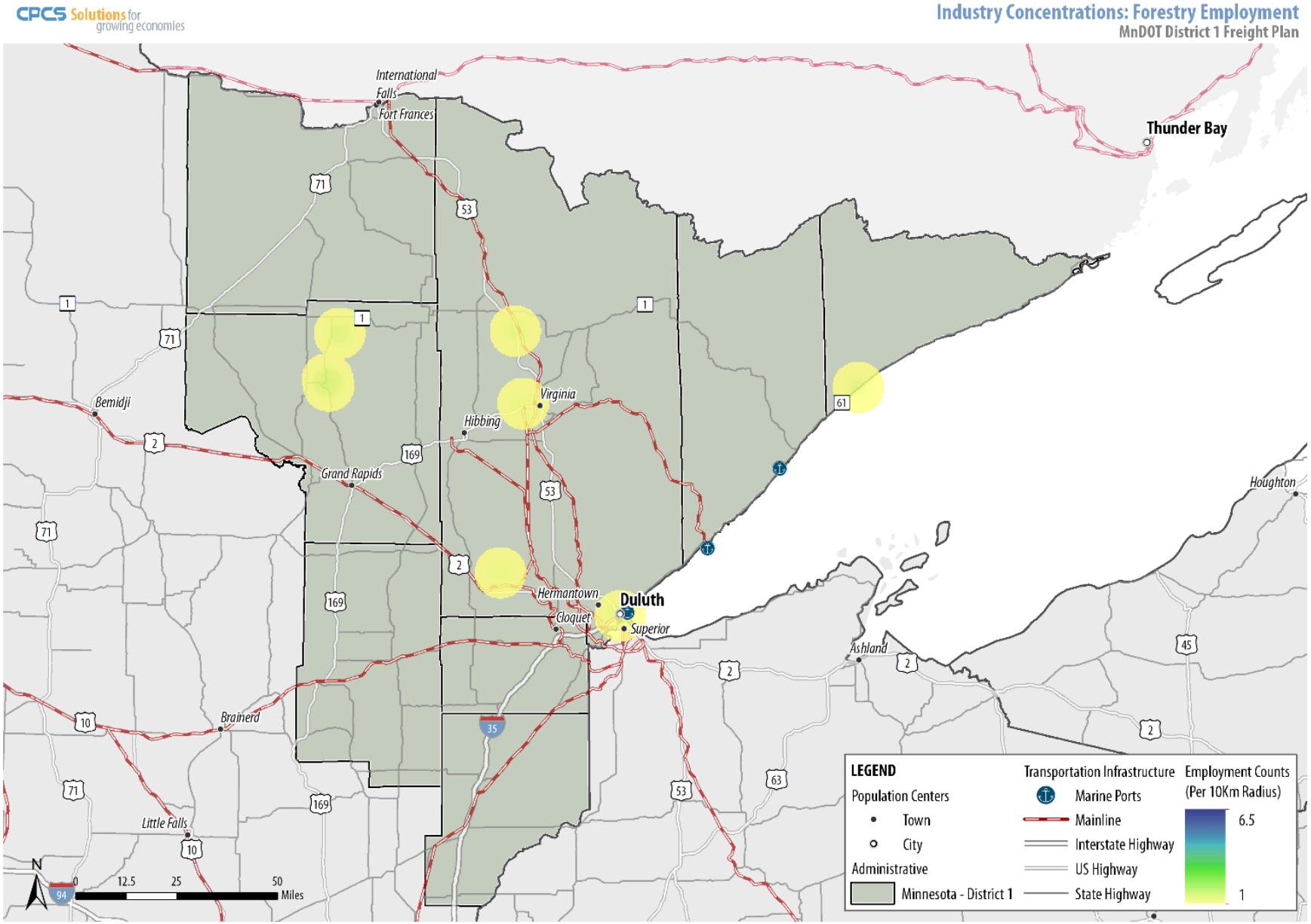
[9] Coordinates for these businesses come from Reference USA's database, an Infogroup company that aggregates and updates business and consumer data from more than 5,000 public sources. The establishments listed under this database tend to be larger firms but provide a general snapshot of where forestry is located. However as most forestry firms are small, the Bureau of Labor Statistics provides more comprehensive detail on the number of establishments and employee count.

Figure 2-26: Forestry Establishments



Source: CPCS Analysis of Reference USA Data, 2016

Figure 2-27: Forestry Employment Concentration



Source: CPCS Analysis of Reference USA Data, 2016

2.4.5 Manufacturing

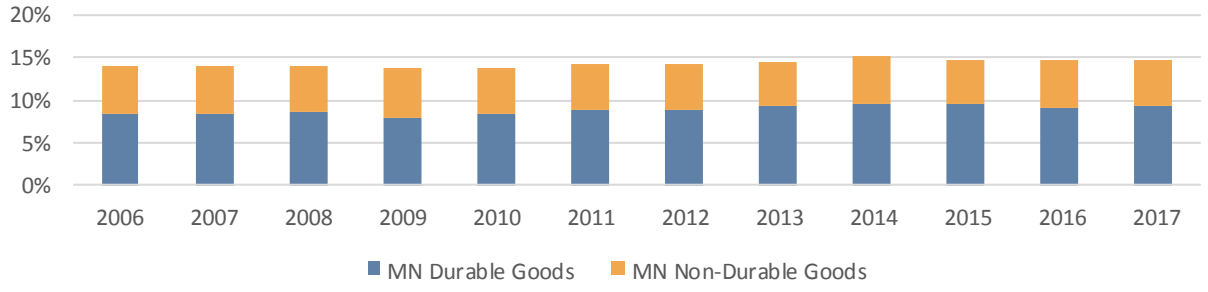
While much of District 1's economy was initially built on natural resources, it has also grown a diverse manufacturing sector. Manufacturing activity can be broken into two categories:

- **Local Clusters:** firms that trade internally with other businesses in the region
- **Traded Clusters:** firms that trade with businesses outside the region

District 1's manufacturing firms tend to be engaged in traded clusters, bringing trade into the region from other states and other countries. Figure 2-30 provides a map illustrating the distribution of manufacturers across the District, and Figure 2-31 shows where employment in manufacturing is concentrated. St. Louis, Carlton, and Itasca counties stand out as particularly important centers for manufacturing employment, with towns such as Grand Rapids, Virginia, and Duluth hosting concentrations of manufacturing jobs.

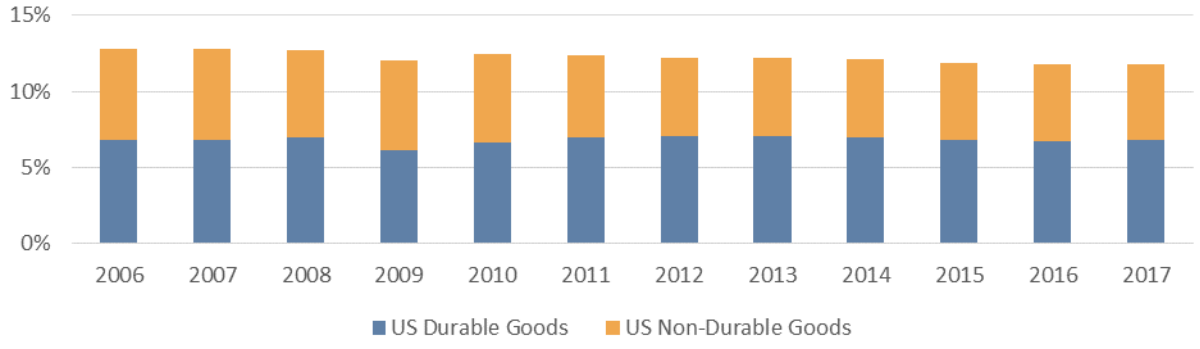
Minnesota's GDP is slightly more reliant on the manufacturing industry than the US as a whole, and Minnesota's manufacturing industry is slightly more represented by durable goods compared to the rest of the country. Figure 2-28 illustrates how Minnesota's manufacturing share of GDP has remained relatively steady between 13.7 and 15.0 percent since 2006, while the US' manufacturing share of GDP represents between 11.7 and 12.8 percent GDP. Figure 2-29 indicates the national manufacturing share of GDP from 2006 to 2017.

Figure 2-28: Minnesota Manufacturing Share of GDP (2006-2017)



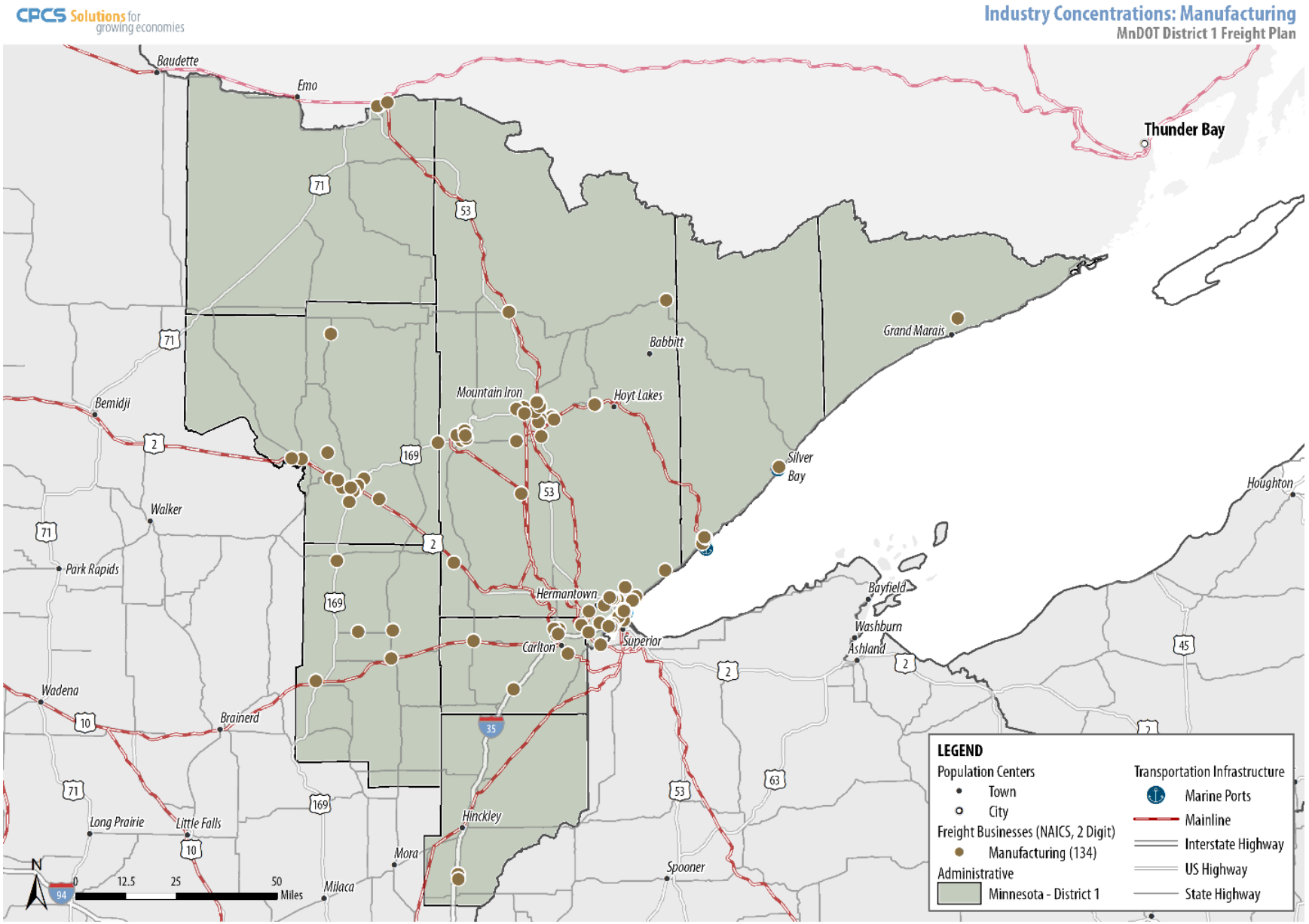
Source: BEA GDP Data, chained to 2009 dollars, 2006-2017

Figure 2-29: US Manufacturing Share of GDP (2006-2017)



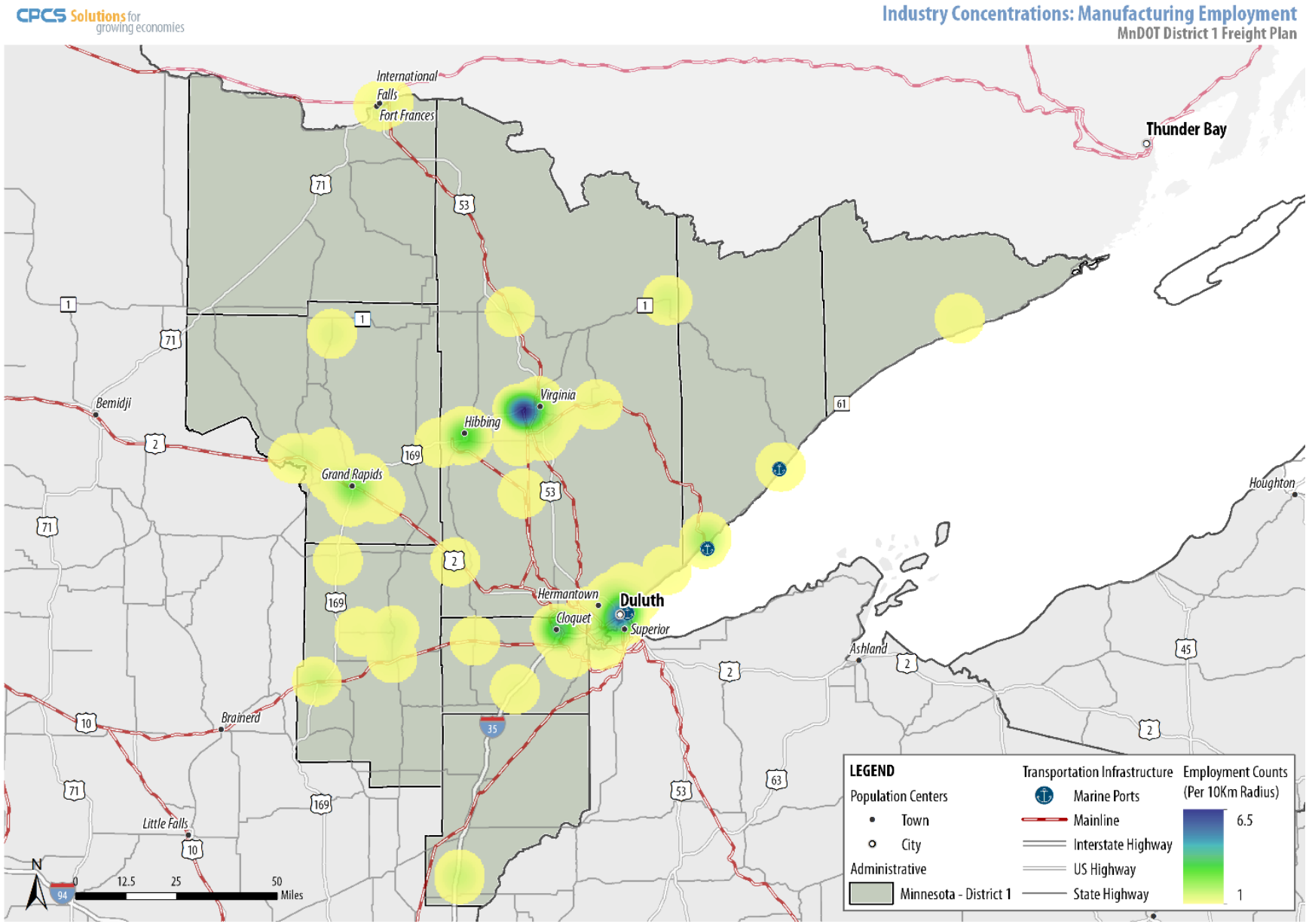
Source: BEA GDP Data, chained to 2009 dollars, 2006-2017

Figure 2-30: Manufacturing Establishments



Source: CPCS Analysis of Reference USA Data, 2016

Figure 2-31: Manufacturing Employment Concentration



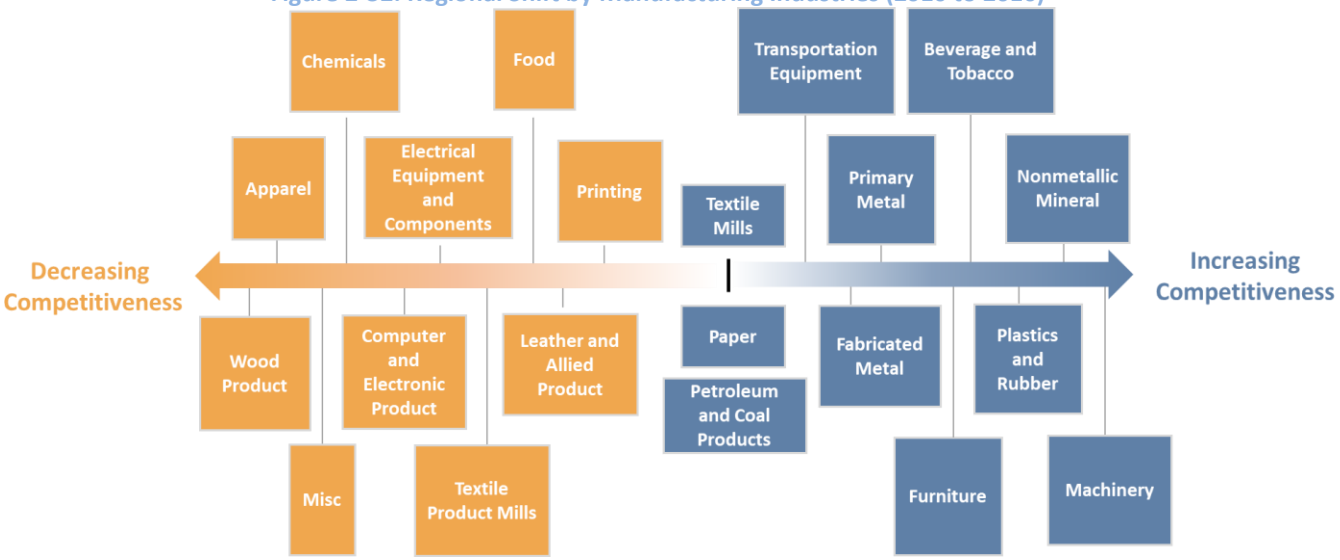
Source: CPCS Analysis of Reference USA Data, 2016

While the state's manufacturing contributions to state GDP remains steady, District 1's manufacturing industry is declining in competitiveness.

However, when broken out into different industry groups, District 1's machinery, nonmetallic mineral, and plastics and rubber manufacturing industries have increased in competitiveness independent of national industry and employment trends over the last 7 years. Wood product, apparel, and chemical manufacturing are decreasing in competitiveness.

Figure 2-32 provides a spectrum indicating the rate of change in regional competitiveness for different manufacturing industries between 2010 and 2016. In blue are industries that are increasing in competitiveness, and orange indicates industries that are declining in competitiveness within District 1. Over the last 7 years in District 1, the machinery industry has seen the fastest increase in competitiveness while the wood products industry has declined the fastest.

Figure 2-32: Regional Shift by Manufacturing Industries (2010 to 2016)



Source: CPCS Analysis of County Business Patterns, US Census Bureau 2010 and 2016.

Note: Employment information relies on approximations due to company confidential information. Employment data is estimated based on the median of each employment range. Employment figures do not include government employees, railroad employees, and self-employed persons

The manufacturing industry's freight needs are varied due to the wide variation in the types of products and value. Manufacturers are also spread across District 1, with larger concentrations of manufacturing in Duluth-Superior and around the town of Virginia. The most heavily relied upon routes in the District tend to include I-45, I-53, and State Highways 102 and 161.

3 District 1 Multimodal Freight System

Key Findings

Generally, District 1's transportation systems are aligned for the movement of bulk goods on Lake Superior and freight activities around Duluth-Superior metro area. As only one Interstate serves the District, trucks traveling in the region are highly reliant on the system of US highways and Minnesota state routes to move goods. On the rail side, the District is served by four Class I railroads operating on more than 860 miles of tracks that provide inter-district, inter-state, and cross-border connections. Waterborne freight in the District is served by three ports on Lake Superior. In addition, there are three commercial airports in the District that can provide air cargo service, and pipelines carrying a variety of petroleum products.

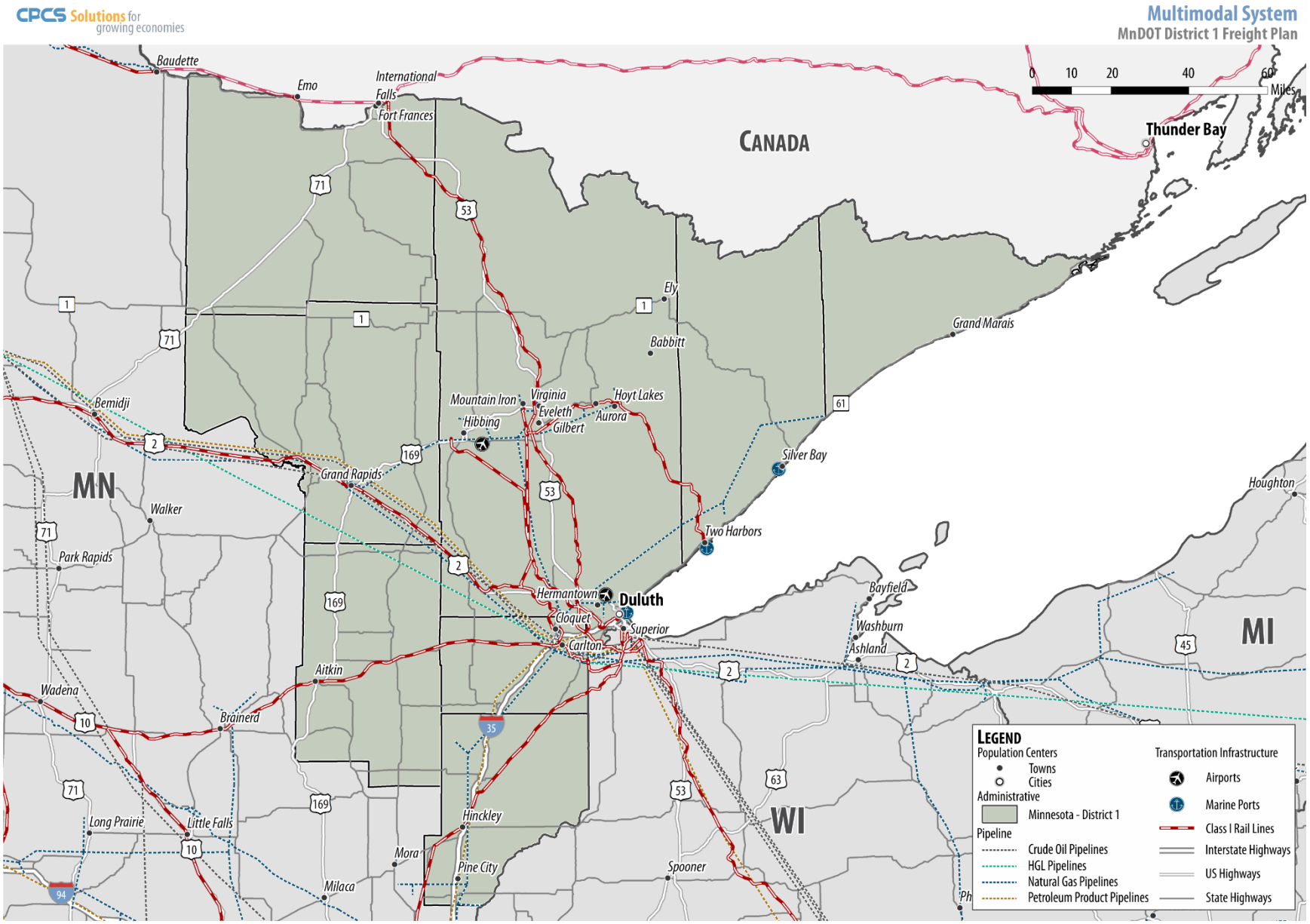
3.1 District 1 Freight System Overview

District 1 is uniquely located at the far southwestern western end of Lake Superior, giving it direct access to the Atlantic Ocean via the Great Lakes and St. Lawrence Seaway. This geographic advantage, along with a diversified multimodal freight system has made the region, and Duluth-Superior in particular, a key regional transportation hub since the late 1800s. Since its initial development, District 1's multimodal freight system has grown to include highway connections to the Central Midwest via I-35, and Chicago via US-53 and I-94. Additionally, multiple railroads provide service to all corners of the US. As a result of the confluence of these systems, District 1 serves as a key regional freight hub for Minnesota, northern Wisconsin, Michigan's western Upper Peninsula, eastern North Dakota, and parts of northern Ontario.

District 1 serves as a regional transportation hub for Northern Minnesota and Wisconsin, and western portions of the Upper Peninsula

Figure 3-1 provides a high-level snapshot of the District's key transportation assets. Together, these assets provide a wide range of freight services to the District and support the continued economic well-being of the District. This chapter provides a review of each modal element of the District's freight system, which will provide a baseline for the evaluation of its condition and performance.

Figure 3-1: The District 1 Multimodal System



Source: CPCS Analysis of National Transportation Atlas Database

More than 1,500 miles of US and state highways and nearly 100 miles of interstates cross the District. Together, these routes account for 13% of Minnesota's total highway and interstate miles. In addition to the road network, more than 860 miles of railroad, 567 bridges, 17 miles of navigable inland waterway, and 3 commercial public airports make up District 1's integrated multimodal freight system.

100	1,500	860	567	3	8
Miles of Interstate	Miles of US and State Highways	Miles of Rail	Bridges	Commercial Airports	Pipelines

3.1.1 Statewide Freight Trends

A brief background on Minnesota's freight system can provide context to discussion about District 1's system. In 2012, one billion tons of freight with an estimated value of $912 billion was carried on Minnesota's freight system. In terms of the freight modal split, trucking was the dominant mode with a 63% share of the total cargo tonnage carried, followed by rail with a 25% share. Trucking also accounted for 67% of the state's total commodity value, while rail held a 21% share.[10] The following table summarizes the 2012 and projected 2040 freight modal split for Minnesota.

Figure 3-2: Freight Modal Split in Minnesota

Freight Mode	2012 Tonnage	Projected 2040 Tonnage	2012 Value	Projected 2040 Value
Truck	63%	63%	67%	63%
Rail	25%	26%	21%	20%
Water	3%	2%	<1%	<1%
Pipeline	5%	6%	3%	2%
Multiple Modes and Mail	4%	3%	7%	11%
Air	-	-	2%	4%

Source: MnDOT "Statewide Freight System Plan" (2016).

According to the FHWA's 2040 projections, the total freight volume in Minnesota will increase by 80% to 1.8 billion tons. Total freight value is expected to increase much more: by 161% to $2.3 trillion. As the above table shows, the freight modal split regarding weight and value is expected to remain relatively constant through 2040.

[10] MnDOT Statewide Freight System Plan (2016). https://www.dot.state.mn.us/planning/freightplan/pdf/mn-statewide-freight-system-plan.pdf

Minnesota's freight tonnage is expected to increase by 80% between 2012 and 2040. Freight value is expected to increase by 161%.

In 2012, grain accounted for 23% of the total cargo weight carried in Minnesota, followed by metallic ores with 9% and coal and gravel each with 7% share of the total cargo volume. As Figure 3-3 shows, based on the 2040 projections the share of cereal grains and other agricultural products from the total commodity weight is expected to increase to 24% while the metallic ore share is expected to drop to 5%.

In terms of value, the top commodities carried across the state in 2012 were electronics, machinery, motorized vehicles, mixed freight, and precision instruments. By 2040, the precision instruments are expected to hold a 23% share of the state's commodity value followed by machinery and commodities with 9% and 8% shares respectively.

Figure 3-3: Top Five Current and Forecasted Commodity Shares

2012 Top Commodities by Tonnage	Share %	2040 Top Commodities by Tonnage	Share %	2012 Top Commodities by Value	Share %	2040 Top Commodities by Value	Share %
Cereal Grains	23	Cereal Grains	24	Electronics	8	Precision Instruments	23
Metallic Ores	9	Coal	8	Machinery	8	Machinery	9
Coal	7	Other Agriculture	8	Motorized Vehicles	6	Electronics	8
Gravel	7	Animal Feed	6	Mixed Freight	6	Mixed Freight	5
Animal Feed	5	Gravel	6	Precision Instrument	5	Misc. Manufacturing Products	5

Source: MnDOT Statewide Freight System Plan (2016).

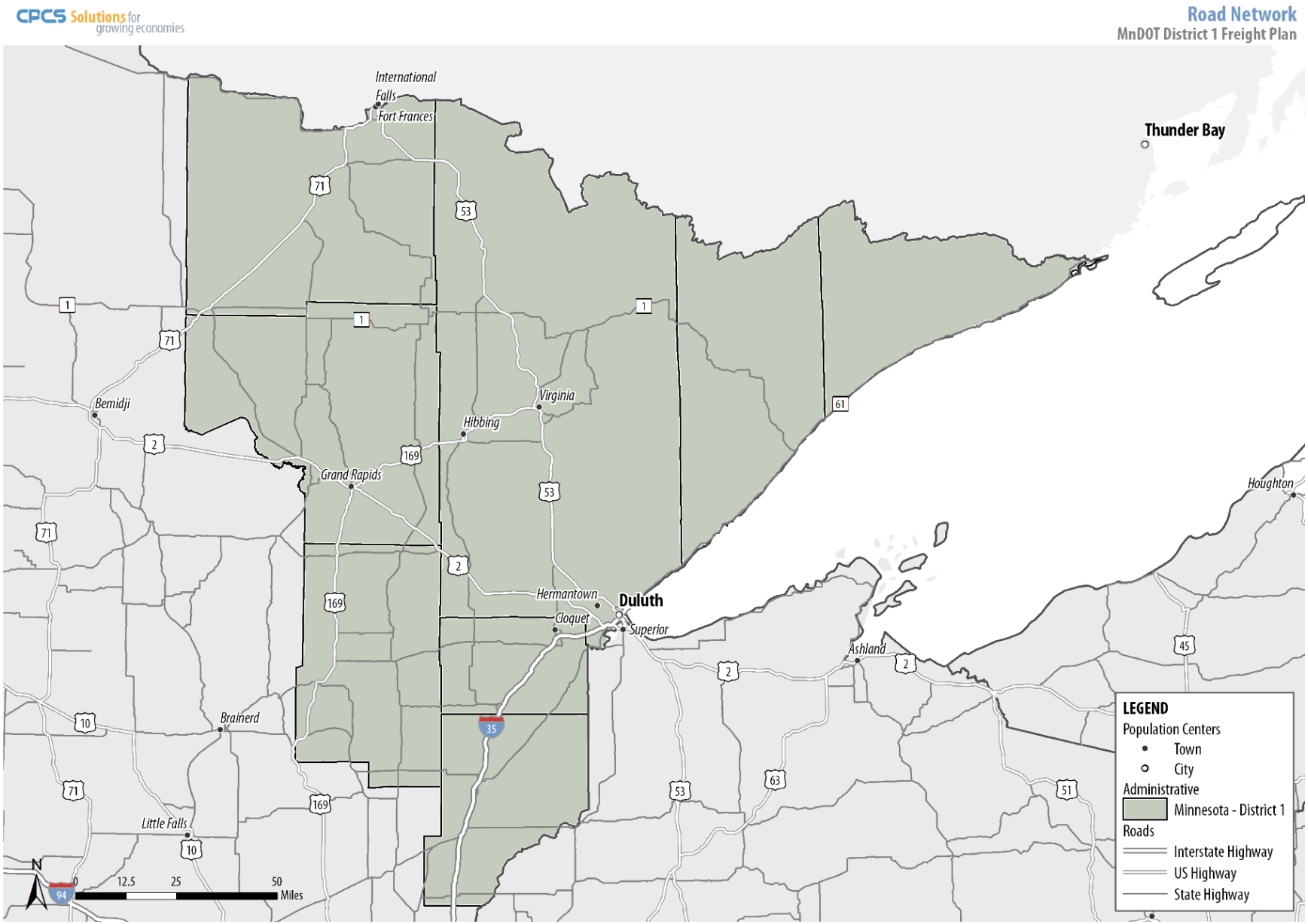
The implications of these expected shifts for District 1's freight system are uncertain. For example, Minnesota's maritime tonnage is forecasted to decrease, but grain and coal (which are key commodities at the Port of Duluth Superior) are expected to remain top commodities for Minnesota as a whole.

The following sections provide an introduction to the District's multimodal freight system and describe infrastructure, key facilities, and the corridors that integrate the District's freight operations with the State's freight network.

3.2 Road Network

The District's road network consists of a variety of road types, including interstates, US highways, state highways, and county roads. The road network is important because it provides direct connections to all of the District's businesses and to other modal systems. Figure 3-5 lists the mileages of some elements of the District's roads, and Figure 3-4 provides a visual overview of the routes within the system. Of note is the relatively small number of interstate miles in the District, and the reliance on US and state highways to provide connections to much of the District.

Figure 3-4: District 1 Highway System Map



Source: MnDOT, "Northeast Minnesota Regional Information" (August 2018). http://www.dot.state.mn.us/d1/

Figure 3-5: District 1 Road System Mileages

	District 1	Minnesota
Interstate	95	912
US Highway	475	3,295
State Highway	1,314	7,080

Source: CPCS Analysis of FHWA Data

Interstate service in District 1 is relatively limited, so US and state trunk highways serve as critical road connections for much of the region.

Tonnage information by commodity specific to District 1 is not available, but statewide tonnage figures can provide insight into what freight may be moving on District 1's road network. Trucks carry 63 percent of the total freight tonnage and account for 67 percent of the commodity value carried across Minnesota. Due to the flexibility of trucking operations, trucks carry a wide range of commodities in short and long haul and are the sole provider of "last mile" services for most businesses. In 2012, cereal grains, animal feed, agricultural products, and gravel were the top commodities carried via trucks in terms of tonnage. Figure 3-6 summarizes Minnesota's top commodities carried by truck in 2012 and 2040, and Figure 3-7 lists District 1's top truck-borne commodities as of 2012.

Figure 3-6: Major Commodities Carried by Trucks, 2012

Top Commodities	Tonnage Carried by Trucks in 2012	Percent	Projected Increase by 2040
Cereal Grains	102,444,952	27%	56%
Gravel	36,411,736	9%	21%
Animal Feed	27,660,293	7%	104%
Nonmetal Mineral Products	26,059,761	7%	68%
Waste/Scrap	21,527,179	6%	32%
Other Agricultural Products	21,194,640	5%	153%
Other Foodstuffs	14,968,912	4%	79%
Coal	14,024,837	4%	2%
Gasoline	12,075,671	3%	9%
Wood Products	8,706,138	2%	21%
Base Metals	7,974,647	2%	N/A
Fuel Oils	7,470,600	2%	N/A
Fertilizers	7,127,865	2%	N/A
Milled Grain	6,512,195	2%	188%
Logs	6,413,718	2%	N/A
All Others	65,388,376	17%	N/A

Source: MnDOT "Statewide Freight System Plan" (2016).

Figure 3-7: District 1's Major Commodities by Total Truck Tonnage, 2012

Commodity	Tonnage	Percent	Percent Originating in D1
Gravel	8,823,326	26%	70%
Animal Feed	3,615,966	11%	86%
Nonmetal Mineral Products	2,484,173	7%	53%
Natural Sands	2,448,661	7%	83%
Logs	2,355,326	7%	31%
Cereal Grains	2,344,533	7%	56%
Waste/Scrap	1,669,910	5%	33%
Live Animals/Fish	1,525,623	5%	97%
Coal	994,631	3%	63%
Other Agricultural Products	982,729	3%	17%
All Others	6,324,515	19%	41%

Source: MnDOT Statewide Freight System Plan Technical Memo 3.

Comparing statewide commodities and District 1-specific commodities provides insight into the unique qualities of the District's transportation system. Specific differences between District 1 and Statewide commodities include:

- **Cereal Grains** make up a much larger share of Minnesota's truck tonnage (27%) than District 1's truck tonnage (7%). This is likely due to the high levels of agriculture activity in other Districts relative to District 1.
- **Logs**, which made up 7% of District 1's truck tonnage, but only 2% of Minnesota's truck tonnage. This difference likely reflects the fact that District 1 is home to both forestry firms, as well as paper and other wood product manufacturers.
- **Gravel** made up 26% of District 1's truck tonnage, but only 9% of Minnesota's truck tonnage. **Natural Sands** also made up 7% of District 1's tonnage, but less than 2% of Minnesota's.
- **Live Animals and Fish** made up 5% of District's truck tonnage, but less than 2% of Minnesota's.

The FHWA's projections anticipate a 56% increase in the cereal grain tonnage, 104% increase in animal feed tonnage, 153% increase in agricultural products tonnage, and 21% increase in gravel tonnage carried via trucks by 2040.[11] Given that each of these commodities is a major commodity for District 1's network as well, it is likely that truck tonnages in this District are likely to increase in the future, although they may do so at a rate slower than Minnesota as a whole, given District 1's historically flat population growth.

[11] MnDOT "Statewide Freight System Plan" (2016). https://www.dot.state.mn.us/planning/freightplan/pdf/mn-statewide-freight-system-plan.pdf

District 1's truck tonnages are likely to increase in the future, although their growth may be slower than Minnesota's overall truck tonnages due to slow population growth.

3.2.1 Key Corridors

I-35 is the only major interstate within District 1 and is a key truck route as it directly links Duluth and the Twin Cities, and provides access between much of the Central Midwest and Lake Superior. In the absence of more interstates, the freight activities in the District are reliant on US Highways and State Routes, especially US-2 and US-53, which are essential corridors serving freight movement between densely populated areas in the District, and across the US-Canada border.

Figure 3-8 and Figure 3-9 provide a respective overview of all vehicle and truck-specific traffic volumes in the region and help to show which routes are most important based on vehicle volume.

Figure 3-9 shows how the District's road network and truck traffic is centered on the Duluth area, with I-35 connecting the District to the Twin Cities, and US-53 and US-2 providing links to the Range Cities and Grand Rapids. US-169, MN-61, and MN-210 also provide links to other sections of the District.

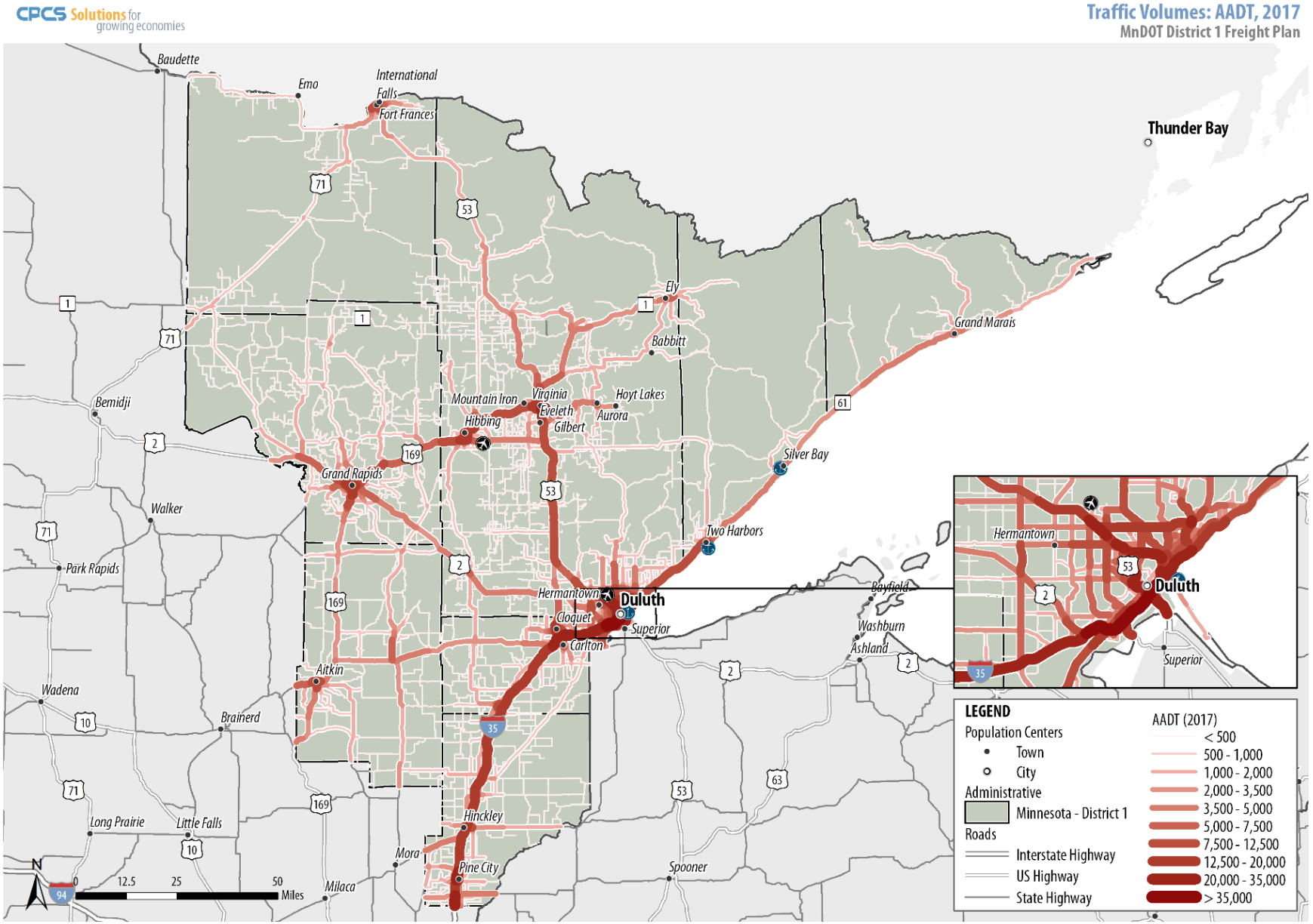
I-35

Interstate 35 runs north-south between Duluth and the Twin Cities, passing through the District 1 counties of Carlton and Pine along the way. In Duluth, I-35 starts at a spur with MN-61, and remains a 4-lane highway for the majority of its length in Minnesota, with limited 6-lane sections between major interchanges. Outside of District 1 boundaries, I-35 divides into I-35 West and I-35 East when passing through the Metro District, and then unites again to cross Iowa, Kansas, Oklahoma, and Texas, all the way south to US-Mexico Border in Laredo.

In the District, the Annual Average Daily Traffic count (AADT) on I-35 is about 17,825, about 8% of which (1,494 vehicles) is Heavy Commercial Annual Average Daily Traffic (HCAADT).[12] As Figure 3-9 shows, I-35 has the highest HCAADT volume compared to other highways in the District, which suggests that it is an essential corridor within the District's integrated freight network.

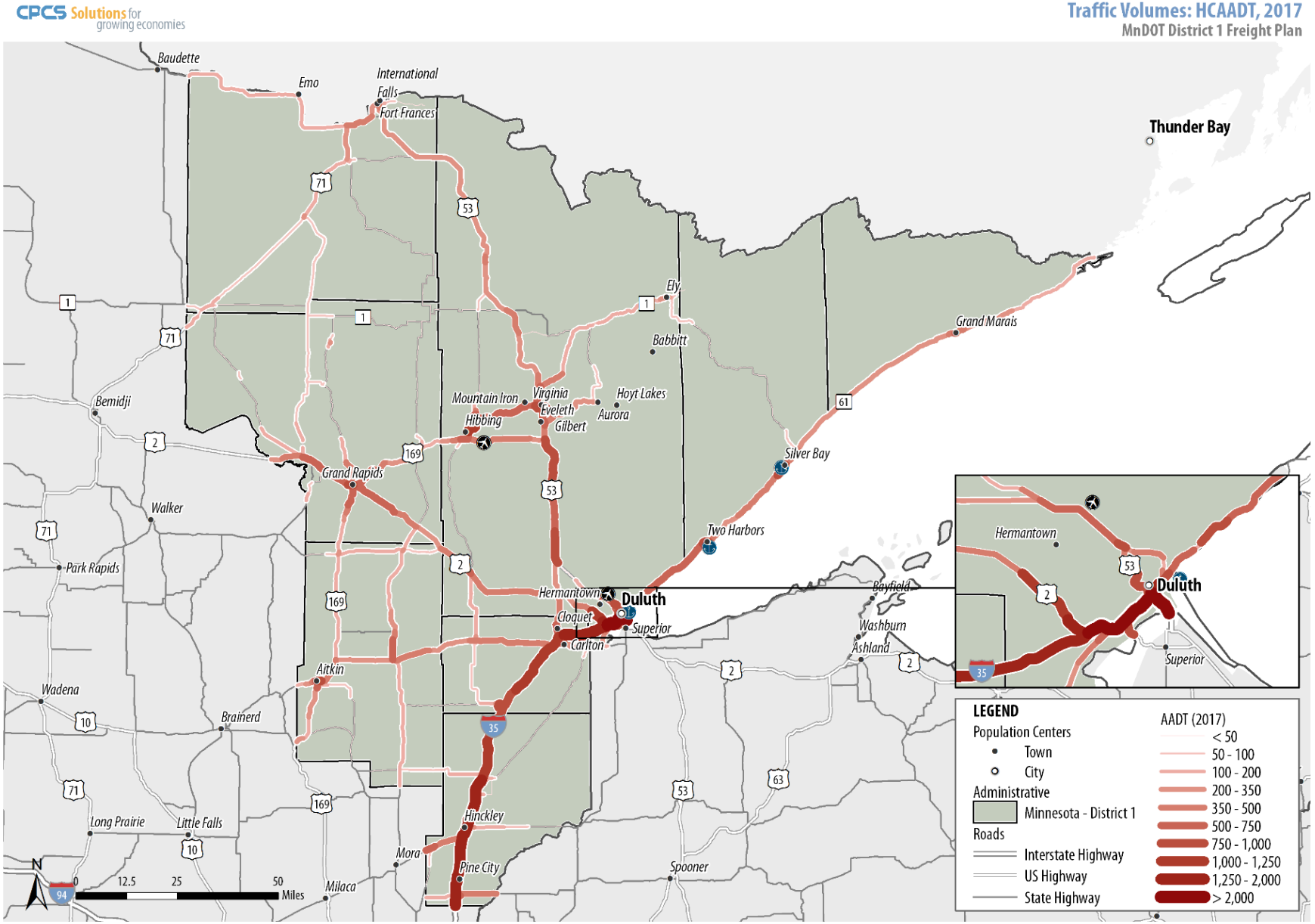
[12] MnDOT Traffic Data (September 2018), [Online]. http://mndotgis.dot.state.mn.us/tfa/Map

Figure 3-8: District 1 Average Annual Daily Traffic Volumes (all vehicles)



Source: CPCS analysis of MnDOT and NTAD data. 2017.

Figure 3-9: District 1 Annual Average Daily Truck Traffic Volume



Source: CPCS analysis of MnDOT and NTAD data. 2017.

US-2

US Highway 2 is an east-west route with a total of 2,571 miles that runs between Washington State and Maine. In Minnesota, US-2 connects Duluth with the cities of East Grand Forks, Bemidji, and Grand Rapids linking I-35 with US-169, US-71, US-59, US-75, and eventually I-29 in North Dakota. East of Duluth, US-2 provides service to northern Wisconsin, and Michigan's Upper Peninsula, making it a key route for logging products bound for District 1's mills. Nearly 55% of US-2 in Minnesota has four lanes (2 at each direction), mostly in Northeast parts of the state.

As Figure 3-8 and Figure 3-9 show, in the District, US-2 is most heavily traveled near Grand Rapids and Duluth with an AADT of 7,673 and HCAADT of 652.

US-53

US highway 53 is primarily North-South aligned and runs across the eastern side of Minnesota. The route starts at a junction with I-94 in Eau Claire, Wisconsin and ends at the US-Canada border in International Falls. US-53 enters Minnesota in Duluth by crossing the John Blatnik Bridge over the St. Louis River. For the majority of its length in District 1, US-53 is a four-lane separated highway with an AADT of 10,012 and HCAADT of 473. US-53 is a key connection between Duluth-Superior and the Range Cities, as well as the Canadian border. US-53 is also important to the District because of its link with I-94 in western Wisconsin, which is an important route for truck freight bound to or from Milwaukee or Chicago.

3.2.2 Secondary Corridors

In addition to the key corridors previously described, there are other important routes that support freight movements within the District:

US-169 is a primarily North-South route in Northeast Minnesota, which starts at an interchange with US-53 near the city of Virginia and continues northeast to end at an intersection with Lake County Road 18 and Power Dam Road east of Ely. In the District, US-169 is most heavily traveled near Grand Rapid and Aitkin with an AADT of 8,230 and HCAADT of 422.

MN-61 follows Lake Superior's shores from I-35 in Duluth, to Grand Portage at the Canadian border. The majority of its length has two travel lanes, only the section between Duluth and Two Harbor is a four-lane divided highway. MN-61 has an AADT of 6,912 and HCAADT of 524. Stakeholders indicated that in previous years, MN-61 had higher truck volumes, but changes in operations at paper mills in Thunder Bay, Ontario had reduced this traffic significantly.

US-71 is a North-South route that enters the State in Jackson, near Minnesota's border with Iowa. US-71 then passes through multiple counties to end in Pelland, Koochiching County. US-71 has low truck traffic between Pelland and its intersection with I-10 in Wadena. After that point, US-71's truck traffic volume increases to moderate to high levels as it is affected by high-volume trucking activities near the Minneapolis metro area.

MN-1 starts at a T-junction with MN-61 in Illgen City by Lake Superior and runs eastward across Cook, Lake, St. Louis, Itasca, Beltrami, and Marshall Counties to end at an interchange with I-29 in North Dakota. In District 1, MN-1 has a low to moderate truck traffic and primarily serves as a minor trucking link between the Northern counties of the state.

MN-65 starts at a T-junction with US-71 near Little Fork in Koochiching County and heads south passing through Itasca County to end at an intersection with MN-27 in Aitkin County. MN-65 has a low to moderate truck traffic but serves as a local truck connection for two major highways: US-71 and I-35.

MN-210 is a 227-mile, 2-lane highway that runs between Carlton County and Breckenridge in Wilkin County. The route serves as an important truck connection between Carlton and Aitkin and provides some southern portions of District 1 with access to I-35.

MN-48 is a 2-lane 24-mile highway in Pine County which starts at an interchange with I-35 in Hinckley and ends at the Minnesota-Wisconsin border on the St. Croix River. After crossing the river, the highway becomes WI-77 which ends at an intersection with WI-35 in Danbury, WI. MN-48 is also a super load corridor and a major point of entry for Over-Sized Over-Weight (OSOW) vehicles. Carrying OSOW on MN-48 requires specific District approval due to route weight and size limitations.

MN-70 starts as a 2-lane highway at an intersection with MN-107 and route 41, in Brunswick, MN and meets I-35 at an interchange in the City of Rock Creek in Pine County. From that point, MN-70 runs eastward towards the Minnesota-Wisconsin border on the St. Croix River. After crossing the river, the highway becomes WI-70 which ends at an intersection with WI-35 in Siren, WI. MN-70 is a super load corridor and a major point of entry for Over-Sized Over-Weight (OSOW) vehicles. MN-70 is approved for 16 ft. wide OSOW loads, however, rear civilian escort is required due to bridge height limitations

Route 16 in Lake and St. Louis Counties Route 16 is a key route for logging companies to move log loads between Silver Bay, and US-53 south of Eveleth.

3.2.3 Connectors and Critical Freight Corridors

NHS intermodal connectors provide critical first and last mile connectivity between the national or interstate highway system and other freight and passenger modes. Designation of NHS connectors is done in cooperation with the USDOT, state DOTs, and MPOs based on the role they serve, and certain traffic volume thresholds established by federal regulations. In short, the facilities served NHS intermodal connectors are significant to District 1 and Minnesota.

Nationwide, USDOT has designated more than 1,000 miles of urban connectors and nearly 220 miles of rural connectors that connect 616 freight intermodal terminals to the NHS. In Minnesota, seven connectors have been designated, of which three are in District 1. These three connectors are shown in Figure 3-10, and are:

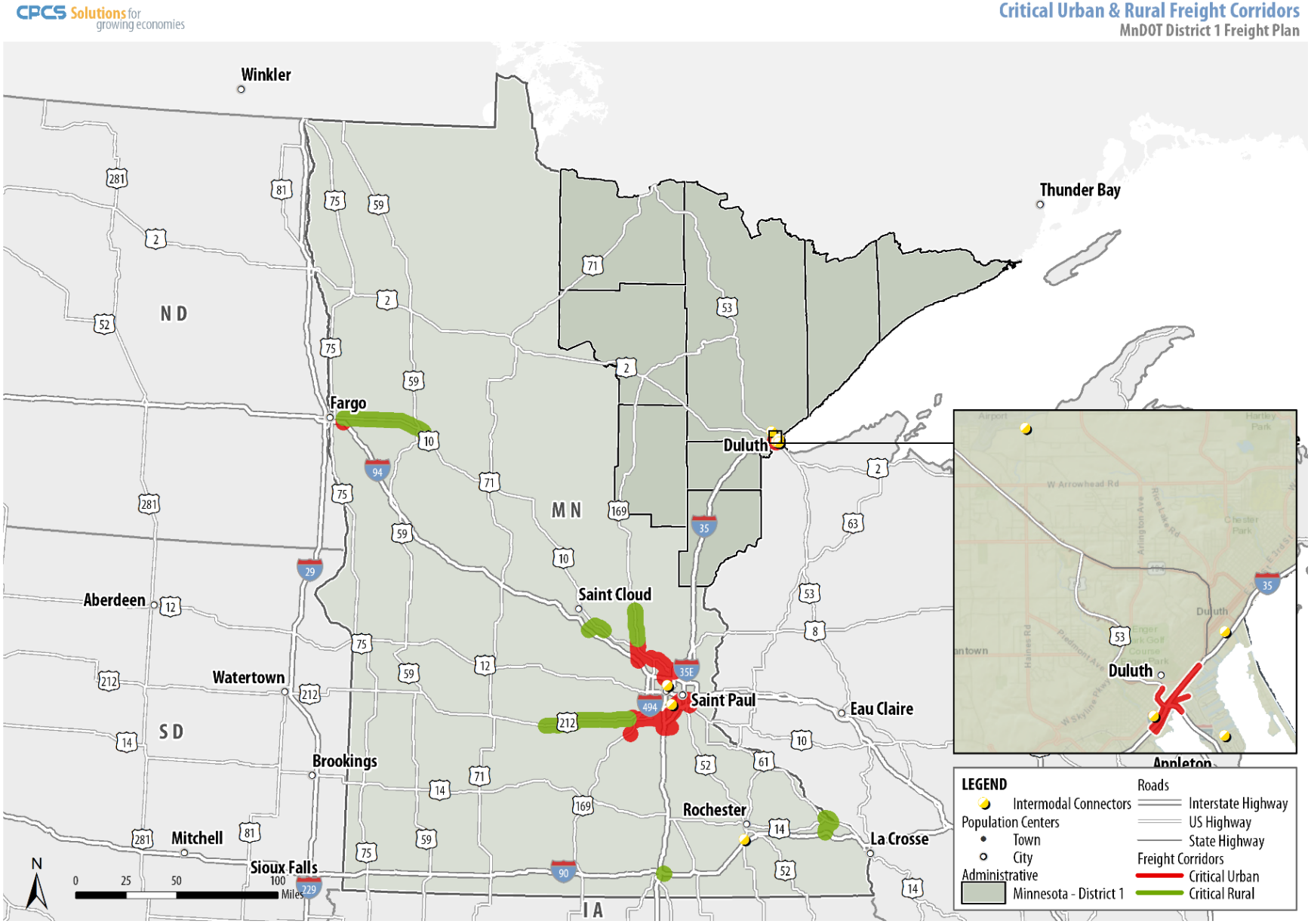
- Haines Road between Duluth International Airport and US-53
- Surface streets between the Duluth Transit Authority Hub and I-35, including Mesaba Avenue, Superior Street, Michigan Street, and Lake Street.
- Links from I-535 to the Port of Duluth's Clure Public Terminal, including Garfield Avenue, Port Terminal Road, and Helberg Drive.

In addition to these intermodal connectors, Minnesota has designated Critical Urban and Critical Rural Freight Corridors (CUFCs/CRFCs). A Critical Rural Freight Corridor (CRFC) is a rural arterial on which more than 25% of the AADT is truck traffic. A Critical Urban Freight Corridor (CUFC) is an urban arterial that connects intermodal freight facilities to the interstate system. Designating a corridor as a CRFC or CUFC can help a state guide Federal resources towards prioritized freight performance improvements. FHWA has designated a maximum of 150 miles or 20% of Primary Highway Freight System (PHFS) for CRFC and a maximum mileage of 75 or 10% of PHFS for CUFC in Minnesota (centerline mileages).[13] MnDOT has designated one Critical Urban Freight Corridor in District 1: Courtland Street, which provides oversize-overweight truck service between the Port of Duluth, and I-35. No Critical Rural Freight Corridors have been designated in District 1.

District 1 has a three of Minnesota's seven intermodal connectors, thanks to Duluth's position as a regional transportation hub.

[13] PHFS is designated by FASC Act as the network of the most critical freight highways in the U.S. transportation system. FHWA designates the PHFS highways and updates the list every five years. For more information see: https://ops.fhwa.dot.gov/freight/infrastructure/ismt/nhfn_states_list.htm

Figure 3-10: Critical Urban and Rural Corridors, and NHS Intermodal Connectors



Source: CPCS analysis of MnDOT data

3.2.4 Key Structures and Facilities

Bridges

District 1 has 571 state-owned road bridges that account for nearly 12% of Minnesota's total number of bridges (10 ft. and greater), and Figure 3-12 shows the location of these bridges. Two bridges: the Richard I. Bong Memorial Bridge and John A. Blatnik Bridge are critical to freight movement in the District.

- **Richard I. Bong Memorial Bridge** has two lanes in each direction and carries US-2 across the St. Louis River. This eastern section of US-2 starts from an interchange with I-35 Southwest of Duluth and after crossing the Bong Bridge, ends at an intersection with US-53 in Superior, Wisconsin. Construction of the 2.5-mile Bong Bridge (1.57-mile over water) started in 1982, and the Bridge started service in 1985. Over 20,000 vehicles travel over the Bong Bridge every day.[14] As one of the two primary access routes over the St. Louis River, the traffic condition on the bridge has significant impacts on the level of service on surrounding roads, as well as the nearby Blatnik Bridge.

- **John A. Blatnik Bridge** carries I-535 over the St. Louis Bay, connecting I-35 in Duluth to US-53 and WI-35 in Superior, Wisconsin. The 1.5-mile Blatnik Bridge has two lanes in each direction and carries nearly 28,000 vehicles every day. The bridge was constructed in 1961, but its structure was reinforced and the shoulders were widened in 1992 and 1993.[15] In early 2008, the bridge structure underwent another reinforcement project.

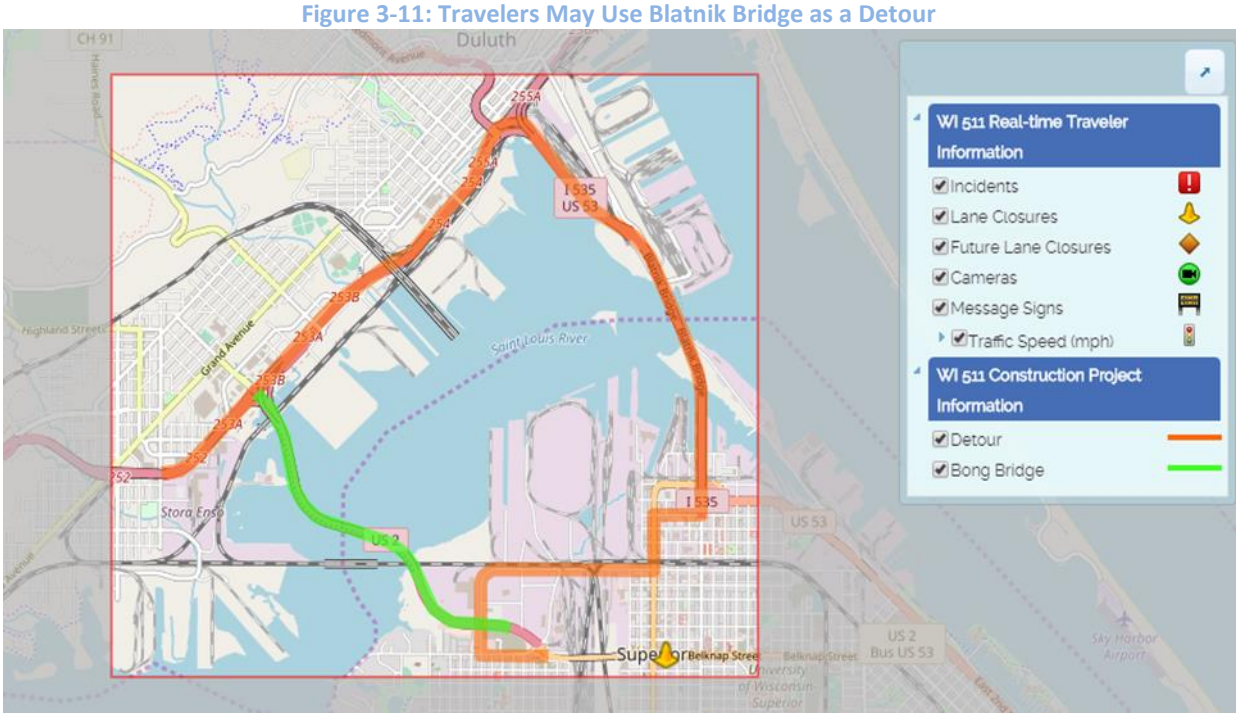
The Bong and Blatnik Bridges between Duluth and Superior are critical freight links for the District.

Since 2008, trucks over 40 tons are diverted to Bong Bridge to cross the St. Louis River, making the Bong Bridge a critical network link for heavy trucks traveling in the region. If the Bong Bridge was impassable, the truckers traveling on I-35 destined for Superior, WI have to either use Blatnik Bridge or take an at least 120-mile detour to get to WI-35 and then travel another 50 miles north to reach Superior. Figure 3-11 shows the Bong Bridge highlighted in green and the Blatnik Bridge in orange as a detour for the traffic that could not travel over Bong Bridge due to construction projects by WisDOT in 2015. Road sections that are highlighted red reflect reduced travel speed (of 20-30 mph) due to traffic congestion.

[14] Johnweeks "Richard I. Bong Memorial Bridge" (2004). https://www.johnweeks.com/river_stlouis/pages/stlL06.html

[15] Johnweeks "John A. Blatnik Bridge" (2004). https://www.johnweeks.com/river_stlouis/pages/stlL04.html

Figure 3-11: Travelers May Use Blatnik Bridge as a Detour



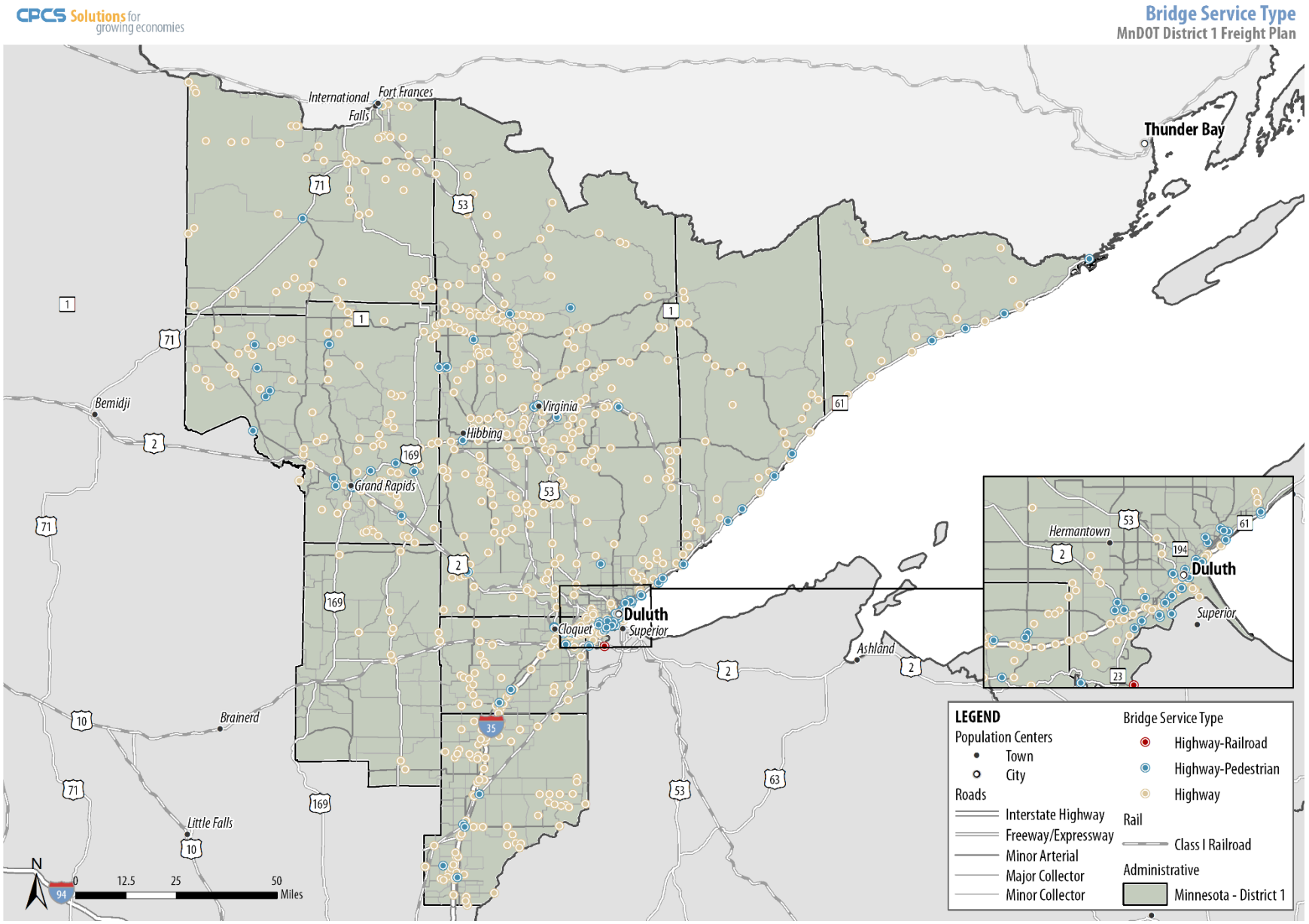
Source: Project 511 "US 2 Bong Bridge" (2015). https://projects.511wi.gov/us2bongbridge/map/

Also important to District 1 is the Highway 70 Bridge.

- **Highway 70 Bridge** is a 605-foot bridge over St. Croix River that connects Minnesota State Highway 70 with Wisconsin State Highway 70. The bridge was initially named Grantsburg Toll Bridge, built in 1929 on the WI side and completed in 1933 on the MN side. In 1991, the old Grantsburg Bridge was replaced with a new steel and concrete structure. Nearly 4,000 vehicles cross the bridge on a daily basis.[16] MnDOT staff and OSOW stakeholders have indicated that Highway 70 is a key point for OSOW loads that are too large or heavy to pass through Bridges in the Twin Ports.

[16] MnDOT Traffic Data Map (September 2018), [Online]. http://mndotgis.dot.state.mn.us/tfa/Map

Figure 3-12: District 1 Bridge Inventory



Source: CPCS analysis of MnDOT Bridge Inventory Data.

Weigh Stations

District 1 is home to one MnDOT weigh station, the Saginaw Weigh Station. This facility is located west of the MN-2 and MN-33 interchange, near Duluth. Trucks traveling on both routes are required to stop at the weigh station when it is open. There is also an inspection pull off site in the District which is located on I-35 in Carlton.

Truck Stations and DOT Headquarters

MnDOT maintains two headquarters in District 1, located in Duluth and Virginia. MnDOT also maintains 19 truck stations throughout the District to aid in highway maintenance and plowing. Figure 3-13 displays the distribution of these key facilities which are located along major corridors such as I-35, US-53, US-2, MN-1, and MN-61. These facilities are shown in Figure 3-13.

Minnesota has more than 840 snowplows and reserve trucks[17] to control the impacts of the inclement weather on major corridors. Between 2017 and 2018, the MnDOT's plow operations in the District plowed more than 3,810 lane miles of snow.[18] In addition to MnDOT's work, local counties and municipalities operate their own maintenance and plowing programs for their respective transportation assets.

Truck Stops and Rest Areas

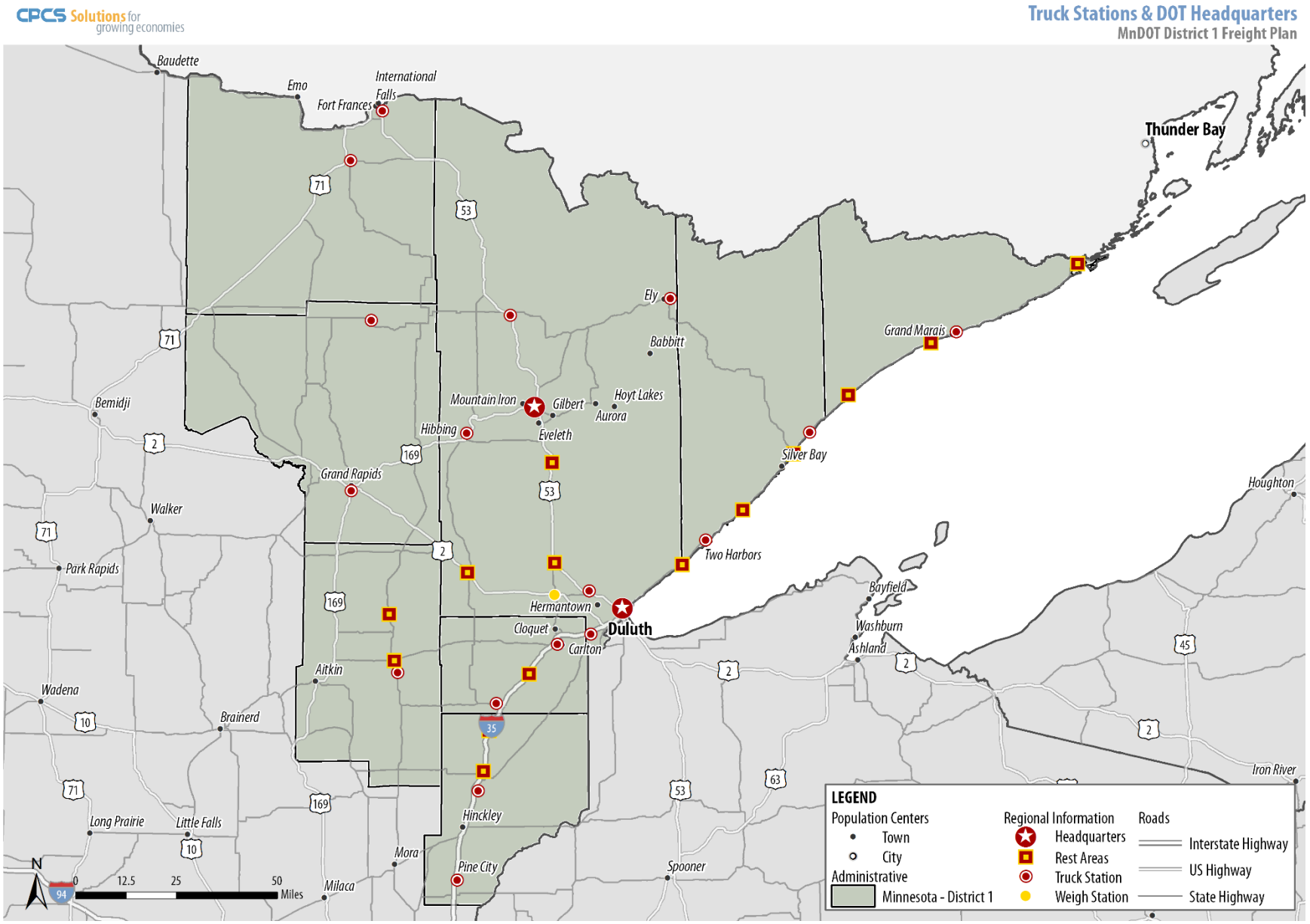
Truck stops and rest areas are necessary parts of the freight system and the transportation system in general as they ensure the safety of all road users. Rest areas help reduce the possibility of fatigue-related truck crashes. Also, in the absence of truck stops and rest areas, truckers may stop at the Interstate and highway shoulders and impose a risk to other road users.

District 1 has 11 full-service or information center rest areas, distributed across the District's major highway corridors, and these facilities are shown in Figure 3-13.

District 1 also has some of Minnesota's more unique rest areas, with two sites on MN-61 jointly-operated by MnDOT and the Minnesota Department of Natural Resources. Gooseberry Falls and Tettegouche State Parks both have truck parking and rest area facilities integrated into state park visitor centers, which provide parking in relatively remote areas and reduce the cost of operation for both agencies.

[17] MnDOT "Work Zone Safety" (September 2018). https://www.dot.state.mn.us/workzone/snowplow-facts.html
[18] MnDOT "District 1 Fact Sheet" (September 2018). https://www.dot.state.mn.us/information/factsheets/d1-fact-sheet.pdf

Figure 3-13: District 1 Truck Stations



Source: MnDOT "Northeast Minnesota Regional Information-MnDOT District 1" (August 2018). http://www.dot.state.mn.us/d1/contacts.htm

3.3 Railroad Network

Rail has historically played a large role in District 1's freight system, as it provided all-season service to haul heavy commodities like iron ore and timber. Today, rail still serves as a key mode in the District and provides connections to markets such as Chicago and the Pacific, Atlantic, and Gulf coasts. District 1 is served by four Class I and four short line railroads, which operate over 860 miles of track. 411 railway and roadway crossings exist in the District of which only 40 percent are signalized.

1,049	18.9%	161	279	4
Miles of Track	of the State's Total Track Miles	Actively-Protected Public Crossings	Passively-Protected Public Crossings	Class I Freight Rail Operators

Burlington Northern Santa Fe (BNSF) and Canadian National (CN) are the two Class I railroads that own trackage in the District. The Union Pacific (UP) and Canadian Pacific (CP) railroads also operate in the District, through trackage right agreements with the CN and BNSF. Figure 3-14 lists the trackage and crossings held by the BNSF and CN, and Figure 3-16 shows the train volumes and speed limits on each Class I line.

Figure 3-14: Freight Railroad System of the District*

Railroad	System Miles in the District	Number of Mainline Tracks	Public Road Crossings
BNSF	435	1	219
CN	497	1	158
Northshore Mining (NMCZ)	47	1	4
North Shore Scenic Railroad (NSSR)	25	1	26
St. Croix Valley (SCXY)	36	1	25
Cloquet Terminal Railroad (CTRR)	3	1	2
Minnesota Dakota & Western (MDW)	6	1	6

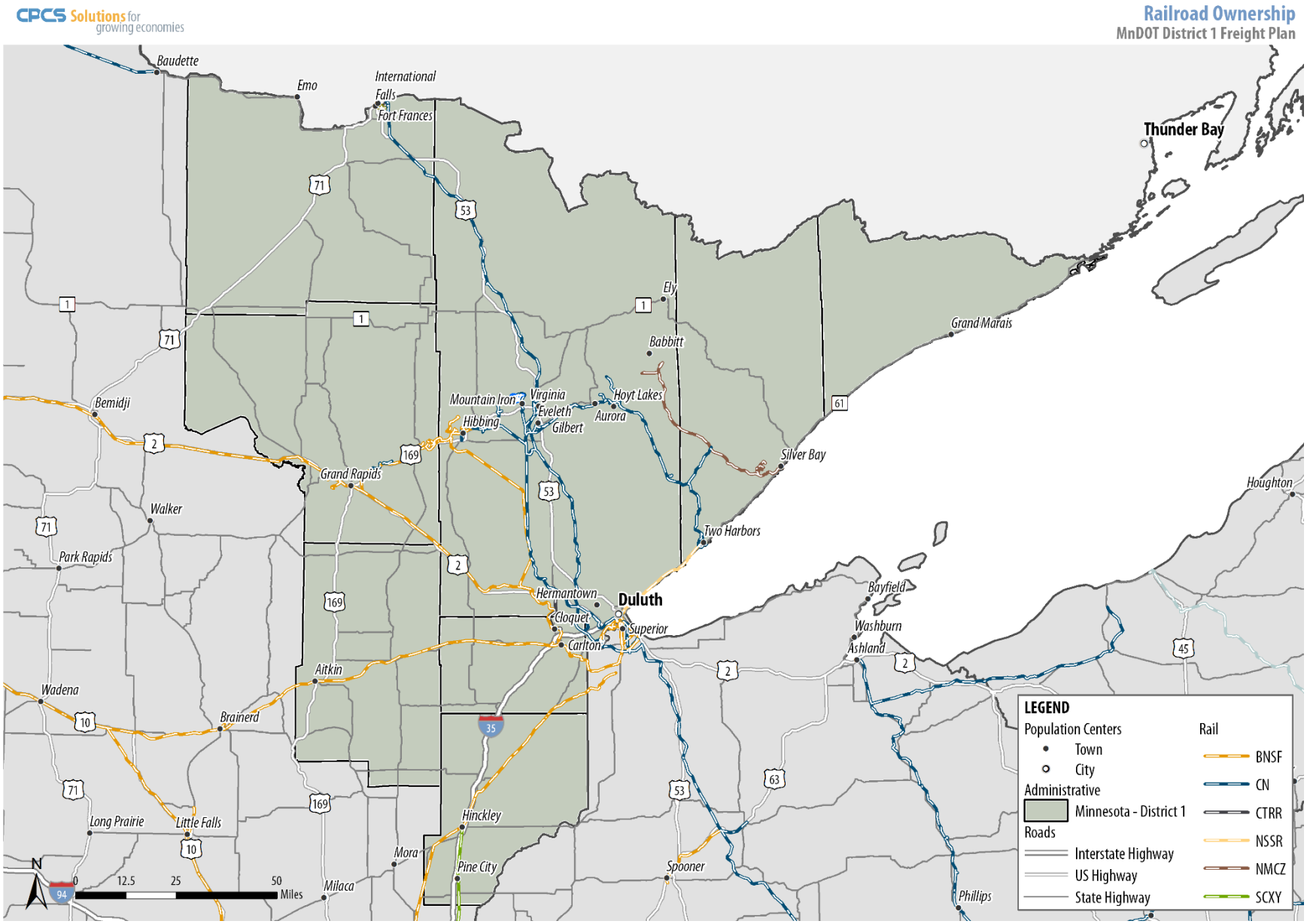
Source: Minnesota State Rail Plan, 2015. MnDOT Grade Crossing Safety Data, 2015. National Transportation Atlas Database, 2017.

*Note: for the purpose of GIS data queries, District 1 as defined here includes the full extent of Aitkin, Koochiching, and Itasca Counties. Therefore, track mileage and crossing counts are slightly higher than would otherwise be reported for District 1. This figure does not include the Lake Superior and Mississippi Railroad (LSMR), which does not provide freight service.

Rail lines in Minnesota carried more than 250 million tons of cargo in 2012, 93 percent of which was carried in rail cars while the rest was carried in intermodal containers. The state's rail freight tonnage is anticipated to grow by 83 percent to more than 460 million tons by 2040, 90 percent of which is expected to be carried in carloads and the remaining 10 percent is expected to be carried in intermodal containers.[19]

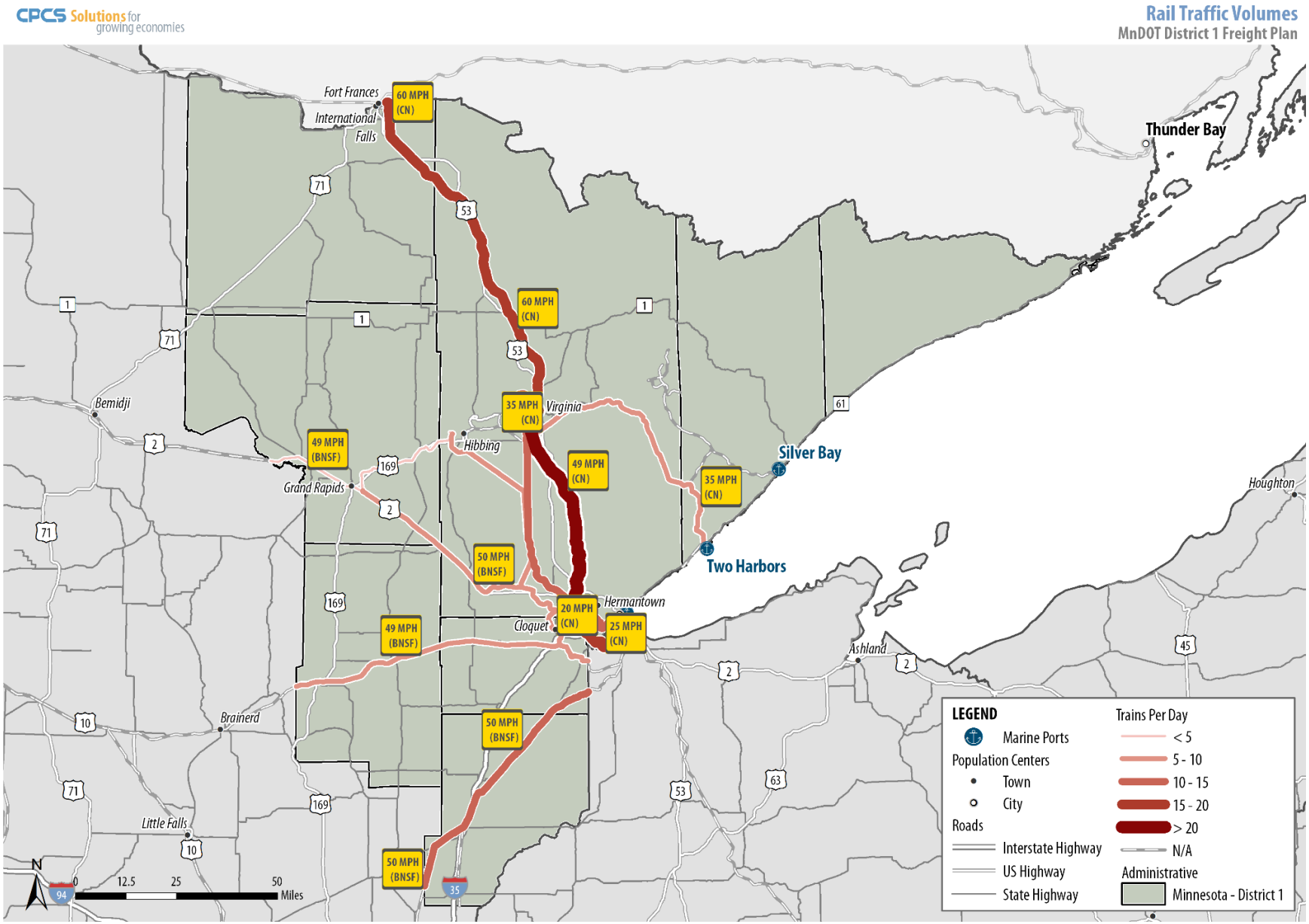
[19] MnDOT "Minnesota State Rail Plan" (2015). http://www.dot.state.mn.us/planning/railplan/resources.html

Figure 3-15: District 1 Railroad Lines and Owners



Source: CPCS analysis of National Transportation Atlas Database. 2017.

Figure 3-16: District 1 Rail Volumes and Average Track Speeds



Source: CPCS analysis of National Transportation Atlas Database. (2017) and MnDOT Freight Railroad Map.

Figure 3-17 lists the major commodities carried by rail in Minnesota. In 2012, cereal grains, metallic ores, and coal held the highest shares of the total tonnage carried by rail in the state. However, almost all of the metallic ores carried by rail in Minnesota were taconite moved entirely within District 1. The FHWA's provisional estimates project a 232 percent increase in the total cereal grain tonnage carried in Minnesota by 2040, while shares of metallic ores and coal commodities from the total tonnage are anticipated to decrease by 4 percent and 6 percent respectively. The extremely large volume of iron ore moving in District 1, combined with a forecasted 4 percent decrease in metallic ore tonnage will mean that the overall tonnage moved on the District's rail system may actually decrease, depending on the remaining cargo makeup in the District. Unfortunately, more-detailed disaggregated rail tonnage data specific to District 1 is unavailable.

Figure 3-17: Major Commodities Carried by Rail in Minnesota

Top Commodities	Tonnage Carried by Rail in 2012	Projected Change by 2040
Cereal Grains	89,294,595	232%
Metallic Ores	30,782,670	-4%
Coal	17,805,883	-6%
Basic Chemicals	15,411,006	355%
Fertilizers	10,167,477	84%
Other Agricultural Products	8,303,144	159%
Coal	7,698,022	159%
Non-metallic Minerals	6,578,648	255%
Animal Feed	5,963,228	87%
Wood Products	5,918,011	4%

Source: Minnesota State Rail Plan (2015).

Metallic ores are the second highest rail-borne commodity in Minnesota by tonnage and are handled almost entirely within District 1.

It should also be noted that major shifts in commodity markets can have a major impact on rail volumes and rail service in District 1. For example, during the initial oil production boom in North Dakota in the early 2010s, railroads prioritized the efficient (and profitable) movement of crude oil trains. As a result, local businesses in District 1 such as paper mills and power plants reported increasing delays on their rail-served trade lanes. Some previous plans note that even iron ore was being moved by truck due to a shortage of locomotives. Since the decline in growth of North Dakota's oilfields, and the establishment of pipeline infrastructure in the Dakotas, the District's rail users have reported a return to more reliable service levels. However, more general concerns about rail access and overall reliability still remain and will be discussed further in Working Paper 3 – Needs, Issues and Opportunities.

3.3.1 Key Corridors

BNSF

The BNSF railway operates 1,584 miles of track in Minnesota and 345 miles of track within the District. The BNSF tracks in the District mainly connect Duluth with Minneapolis, as well as Grand Forks and Fargo in North Dakota. In Duluth, BNSF tracks cross St. Louis Bay over the Grassy Point Bridge to Superior, Wisconsin. The BNSF line between Minneapolis and Superior, WI is also known as the Hinckley Subdivision and provides trackage rights to the UP and CP.

Figure 3-16 and Figure 3-18 show the number of trains per day and average speed of trains on BNSF tracks in the District. The BNSF tracks between Hinckley and Duluth has the highest train volume as they provide access to Minneapolis-St. Paul metro area terminals and are not only traveled by BNSF trains but by UP and CN railways.

Figure 3-18: BNSF Railway Operations in the District

Railway Segment	Trains Per Day	Maximum Speed (MPH)
Between Cloquet and Grand Rapids	7	50
Between Cloquet and Aitkin	6	49
Between Duluth and Hinckley	10	50
Between Duluth and Superior	6	10

Source: CPCS Analysis of Minnesota Freight Railroad Map, June 2015, Office of Freight and Commercial Vehicle.

In Minnesota, BNSF is the dominant freight rail service provider by trackage owned, primarily carrying crude oil, coal, ore, and agricultural commodities as well as intermodal traffic.

CN Railway

The CN Railway operates on 497 miles of track in District 1, from International Falls to Virginia, and then to Two Harbors and Duluth. The CN crosses the St. Louis River at the far western end of Duluth. CN tracks also connect Minneapolis to different destinations in Wisconsin.

Figure 3-19: CN Railway Operations in the District

Railway Segment	Trains Per Day	Maximum Speed (MPH)
Between Virginia and Duluth	20	49
Between Mountain Iron and Duluth	11	49
Between Virginia and Two Harbor	8	35
Between International Falls and Virginia	17	60
Between Duluth and Superior	17	49

Source: CPCS Analysis of Minnesota Freight Railroad Map, June 2015, Office of Freight and Commercial Vehicle.

The CN serves a variety of commodity groups with chemical and plastics (46%), petroleum products (33%), and crude and condensates (17%) accounting for the highest shares of the company's total revenue.[20]

Figure 3-16 and Figure 3-19 display the number of trains per day and average speed of trains on CN tracks. The CN tracks between International Falls and Duluth-Superior have the highest train volume and speed as this line is a critical link between Chicago and CN's ports on the Pacific Ocean. This advantageous location on a transcontinental mainline has also made it feasible for CN to support intermodal container service in Duluth, which is discussed later in this chapter.

Short Lines

Short lines are freight carriers that serve the local or regional freight demands. In addition to the two Class I railroads serving the freight activities in the District, four short lines operate on over 110 miles of track. The following table provides an overview of the short lines that are active in the District.

Figure 3-20: Short Lines Operating in the District

Short Line Railroads	Mileage	Area Served	Class I Railway Connection	Commodities
Northshore Mining (NMCZ)	47	From Babbitt in St. Louis County to Silver Bay in Lake County	None	Taconite - dedicated to providing the raw material for the taconite pellet plant in Silver Bay
North Shore Scenic Railroad (NSSR)	28	Duluth to Two Harbors	CN, BNSF	None, although CN retains trackage rights and NSSR leases siding space for railcar storage.
St. Croix Valley (SCXY)	36	From Hinckley in Pine County to North Branch in Chisago	BNSF	Chemicals, grain, flour, sand, and fertilizers
Cloquet Terminal Railroad (CTRR)	6	Cloquet in Carlton County	BNSF	Switching services for Sappi paper mill and other local customers.
Minnesota Dakota and Western (MDW)	4	International Falls	BNSF	Serves paper mills in International Falls.

Source: CPCS Analysis of Minnesota Freight Railroad Map, June 2015, Office of Freight and Commercial Vehicle; Minnesota State Rail Plan of 2015.

At-Grade Rail Crossings

Railroad-road grade crossings are potential safety conflict points that can create delays for the whole freight system (both truck and rail modes). Figure 3-21 provides a breakdown of the types

[20] CN 2017 Annual Report. file:///C:/Users/rsaeedi/Downloads/2017-CN-Annual-Report.pdf

and number of crossings by county. Controlled crossings are equipped with active warning devices like gates, flashing lights, or bells, while uncontrolled crossings are only protected by passive warning devices such as stop signs or crossbucks.

Figure 3-21: Public Grade Crossings in the District*

County	Active	Passive	Total Public	Private**
Aitkin	6	24	30	8
Carlton	11	33	44	26
Cook	0	0	0	0
Itasca	27	21	48	29
Koochiching	6	9	15	9
Lake	8	20	28	25
Pine	21	44	65	20
St. Louis	82	131	213	129
Total	161	282	443	246

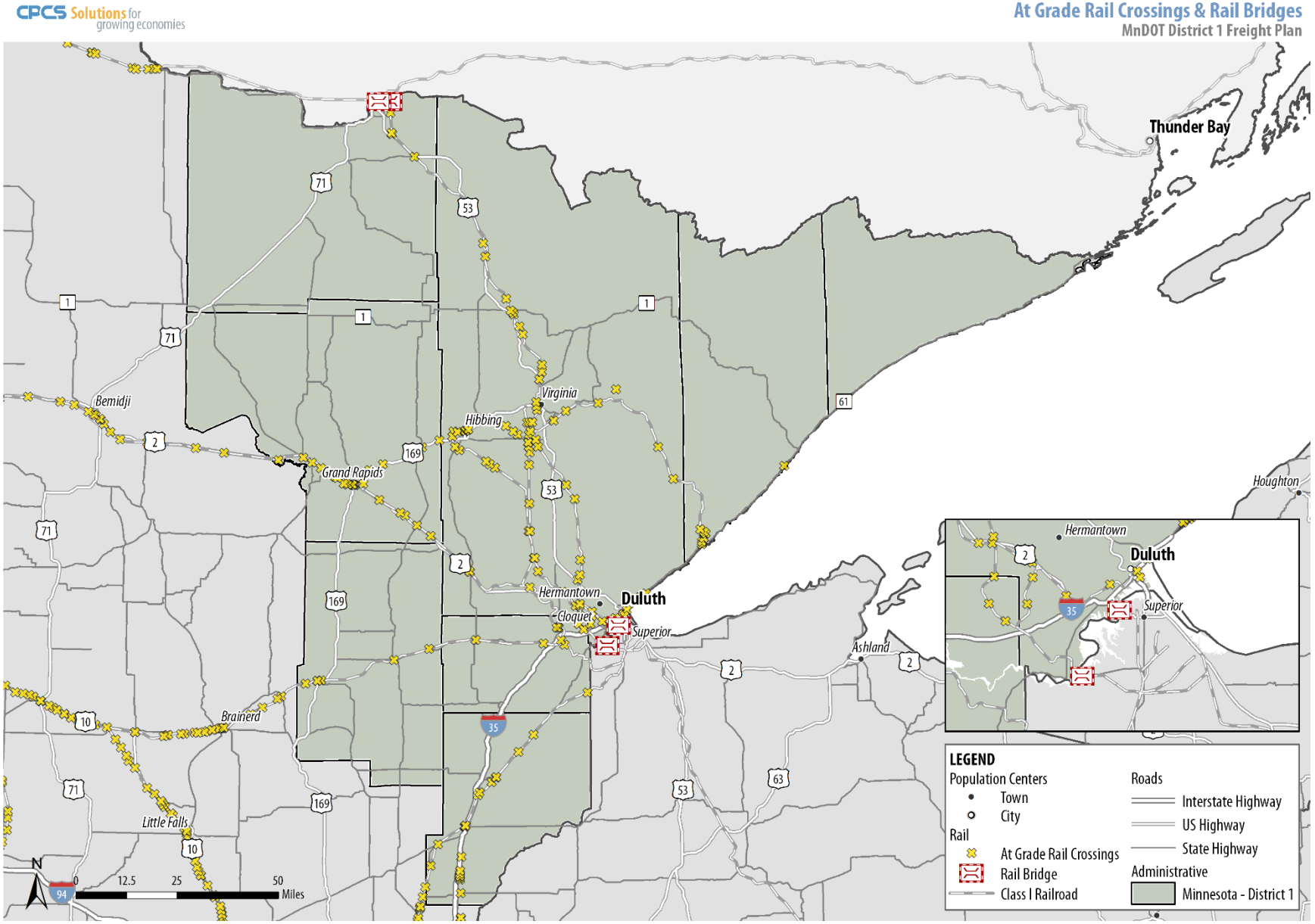
Source: MnDOT

* Note: for the purpose of GIS data queries, District 1 as defined here includes the full extent of Aitkin, Koochiching, and Itasca Counties. The numbers presented here also include the Lake Superior and Mississippi Railroad (LSMR) not profiled above because it does not provide freight service.

**Information on private crossings was not available from MnDOT, and this private crossing data was retrieved from the Federal Railroad Administration Crossing Inventory.

As the table shows, the District has 443 publicly-owned crossings and 246 private crossings. 36 percent of the public crossings have some form of protection such as gates, or flashing lights, while the remaining 64 percent only have stop signs or crossbucks.

Figure 3-22: District 1 Rail Crossings and Bridges



Source: CPCS Analysis of Federal Railroad Administration Data.

3.3.2 Key Structures and Facilities

Railroad Bridges

In addition to hundreds of miles of track, the District is home to two rail bridges across the St. Louis River and two bridges that provide access to international markets in Canada and beyond. A list of basic facts about each bridge is provided in Figure 3-23. These bridges are important connection points for freight activities between Minnesota and Wisconsin as well as cross-border freight operations.

Figure 3-23: District 1 Major Railroad Bridges

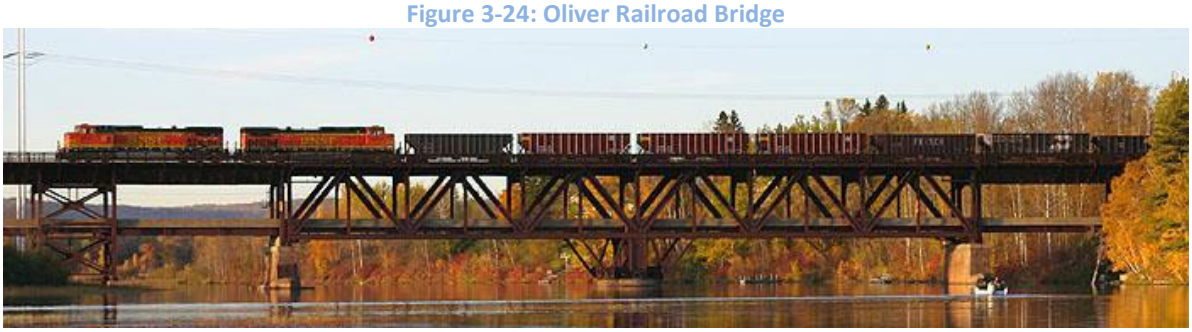
Name	Tracks	Owner	Trains per Day	Year Opened
Oliver Bridge	1	CN	24	1916
Grassy Point Bridge	1	BNSF	4	1912
Ranier Bridge	1	CN	20-22	1908
Fort Frances–International Falls International Bridge	1	CN	20	1912

Sources: JohnWeeks "Highways and Bridges" (September 2018). https://www.johnweeks.com/index.html

The District's railroad bridges, especially the two bridges over the St. Louis River are potential chokepoints for rail and truck traffic. Oliver Bridge between Duluth and Oliver, WI is only 14 ft. above the river's water level and has a two-lane highway deck beneath the railway deck. The Bridge was originally constructed as a swing span to allow for barges to travel up the St. Louis River. Today, however, the river is not navigable for barges beyond Oliver Bridge.

Besides the CN railway who owns the bridge, other railroads also have trackage rights and with 24 trains per day served on a single track, Oliver Bridge is a chokepoint for freight activities between Minnesota and Wisconsin. As of 2018, CN is continuing a strengthening and maintenance project on the bridge. The maintenance project includes installation of a new solid timber deck to carry the rail with more safety and efficiency.[21]

Figure 3-24: Oliver Railroad Bridge

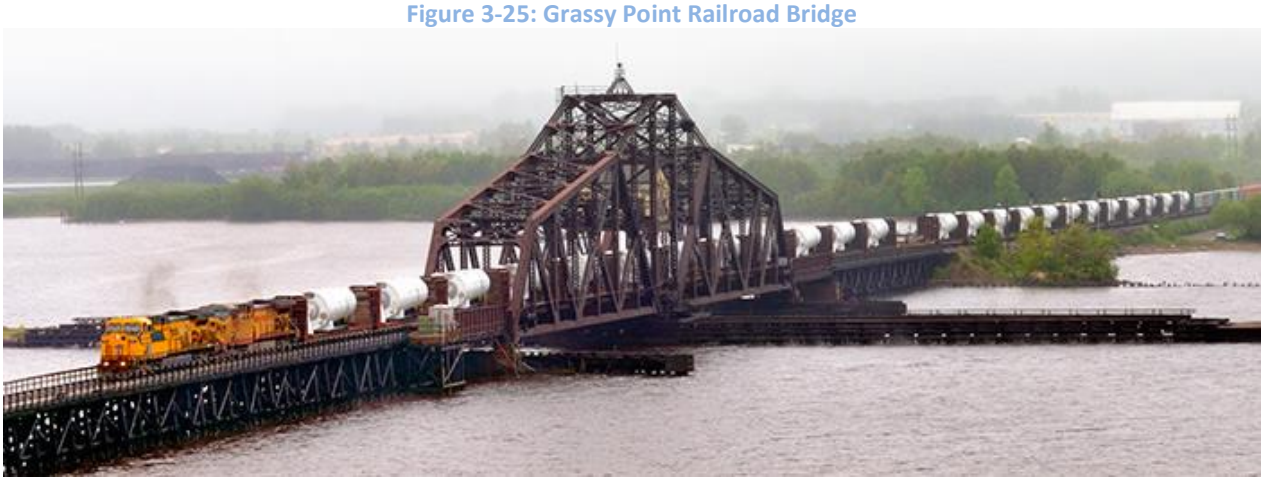


Source: Village of Oliver, Wisconsin.

[21] MnDOT "Oliver Bridge Rehabilitation Project" (September 2018). http://www.dot.state.mn.us/d1/projects/Oliver-Bridge-Rehabilitation/

The Grassy Point Bridge is owned by the BNSF and crosses the St. Louis River at the shortest distance point between Duluth and Superior. This bridge has relatively low traffic of approximately four trains per day and is only 12 feet above the river's water level. This steel truss swing span bridge opens to allow waterborne freighters to pass. Grassy Point is a critical connection for local trains originating in railyards in Superior and destined for the Port of Duluth and other businesses on Duluth's west side. The CP can also use the bridge to access Duluth.

Figure 3-25: Grassy Point Railroad Bridge



Source: Duluth Cargo Connect

The International Bridge between International Falls, MN, and Fort Frances includes a CN rail track on the west side, two lines of highway and a pipeline. This privately owned bridge is a US-Canada border point of entry and with 20 trains per day, and can become a major chokepoint for cross-border freight operations.

Serving 20 to 22 trains per day, the CN's Ranier Rail Bridge is a major port of entry for intermodal containers that come from China to Prince Rupert Port in Western Canada by ship. The containers transfer to rail mode at the port and enter the US in Ranier, MN. The inbound cross-border freight activities over the Ranier Bridge have ranked the city as the most heavily traveled US port of entry after Laredo, TX.[22]

Figure 3-26: Ranier Rail Bridge

Source: Ian Graham, Flickr.

[22] US Government Accountability Office "US Border Communities" (2016). https://www.gao.gov/assets/680/674851.pdf

Thanks to its role in facilitating the movement of container trains, the Ranier Rail Bridge is the US' second most heavily-used port of entry.

Rail Terminals and Yards

While the majority of intermodal terminals in Minnesota are clustered around the Twin Cities metro area, there are a handful of rail intermodal facilities in Duluth that serve the Districts freight activities. The following table lists the rail terminal and yard facilities in the District as well as the rail yards and terminals in Superior, WI.

Figure 3-27: District 1's Rail Terminals and Yards

Facility Name	City	Facility Type	Commodity	Railway
Azcon Metals	Duluth	Lake Terminal	Scrap Iron and Metals	BNSF, CP
C. Reiss Terminal	Duluth	Lake Terminal	Coal, Limestone, Salt, Slag, Coke	BNSF
Cliffs Erie*	Taconite Harbor	Lake Terminal	Natural Iron Ore and Iron Ore Pellets, Coal, Fluxstone	ZLTV
CN Railway Docks	Two Harbors	Lake Terminal	Natural Iron Ore and Iron Ore Pellets	CN
CN Duluth Docks	Duluth	Lake Terminal	Natural Iron Ore and Iron Ore Pellets, Coal, Limestone	CN
Compass Minerals	Duluth	Lake Terminal	Bulk Rock Salt, Bulk Evaporated Salt, Bulk Solar Salt	BNSF
CRH US	Duluth	Lake Terminal	Cement	CP
Duluth Lake Port Storage, Inc.	Duluth	Lake Terminal	Grain	BNSF, CP
General Mills Duluth Elevator	Duluth	Lake Terminal	Grain	BNSF
Hallett Dock 5	Duluth	Lake Terminal	Bulk Material	BNSF
Northland Pier	Duluth	Lake Terminal	Asphalt, Concrete, Limestone	BNSF, CP
Northshore Mining Co	Silver Bay	Lake Terminal	Iron Ore, Taconite Pellets	NMCZ
Proctor Yard	Proctor	Classification Yard	N/A	CN
Ranier Yard	Virginia	Classification Yard	N/A	CN
Rice's Point Yard	Duluth	Classification Yard	N/A	BNSF
Clure Public Marine Terminal	Duluth	Lake Terminal	General Cargo, Finished Steel, Scrap Iron, Fuel Oil, Waste Oil	CP
Allouez Yard	Superior	Unloading	Iron Ore	BNSF
BNSF Taconite Ore Dock No. 5	Superior	Lake Terminal	Taconite	BNSF
CHS Inc No. 1	Superior	Lake Terminal	Grain	BNSF
CHS Inc No. 2	Superior	Lake Terminal	Grain	BNSF
Connors Point Properties	Superior	Lake Terminal	Cold Storage	BNSF, UP, CP
Gavilon Grain	Superior	Lake Terminal	Grain	BNSF

Facility Name	City	Facility Type	Commodity	Railway
Graymont Superior Lime	Superior	Lake Terminal	Limestone, Coal	BNSF
General Mills Superior Elevators	Superior	Lake Terminal	Grain	BNSF
Hansen Mueller Elevator M	Superior	Lake Terminal	Grain	BNSF, CN, CP, UP
Itasca Yard	Superior	Classification Yard	N/A	UP
LaFarge North America Superior	Superior	Lake Terminal	Cement	BNSF

Source: Minnesota Intermodal Freight Facility Dataset. Duluth-Superior Port Authority. Wisconsin State Rail Plan.
*Abandoned Facility.

Superior's Yards: Critical Assets for District 1's Freight System

The steep hills surrounding Duluth present a geographic barrier to the development of rail lines in and out of the city. However, Superior, Wisconsin's relatively flat terrain is more favorable for the development of rail facilities. As a result, all of the Class I railroads operating in Duluth have yards in Wisconsin. These yards include the BNSF 28th Street Yard, CN's Pokegama Yard, CP's Stinson Yard, and the UP's Itasca yard. These nearby rail facilities are critical to efficient rail operations, particularly for the port and rail-served businesses located near Duluth's waterfront.

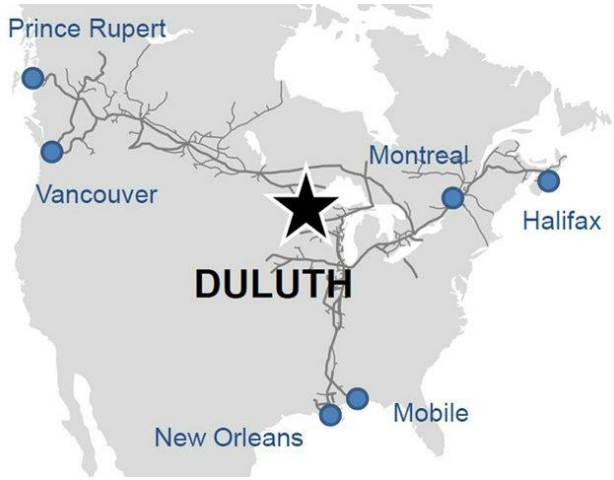
Duluth Intermodal Terminal

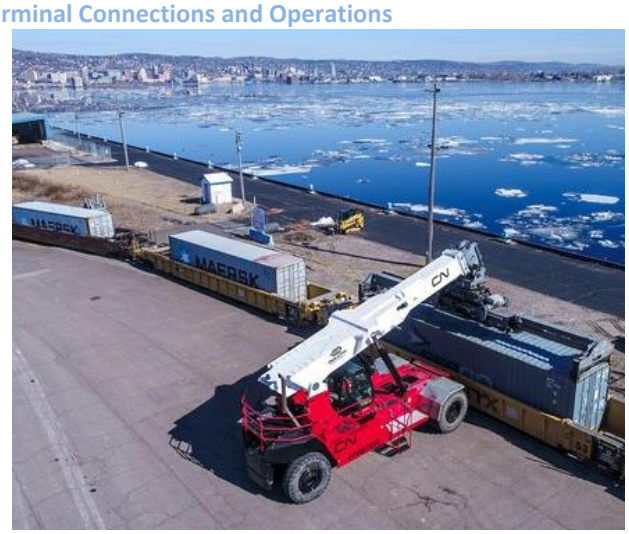
CN's Duluth Intermodal Terminal is located in Duluth at the Clure Public Marine Terminal. The truck-rail intermodal container terminal operated by Duluth Cargo Connect, a partnership between the Duluth Seaway Port Authority, which owns the terminal, and Lake Superior Warehousing, which provides stevedoring, warehousing, and other cargo handling services at the port.

Intermodal service has only been available since September 2017 but has already become an attractive shipping option for many firms in District 1, greater Minnesota, Wisconsin, and Michigan's Upper Peninsula. As of April 2018, the facility handled about 225 containers per month, but stakeholders have indicated that container volumes and trains per week are increasing.[23] The intermodal service is an attractive option because it allows local firms to quickly access CN's continent-wide network (and foreign markets) without long or congested drayage trips to terminals in the Twin Cities. Figure 3-28 shows CN's main lines and port connections in North America, which District 1 companies can access via the Duluth terminal.

[23] Finance & Commerce "Progress MN: Duluth Cargo Connect" (April 2018). https://finance-commerce.com/2018/04/progress-mn-duluth-cargo-connect/

Figure 3-28: Duluth Intermodal Terminal Connections and Operations





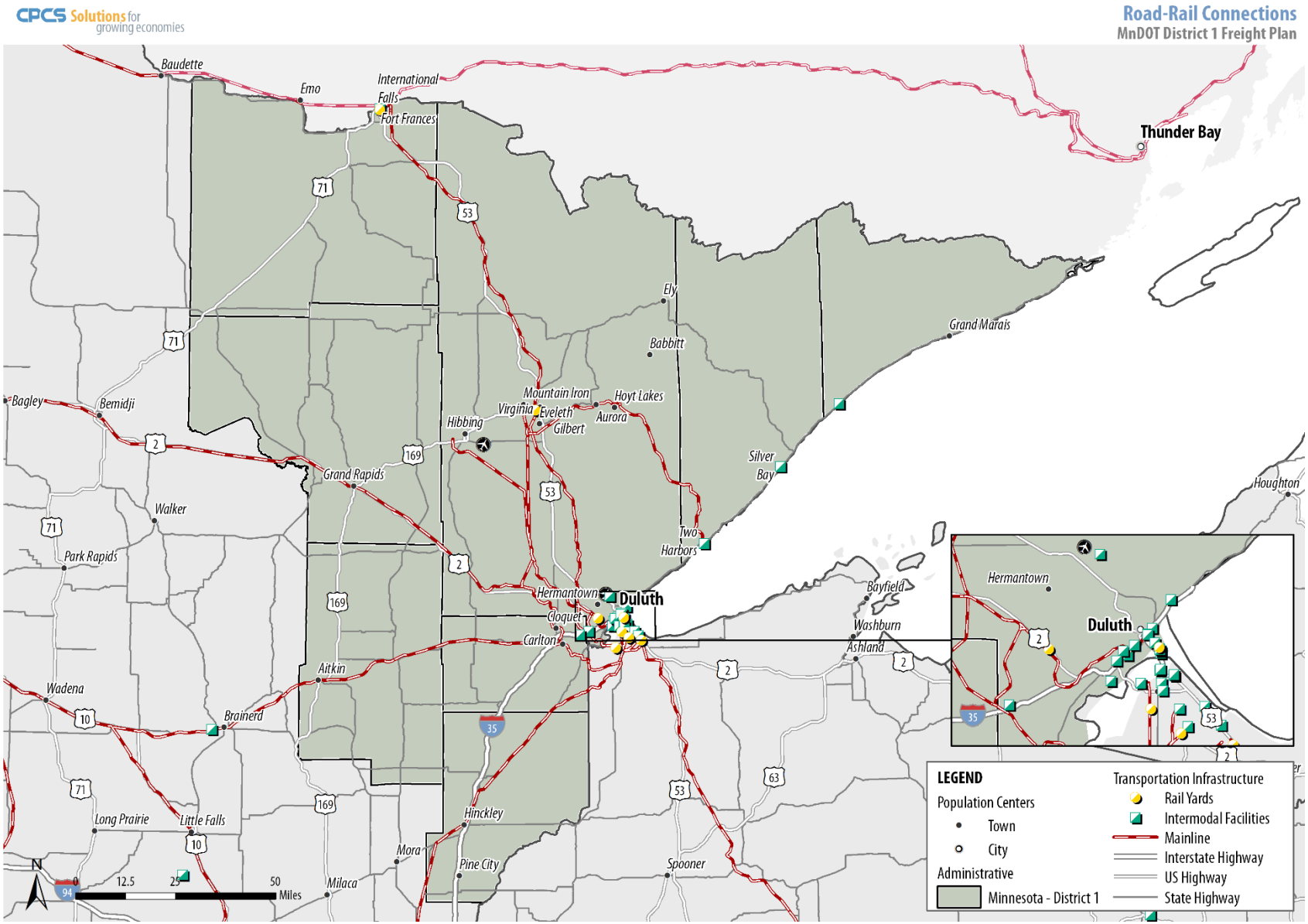
Source: Lake Superior Magazine

In addition to access to new markets, the Duluth Intermodal Terminal offers the District's shippers access to amenities that can lower a firm's logistics costs. Lake Superior Warehousing offers on-site value-added services such as container packing and unpacking, warehousing, truck weighing, and customs clearance, which can further reduce logistics costs for firms using the container service. Port stakeholders indicated that some terminal users reported logistics cost savings of over 25 percent after re-routing shipments through the intermodal terminal.

The Duluth Intermodal Terminal is important because it provides District 1's businesses with more transportation options, easier access to foreign markets, and the potential for lower logistics costs.

Previous freight plans for District 1 and Duluth commonly mentioned a need for an intermodal facility, but the Duluth terminal's reach goes far beyond the District, up to about a four-hour radius around the port, which reflects the round-trip distance a truck driver can cover in one day. If this service continues to grow in popularity, it will likely mean that firms in the District will have even more frequent access to intermodal trains traveling to Chicago or the Pacific, Atlantic, or Gulf coasts. However, the increased popularity of the service will also mean increased truck traffic around the port, and on major highways for the District.

Figure 3-29: District 1 Rail Facilities



Source: CPCS Analysis of National Transportation Atlas Database (February 2018).

3.4 Port and Waterway Network

District 1 lies at the western end of one of North America's most important maritime trade corridors: the Great Lakes and St. Lawrence Seaway. The lakes and Seaway provide District 1 with direct access to the Atlantic Ocean and foreign markets. In particular, they serve as an important trade corridor for bulk goods such as iron ore from District 1, grain from the Great Plains, and coal from Wyoming's Powder River Basin.

The Great Lakes and St. Lawrence Seaway provides District 1 with direct access to the Atlantic Ocean – and foreign markets.

The Great Lakes system is divided into five navigable systems: Lake Superior, Lakes Michigan, and Huron (considered as one body of water), Lake Erie, Lake Ontario, and St. Lawrence Seaway which connects the Great Lakes to the Atlantic Ocean. Lake Superior is the World's largest freshwater lake by area with a surface area of more than 31,700 square miles. With an average depth of 500 feet large lake freighter "lakers", and smaller ocean-going "salties" can navigate Lake Superior.

The lake's maritime activities started with the fur trade and continued with serving the iron ore market. Today, the main commodities carried across the lake are iron ore, coal, grain, and other mine and manufacturing products. As the following figure shows, the lake's waterborne commerce in Minnesota accounts for nearly 49 million tons of handled cargo. According to the US Army Corps of Engineers (USACE), only about 16% of the maritime activities on Lake Superior are import or export movements.[24]

In 2016, nearly 49 million tons of cargo were handled at District 1's three ports.

The District's three ports are Duluth-Superior, Two Harbors, and Silver Bay. Two Harbors and Silver Bay nearly exclusively serve the iron mining industry, while Duluth-Superior's services are more varied, including substantial iron, grain, coal, cement, limestone, and other dry bulk terminals, as well as a public terminal capable of handling specialty cargoes. Even though Lake Superior is closed to shipping from mid-January to the end of March due to winter ice, District 1's ports are among the most heavily trafficked Ports on the Great Lakes System. In particular, Duluth is frequently cited as the world's biggest freshwater port by tonnage handled.[25]

[24] USACE "Waterborne Commerce Statistics Center" (2016). https://www.iwr.usace.army.mil/about/technical-centers/wcsc-waterborne-commerce-statistics-center/

[25] Duluth-Superior Port Authority

In addition to these three active ports, the abandoned Taconite Harbor ore and coal terminal is located about 30 miles north of Two Harbors. The terminal was abandoned in 2001 along with the closure of the mine it served. Cleveland-Cliffs Inc. owns the Taconite Harbor loading dock, as well as the currently-active Silver Bay terminal.[26]

Figure 3-30 shows that while the Port of Duluth-Superior handles both domestic and foreign cargo operations, Silver Bay is only engaged in domestic waterborne activities and Port of Two Harbors only supports outbound domestic and foreign shipments.

Figure 3-30: Annual Waterborne Freight Statistics of the District

Port	Total Tonnage	Domestic Tonnage	Foreign Tonnage	Imports Tonnage	Exports Tonnage
Duluth-Superior	30,277,995	22,644,517	7,633,478	425,767	7,207,711
Silver Bay	3,399,616	3,399,616	0	0	0
Two Harbors	15,431,524	15,080,841	350,683	0	350,683

Source: CPCS Analysis of USACE 2016 Data.

The top commodities in terms of tonnage handled at Minnesota's ports in 2012 included iron ore, iron, and steel scrap (68% share), food and farm products such as grain (10%), sand and gravel (6% share), and chemical fertilizers (4% share). 11% of the commodity tonnage handled at the state's ports were categorized as unknown and not elsewhere classified.[27]

Figure 3-31: Major Commodities Handled at Minnesota Ports

Commodity	Tonnage	Percent of Total
Iron Ore, Iron, and Steel Waste and Scrap	29,431,604	68%
Unknown and Not Elsewhere Classified	4,912,147	11%
Food and Farm 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: Minnesota State Freight Plan, 2016 based on USACE Data.

[26] Duluth News Tribune "Taconite Harbor dock reopening could hurt CN, Twin Ports" (May 9, 2004)
[27] MnDOT "Statewide Freight System Plan" (2016). https://www.dot.state.mn.us/planning/freightplan/pdf/mn-statewide-freight-system-plan.pdf

Figure 3-32 lists the commodities handled at each port. While the terminals in the Port of Duluth-Superior handle a wide variety of commodities in mining, manufacturing, and food industries, Silver Bay's operations are almost entirely focused on handling mine products such as iron ore and limestone and Two Harbors handles outbound taconite.

Figure 3-32: Commodities Handled at District 1's Ports

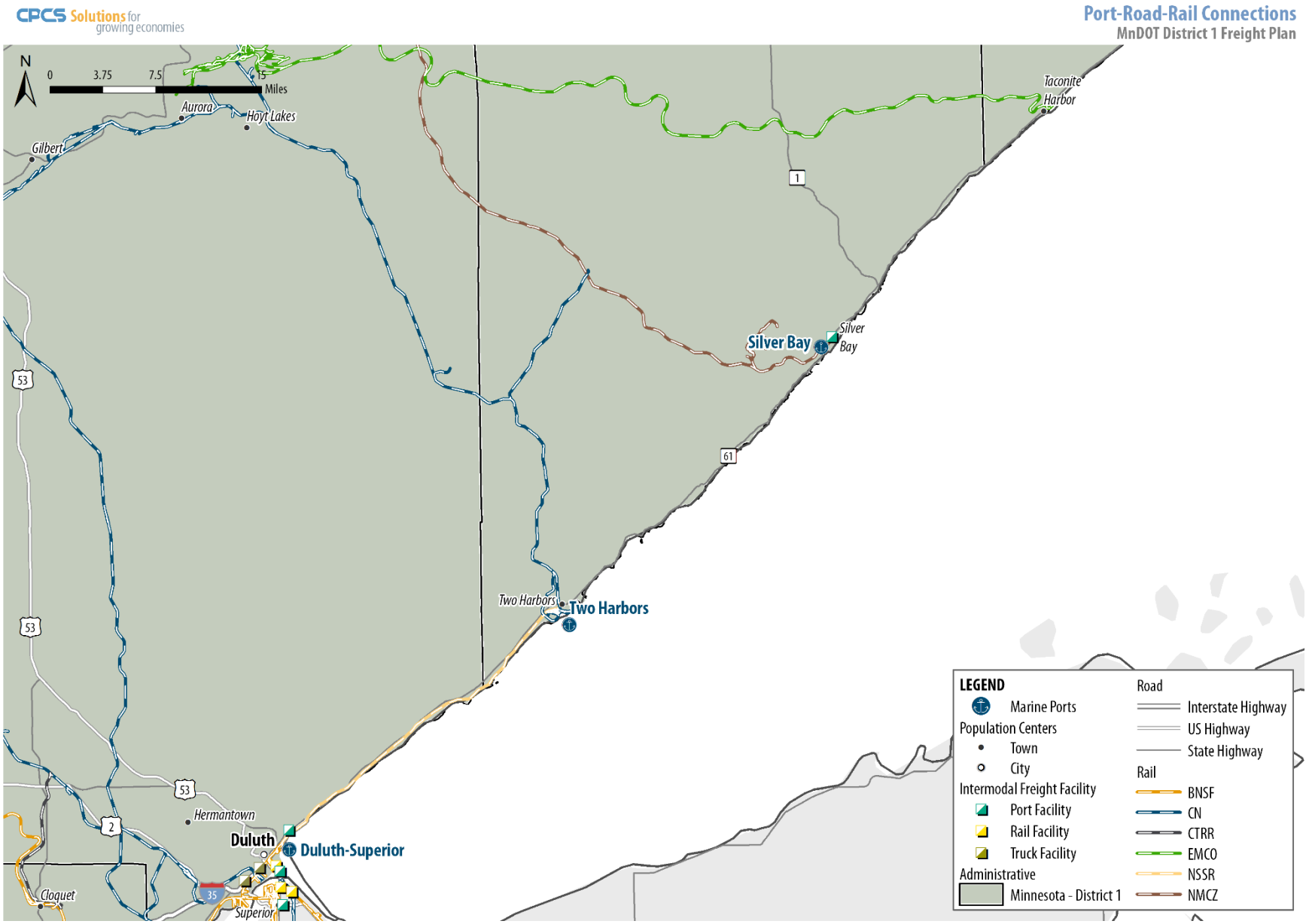
Commodity Group	Duluth-Superior	Silver Bay	Two Harbors
Sand, Gravel, Stone, Rock, Limestone, Soil, Dredged Material	*	*	
Iron Ore and Iron & Steel Waste & Scrap	*	*	*
Building Cement & Concrete; Lime; Glass	*		
Primary Iron and Steel Products (Ingots, Bars, Rods, etc.)	*	*	
Food and Farm Products	*		
Wheat	*		
Animal Feed, Grain Mill Products, Flour, Processed Grains	*		
Coal, Lignite & Coal Coke	*	*	
Non-Ferrous Ores and Scrap	*		
Sulfur (Dry), Clay & Salt	*		
Slag	*		
Waste Material; Garbage, Landfill, Sewage Sludge, Waste Water	*		
Petroleum Pitches, Coke, Asphalt, Naphtha, and Solvents	*		
Other Chemicals and Related Products	*		
Oilseeds (Soybean, Flaxseed, and Others)	*		
Vegetable Products	*		
Other Agricultural Products; Food and Kindred Products	*		
Fertilizers	*		
All Manufactured Equipment, Machinery and Products			
Distillate, Residual & Other Fuel Oils; Lube Oil & Greases			

Source: CPCS Analysis of USACE 2016 Data.

Duluth-Superior handles a wide range of cargoes, while Two Harbors and Silver Bay specialize in serving the mining industry.

Figure 3-33 illustrates the location of maritime facilities located in District 1, as well as the rail and road connections to these facilities. The following sections review the maritime infrastructure and operations in the District.

Figure 3-33: District 1 Ports and their Multimodal Connections



Source: CPCS Analysis of National Transportation Atlas Database. 2017.

3.4.1 Duluth-Superior

The Port of Duluth-Superior is the largest inland freshwater port in the nation, ranked among the top 20 US ports in terms of cargo tonnage, and the backbone of the District's economy, with an average of nearly 900 vessel visit.[28] The western portions of the harbor are shown in Figure 3-34, with Lake Superior at the bottom left of the image, and Superior, Wisconsin at the top. Iron ore, grain, and coal are the main commodities served at the port The Port of Duluth-Superior is located at the far southwestern end of Lake Superior and includes portions of the cities of Duluth, MN and Superior, WI, which are separated by the St. Louis River. The port is served by four Class I railways: the CN, CP, UP, and BNSF. The port also has direct access to I-35, which connects the region to the rest of the US Midwest as well as US-53 south which crosses the Blatnik Bridge over the St. Louis River and links Duluth with Superior.

Figure 3-34: Port of Duluth-Superior

Source: Duluth Seaway Port Authority.

In 2017, the Port of Duluth-Superior handled a total of about 35.3 million tons of cargo. Of this total tonnage, 31.1 million tons (88%) was outbound from the port, and about 75% was domestic tonnage. Figure 3-35 provides a high-level breakdown of the port's key commodities and trade flows.

[28] Duluth Seaway Port Authority. 2018.

Figure 3-35: Duluth-Superior 2017 Tonnage Breakdowns: Commodities and Trades

Commodity	Tonnage	Share
Iron Ore	19,714,153	56%
Coal and Coke	10,342,498	29%
Limestone	3,425,065	10%
Grain	1,004,815	3%
All others	765,243	2%
Total	**35,251,774**	100%

Trade	Tonnage	Share
Domestic	26,602,734	75%
Canadian	7,553,698	21%
Overseas	1,095,342	4%

Source: CPCS analysis of Duluth Seaway Port Authority Data.

It is important to note that some of the tonnage listed as Canadian is actually bound for overseas markets, but is transshipped at an intermediate point in Canada. For example, in 2017, about 1/3rd of the iron ore shipped out from Duluth-Superior was shipped to Quebec for export to locations like China and Japan.[29]

Major commodities handled at Duluth-Superior include iron ore, coal, limestone, and grain.

As the largest port on the Great Lakes in terms of tonnage, Duluth-Superior has a major economic impact on the region. A 2018 study estimated that port activity directly employs 2,800 people, produces $1.4 billion in business revenue, and $240 million in state and federal tax receipts.[30]

2,814	$132 million	$1.4 billion	$299 million	$240 million
Direct employment	In personal income	In business revenue	In local purchases	State and Federal Tax Receipts

The port consists of a 49-mile long waterfront, with 16.7 miles of dredged channels to support vessel movements.[31] The port is also home to 22 freight handling terminals, most of which are privately owned and operated. These terminals include two ore docks and seven grain terminals.

[29] Johnson, Brooks. September 2, 2017. "Third of Twin Ports-shipped taconite leaving U.S." Duluth News-Tribune.
[30] Martin Associates. 2018. "Economic Impacts of the Port of Duluth-Superior."
[31] Minnesota Sea Grant.

A brief list of the port's terminals is provided in Figure 3-36. Figure 3-37 shows the port region, with Duluth at the top, Superior below, and Lake Superior at right.

Figure 3-36: Duluth-Superior Terminals

Terminal Name	Key Commodities Handled
Azcon Metals	Ships scrap metal
BNSF Railway Dock 5	Ships iron ore
Compass Minerals	Receives salt
Superior Midwest Energy Terminal	Ships coal
CHS	Ships grain
Clure Public Marine Terminal	General cargo
CRH US	Receives cement from Ontario
CN Duluth Dock	Ships iron ore, receives limestone
C. Reiss Terminal	Receives aggregates and limestone
Duluth Storage	Ships grain
Duluth Lake Port Storage	Ships grain
Gavilon Grain	Ships grain
General Mills Duluth Elevator	Ships grain
Graymont Superior Lime	Receives limestone
Hallett Dock 5	Shipping bulk goods
Hallett Dock 8	Receives dry and liquid bulk
Hansen-Mueller Superior Elevators	Ships grain
Lafarge Superior	Ships cement
Northland Pier	Receives aggregate
General Mills Superior Elevators	Ships grain

Source: Duluth Seaway Port Authority.

Clure Public Terminal

The Clure Public Terminal is the only general cargo terminal at the Port of Duluth-Superior and is a key facility for the inbound and outbound shipment of cargoes such as wind turbine components, mining equipment, heavy machinery, and specialty bulk products. The terminal is owned by the Duluth Seaway Port Authority and operated in partnership with a private company, Lake Superior Warehousing. Figure 3-38 provides a map of operations at the terminal

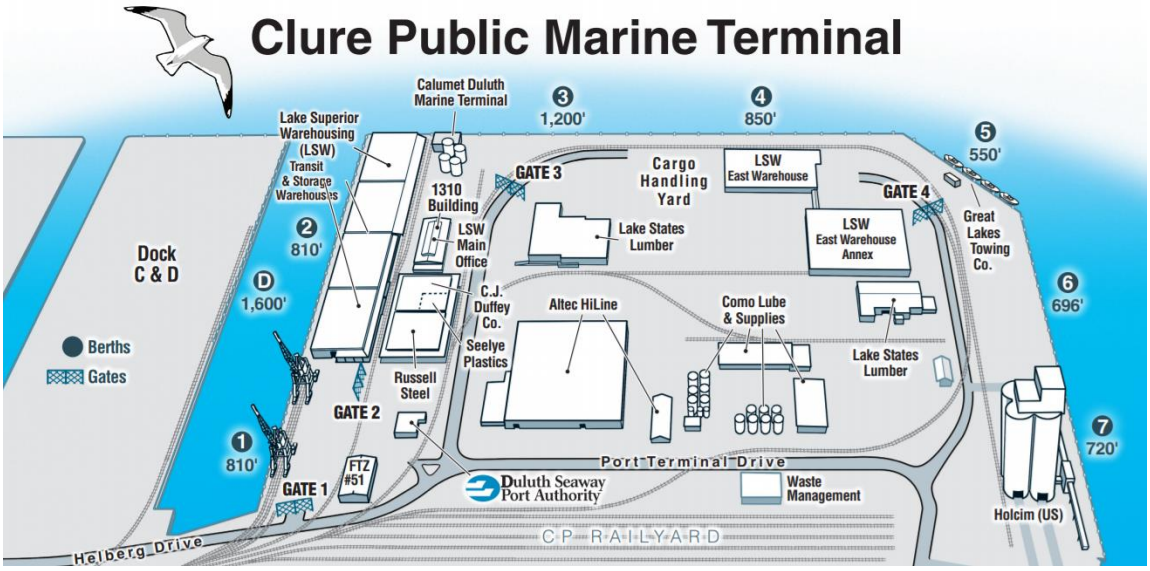
Clure Public Terminal connects also provides an array of intermodal, transloading, and warehousing services including through the following facilities:

- Connection to four Class I railroads: CN, BNSF, UP, and CP,
- Foreign Trade Zone status, with customs checkpoint on-site
- Five cargo berths at Seaway depth (minimum of 27 feet),
- 400,000 square feet of indoor and 40 acres of outdoor storage,
- Rail mounted gantry cranes and high capacity cranes, and
- Truck scales.

Figure 3-37: Port of Duluth-Superior, 2018

Source: Duluth Seaway Port Authority

Figure 3-38: Clure Public Terminal Facilities



Source: Minnesota State Senate Committee on Transportation and Public Safety, 2016.

The Duluth Seaway Port Authority recently purchased an additional wharf and berths to expand the public terminal's area, and the Authority has allocated $35 million for the following work at the Public Terminal:

- Demolition of vacant waterfront buildings at newly-purchased wharves on Dock C&D,
- Paving new docksides,
- Laying new railroad track to new docksides, and
- Moving established port businesses to newly-purchased wharves.

In the long term, this expansion and reorganization of the public terminal is intended to create additional space for project and containerized cargo, including the CN Duluth Intermodal facility, which currently uses land at the Public Terminal.

3.4.2 Two Harbors

Two Harbors (not to be confused with the colloquial "Twin Ports" name for Duluth-Superior) is home to a set of ore docks owned by the Canadian National Railway. Two Harbors exclusively handles outbound taconite shipments, with almost no other goods handled. In 2016, Two Harbors shipped 15.4 million tons of iron ore, and tonnages handled at the port have varied between 14.8 million and 16.7 million tons in the past five years.[32]

[32] US Army Corps of Engineers. 2016. Waterborne Commerce of the United States.

Figure 3-39: CN Docks at Two Harbors

Source: US Army Corps of Engineers.

3.4.3 Silver Bay

Like Two Harbors, Silver Bay is mostly devoted to the outbound shipment of taconite pellets. Silver Bay is home to a large taconite pellet processing plant owned and operated by Cliffs Natural Resources, which also maintains its own harbor basin. As a result of the presence of a large processing facility, this harbor also receives inbound shipments of inputs to taconite pellet production, such as limestone and coal. Silver Bay is the smallest port in the District by tonnage, in 2016, the port handled 3.2 million tons of iron ore, 34,000 tons of limestone, and 67,000 tons of coal.

3.4.4 Taconite Harbor

Taconite Harbor is located between Two Harbors and Grand Marais. The port is no longer used as a commercial shipping port, although it was previously used to handle outbound shipments of taconite and inbound shipments of coal. The port was served by a private mining railroad connecting the terminal with mines near Hoyt Lakes. It is possible that in the future Taconite Harbor could be re-activated to handle minerals produced at the proposed PolyMet mine near Hoyt Lakes.

3.5 Aviation Network

Freight shipped by air accounts for a small portion of the freight carried by other modes. However, air freight is still important to the economy as the cargo carried by air is typically of high value. Also, air cargo usually has relatively lower weight, and is highly time-sensitive. As Figure 3-40 shows, precision instruments, electronics, and valuable machinery are the top air carried commodities in Minnesota. As the table shows, the FHWA's projected 2040 growth for air cargo activities in Minnesota estimates a significant increase in the chemical product tonnage.

Figure 3-40: Top Air Commodities in Minnesota

Commodity	2012 Tonnage	Percent of Total	Projected 2040 Increase
Precision Instruments	202,395	31	697%
Electronics	134,068	21	125%
Machinery	65,260	10	268%

Commodity	2012 Tonnage	Percent of Total	Projected 2040 Increase
Chemical Products	37,974	6	327%
Manufacturing Products	35,808	5	224%
Basic Chemicals	31,135	5	1623%
Article-Based Metal	19,081	3	193%
Plastics	18,661	3	190%
Motorized Vehicles	14,749	2	74%
All Other Freight	79,142	14	79%

Source: Minnesota State Freight Plan, 2016.

The following figure shows the commercial airports that are located in the District. Duluth International Airport (DLH) is the largest facility that supports air freight operations in the District. The Falls International Airport (INL) and the Range Regional Airport (HIB) are also part of the air cargo network in Minnesota as well as the District. INL and HIB are both primarily dedicated to general operation, however limited passenger services at both airports are subsidized through Essential Air Service (EAS) Act.[33]

Figure 3-41: FAA Airport Operations Data

Airport	ID	Location	2017 Enplanement	2016 Enplanement
Duluth International	DLH	Duluth	122,717	124,284
Range Regional	HIB	Hibbing	15,377	12,654
Falls International-Einarson Field	INL	International Falls	15,278	13,831

Source: FAA "Passenger Boarding (Enplanement) and All-Cargo Data for U.S. Airports" (2017).

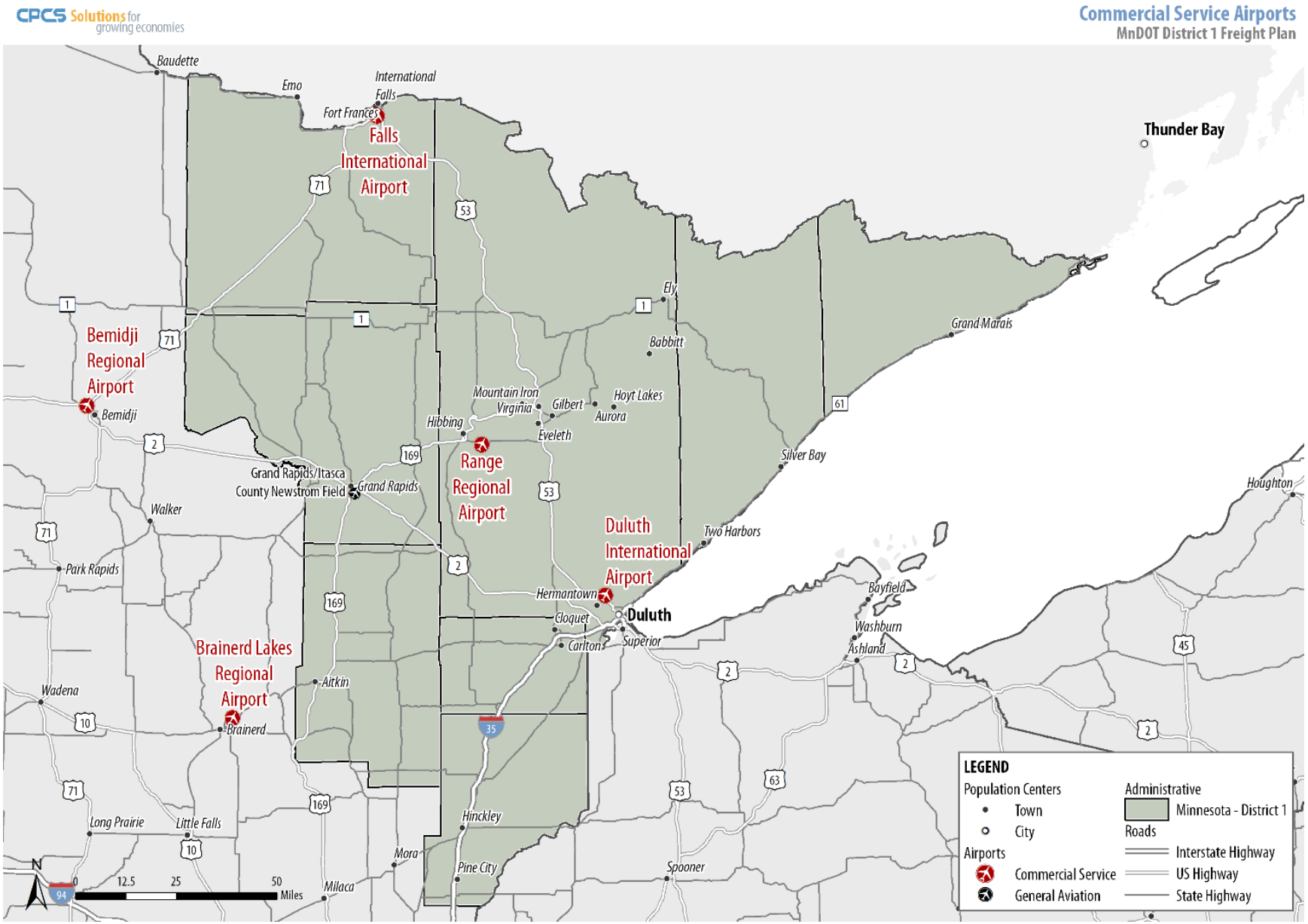
Other than the three commercial airports located in the District, the area is close to Bemidji Regional Airport (BJI) and the Brainerd Lakes Regional Airport (BRD). In addition, DLH is located 160 highway miles from Minneapolis-St. Paul International Airport (MSP) and 460 highway miles from O'Hare International Airport (ORD), both of which are among the busiest commercial airports in the US.

A 2015 study of the competitive advantages of DLH compared to these other airports in the state showed that the firms located in northwestern Minnesota primarily are more likely to truck their shipments to BJI, or MSP compared to DLH, due to having direct access to I-94.[34] The same is true for BRD as firms have relatively quick access to MSP through US-169. However, there is potential for DLH to compete with BRD market as the freight activities in BRD are limited and trucking cargo to DLH could be more economically justifiable.

[33] EAS was enacted as a response to Airline Deregulation Act of 1978 which enabled the airlines to define their own market and fare system. EAS ensures that small communities have a minimum level of scheduled air service. For more information see the USDOT's aviation policy page at: https://www.transportation.gov/policy/aviation-policy/small-community-rural-air-service/essential-air-service

[34] University of Wisconsin, "Duluth Airport Authority Air Cargo Study", (2015). https://www.uwsuper.edu/tlresearchcenter/research-grants/upload/DLH-Cargo-Study-Final-Report-FINAL-151127.pdf

Figure 3-42: Commercial Airports in the District



Source: CPCS Analysis of National Transportation Atlas Database (February 2018).

Figure 3-43: Competitive Position of DLH Airport

Airport	City	Population Served	Daily Cargo Flights	Destinations
BJI	Bemidji	45,700	2	MSP and IRO
BRD	Brainerd	91,800	1	MSP

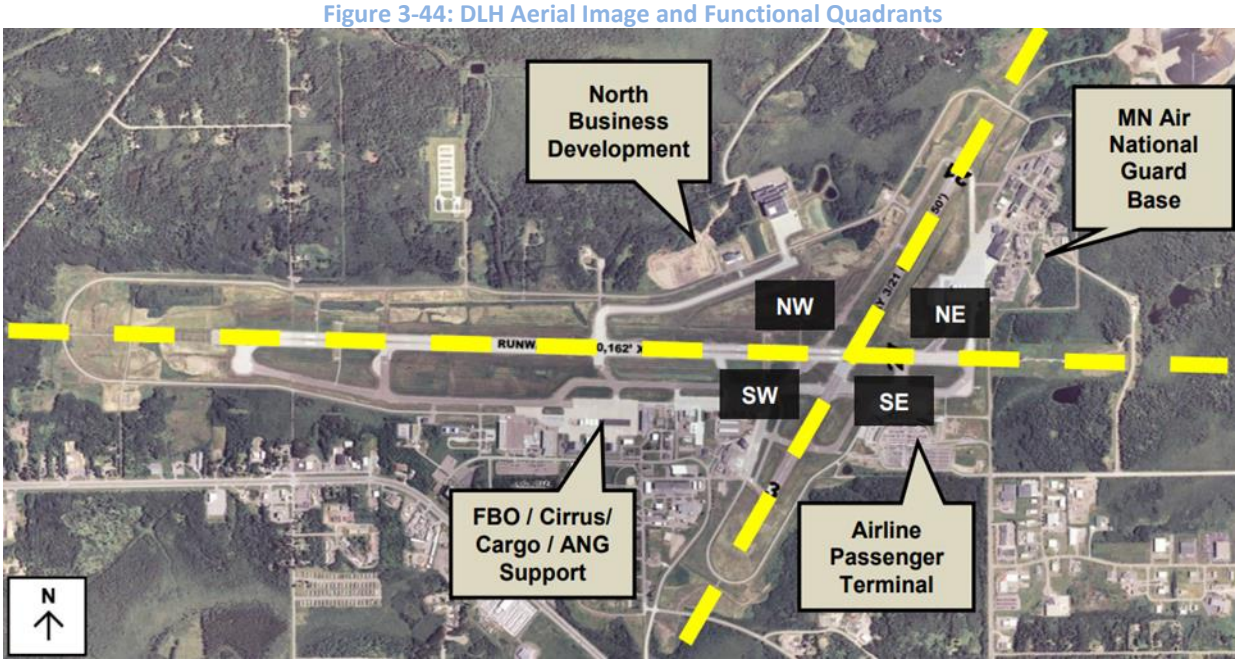
Source: Duluth Airport Authority Air Cargo Study, 2015.

Duluth International Airport

The Duluth International Airport (DLH) is located five miles northwest of Duluth serving the Duluth-Superior metropolitan area. The two runways at the airport divide its commercial and general aviation operations into four functional quadrants:

- Northeast: Minnesota Air National Guard complex,
- Southeast: Passenger terminal area,
- Southwest: General aviation, air cargo, and air traffic control facilities, and
- Northwest: Commercial and general aviation tenants and navigational facilities.

Figure 3-44: DLH Aerial Image and Functional Quadrants



Source: DLH "Duluth Airport Authority Airport Master Plan Update" (2015). https://duluthairport.com/wp-content/uploads/2015/07/Updated-Master-Plan-061215-Binder1.pdf

Nearly 5,300 direct and indirect jobs are associated with DLH operations, with an approximate $620 million value-added contribution to Duluth-Superior Metropolitan Statistical Area.[35]

Figure 3-45: Operations at DLH – Forecast

Activity	2015	2020	2025	2030
Commercial	11,500	12,200	12,900	13,600
General Aviation	42,000	45,400	49,100	53,100
Military	9,400	9,400	9,400	9,400
Total	62,900	67,000	71,400	76,100

Source: DLH "Duluth Airport Authority Airport Master Plan Update" (2015). https://duluthairport.com/wp-content/uploads/2015/07/Updated-Master-Plan-061215-Binder1.pdf

Note: all numbers are forecasts based on 2010 operation data.

The cargo terminal at the DLH has two major operators: FedEx Feeder and UPS Airlines. FedEx Feeder is the term used for the small aircraft used by FedEx that carry the cargo between smaller airports and larger hub airports. In the case of DLH, the FedEx Feeders are either destined for Minneapolis–St. Paul International Airport (MSP) or Rochester International Airport (RST). The UPS Airlines also collects cargo form DLH and carries them to the freight hub at MSP. Delta Cargo, Bemidji, and Mountain Air Cargo are the air cargo operators at DLH.

Figure 3-46: Air Cargo Operations at DLH

Air Cargo Operator	Airline in Service	Number of Annual Operations	Facilities at DLH
FedEx	Bemidji Airline	520	20,000 square foot sort facility, 2,700 square foot office, 11,300 square foot air operations/equipment storage structure.
UPS	Mountain Air Cargo	730	Processing express package cargo on the FBO/General Aviation ramp using delivery trucks.
Other	Carried as belly cargo of commercial carriers	-	Air carrier terminal building.

Source: DLH "Duluth Airport Authority Airport Master Plan Update" (2015). https://duluthairport.com/wp-content/uploads/2015/07/Updated-Master-Plan-061215-Binder1.pdf

Range Regional Airport

Range Regional Airport (HIB) is a commercial airport in Hibbing of St. Louis County. The airport is mostly used for general aviation and Delta Connection is the only commercial airline serving HIB. The commercial operations at HIB are primarily between Hibbing and Minneapolis (MSP airport).

[35] MnDOT "Employment and Economic Development" (2017). https://duluthairport.com/wp-content/uploads/2017/08/Aviation-Economic-Impact-Study-2017.pdf

HIB is also home to the Range Regional Airpark, 60 acres of industrially-zoned land with access to both the airport and MN-37. The Iron Range Resources and Rehabilitation Board (IRRRB) and other local partners have been using the Airpark to attract local economic development, and at least one electronics manufacturing company, Detroit Diesel Remanufacturing, has chosen to locate at the park.

Falls International Airport

Falls International Airport (INL) in International Falls is also served by Delta Connection carrier with busiest routes to Minneapolis (MSP airport) and Hibbing (HIB airport).

3.6 Pipeline Network

Pipelines offer a high-volume, low-cost option for transporting large amounts of liquids and gases, and this quality means they are key elements of transportation network for liquid fuels. Figure 3-47 summarizes major commodities that are via pipelines in Minnesota.

Figure 3-47: Major Commodities Carried through Minnesota's Pipelines

Commodity	2012 Tonnage	Percent of Total	Projected 2040 Change
Coal	64,674,269	63%	117%
Crude Petroleum	26,447,999	26%	109%
Gasoline	8,386,049	8%	-20%
Fuel Oils	3,552,178	3%	-17%

Source: MnDOT Statewide Freight System Plan (2016).

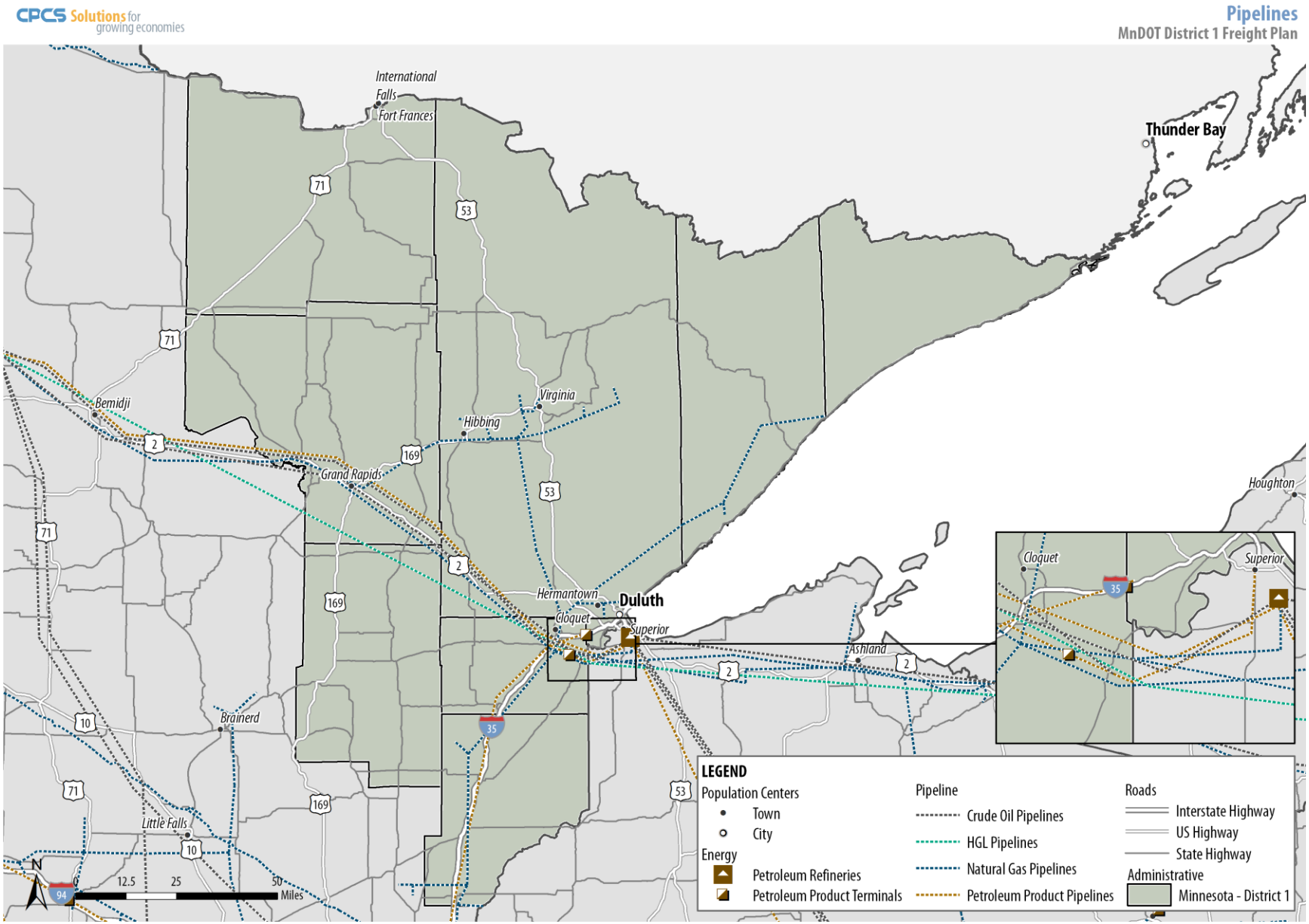
Minnesota has no petroleum or natural gas resources and primarily imports crude oil, natural gas, and other petroleum products. Minnesota has two oil refineries that process crude coming from Canada and North Dakota. Both of these refineries are located near the Twin Cities metro area at St. Paul and Flint Hills.

Increased oil production in Canada and North Dakota due to technological advances in hydraulic fracturing have required capacity increases at Minnesota's refineries and expansion of pipelines across the state to carry crude oil to other refineries in US and Canada. Although there are no refineries in District 1, the area uses refined petroleum products processed at Husky Energy's Superior, WI refinery. As the map in Figure 3-48 shows, the Superior refinery receives crude oil from Canada and North Dakota via the pipelines stretched across the southern portions of the District.

The crude pipelines crossing the District directly serve two petroleum product terminals near Duluth and a coal-powered plant near Cohasset in Itasca County. Outside of the District, the crude pipelines are linked to refineries and oil terminals of the Twin Cities metro area, as well as facilities in North Dakota, Wisconsin, and eastern Canada. The petroleum product pipelines exit the Superior refinery in three directions: southeast towards multiple oil terminals and plants in Wisconsin and Illinois; south towards the Twin Cities; and northwest towards the refinery at Thief River Falls and other refineries and plants in North Dakota.

The Hydrocarbon Gas Liquid (HGL) pipelines that cross the District also connect refineries in Sarnia, Ontario to Michigan, northern Wisconsin, north-central Minnesota and North Dakota. The Lakehead line enters Canada at Neche, ND.

Figure 3-48: District 1 Pipelines



Source: CPCS Analysis of Environmental Protection Agency Data.

4 District 1 Freight System Condition & Performance

Key Findings

District 1's freight system performance is mixed. While District 1 does not suffer from traffic congestion problems like larger metropolitan areas, road safety and truck collisions are a concern. In particular, the District had the third highest severe crash count of all districts in Greater Minnesota between 2009 and 2013, and 73 percent of the district's total traffic incidents between 2009 and 2013 were truck-involved. While most of these truck-involved incidents resulted in property damage only, or minor injuries, it is clear that safety improvements can be made. On a more positive note, grade crossing safety and incident rates in the District compare favorably to Minnesota as a whole.

Condition of the network is also mixed: District 1 lags behind Greater Minnesota in terms of bridge age and sufficiency, but bridges on the District's core freight network of interstates and trunk highways are better-maintained than county, township, or other local bridges.

4.1 Performance Measurement Background

MnDOT's 2018 Statewide Freight System and Investment Plan provided an assessment of freight system condition and performance at the state level but lacked detailed insights necessary to understand local performance issues in District 1. However, prior plans do provide a framework for evaluating District 1's system. In 2016, MnDOT established investment criteria and measures for evaluation of freight projects, and these criteria were used to evaluate potential projects in the 2018 Statewide Freight System and Investment Plan. Figure 4-1 lists these freight investment criteria and measures.

These investment criteria and measures are similar to the performance measures used in the 2018 Statewide Freight Plan; however, some measures were excluded. Since an ultimate goal of the District 1 Freight Plan is advancing specific projects for pre-feasibility studies and potential funding, select investment plan criteria will be used to evaluate the performance of District 1's freight system.

The District 1 Freight Plan's freight condition and performance assessment has been tailored to reflect elements of MnDOT's investment plan criteria, as well as feedback from District 1 planning staff.

Figure 4-1: MnDOT Investment Plan Freight Criteria and Measures

Criteria	Measures
Truck Volume	• HCAADT
Safety	• Crash rate reduction • Address a sustained crash location (Y/N) OR not sustained crash location but addresses a safety issue identified in a district or county safety plan (Y/N) • For truck parking projects: truck parking utilization at existing rest stops
Freight Mobility	• Truck Travel Time Reliability • Removes a geometric or temporary (e.g. flooding) barrier, or avoids future load restrictions on an OSOW route (Y/N) • Upgrades a roadway to 10-ton standards
Freight Facility Access	• Daily truckload equivalents entering and exiting a freight facility or facilities
Cost-Effectiveness	• Divide amount of points awarded above by amount of requested funds divided by 1,000
Project Readiness	• Environmental Documentation • Review of Sec 106 Historic Resources • Review of Sec 4f/6f Resources • Right-of-Way • Construction Plans/Documentation • Railroad Involvement • Funding

Source: Minnesota State Freight Investment Plan for State Fiscal Years 2016-2027, November 2017

This chapter provides an assessment of the freight system against the select criteria and measures, while other measures will be incorporated in analysis in Working Paper 3.

- **Truck Volume** information is explored in the mobility section of this performance assessment.
- **Safety** of roads and grade crossings is discussed in the safety section of this performance assessment, and this discussion includes information on existing crashes as well as risk factors for future crashes.
- **Freight Mobility** is discussed in the mobility section, which includes measures of truck speeds, travel time reliability, bridge clearances, and OSOW movement.
- **Freight Facility Access** will be reviewed later in Working Paper 3, and informed by previously-reviewed literature and feedback from regional freight stakeholders.
- **Cost-Effectiveness** and **Project Readiness** will be discussed later in the planning process, as part of project feasibility and pre-scoping work for select projects.

This assessment is mostly focused on highway modes as MnDOT has the most control over investments and improvements in these areas, and relatively less control of funding for railroads, ports, or airports.

4.2 Safety

Ensuring the safety of the transportation system is one of MnDOT's most critical missions. Not only can accidents result in physical harm, but they can also result in damaged vehicles and

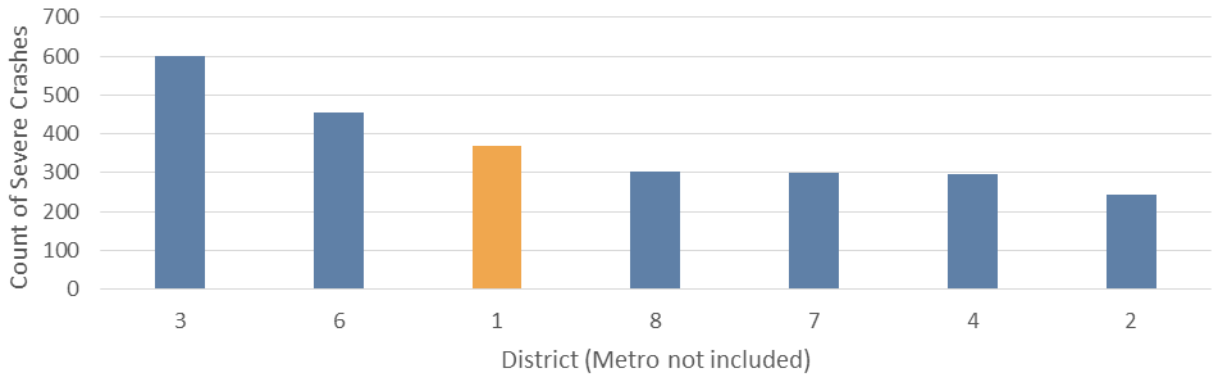
cargo, and negatively impact the performance of the transportation system. To measure safety, this plan examines four topics:

- **Previous roadway crashes:** This assessment reflects MnDOT's Investment Plan measure of "sustained crash location" and provides a background to inform discussion of risk factors.
- **Roadway crash risk factors:** Nearly every county in Minnesota has completed a County Road Safety Plan (CRSP), and these combined CRSPs make up District Safety Plans. Part of this safety planning work involves an assessment crash risk factors, and District 1 stakeholders asked that these factors be included in the safety analysis.
- **Previous road-rail grade crossing incidents:** Like roadway crashes, this assessment reflects MnDOT's Investment Plan measure of "sustained crash location" and provides additional context to the discussion of risk factors.
- **Road-rail grade crossing risk factors:** MnDOT recently completed an assessment of the relative safety of public grade crossings in the state, and the results of that assessment are incorporated into this analysis.

4.2.1 Roadway Safety

In order to understand road safety in District 1, it is helpful to examine how the District's crash rates compare with other areas in Minnesota. This comparison can help determine whether or not District 1's safety-related performance is relatively better or worse than other Districts. Figure 4-2 provides a snapshot comparing severe (injury and fatality) crashes in District 1 against the remainder of Minnesota for five years from 2009 to 2013. The Metro District is not included because of its significantly higher traffic volumes, and correspondingly higher number of crashes.

Figure 4-2: Severe Crashes in Minnesota, 2009-2013



Source: District 1 Safety Plan Update, 2016.

Between 2009 and 2013 District 1 had the third-highest severe crash rate in Minnesota and about 10% of Minnesota's total severe crashes.

The Minnesota Strategic Highway Safety Plan provides additional background on truck-specific safety trends. Overall, truck-involved crashes made up about 10 percent of all of Minnesota's severe crashes between 2008 and 2012, and 88 percent of these truck-involved severe crashes were concentrated on state trunk highways and county roads. Furthermore, 50 percent of the state's severe truck-involved crashes were intersection-related, 61 percent of severe crashes occurred during the day, and 78 percent occurred on dry pavement. These findings suggest that, for Minnesota as a whole, inclement weather or low light conditions may not be major risk factors for truck-involved severe crashes, but intersections on trunk and county highways may be particularly "risky."

Not all of District 1's crashes involve commercial vehicles, but for this freight-specific plan, crashes involving commercial vehicles have been isolated to determine if there are specific locations that are "hot spots" for truck crashes. Figure 4-3 shows the number of crashes that involved trucks greater than 10,000 lbs. in District 1. Further detail on crash rate breakdowns between medium and heavy trucks is not available.

Figure 4-3: Truck-Involved Crashes in District 1, 2016-2017

Crash Severity	Crash Count
Fatality	10
Injury	128
Property Damage Only	419
Unknown	2

Source: CPCS analysis of MnDOT crash data, 2018.

Figure 4-4 shows the distribution and severity of truck crashes in District 1 in 2016 and 2017. Generally speaking, commercial vehicle crashes are concentrated around two things:

- **Population centers**, such as Duluth, Grand Rapids, and the Range Cities, and
- **Major highways**, including I-35, US-2, US-53, and US-169.

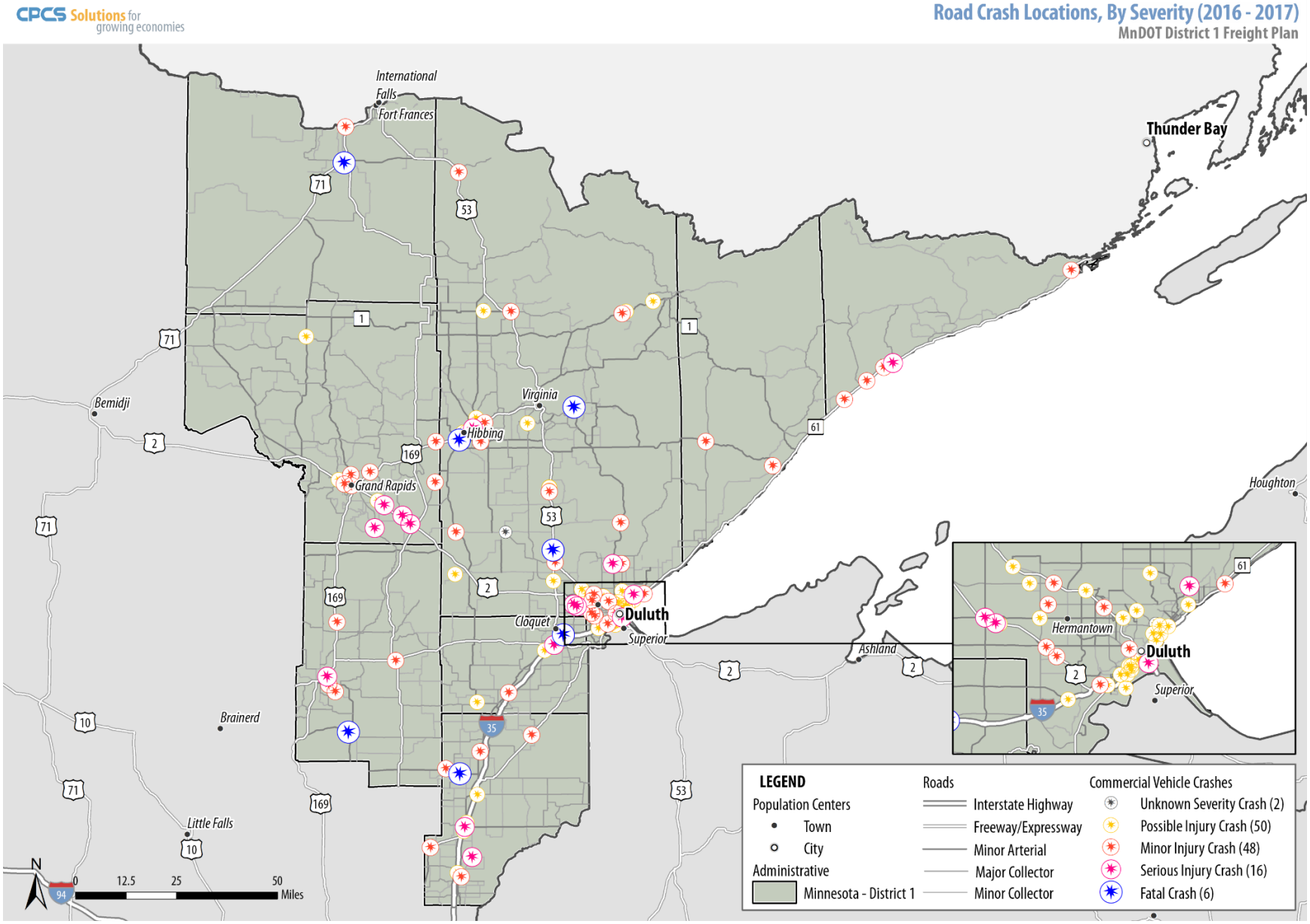
A common theme between these population centers and major highways is that they both have high overall traffic volumes and truck traffic volumes relative to the region as a whole. The concentration in crashes in these areas is unsurprising, as traffic numbers rise, so does the potential for traffic incidents. Another common theme is the occurrence of crashes near roadway intersections, where the potential for incidents is increased by the presence of stopping, turning, cross-cutting and accelerating traffic.

Statewide, only 10 percent of severe crashes occur at high-crash locations.

Interesting, the severity of truck-involved crashes in District 1 does not follow the same pattern as the distribution of overall crashes, and severe injury and fatal crashes appear to be distributed more "randomly" across the District. This phenomenon is noted in MnDOT's District Safety Plans, as a statewide analysis found that approximately 10 percent of severe crashes occur at high-crash locations. For example: three of the District's six fatal crashes occurred on lesser-used county highways, and four of the six fatal crashes occurred in areas where no other

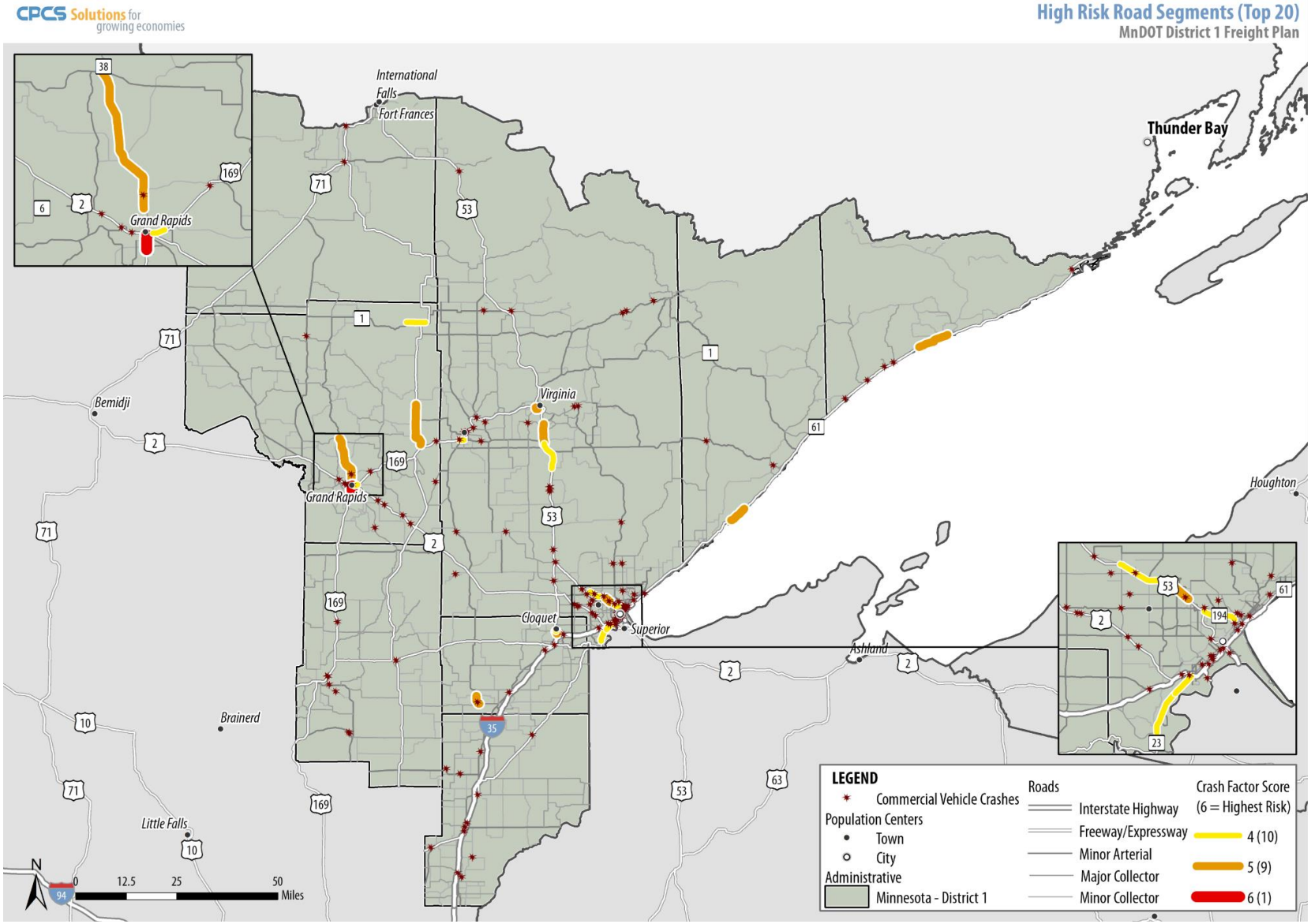
crashes were observed. This seemingly-random distribution of fatal and serious injury crashes throughout the region, and throughout the state means that basing safety-related investments on crash occurrences alone might result in sub-optimal investment decisions, as planners could often be "chasing crashes" around the network.

Figure 4-4: District 1 Commercial Vehicle Crashes by Severity



Source: CPCS analysis of MnDOT crash data. 2018.

Figure 4-5: District 1 Commercial Vehicle Crashes and High-Risk Areas



Source: CPCS analysis of MnDOT crash data. 2018.

Overall, commercial vehicle-involved crashes are concentrated in areas with higher traffic volumes, but severe and fatal crashes are distributed across the system more "randomly."

Crashes can be caused by a wide range of factors, many of which (such as weather, time of day, driver behavior, vehicle maintenance) are largely outside of the DOT's control. However, the DOT can strongly influence a particular factor: the design of infrastructure. In response to the apparent "randomness" of crashes and the fact that it can control infrastructure design, MnDOT has adopted a risk factor-based approach to examining and investing in safety improvements. This risk-based approach is intended to be a supplement to more traditional historic high-crash analysis. Figure 4-5 provides an illustration of the District highways identified as higher-risk, as well as the locations of crashes. This information came from the District 1 Safety Plan, which was completed in May 2016, and a list of the District 1 road segments identified as high-risk is provided in **Appendix E**.

The District's Safety Plan used a variety of risk factors to evaluate the risk of accident for different types of roads and intersections, including 2-lane, 4-lane, and freeway segments and intersections for both rural and urban areas. Examples of the risk factors evaluated include shoulder width, median width, curve density, access point density, vehicle volume on mainline and intersecting roads, the angle of intersections, previous crash history, and speed limit. Specific risk thresholds for each safety factors were created, and if a segment exceeded a threshold in a specific factor, it was awarded a star. For example, if a segment exceeded a particular traffic volume range considered safe for that road type, it may receive a star. Segments could receive a total of 0 to 6 stars, with 0 as least risky, and 6 as most risky. Figure 4-6 provides an example of stars assigned to some segments of 4-lane rural roads.

Figure 4-6: Risk Factor Tabulation

									Tiebreakers	
End	Length	ADT	ADT Range	Severe Lane Departure Density	Access Density	Critical Curve Radius Density	Median Width	Total	Severe Lane Departure Density	ADT
DODDRIDGE CLOQUET (SL 35)	0.6	16,600	★	★	★	★	★	★★★★★	0.32	16,600
.1 MI E 12TH AVE (SL 45)	4.9	16,065	★	★	★	★	★	★★★★★	0.04	16,065
.3 MI S S JCT TH 37	7.0	9,200		★	★	★	★	★★★★	0.09	9,200
.1 MI N CSAH 13 MIDWAY RD (SL 65)	4.4	15,480		★	★	★	★	★★★★	0.05	15,480
N N JCT TH 169 (SL 55)	4.8	10,295		★		★	★	★★★	0.08	10,295
.4 MI S N JCT TH 37 (SL 55)	4.3	10,120		★	★		★	★★★	0.05	10,120
.2 MI N STEBNER RD CSAH 17 (SL 55)	1.5	20,060	★		★		★	★★★	0.00	20,060
.1 MI S WASH AVE CLOQUET (SL 45)	1.4	14,500			★	★	★	★★★	0.00	14,500

Source: MnDOT District 1 Safety Plan, 2016.

Figure 4-5 highlights key areas with a higher risk in the District, including:

- MN-38 north of Grand Rapids,
- US-169 in downtown Grand Rapids,
- MN-65 north of Nashwauk,
- US-53 south of Virginia,

- Central Entrance Road and US-53 in Duluth,
- MN-61 between Castle Danger and Beaver Bay, and around Grand Marais, and
- The MN 73/27 junction west of Moose Lake.

Interestingly, most of these identified segments, with the exception of US-53 in Hermantown/Duluth had little to no truck accident activity. This reflects the fact that risk factors are not truck-specific, and reflect risk for all road users as a whole. However, examining high-risk corridors is still a useful exercise because safety funds and plans could still benefit freight projects identified in these areas.

A brief summary of the count of higher-risk network elements in District 1 and Minnesota as a whole is provided in Figure 4-7. The figure shows that the majority of District 1's severe crashes at intersections and general road segments occurred at locations where potential projects were identified.

Figure 4-7: Systemic High-Risk Locations in District 1 and Minnesota as a Whole (Metro District excluded)

	Intersections		Road Segments		Curves	
	Qualified Projects	% Severe Crashes at Qualified Locations	Qualified Projects	% Severe Crashes at Qualified Locations	Qualified Projects	% Severe Crashes at Qualified Locations
District 1	240	67%	120	62%	317	49%
Remainder of MN Total	1,334	57%	629	51%	1,584	63%
District 1 Share of MN Total	17%	12%	19%	14%	20%	18%

Source: District 1 Safety Plan Update, 2016.

Road segments and intersections identified as "risky" in the District Safety Plan had little overlap with 2016-2017 truck crashes.

Consultations with industry stakeholders revealed that roadway safety is a concern especially for oversized/overweight (OSOW) vehicles due to one-lane roads, lack of acceleration and deceleration ramps, and difficulty of navigating roundabouts. State patrol assists with safety concerns, but infrastructure improvements for safety are also needed.

In order to better inform freight-related safety improvements, the District may wish to do a freight-specific risk factor analysis tailored to target truck-specific concerns, such as the need for shoulders, acceleration, deceleration, and turning lanes. Additional guidance on potential risk factors or assessment approaches will be provided in Working Paper 4 – Investment Priorities.

4.2.2 Grade Crossing Safety

Review of incidents at at-grade crossings crashes provides insight into safety issues through both road (truck) and rail lenses. Between 2004 and 2013, District 1 had a total of 43 incidents at public grade crossings, and Figure 4-8 provides a breakdown between types of crossings and

severity of incidents. Passive crossings are crossings with signage such as stops signs, whereas active crossing protection includes equipment such as gates, lights, and bells.

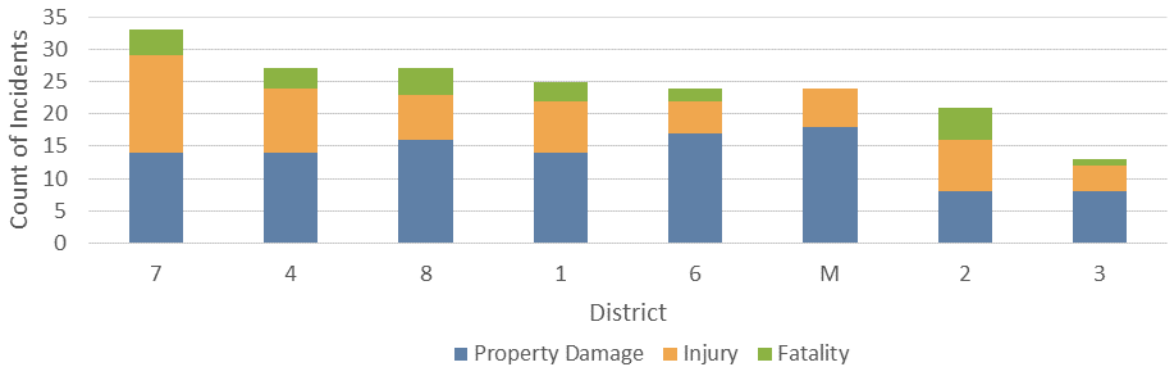
Figure 4-8: District 1 Public Grade Crossing Crashes, 2004-2013

Crossing Type	Property Damage Only	Injury	Fatality	Total
Passive	14	8	3	25
Active	10	5	3	18
Total	24	13	6	43

Source: CPCS analysis of MnDOT Rail Grade Crossing Safety Data. 2018

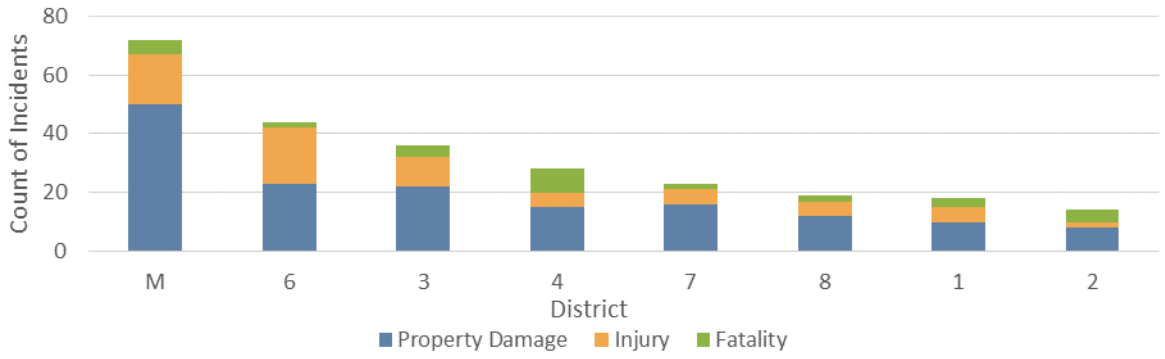
District 1's grade crossing safety performance is generally better than road safety performance: the District had low to moderate numbers of grade crossing incidents relative to the rest of the state. Figure 4-9 illustrates how District 1 had a roughly average crash rate at public crossings with passive protection and Figure 4-10 shows how the District had the second lowest rate of incidents at actively-protected crossings.

Figure 4-9: Crashes at Passively-Protected Public Grade Crossings, 2004-2013



Source: CPCS analysis of MnDOT Rail Grade Crossing Safety Data. 2018

Figure 4-10: Crashes at Actively-Protected Public Grade Crossings, 2004-2013



Source: CPCS analysis of MnDOT Rail Grade Crossing Safety Data. 2018

District 1's grade crossing crash rate compares favorably to other Districts.

Figure 4-11 provides a map of public grade crossing incidents in the District between 2004 and 2013. The data was provided by MnDOT and used for their Rail Grade Crossing Safety Project Selection report (2016), which included a risk factor analysis.

Like fatal truck accidents, fatal rail accidents were relatively rare, with only six fatal incidents in ten years. Furthermore, these fatal rail accidents also exhibited "randomness" in their distribution across the region. General crossing incidents appeared to be concentrated on CN's line between Duluth and International Falls, and on BNSF's line between Duluth and the Twin Cities.

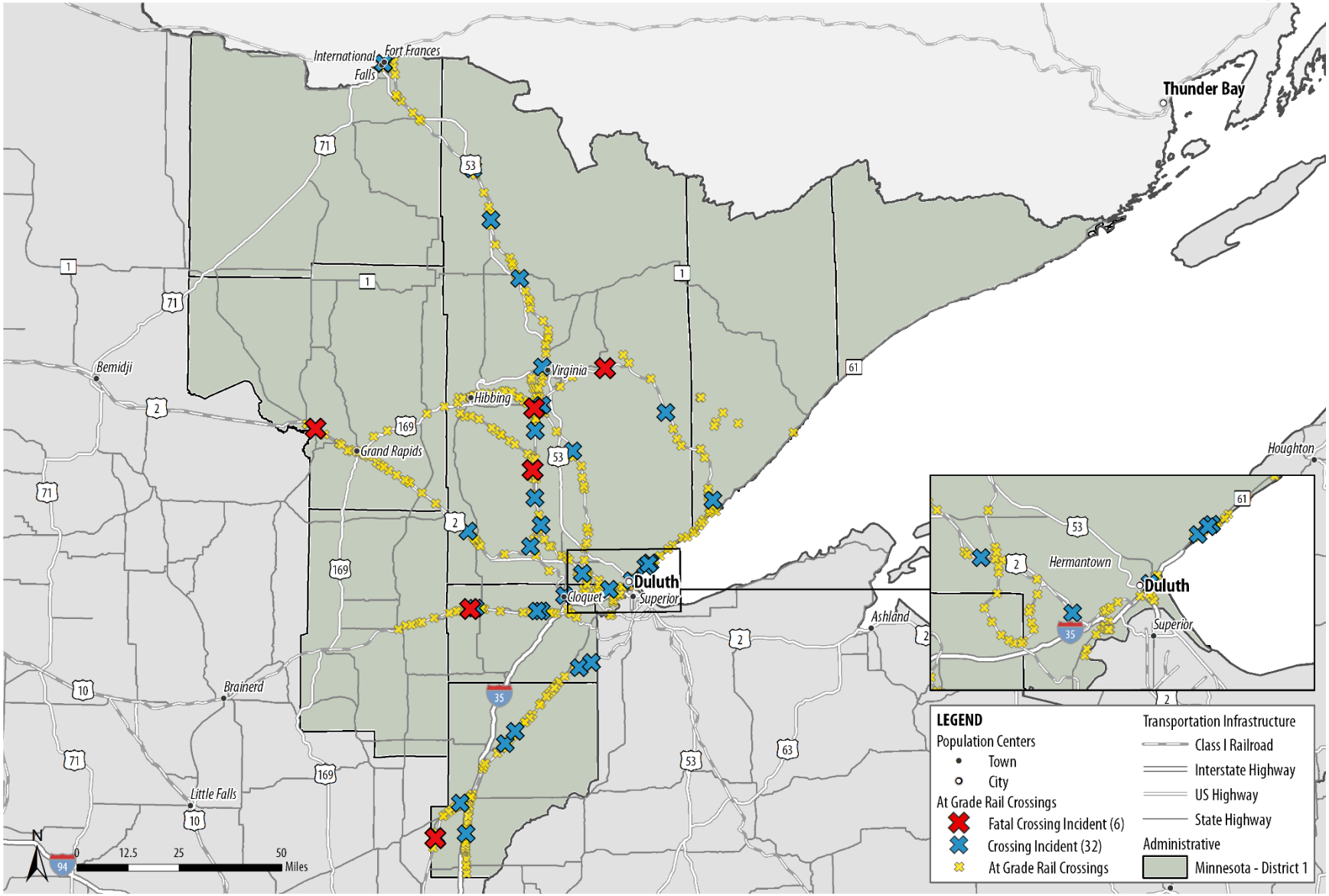
District 1's grade crossing incidents were concentrated on the CN line from Duluth to International Falls, and the BNSF line from Duluth to the Twin Cities.

A risk factor analysis was conducted for active and passive crossings in Minnesota, and results of that work are presented in Figure 4-12 and Figure 4-13. Figure 4-12 shows the risk ratings for crossings with active control devices such as lights, bells, and gates. Figure 4-13 shows the risk ratings for crossings with passive protection, such as stop or yield signs or crossbucks. Additionally, **Appendix F** provides a list of the risk ratings of passive crossings, and **Appendix G** provides a list of the risk ratings of active crossings.

The risk factors used to evaluate crossing risk included road traffic, rail traffic, speed limits, number of tracks, angle of crossing (or skew), and number of tracks, sight distances, and distance to other crossings or intersections. Based on each of these factors, active and passive crossings were assigned a numbered risk rating between 0 and 9. Both Figures 4-12 and 4-13 only show ratings up to 7, as MnDOT staff indicated that crossings with ratings of 8 and 9 had already been assessed and/or improved since the 2016 Safety Report was completed.

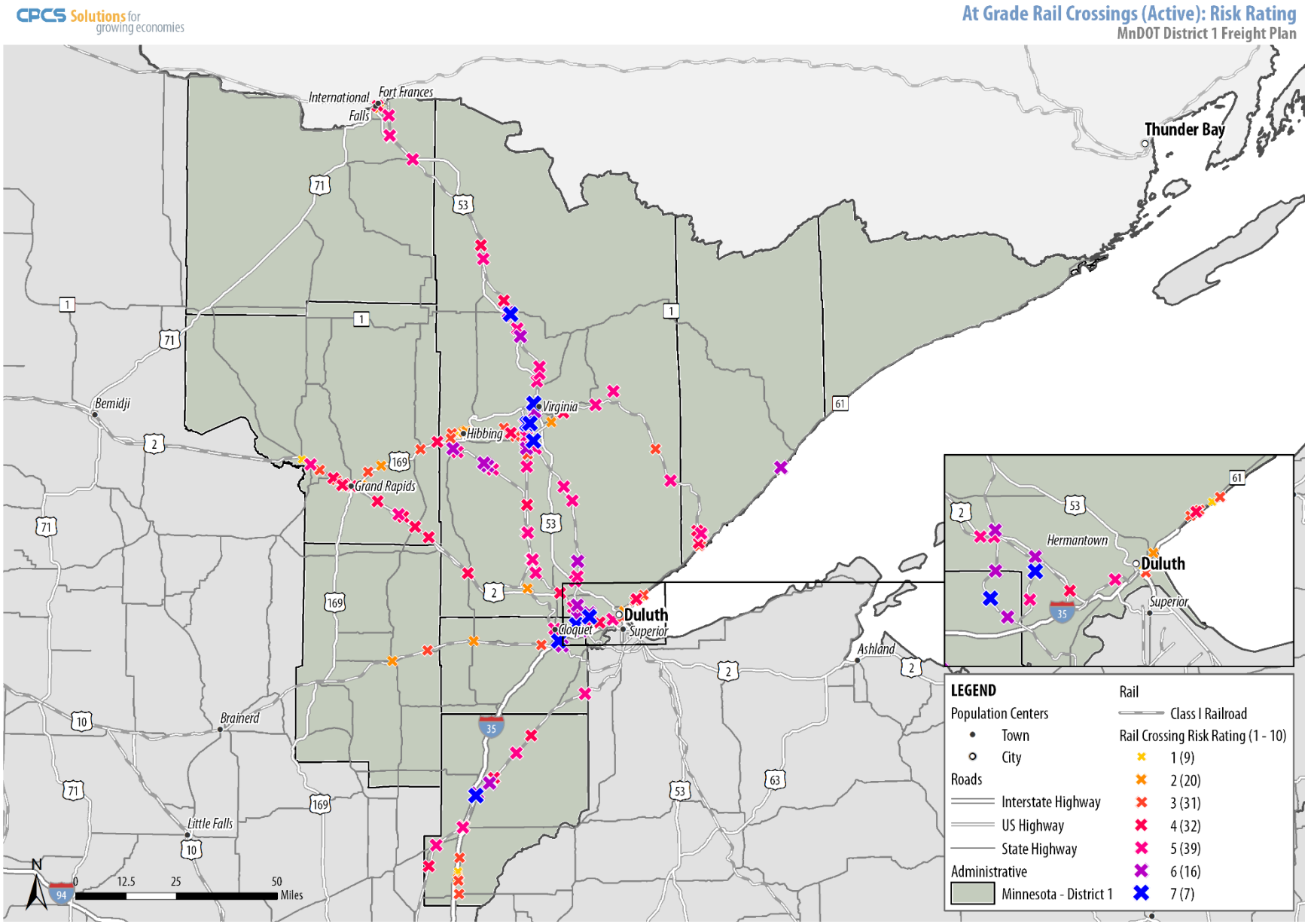
The figures below illustrate that District 1 as a whole has a large number of relatively moderate to high-risk crossings. This relatively high risk of road-rail incidents could detrimental to the safety and performance of the District's freight network. However, the relatively low number of incidents over the 10-year period of data in the study suggests that the overall impact of road-rail incidents on regional mobility may be low, and reviews of previous plans and studies found that grade crossing safety was not a major concern for the District.

Figure 4-11: District 1 Grade Crossing Incidents (2004-2013)



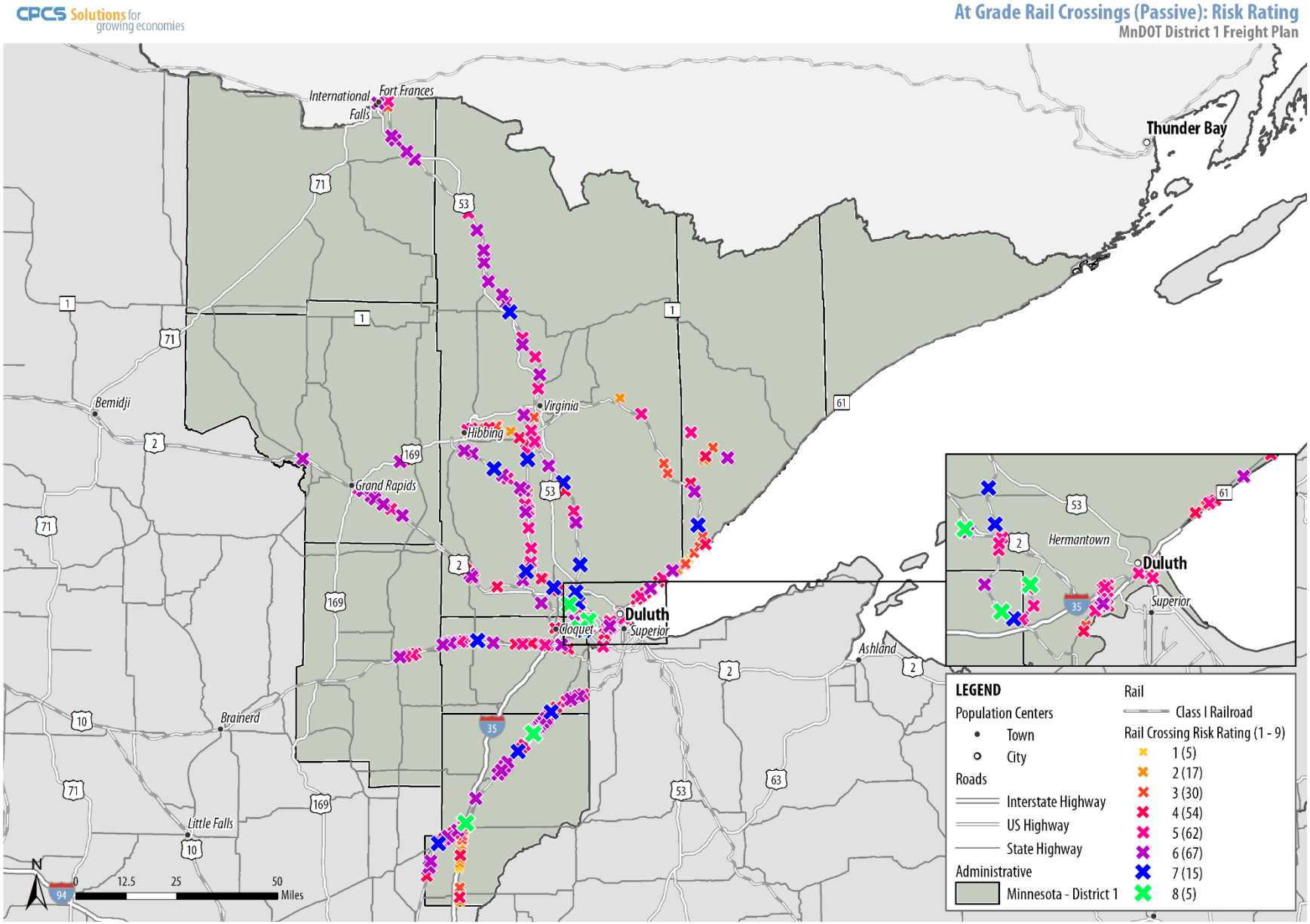
Source: CPCS analysis of MnDOT Rail Grade Crossing Safety Data. 2018

Figure 4-12 Active Grade Crossing Risk Ratings



Source: CPCS analysis of MnDOT Rail Grade Crossing Safety Data. 2018

Figure 4-13: Passive Grade Crossing Risk Ratings



Source: CPCS analysis of MnDOT Rail Grade Crossing Safety Data. 2018

4.3 Mobility

The ease and cost-effectiveness of moving goods, along with the confidence to know that goods will arrive on time are critical transportation considerations for many firms. Conversely, a transportation system that is unreliable, expensive, or otherwise cannot support efficient freight movement can represent a threat to a region's economic well-being. In order to understand freight mobility in District 1, four measures were evaluated:

- Overall truck travel speed.
- Truck Travel Time Index, a measure of the difference in truck travel speeds between peak times and non-peak times.
- Truck Travel Time Reliability, a measure of the variability or "peakiness" of truck travel speeds in District.
- Roadway clearances and oversize-overweight load restrictions

These measures were evaluated using one year's worth of truck GPS probe data from 2017 which was aggregated and provided by StreetLight Data. This data was primarily generated by GPS tracking devices installed by private trucking companies and used to monitor fleet performance and driver behavior. The GPS units are capable of tracking speed, time, and location and transmit this information back to centralized computer systems. Aggregated data from hundreds of companies and thousands of trucks can be used to measure traffic speed and system performance.

A Few Notes on StreetLight Data

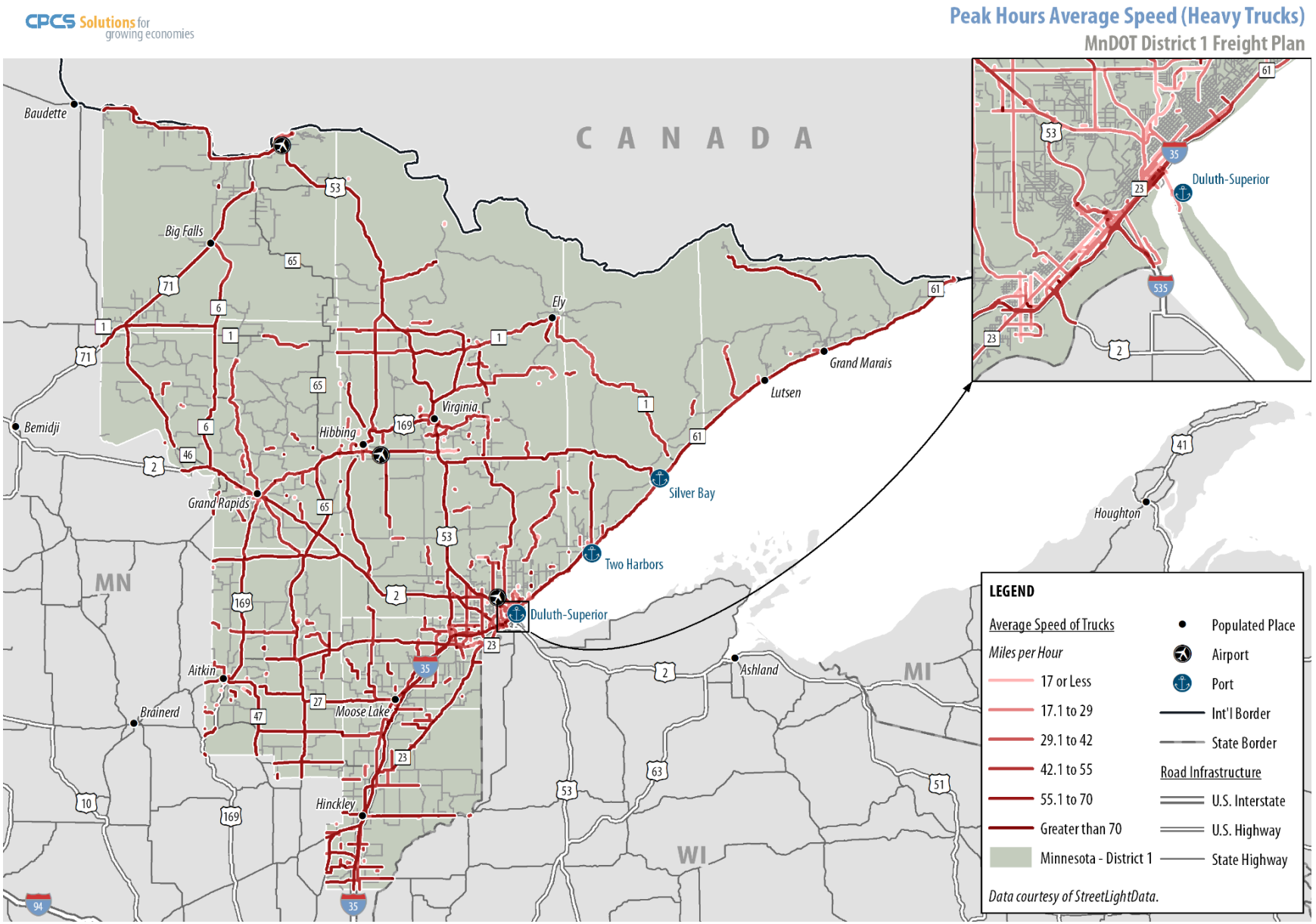
It is important to note that StreetLight Data's coverage of trucks is not comprehensive, it only includes a portion of the total truck fleet operating in District 1. Generally speaking, StreetLight and other services' coverage favors large commercial fleets, which can afford to implement standardized GPS tracking systems, and which find value in selling such tracking data to StreetLight or other data services. However, smaller fleets and owner-operators are less likely to be represented in the data. Therefore, industries served by smaller fleets or individual truckers – such as logging and agriculture are likely to be under-represented in the StreetLight Data used here. Consultations with companies and individuals in these industries will help fill this data gap.

Additionally, a lack of cell phone coverage in some remote areas of the District means that data will be unavailable, as GPS tracking systems rely on cellular phone signals to return speed and location information to central servers.

4.3.1 Truck Speed

Examining overall truck speed will help inform more in-depth measures of truck mobility and system performance. Figure 4-14 displays the average speed of trucks in the District. The average speed on the District's major road corridors is high, suggesting that there are be no major problems with truck congestion at a system-wide level.

Figure 4-14: District 1 Average Truck Speeds



Source: CPCS analysis of StreetLight Data, 2017.

4.3.2 Travel Time Index

Travel Time Index (TTI) is a measure of the differences in travel times or speeds between peak (AM and PM rush hour) and non-peak times. For this analysis, TTI was calculated for individual segments of the road network using the following formula:

$$Travel\ Time\ Index = \frac{Average\ Peak\ Time\ Speed\ on\ Weekday\ Mornings\ and\ Evenings}{Free\ Flowing\ Speed}$$

In this case, TTI represents the relative "slowness" of peak-time traffic. For example: a TTI value of 0.9 would indicate that peak-time traffic moves at 90% of free flow speeds, and a TTI value of 0.5 would indicate that peak time traffic moves at 50% of free-flow speeds.

Peak Time Speed was defined as the average speed during the combined morning (6-10 AM) and evening (3-7 PM) rush hours on weekdays. Free flow speed was provided automatically from StreetLight, which calculated free-flow as an average of the highest speeds observed for a segment for each day of the year.

Evaluating TTI for the road network is useful because it can reveal areas where traffic congestion may be more likely, particularly at peak times. In turn, this understanding of congestion locations and patterns can help inform policy and operations decisions. Figure 4-15 shows TTI for personal vehicles in District 1, and Figure 4-16 shows TTI for heavy trucks in District 1.

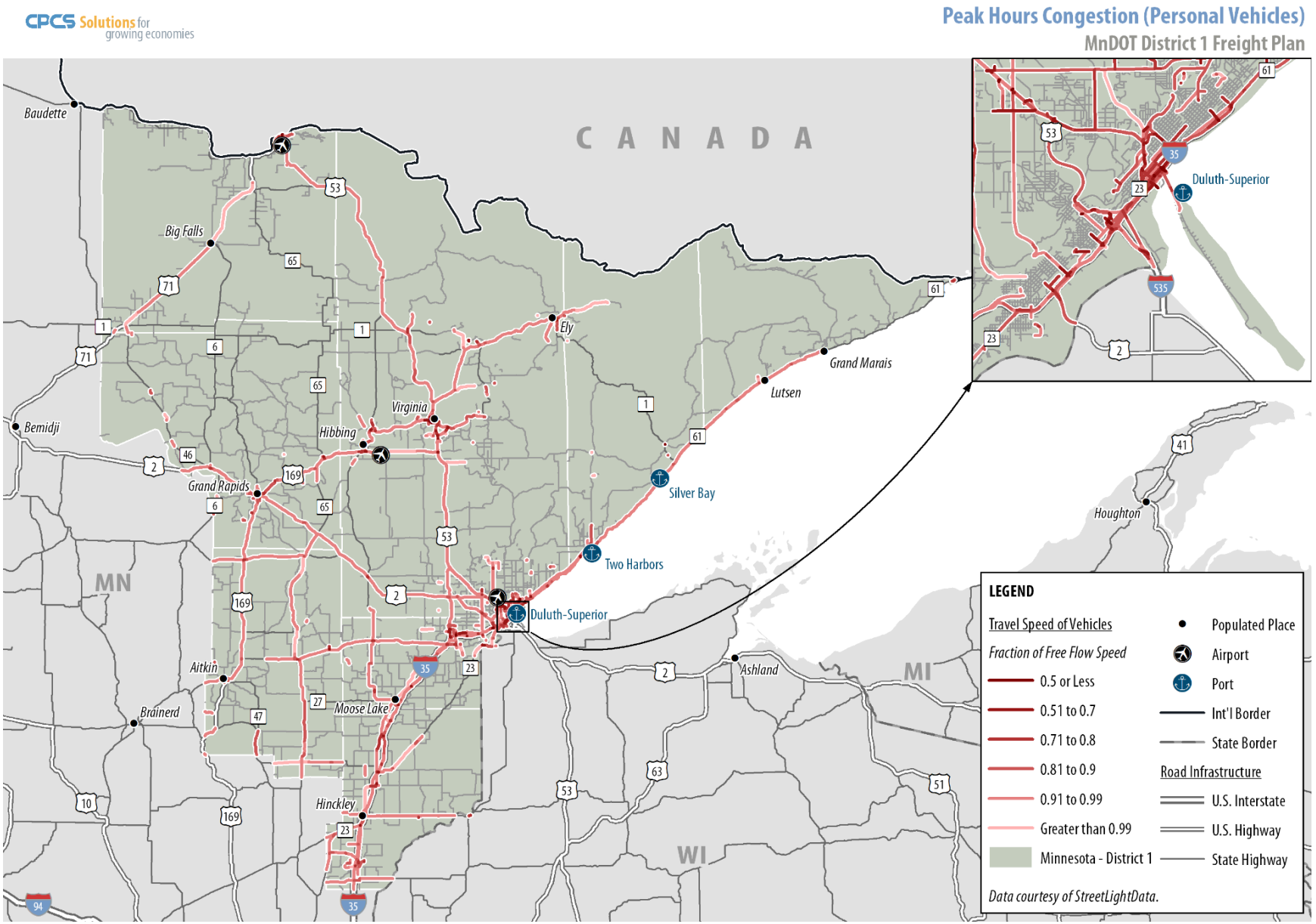
An examination of personal vehicle traffic in Figure 4-15 shows that most of the District's highways do not experience much peak-hour congestion. The worst peak-time congestion in the District is concentrated around select highway segments in Duluth, downtown Hibbing, and Virginia. I-35, MN-23, and MN-61 in Pine and Carlton Counties, and US-71 in Koochiching County also had longer segments with higher congestion.

Peak-hour congestion for trucks or personal vehicles is generally not a problem in District 1.

In comparison, truck peak-hour congestion does not overlap with personal vehicle congestion and is distributed more widely across the District. Much of this congestion is found on relatively shorter road segments, and segments at or near road intersections. This concentration of congestion at intersections and the fact that truck congestion and personal vehicle congestion do not overlap suggests that low truck speeds at peak times may not be related to overall traffic congestion. Instead, low truck speeds are likely related to the fact that heavy trucks are slower to accelerate, decelerate, climb hills, or turn relative to general traffic. This finding lends further support to conclusions from the Manufacturer's Study, which noted needs for improved passing, climbing, acceleration, deceleration, and turning lanes in the District.

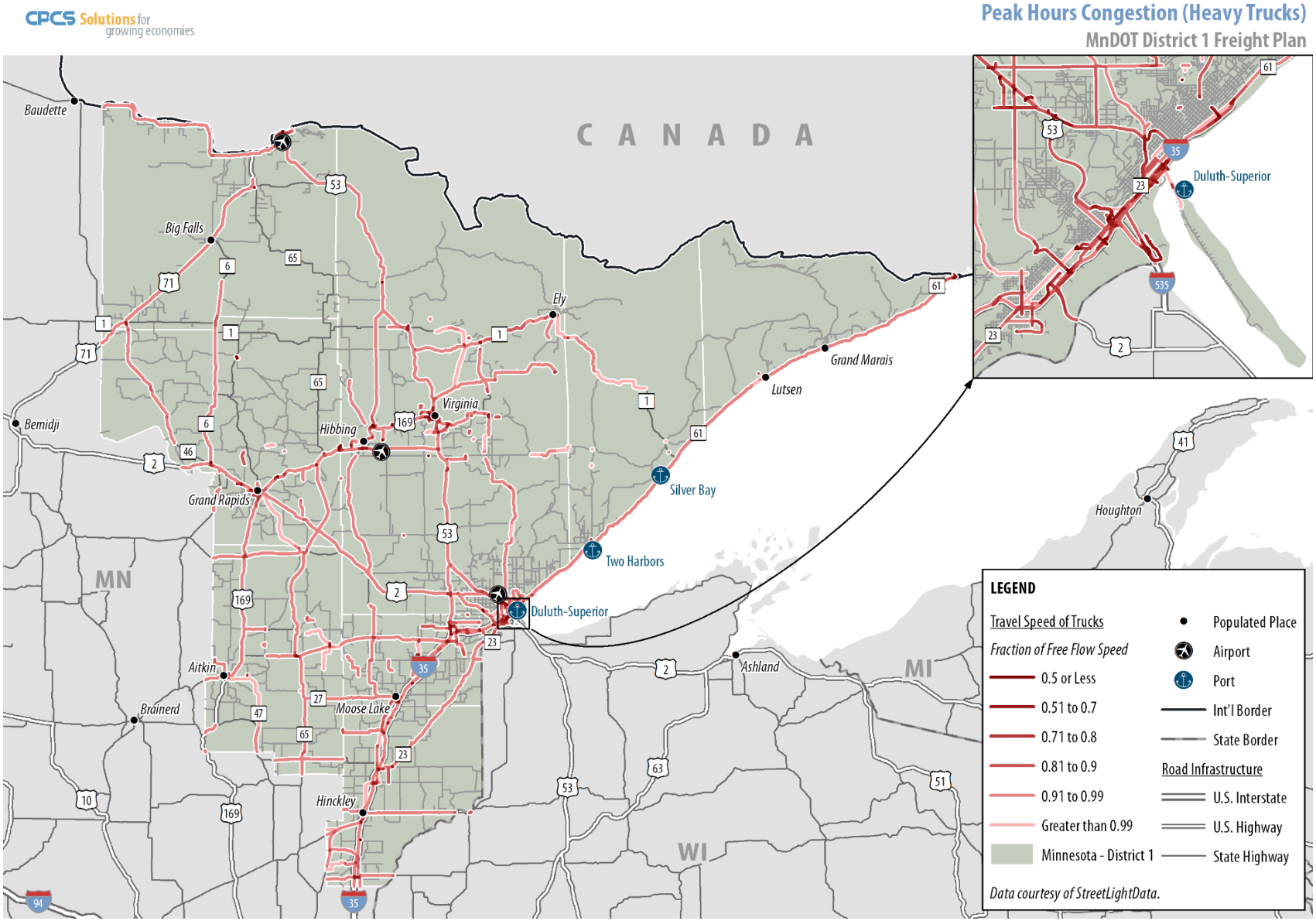
Truck congestion does not overlap with personal vehicle traffic and is likely a function of trucks' slower speeds.

Figure 4-15: Personal Vehicle Peak Travel Time Congestion



Source: CPCS analysis of StreetLight Data, 2017.

Figure 4-16: Heavy Truck Peak Travel Time Congestion



Source: CPCS analysis of StreetLight Data, 2017.

4.3.3 Travel Time Reliability

Travel Time Reliability (TTR) is a measure of the consistency of travel times, or the degree to which delays are unexpected. TTR is important because businesses and commuters may be able to plan trips to accommodate peak congestion, but unexpected delays cannot be planned for, and can disrupt operations. For this plan, TTR at peak times of day was calculated for both personal vehicles and trucks using the following formula:

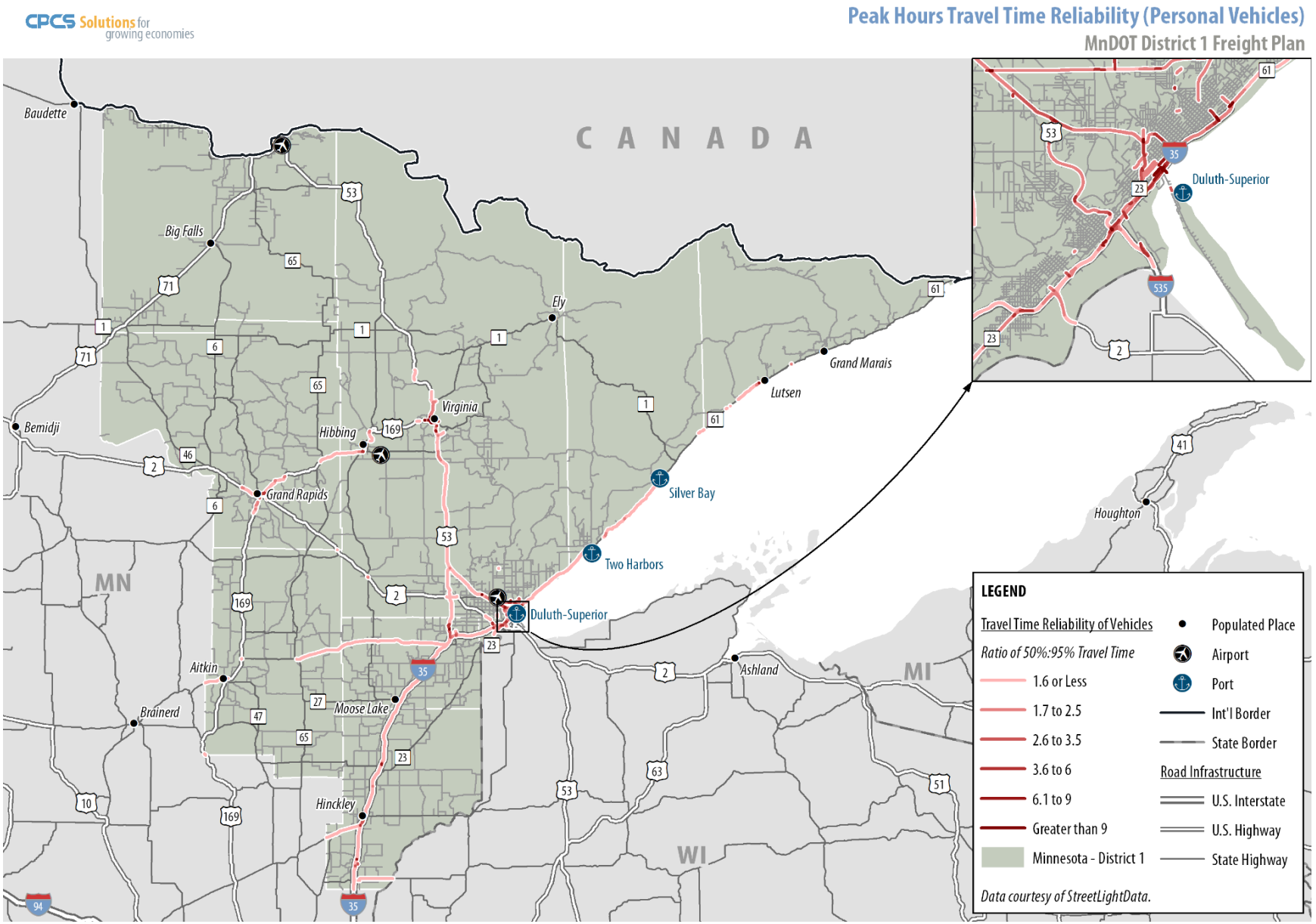
$$Travel\ Time\ Reliability = \frac{50th\ percentile\ travel\ speed\ at\ peak\ hours}{95th\ percentile\ travel\ speed\ at\ peak\ hours}$$

With this formula, lower values represent a more reliable travel speed, while higher values represent more variable travel speeds. Therefore, a high TTR value means low reliability. TTR for passenger vehicles is illustrated in Figure 4-17, and the figure shows that that travel times in the region are very consistent, with the exception of areas around Duluth. Coverage for personal vehicles was only available using StreetLight Data's personal vehicle GPS dataset, which includes a relatively small sample of vehicles. This relatively small sample size meant that

Truck TTR is shown in Figure 4-18 and tells a similar story: travel times across the District are consistent, even during peak-time congestion. The only exceptions are more variable times around I-35 and US-53 in Duluth. Ultimately, this truck speed, TTR, and TTI analysis suggests that congestion and unreliable travel speeds are generally not an issue in District 1. This finding aligns with previous plans and literature on the District's freight system performance, which did not note any significant problems with truck speed or congestion. Instead, mobility issues are more closely related to general performance characteristics of trucks, such as their slow speed and heavy mass, and the need for infrastructure such as turning lanes and passing lanes to support safe truck movements. The need for infrastructure improvements like these will be discussed in Working Paper 3 – Needs, Issues and Opportunities.

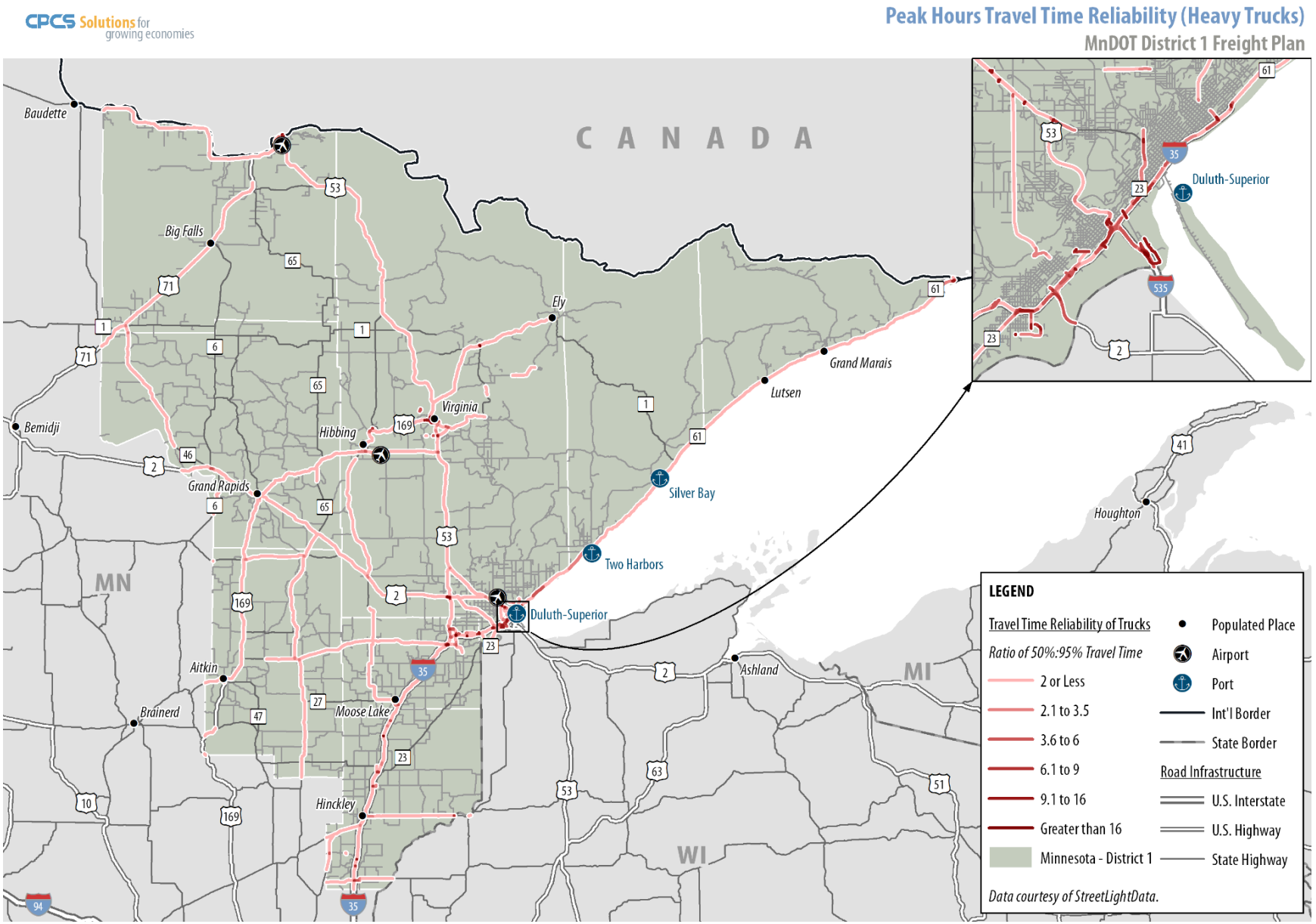
Truck congestion and travel speed is not an issue for the District, and mobility issues are concentrated at specific points of the system where trucks must stop, accelerate, or turn.

Figure 4-17: District 1 Personal Vehicle Travel Time Reliability



Source: CPCS analysis of StreetLight Data, 2017.

Figure 4-18: District 1 Truck Travel Time Reliability



Source: CPCS analysis of StreetLight Data, 2017

4.3.4 Bridge Clearances

The movement patterns of trucks can also be influenced by the design and dimensions of roadways and bridges, and exceptionally low bridges may act as barriers to truck movements. In particular, vertical and horizontal clearances can pose significant challenges for the movement of oversize-overweight (OSOW) loads, which may exceed the dimensions of a normal truck. This section provides a discussion of bridge clearances in the District.

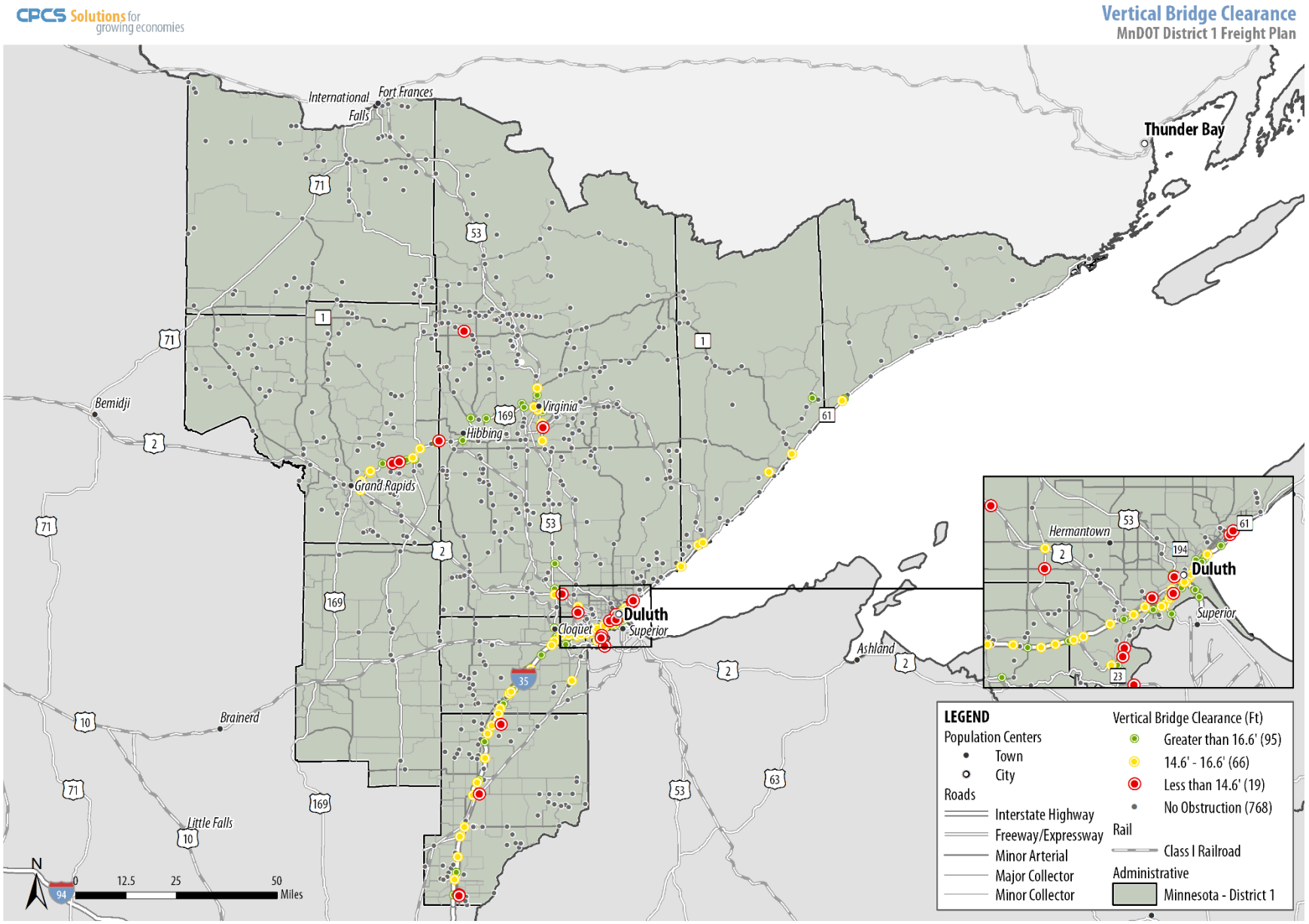
One of the most common potential impediments to truck movements are low bridges over roadways, which require trucks to take circuitous routes to avoid damage to vehicles, cargo, and bridge infrastructure. Figure 4-19 illustrates the location of road bridges in the District and highlights potential areas for conflict, and **Appendix H** provides information on specific bridge clearances. Bridges are broken down into four categories:

- Red icons indicate bridges over roads with a vertical clearance of less than 14’ 6”, which may present major barriers to truck movement. The maximum truck height allowed per Minnesota Commercial Truck and Passenger Regulations is 13’6”, and the FHWA recommends that bridges be constructed with at least one foot of additional clearance above maximum truck height.
- Yellow icons indicate bridges over roads that have enough clearance to accommodate regular truck traffic but are below the 16’6” minimum height requirement for MnDOT Super Load OSOW Corridors.
- Green icons indicate bridges that have enough vertical clearance to qualify for OSOW Super Load Corridor status, which requires a minimum vertical clearance of 16’6”.
- Gray dots indicate other bridges in the region, with no vertical obstruction over a road.

Overall, District 1’s bridge clearances do not create a barrier to general truck traffic, as bridges lower than 14’6” are relatively rare outside of Duluth, and are not placed on major truck routes. However, numerous barriers to OSOW superload movement exist on key transportation routes including I-35, MN-61, and US-169.

Bridge clearances are not an issue for general truck traffic in the District, but present potential problems for the movement of oversize loads.

Figure 4-19: District 1 Bridge Clearances



Source: CPCS analysis of MnDOT Bridge Condition and Clearance Data. 2018.

A Lesson on the Safety, Mobility, and Economic Hazards of Low Bridges

On Thursday, August 31, 2017, just before the Labor Day weekend, a truck carrying an oversize load struck and damaged a low-clearance abandoned railroad bridge crossing MN-61 at Taconite Harbor. MnDOT determined that the bridge was unsafe, and drivers were forced to take a 27-mile detour on gravel roads. However, communities north of Taconite Harbor, such as Grand Marais are heavily dependent on tourism, and a road closure before Labor Day represented a major threat to the economic well-being of the area. In order to avoid this economic impact, MnDOT and its contractors worked through the night to remove the damaged span in about 24 hours, ensuring that Labor Day traffic was not impacted. Events like this demonstrate the potential hazards of low-clearance infrastructure for freight mobility and public safety.

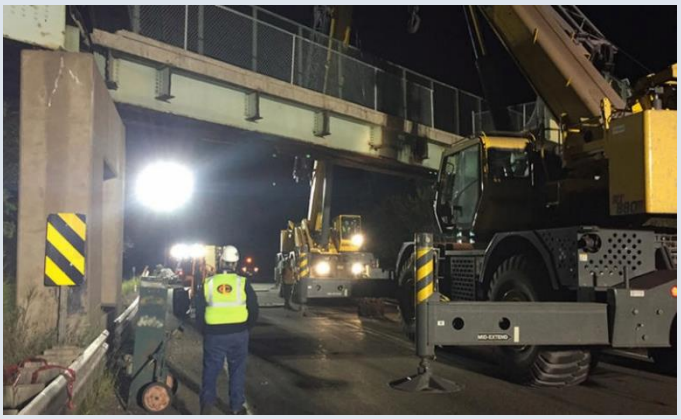


Image source: MnDOT.

4.3.5 OSOW Operations in the District

Definitions and Requirements for Permits

Oversize and overweight loads are fairly common in District 1 and take a variety of forms based on the industries they serve. In order to ensure the safe movement of OSOW load and to mitigate damage to pavement and bridges, or prevent collisions with infrastructure, carriers are required to obtain OSOW permits prior to moving loads. MnDOT issues permits for interstate, US, and state highways, while some counties and municipalities may require permits for local roads. A variety of permit types may be available based on a carrier's goods and operations. For example, annual MnDOT OSOW permits are available for specific routes and specific commodities such as construction materials, and monthly permits are available for "jobs" of like-loads carried on specific corridors. Seasonal permit exemptions are also available for the agricultural and forestry industries.

MnDOT classifies oversize loads as loads with a height greater than 13'6", and width greater than 8'6". Loads greater than 14'6" wide, 16'0" tall, and 110'0" are ineligible for annual permits, and are often restricted from movement on high-volume days such as holidays and summer weekends. Definitions of "overweight" loads are more complicated, as they are based upon axle counts, axle groups, and weight per axle of specific loads.

In 2016, 1,652 permits were issued to OSOW trips either starting or ending in District 1. This represented about 15 percent of the total permits issued in Minnesota for the year. Figure 4-20 provides a list of MnDOT's permit categories.

- **Transactional permits** are considered to have dimensions that present minimal problems for routing.
- **Collaborative permits** require more coordination, and MnDOT OSOW analysis documents note that "improvements to existing infrastructure that accommodate the collaborative range of dimensions could have the biggest impact in the overall movement of OSOW."[36]
- **Consultative permits** are related to "megaloads" or "superloads," where unique planning processes are required for each move.

Figure 4-20: MnDOT OSOW Permit Types and Criteria

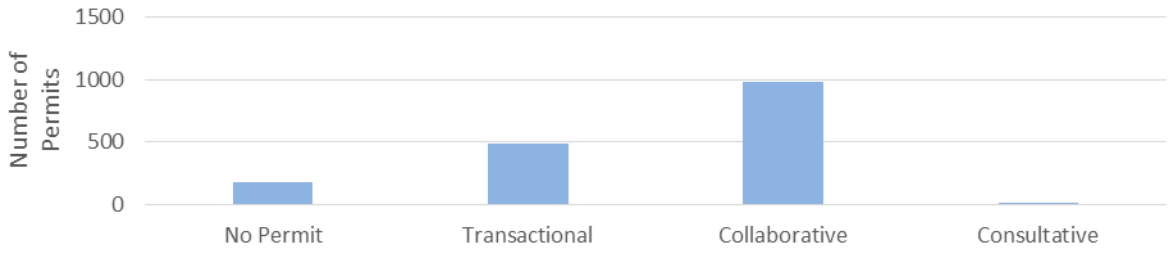
Permit Type	Height	Width	Length	Gross Vehicle Weight (1000s of lbs)
No Permit	Up to 13.5 feet	Up to 8.5 feet	Up to 75 feet	Up to 80
Transactional	13.5 to 15 feet	8.5 to 15 feet	75 to 140 feet	80 to 187
Collaborative	15 to 16.5 feet	15 to 17 feet	140 to 180 feet	187 to 255
Consultative	Over 16.5 feet	Over 17 feet	Over 180 feet	Over 255

Source: MnDOT. "District 1 2016 Oversized/Overweight Permit Data."

The figures below provide a summary of the dimensions listed on permits for District 1 in 2016 and breaks each dimension of a load into its respective permit type. These figures show that most of the OSOW permits in District 1 would fall into the transactional category in all dimensions except for height. Based on height alone, nearly 60 percent or 981 of the District's OSOW permits would fall into the "collaborative" category. 787 of these 981 permits are for loads under 15.5 feet high, and 958 of these permits are for loads under 16 feet high.

More than any other factor, the height of loads and vertical clearances is a key consideration for OSOW permits in District 1.

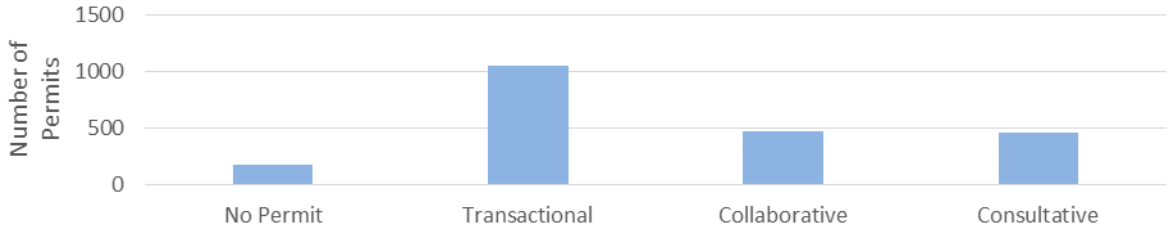
Figure 4-21: Height on OSOW Permits with Origin or Destination in District 1, 2016



[36] MnDOT. "District 1 2016 Oversized/Overweight Permit Data."

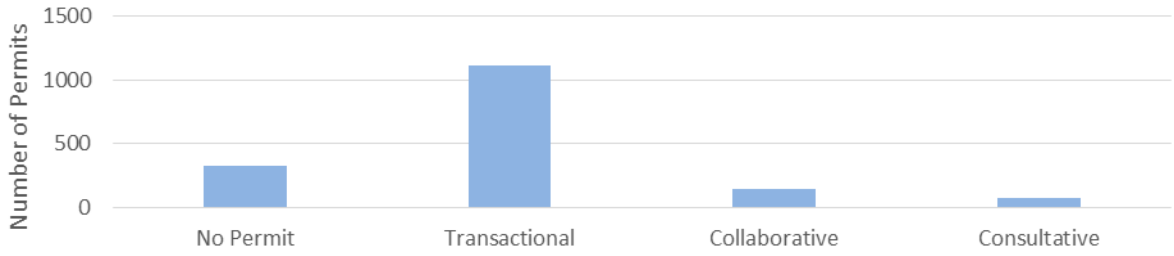
Source: MnDOT OSOW permit data. 2016.

Figure 4-22: Width on OSOW Permits with Origin or Destination in District 1, 2016



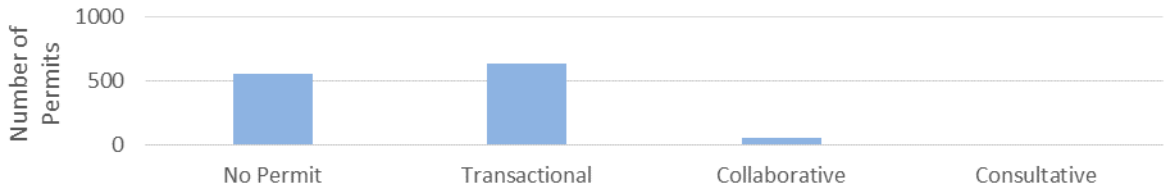
Source: MnDOT OSOW permit data. 2016.

Figure 4-23: Length on OSOW Permits with Origin or Destination in District 1, 2016



Source: MnDOT OSOW permit data. 2016.

Figure 4-24: Gross Vehicle Weight on OSOW Permits with Origin or Destination in District 1, 2016*



Source: MnDOT OSOW permit data. 2016. NOTE: 404 permits had a weight of "0" listed, and were excluded from this figure.

OSOW Flows To and From District 1

In District 1, the majority of OSOW permits are issued for loads originating and terminating in the District, or loads originating elsewhere in Minnesota (or the US) and terminating in the District. Figure 4-25 shows the number of permits that are issued for different combinations of origins and destination, with top combinations highlighted. It is important to keep in mind that the numbers below reflect **permits**, and not total OSOW **loads** carried. Multiple trips or loads may be allowed under monthly and annual permits.

Figure 4-25: District 1 OSOW Load Permit Origins and Destinations, 2016

Destination	Origin				
	Interior District 1	Other MN District	Wisconsin (District 1)	Canada (District 1)	**Total**
Interior District 1	**406**	**450**	208	1	**1,065**
Other MN District	240	Not Measured	148	5	**393**
Wisconsin (District 1)	28	126	3	0	**157**
Canada (District 1)	1	26	9	1	**37**
Total	**675**	**602**	**368**	**7**	**1,652**

Source: CPCS analysis of MnDOT OSOW permit data. 2016.

- About 25 percent of permits (406) were issued for moves **entirely within District 1**. 75 percent of these District 1 internal permits (300) was for the movement of construction equipment such as excavators.
- About 40 percent (659) of permits were issued for **loads originating elsewhere and ending in District 1**. These permits were issued mostly for mobile homes, concrete, and construction equipment, with smaller amounts of steel.
- About 16 percent of permits (269) were issued for **loads originating in District 1 and traveling elsewhere**. These loads consisted primarily of construction equipment, and wind turbine components. It is likely that turbine components originating in the District are being unloaded at the Port of Duluth, and trucked westward, which was a commonly-noted commodity in consultations.
- About 19 percent of permits (318) were issued for **loads passing through District 1.** These loads consisted primarily of mobile homes and modular buildings.

Key OSOW Routes in District 1

OSOW permit data provided by MnDOT also provides limited insight into key corridors for OSOW freight in the District. Unfortunately, this OSOW data is not an easily-mapped format, so the number of OSOW permits issued for specific road segments cannot be isolated. Instead, counts of specific routes mentioned in OSOW permits are listed in Figure 4-26.

Figure 4-26: Top 10 Highways Listed in District 1 OSOW Permits

Route	Count
I-35 N	569
US-169 N	393
I-35 S	377
US-53 N	322
MN-65 N	297
US-2 W	253
US-10 E	250
MN-73 N	249
US-169 S	225
US-2 E	223

Source: CPCS analysis of MnDOT OSOW permit data. 2016.

In addition to this identification of routes, the top 5 OSOW origins and destinations in District 1 were identified, as listed in Figure 4-27.

Figure 4-27: Top OSOW Permit Origins and Destinations in District 1, 2016

Top Origins	Trips	Top Destinations	Trips
MN-48 at Wisconsin	168	Virginia	205
MN-70 at Wisconsin	119	Grand Rapids	73
Duluth	112	Duluth	64
Virginia	106	MN-48	53
US-2 at Wisconsin	67	US-2 Wisconsin	52

Source: CPCS analysis of MnDOT OSOW permit data. 2016.

This information on routes, origins, and destinations confirms information gathered from previous studies and stakeholder consultations. In particular, common themes related to OSOW movement were:

- The important role of the Port of Duluth as an inbound port for OSOW materials including wind turbine components, mining equipment, and heavy machinery,
- MN-48 and MN-70 as entry points for large loads from Wisconsin like wind turbine components, and
- Mining operations are major origins *and* destinations of OSOW traffic thanks to the movement of large mining equipment.

4.4 Condition

The condition of road infrastructure is important because poorly-maintained infrastructure can negatively impact safety and reliability of the transportation system. In particular, infrastructure conditions matter to freight because deficient structures may not be able to bear as much weight (creating barriers for truck movement), and rough road surfaces can create bumps and shocks that damage or dislodge cargo.

The condition analysis conducted for the District 1 Freight Plan focuses on bridge condition. Pavement condition is not included in this condition analysis because MnDOT and county staff indicated that impaired or deficient road segments would already be identified and programmed for improvement as part of routine highway maintenance and improvement plans. Figure 4-28 lists the number of bridges over 10 feet in each District, their average age, and average sufficiency rating. A rating less than or equal to 80 is considered “deficient.”

Figure 4-28: Average Age and Condition of Bridges 10 Feet and Over, 2017

District	Interstate	Trunk Highway	County	Township	City	Total	Average Age	Average Sufficiency Rating
1	150	404	995	197	142	1,889	36	89
2	0	312	943	938	31	2,224	30	95
3	70	387	869	506	52	1,884	33	92
4	78	246	709	614	58	1,705	32	94
6	203	639	1,436	1,345	192	3,815	38	91
7	124	342	1,190	1,224	55	2,935	36	92
8	0	356	1,103	1,264	53	2,776	35	91
Metro	642	636	558	132	580	2,548	31	89
TOTAL	1,267	3,322	7,804	6,220	1,163	19,776	34	92

Source: MnDOT Minnesota Bridges December 2017.

District 1 has the third smallest number of bridges 10 feet and over in Minnesota, but the lowest average sufficiency rating, and second oldest average age.

As of December 2017, District 1 had a total of 179 structures 10 feet and over that were considered deficient (based on a sufficiency rating less than or equal to 80), and a county-by-county breakdown by network type is provided in Figure 4-29.

Figure 4-29: Deficient Structures by County (Sufficiency Rating less than or equal to 80)

	Interstate and Trunk	County	Township	City	Total
Aitkin	2	3	3	0	8
Carlton	3	8	1	0	12
Cook	1	15	0	0	16
Itasca	2	17	2	2	23
Koochiching	1	5	1	0	7
Lake	2	3	0	0	5
Pine	0	6	1	0	7
St. Louis	15	62	13	11	101
Total	**26**	**119**	**21**	**13**	**179**
% of District's Total Bridges	**4.7%**	**12.0%**	**10.7%**	**9.2%**	**9.5%**

Source: MnDOT Minnesota Bridges December 2017.

The results above suggest that the District's freight-critical routes (interstates and trunk highways) have relatively well-maintained bridge structures, but last-mile connections to specific locations on county, township, or city roads may be made more difficult by deficient bridge conditions.

The District's freight-critical corridors such as I-35, US-2, US-53, and US-169 have relatively well-maintained bridges relative to the rest of the District's network.

In order to understand how bridge condition issues were distributed across the region, the project team conducted its own bridge condition evaluation using data from MnDOT. MnDOT evaluates bridge condition based on five functional and six structural measures. Each of these factors is assigned a rating from 0 (failing) to 9 (new). The 2018 data provided by MnDOT for this project included data for ratings on three structural topics:

- Deck – the surface that carriers traffic.
- Superstructure – structural components located above a bridge bearing.
- Substructure – structural components located below a bridge bearing.

For each bridge in the District, the three condition ratings were multiplied together to produce a score from 0 to 27. Each bridge was then assigned a percentage rating, and bridges with a rating less than 50% are reflected in Figure 4-31. Overall, 99% of the District's bridges are at 50% condition or higher, and 38% of bridges are 80% or higher condition. Figure 4-30 summarizes the number of bridges within each condition group, and **Appendix H** provides a list with each bridge's rating.

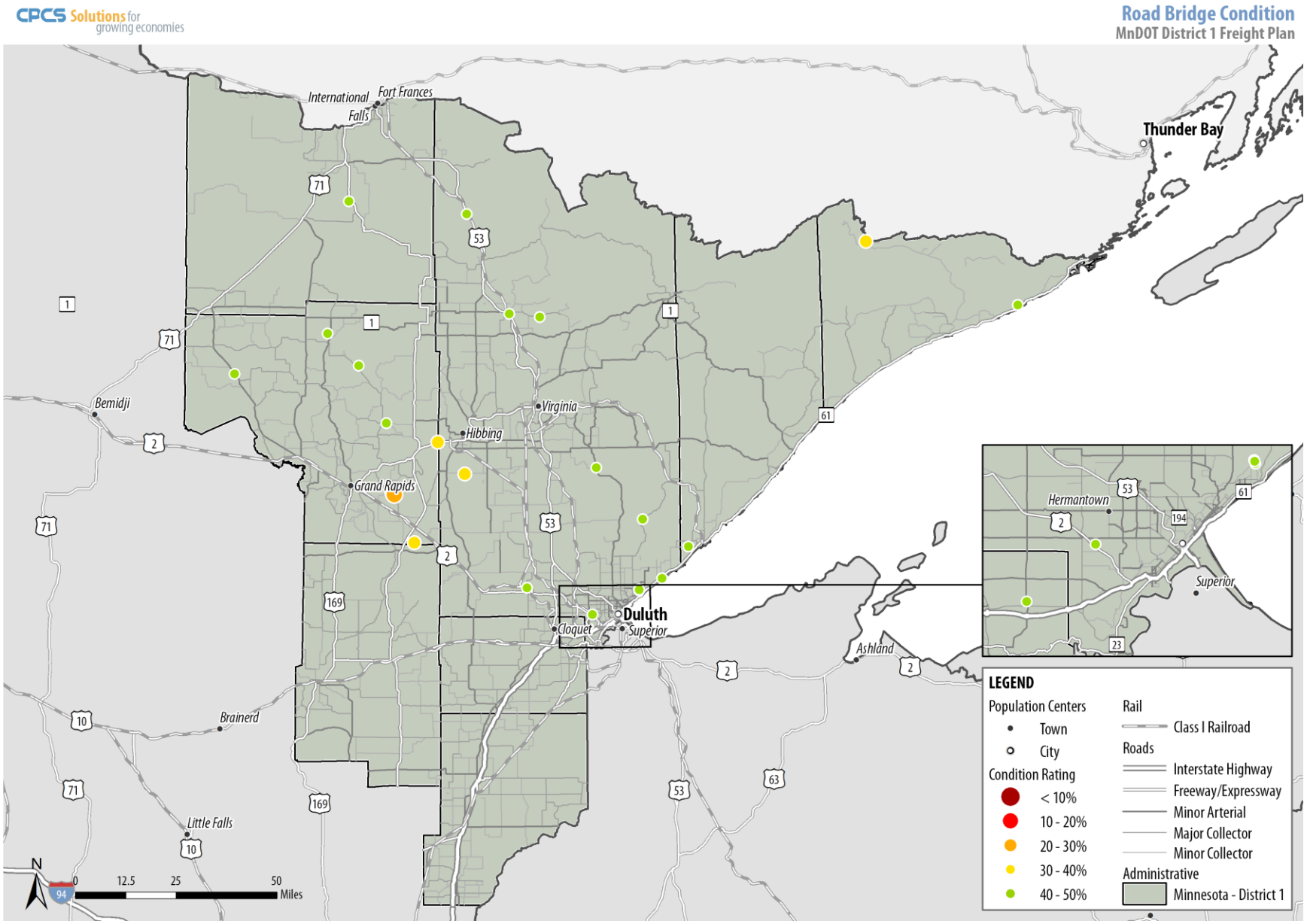
Figure 4-30: Number of District 1 Bridges by Condition Rating

Condition Rating	Total
<10%	0
10 – 20%	0
20 – 30%	1
30 – 40%	4
40 – 50%	20
50 – 60%	108
60 – 70%	123
70 – 80%	299
80 – 90%	303
90 – 100%	36

Source: CPCS analysis of MnDOT Bridge Condition and Clearance Data. 2018.

This analysis of bridge conditions suggests that based on the criteria of deck, superstructure, and substructure alone, a large portion of the District's bridges could be considered "deficient," when deficiency is defined as 80% condition score or less.

Figure 4-31: District 1 Road Bridge Condition



Source: CPCS analysis of MnDOT Bridge Condition and Clearance Data. 2018.

5 Conclusions & Next Steps

5.1 Conclusions

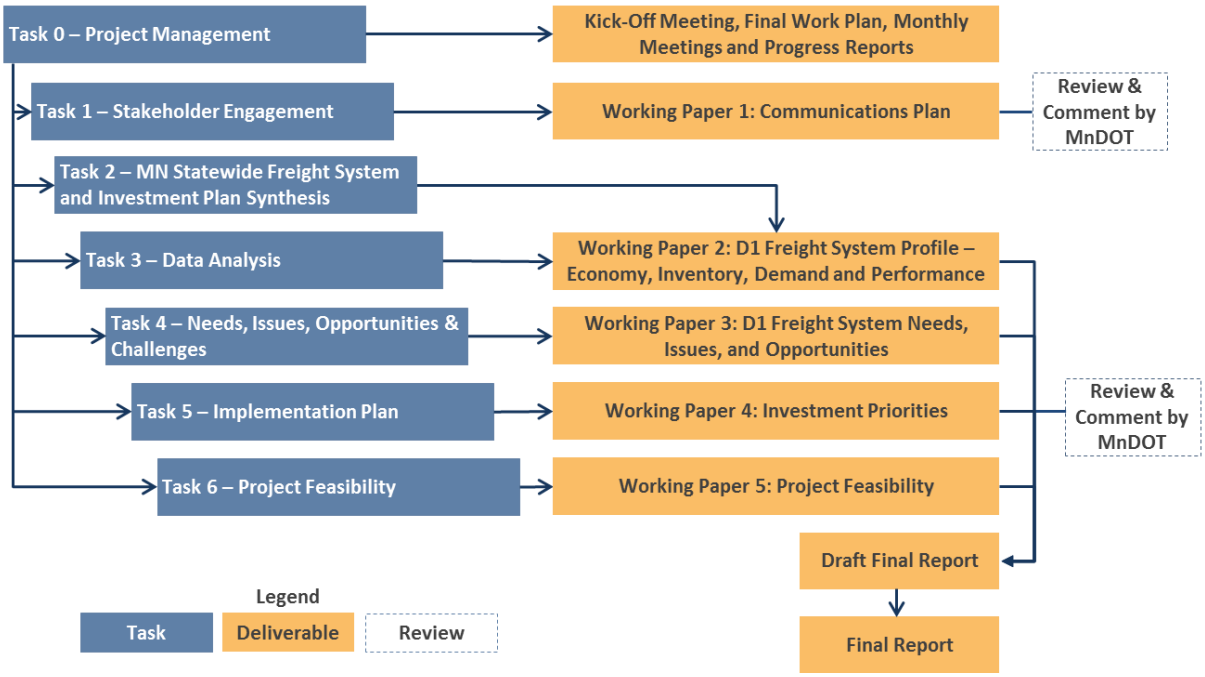
District 1 is a freight hub for northern Minnesota, Wisconsin, the Upper Peninsula, and parts of Ontario. The region's road, rail, aviation, marine and pipeline system assets enable a wide range of freight services and support the continued economic well-being of the District.

District 1's freight system performance is mixed. While District 1 does not suffer from traffic congestion problems like larger metropolitan areas, road safety and truck collisions are a concern. The condition of the network is also mixed: District 1 lags behind the rest of Minnesota in terms of bridge age and sufficiency, but bridges on the District's core freight network of interstates and trunk highways are better-maintained than county, township, or other local bridges.

5.2 Next Steps

As shown in the following figure, this Working Paper represents the output of Tasks 2 and 3, and provides a baseline for all future tasks. The data analysis presented in this Working Paper will be complemented by stakeholder insights gleaned from Task 1, and will inform a comprehensive assessment of District 1's freight system needs, issues, and opportunities in the next Plan deliverable.

Figure 5-1: Project Approach



Appendix A – Document Profiles

This appendix provides profiles of the previous studies and reports reviewed as part of the development of this Working Paper.

Minnesota Statewide Freight System and Investment Plan (State Freight Plan)

Name	Minnesota Statewide Freight System and Investment Plan (State Freight Plan)
Author	MnDOT
Date	January 2018
URL	https://www.dot.state.mn.us/planning/freightplan/index.html

Overview

The Minnesota Statewide Freight System and Investment Plan was released in 20178. This plan provides an inventory of freight assets, an identification of freight needs and issues, and provides a set of strategies, actions, and next steps to help the state address identified needs and issues. The Freight Investment Plan element of the document lays out a strategy for investing in freight-related infrastructure, and identifies specific freight investments.

Findings

The 2018 State Freight Plan found that safety of freight movements was increasing, while freight-relevant highway conditions were remaining consistent from year-to-year. Mobility was a concern, as freight mobility was declining. This decline was attributed to increased congestion, particularly in the Twin Cities.

The plan's general strategies to improve freight performance included: the potential to use the freight system as an economic growth driver, the use of public-private partnerships to provide freight-related infrastructure and services, the use of advanced technology to improve understanding of freight movements, and the integration of freight considerations into agency decision-making.

District 1 Freight Plan-Relevant Elements

The State Freight Plan provides an excellent overview of freight performance, needs, issues, and solutions for Minnesota as a whole, but lacks the granular detail necessary to provide insight into District 1's specific needs and issues. Instead, the Plan is useful for understanding the freight context of Minnesota broadly, as well as the state's vision and goals for freight movement, which can provide context for the District 1 study. Other relevant elements include summaries of District 1 truck tonnages relative to other regions, funds allocated to District 1, and projects located in District 1.

The Freight Investment Plan selected for one project in District 1 for FY 2017-2018: a $17.7million unbonded overlay of portions of I-35. In the following cycle (FY 2019-2022), the Investment Plan allocated $1.9 million for Duluth Port container terminal expansion, and reconstruction of the Twin Ports Interchange.

Minnesota State Highway Investment Plan 2018-2037

Name	Minnesota State Highway Investment Plan 2018-2037
Author	MnDOT
Date	January 2017
URL	https://www.dot.state.mn.us/planning/mnship/

Overview

The Minnesota State Highway Investment Plan (MnSHIP) presents MnDOT's long-term capital investment priorities for the highway system. MnSHIP describes how MnDOT will use capital investments to repair, replace and improve the state highway system. The plan does not address how MnDOT funds the operation of the system or day-to-day maintenance.

Findings

MnDOT expects that it will become more difficult to maintain the current condition of the state's highways in the future, as revenue growth is slow, and construction costs are growing faster than revenue. As a result, there is an expected $18 billion funding gap. Therefore, over the next 20 years, MnDOT is focused on maintaining the system, with limited improvements, rather than widespread construction or expansion.

MnSHIP also provides investment direction that Districts must follow to select specific projects for funding. The plan does not select or recommend specific projects, and that task is left to other plans.

District 1 Freight Plan-Relevant Elements

Like the State Freight Plan, MnSHIP provides a good overview of trends and needs at a statewide level, but does not provide much granular detail relevant specifically to District 1. Instead, the investment guidance provided in MnSHIP can be used to evaluate the performance and needs of specific highways within District 1.

State Transportation Improvement Plan, 2018-2021

Name	State Transportation Improvement Plan, 2018-2021
Author	MnDOT
Date	September 2017
URL	https://www.dot.state.mn.us/planning/program/stip.html

Overview

The State Transportation Improvement Plan (STIP) is Minnesota's four year transportation improvement program, and identifies the schedule and funding amount for specific projects, by year. The STIP includes all state and local transportation projects with federal highway and/or federal transit funding, as well as projects paid for entirely with state funds.

District 1 Freight Plan-Relevant Elements

Project lists are divided by District, so a full list of District 1's 250 STIP-listed projects is available. Information on projects includes project descriptions, work types, total cost, and source of funding. This list can be used to map upcoming highway projects in District 1, and compare these upcoming projects against identified needs or issues. This comparison can then be used to identify areas where problems are not being addressed.

Manufacturer's Perspectives on Minnesota's Transportation System, District 1

Name	Manufacturer's Perspectives on Minnesota's Transportation System, District 1
Author	MnDOT
Date	June 2017
URL	http://www.dot.state.mn.us/ofrw/freight/PDF/D1study.pdf

Overview

The Manufacturers Perspectives study provides the most up-to-date assessment of freight transportation needs and issues in District 1. Since this study was exclusively focused on District 1, all of its information is relevant to this current freight plan.

The study was conducted to better understand freight system users perspectives and priorities, build better relationships with freight shippers, and support continuous improvement at MnDOT. Feedback was collected through consultations with 78 businesses in the District.

Findings

The study found that many of the District's transportation-related challenges were related to two general factors: business priorities and unique geography. Businesses in the District often selected their location based on its proximity to their customers or suppliers. Therefore, adequate truck access assets such as 10-ton roads, passing lanes, and good-quality bridges are necessary. At the same time, the District's unique geography of steep hills, bogs, lakes, and hard winters makes navigating through the region more difficult, especially for trucks. Business operators noted that policy alignment with Wisconsin and Ontario, and better communication about route closures would be helpful.

District 1 Freight Plan-Relevant Elements

While all of the study is relevant to District 1, specific elements are particularly relevant to this freight plan. In particular, the study documents specific areas where highway problems or desired improvements were commonly noted, and this information will be used in the District 1 freight plan. Study-identified needs and issues will be compared against results of quantitative analysis to identify highway segments where stakeholder comments and data are in alignment.

Ultimately, the study recommended that District staff incorporate business feedback into planning and investment decisions, and that District staff continue to partner and engage with business stakeholders. It also provided similar recommendations for central office staff, who could use feedback from District 1 businesses to improve the system and inform planning, and use the overall findings of the study to improve understanding of freight movement in Minnesota as a whole.

Northeast Minnesota Comprehensive Economic Development Strategy

Name	Northeast Minnesota Comprehensive Economic Development Strategy
Author	Arrowhead Regional Development Commission
Date	January 2017
URL	https://ardc.org/ceds/

Overview

The Arrowhead Regional Development Commission (ARDC) is an economic planning organization serving in the counties that make up District 1, except for Pine County. As the planning organization under the jurisdiction of the US Economic Development Administration, the ARDC is required to produce a Comprehensive Economic Development Strategy (CEDS) every 5 years. The CEDS provides a strategic plan for regional economic development.

Findings

The 2017 CEDS provides detailed information on the demographics and economic character of the Region including population trends, racial makeup, educational background, Gross Regional Product, employment in specific industries, unemployment rate, and other measures. In addition to this reference information, it includes a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis for the Region, and provides strategic direction.

District 1 Freight Plan-Relevant Elements

The 2017 CEDS is relevant to the District 1 freight plan because it provides detailed information on the economic context of the Region. For example, the CEDS makes note of the importance of the District's transportation system for business, and notes freight-related infrastructure such as the road system port, rail system, and airport are "foundational strengths" of the District, with the caveat that aging infrastructure and facilities are a "foundational threat."

The Strategic Direction section of the CEDS has a section devoted to the District's transportation context, and establishes a transportation goal: develop and maintain a regional transportation system that supports economic productivity, efficiency, and competitiveness through the region.

Freight-relevant strategies to reach this goal include: encouraging investment in key freight facilities, supporting development of stable transportation funding policies and sources, offering assistance to local governments with planning.

Annual Minnesota Transportation Performance Report

Name	Annual Minnesota Transportation Performance Report
Author	MnDOT
Date	October 2016
URL	https://www.dot.state.mn.us/measures/

Overview

The Annual Minnesota Transportation Performance Report series was last updated in 2016, and provides trends in the condition and levels of service provided by Minnesota's transportation systems. The report also tracks progress toward six objectives from the statewide transportation plan.

Findings

The report found that, statewide, areas for improvement included ride quality, fatalities, and serious injuries. Specific information on District 1 performance is not available.

District 1 Freight Plan-Relevant Elements

The Transportation Performance Report is relevant because it provides two items: (1) it provides a set of performance measures that could be used to evaluate the performance of District 1's transportation system, and (2) it provides a broad contextual overview on the performance of Minnesota's transportation system over time, which can be compared against performance of the District's system.

Duluth-Superior Port Land Use Plan

Name	Duluth-Superior Port Land Use Plan
Author	Duluth-Superior Metropolitan Interstate Council
Date	December 2016
URL	https://dsmic.org/study/portplan/

Overview

The Port Land Use Plan provides guidance on the development and management of working lands around the Duluth-Superior port. Previous plans had been completed in 1992, 2003, and 2005, and the 2016 version is intended to be integrated between Minnesota and Wisconsin sites of the harbor. Therefore this plan also addresses policy and regulatory frameworks and differences between Minnesota and Wisconsin.

The plan also serves four goals: (1) to integrate the large amount of harbor-related planning work undertaken by multiple agencies, (2) to protect and enhance the economic, ecological, and recreational value of the harbor, (3) to identify potential future land use options, needs, opportunities, and complementary strategies, and (4) to encourage participation and direct input from all stakeholder groups.

Findings

The plan provides a general inventory of current land use and development at the port, a summary of stakeholder feedback from businesses located at the port. Feedback included information on land availability, quality of road, rail and utility service, and the impact of regulations on maritime operations. In addition to this information, the plan provides specific plans related to environmental protection, dredged material use, and future land use.

District 1 Freight Plan-Relevant Elements

The Port Land Use Plan is relevant to the District 1 freight plan because it provides a snapshot of feedback about the performance of the port, its access to other modes, and attitudes about whether or not port space was in jeopardy of incompatible development. It also sets forth a vision and specific goals for future land use, which could determine the potential extent of freight-related industrial development in portions of Duluth and Superior

Evaluation Criteria for the Minnesota Highway Freight Program

Name	Evaluation Criteria for the Minnesota Highway Freight Program
Author	MnDOT
Date	2016
URL	https://www.dot.state.mn.us/planning/freightplan/pdf/evaluationcriteria.pdf

Overview

The Evaluation Criteria for the Minnesota Highway Freight Program were originally developed as part of the 2016 version of the Minnesota State Freight Plan. These criteria are used to evaluate submitted projects that are eligible for Minnesota Highway Freight Program Funds. The criteria touch on six topics: truck volume, safety, mobility, facility access, cost-effectiveness, and project readiness. Among these six criteria there are 16 measures upon which projects can be scored.

District 1 Freight Plan-Relevant Elements

These criteria are relevant because the six criteria and 16 measures will be used to evaluate the projects identified as part of work on the District 1 freight plan.

Statewide Rail Plan

Name	Statewide Rail Plan
Author	MnDOT
Date	2015
URL	http://www.dot.state.mn.us/planning/railplan/resources.html

Overview

The 2015 draft of the Minnesota Statewide Rail Plan is intended to provide guidance for the future of both passenger and freight rail systems in Minnesota. The plan includes an inventory of rail assets and commodity shipments, a discussion of issues affecting performance, and an action plan to achieve the vision laid out in the Minnesota GO family of plans.

Findings

The Rail Plan found that infrastructure constraints, a lack of intermodal service, positive train control implementation, and hazmat transport were the top issues for Minnesota's rail network. The plan also laid out 4-year and 20-year action plans for freight rail, which included investments in additional plans and grade crossing improvements for safety, investments to improve rail service for businesses, and upgrade of service levels to support higher speeds and weights.

District 1 Freight Plan-Relevant Elements

The State Rail Plan provided a profile of taconite production and rail shipments in District 1, including some counts of trainloads per day. However, this information is now over 5 years old, making it less reliable for information about the use of District 1's rail system today. However, the plan also offers more general improvements for the state, including the recommendation that offering intermodal service in an area like Duluth could be beneficial.

Exploratory Study of Competitive Industry Clusters and Transportation in Minnesota

Name	Exploratory Study of Competitive Industry Clusters and Transportation in Minnesota
Author	University of Minnesota Center for Transportation Studies
Date	January 2015
URL	http://www.cts.umn.edu/Publications/ResearchReports/reportdetail.html?id=2400

Overview

This report investigated how firms in competitive industry clusters use transportation networks, and what role the networks play in the formation and growth of these clusters. Clusters were identified using "cluster mapping tool" which identified competitive industries by employment location quotients. The port illustrates how cluster analysis can used to provide insight on how transportation networks can support the growth of competitive clusters.

District 1 Freight Plan-Relevant Elements

This study profiles the forestry products industry cluster in District 1, which is primarily focused on paper mills. Within this profile, the supply chains of some paper companies in the District are described. More importantly, transportation issues for this industry are described. Particular issues include unreliable rail service, or increasingly long rail transit times. These issues were affecting the negatively affecting competitiveness of paper firms in the Duluth area.

Minnesota Statewide Ports & Waterways Plans

Name	Minnesota Statewide Ports & Waterways Plans
Author	MnDOT
Date	September 2014
URL	https://www.dot.state.mn.us/ofrw/waterways/pwp.html

Overview

This Statewide Ports & Waterways Plan was created to specifically address maritime needs and issues. It provides an inventory of Minnesota's maritime system assets, a discussion of how the state supports the system, a discussion of opportunities, challenges, and strategies, and a set of next steps and action items to address opportunities and challenges.

Findings

The key issues facing Minnesota's waterway system were aging port infrastructure, and the need to maintain or dredge shipping channels, locks, and dams. Other notable issues included the adoption of new technology, environmental concerns, land use compatibility, and the need for outreach and education.

District 1 Freight Plan-Relevant Elements

This plan provides information on the type, tonnage, and value of cargo handled at District 1 ports, and while this information is 6+ years old, it does provide a good baseline against which the current state of the District's maritime system can be compared. It also provides visual maps of commodity flows into and out of the District's ports, as well as general recommendations for system improvement that are relevant to the District's ports.

Connections 2040 Long-Range Transportation Plan

Name	Connections 2040 Long-Range Transportation Plan
Author	Duluth-Superior Metropolitan Interstate Council
Date	October 2014
URL	https://dsmic.org/study/connections2040/

Overview

Connections 2040 is the Duluth-Superior area's Long Range Transportation Plan (LRTP), which provides strategy to guide public investment in transportation infrastructure. LTRPs serve as the basis for shorter-range transportation improvement programs that allocate funding for highway, transit, and bicycle projects. *Connections 2040* provides information on social, economic, and transportation trends, assesses system performance, and lists transportation projects that will be implemented in the future.

District 1 Freight Plan-Relevant Elements

The LRTP devotes an entire section to analyzing the movement of freight in the Duluth-Superior area. While the data is over four years old, the issues and challenges identified in the LRTP help provide a good base understanding of transportation needs in the Duluth area.

Northern Minnesota / Northwestern Wisconsin Regional Freight Plan

Name	Northern Minnesota / Northwestern Wisconsin Regional Freight Plan
Author	MnDOT, WisDOT, Duluth-Superior Metropolitan Interstate Council
Date	November 2009
URL	https://dsmic.org/study/truckroute/no-mn-ne-wi-regional-freight-plan-2009/

Overview

This Regional Freight Plan covers 19 counties in Northern Minnesota (Districts 1 and 2), and 10 counties in Wisconsin. It provides an inventory of transportation assets across the region, a review of commodity flows, a discussion of trends and issues that affect the transportation system, and recommendations related to key issues.

Findings

The plan notes that the region has unique issues, some of which have changed in the past 10 years. In particular, the plan notes the potential transportation demand for non-ferrous mining, taconite tailings, Alberta oil sands, and wind generation equipment. The plan also notes that heavy-haul routes are critical for the timber and paper industries, and that there is a lack of intermodal service in the region.

District 1 Freight Plan-Relevant Elements

Much of the Regional Freight Plan is relevant to current work on the District 1 Freight Plan. In particular, the regional plan provides an inventory of key transportation assets, as well as information on the supply chains of major industries carried in and through the District, including iron ore, wind turbines, paper production, and coal. Recommendations include promoting port development, expanding port capacity, designating super-haul truck corridors, and improving truck weight rule uniformity.

Appendix B – Stakeholders Consulted

This list reflects stakeholders consulted as of November 15. Consultations are ongoing, and will be used to inform discussions in Working Paper 3.

1. Altec
2. Amsoil
3. Burlington Northern Santa Fe Railway
4. Carlton County Economic Development Agency
5. City of Virginia
6. Cook County Engineer
7. Duluth Airport Authority
8. Duluth Seaway Port Authority
9. Heliene
10. Iron Range Resource and Rehabilitation Board
11. Jeff Foster Trucking
12. Komatsu Mining
13. Lake County Engineer
14. Lake Superior Warehousing
15. L&M Fleet Supply
16. Magellan Midstream Partners
17. Minnesota Power
18. Packaging Corporation of America
19. Pine City
20. Pine County Economic Development Office
21. Sappi Paper
22. St. Croix Valley Railroad
23. UPM Blandin
24. US Army Corps of Engineers

Appendix C – Location Quotient Assumptions

Location Quotients use employment as a proxy for regional strength due to the availability of data. This tool is helpful to quickly compare District 1's regional strength against the US. There are important caveats to understanding Location Quotients, however. As with all economic models, certain assumptions are made in order to analyze across different variables. Using both Location Quotients and the Shift Share Analysis detailed in Chapter 2 more accurately depicts regional strength. The Location Quotient methodology assumes that the US has:

1. Uniform labor productivity
2. Identical consumption between local regions
3. Homogeneous goods being produced
4. Closed economy, meaning that the region does not compete with international markets.

Labor productivity is the measure of economic output per labor hour, meaning the region's real Gross Domestic Product divided by aggregate labor hours in the region. Changes in labor productivity depend on investments and savings, new technologies, and human capital. Industries located in different regions in the US may not have the same labor productivity as there are differences in infrastructure investments, tax and other regulatory policies, educational opportunities, technology investments by businesses, and so on.

Thus, **identical consumption between local regions** is also not expected in the real economy. Different regions also consume different baskets of goods based on geographic availability, cultural preferences, and socioeconomic levels. However, freight-dependent commodities in mining, agriculture, and forestry/fishing tend to be less substitutable goods (many agricultural goods and paper products) or those with a higher replacement cost (e.g. renewable energy in lieu of mining goods).

Homogeneity of goods produced in District 1 is less of a concern as freight-dependent commodities in mining, agriculture, and forestry/fishing products tend to be more homogeneous than commodities in manufacturing and retail/wholesale trade. However, there can be premium goods and services that are not captured by Location Quotients.

The **closed economy assumption** can be problematic for imported goods and services the US is dependent upon, such as in manufacturing. A high Location Quotient does not necessarily mean that the industry is able to successfully export its goods and services to other regions of the country, if similar or substitute goods and services can be imported from international markets. The Region's manufacturing Location Quotient of 0.6 indicates that the Region is relatively unspecialized in this sector compared to the rest of the country however, even without introducing additional international competitive factors.

Figure C-1: County-Level Location Quotients for 3-Digit NAICS Code

3-Digit NAICS Code	Aitkin	Carlton	Cook	Itasca	Koochiching	Lake	Pine	St. Louis
Forestry and Logging (113)	7.32	9.03	ND	29.71	70.53	7.61	23.82	2.64
Mining, Except Oil and Gas (212)	ND	ND	ND	14.12	N/A	ND	ND	ND
Utilities (221)	ND	1.54	4.14	6.08	0.82	ND	1.09	ND
Construction of Buildings (236)	0.69	2.42	1.87	1.16	0.63	0.52	0.69	0.65
Heavy and Civil Engineering Construction (237)	0.33	ND	ND	1.84	1.47	ND	1.81	0.99
Specialty Trade Contractors (238)	1.14	0.85	0.74	0.78	0.71	0.19	1.01	0.87
Textile Product Mills (314)	N/A	ND	N/A	N/A	N/A	ND	N/A	2.38
Wood Product Manufacturing (321)	10.92	ND	ND	2.48	6.69	ND	ND	0.72
Nonmetallic Mineral Product Manufacturing (327)	ND	11.12	ND	0.45	N/A	ND	0.60	0.36
Primary Metal Manufacturing (331)	ND	N/A	N/A	ND	N/A	N/A	N/A	1.04
Fabricated Metal Product Manufacturing (332)	3.98	N/A	N/A	0.33	ND	1.12	1.76	0.52
Machinery Manufacturing (333)	ND	ND	N/A	ND	ND	8.92	ND	0.86
Motor Vehicle and Parts Dealers (441)	2.00	0.77	0.55	1.13	1.16	1.70	0.82	1.06
Furniture and Home Furnishings Stores (442)	N/A	ND	ND	0.93	ND	N/A	ND	1.04
Electronics and Appliance Stores (443)	N/A	ND	N/A	0.36	ND	ND	0.45	1.09
Building Material and Garden Supply Stores (444)	0.97	0.33	1.27	1.68	3.03	0.68	0.69	1.29
Food and Beverage Stores (445)	1.99	0.91	1.82	0.93	1.89	1.32	1.19	0.93
Health and Personal Care Stores (446)	1.45	0.85	ND	1.38	ND	ND	ND	0.90
Gasoline Stations (447)	5.00	3.98	3.53	3.11	2.51	2.26	4.18	1.90
Sports, Hobby, Music Instrument, and Book Stores (451)	ND	0.27	1.29	0.56	0.99	N/A	ND	1.38
General Merchandise Stores (452)	0.65	1.34	ND	1.87	0.90	ND	ND	1.08
Misc. Store Retailers (453)	0.91	0.30	3.85	0.58	1.14	0.91	0.45	1.30
Nonstore Retailers (454)	0.78	1.19	N/A	0.88	0.49	N/A	0.50	0.82
Water Transportation (483)	N/A	N/A	ND	N/A	N/A	ND	N/A	5.33
Truck Transportation (484)	2.49	0.36	ND	0.97	1.77	0.56	ND	0.43
Transit and Ground Passenger	ND	ND	ND	ND	2.67	ND	2.16	1.69

3-Digit NAICS Code	Aitkin	Carlton	Cook	Itasca	Koochiching	Lake	Pine	St. Louis
Transportation (485)								
Pipeline Transportation (486)	N/A	ND	N/A	ND	N/A	N/A	N/A	ND
Scenic and Sightseeing Transportation (487)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.47
Postal Service (491)	ND	1.13	ND	1.01	1.36	1.31	1.49	1.06

Source: CPCS Analysis of Bureau of Labor Statistics, 2016. Location Quotients reflect annual averages based on employment level.

Appendix D – Further Shift Share Analysis

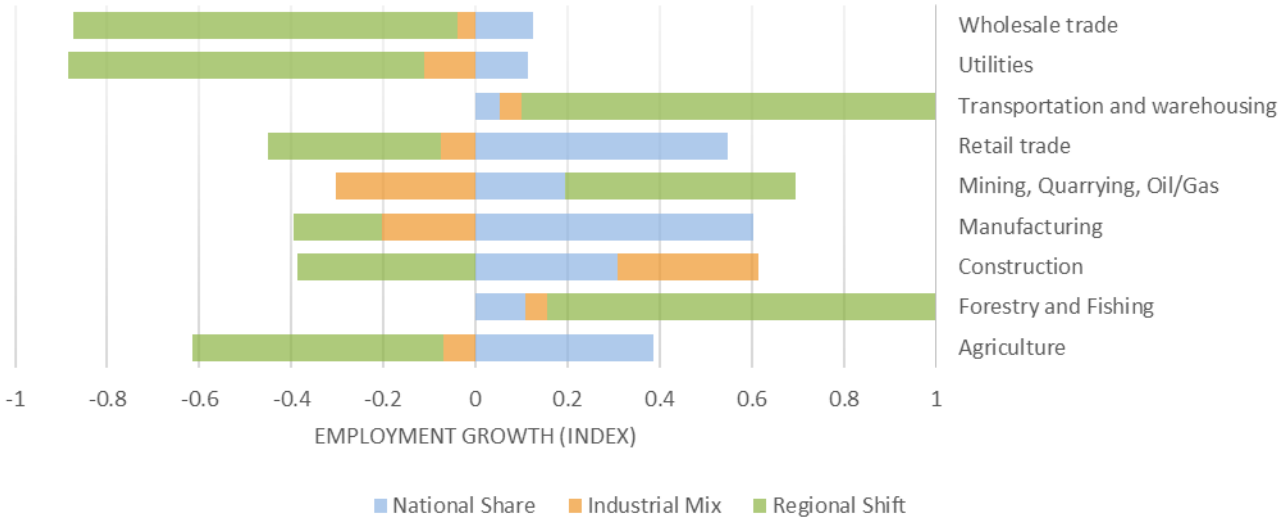
While Location Quotients report economic competitiveness at a particular point in time, Shift Share Analysis is a more dynamic economic indicator used to understand changes in a region's industry competitiveness over time compared to the national norm. The shift share formula is as follows:

Actual Employment Change = National Share + Industrial Mix + Regional Shift

- National Share refers to the amount of employment change due to overall national trends.
- Industrial Mix provides the amount of employment change based on national trends for a specific industry.
- Regional Shift indicates the amount of employment change due to changes in regional competitiveness for a specific industry.

Figure D-1 provides additional detail for all three factors of shift share analysis affecting the Region's freight-relevant industries: national share, industrial mix, and regional shift. Employment growth is portrayed as an index between -1 and 1, with negative numbers indicating a negative growth and positive numbers indicating positive growth based on employment.

Figure D-1: Factors for Regional Employment Change by Freight-Relevant Industry (2010 to 2016)



Source: CPCS Analysis of County Business Patterns, US Census Bureau 2010 and 2016.

Overall national trends (National Share) positively affect employment growth in District 1 across all freight-related industries but most prominently in Manufacturing and Retail Trade.
National industry trends (Industrial Mix) positively affect employment growth in District 1 most prominently in Construction. These trends also resulted in modest growth in Transportation and Warehousing and Forestry and Fishing.

Employment declines in District 1 were affected by national industry trends (Industrial Mix) most significantly in Mining, Quarrying, and Oil/Gas, and in Manufacturing. Modest employment declines in District 1 Wholesale Trade, Utilities, Retail Trade, and Agriculture were due to national industry trends.

As depicted in Chapter 2 of this report, Regional Shift represents employment changes based on changes in regional competitiveness for a certain industry. In District 1, declines in regional competitiveness have occurred most significantly in Wholesale Trade, Utilities, and Agriculture industries. Declines in District 1's competitiveness are of moderate significance in Retail Trade, Manufacturing, and Construction industries.

Appendix E – Roadway Risk Factor Ratings

The two figures below provide a brief overview of the minimum and maximum potential values for risk factors used to evaluate urban and rural segments. These two figures are followed by a list of the District's roadways that had a risk factor "star" rating of four or more. The information in this appendix was taken from the MnDOT District 1 Safety Plan that was updated in 2016.

Figure E-1: Risk Factors for Urban Segments

Risk Factors for Urban Segments		
	Minimum	**Maximum**
Segments		
ADT Range (vehicles per day)	**9000**	**Unlimited**
Road Geometry	**Multi-Lane (4+)**	
Access Density (accesses per mile)	**36**	**Unlimited**
Speed Limit (miles per hour)	**35**	**45**
Primary Land Use	**Urban or Suburban Retail**	
Severe HO + RE + SSP + SSO Crash History	**0.019**	

Source: MnDOT District 1 Safety Plan, 2016.

Figure E-2: Risk Factors for Rural Segments

Risk Factors for Rural Segments						
	Two-Lane Undivided		Four-Lane Expressway		Four-Lane Freeway	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Segments						
Shoulder Width (Feet)	-	2				
Critical Radius Curve Density (curves per mile)	0.1	Unlimited	0.25	Unlimited	0.125	Unlimited
Median Width (feet)			-	65 feet		
Edge Risk Assessment (1 to 3)	2	3				
Access Density (accesses per mile)	8	Unlimited	5	Unlimited		
ADT Range (vehicles per day)	3,500	Unlimited	16,000	Unlimited	20,000	Unlimited
Severe Lane Departure Density (crashes per mile per year)	0.014	Unlimited	0.037	Unlimited	0.028	Unlimited
Interchange Density (interchanges per mile)					0.4	Unlimited

Source: MnDOT District 1 Safety Plan, 2016.

Figure E-3: District 1 Roadways with a Risk Factor of 4 or More "Stars"

OBJECTID	BASE_NAME	STREET_TYP	Type	ADT Range	Road Geometry	Severe Lane Departure Density	Access Density	Speed Limit Range	Primary Land Use	Crash Density	Critical Curve Radius Density	Edge Risk	Shoulder Width	Median Width	MnDOT Star
268880	Congdon	Blvd	Rural Two-Lane Segment	X		X	X				X	X			5
268880	Congdon	Blvd	Rural Two-Lane Segment	X		X	X				X	X			5
201798	Main	St	Rural Two-Lane Segment	X		X	X				X	X			5
286491	Central	Ave	Rural Two-Lane Segment			X	X				X	X	X		5
201803	Elm	St	Rural Two-Lane Segment			X	X				X	X	X		5
268873	Bridge	Ave	Rural Two-Lane Segment				X				X	X	X		4
281466	MNTH 33		Rural Four-Lane Segment	X		X	X				X			X	5
279030	Miller Trunk	Hwy	Rural Four-Lane Segment	X		X	X				X			X	5
279030	Miller Trunk	Hwy	Rural Four-Lane Segment			X	X				X			X	4
279030	Miller Trunk	Hwy	Rural Four-Lane Segment			X	X				X			X	4
268872	USTH 169		Urban Segment	X	X		X	X	X	X					6
268872	USTH 169		Urban Segment	X	X			X	X						4
268872	USTH 169		Urban Segment	X	X		X		X						4
279030	Miller Trunk	Hwy	Urban Segment	X	X			X	X	X					5
279030	Miller Trunk	Hwy	Urban Segment	X	X			X	X	X					5
283927	MNTH 23		Urban Segment	X	X			X		X					4
283927	MNTH 23		Urban Segment	X	X			X		X					4
167946	Mesaba	Ave	Urban Segment	X	X		X		X						4
167946	Mesaba	Ave	Urban Segment	X	X			X	X						4
281466	MNTH 33		Urban Segment	X	X			X		X					4

Source: MnDOT District 1 Safety Plan, 2016.

Appendix F – Passive Railroad Crossing Risk Ratings

In 2016 MnDOT developed the Rail Grade Crossing Safety Project Selection report which included a risk factor analysis for active and passive crossings in Minnesota. The risk factors used to evaluate crossing risk included road traffic, rail traffic, speed limits, number of tracks, angle of crossing (or skew), and number of tracks, sight distances, and distance to other crossings or intersections. Based on each of these factors, active and passive crossings were assigned a numbered risk rating between 0 and 9. **Appendix F** provides a list of the risk ratings of passive crossings. **Appendix G** provides a list of the risk ratings of active crossings.

Figure F-1: Passive Railroad Crossing Risk

Crossing ID	Operator	City	County	Road Designation	Roadway AADT	Total Trains Per Day	Volume Cross Product	Maximum Timetable Speed	Skew	Distance to Nearby Intersection	Distance to Nearest Crossing	Clearing Sight Distance	Approaching Sight Distance	Risk Factors (of 9)
624937	BNSF	Hinckley	Pine County	M38	1	1	1	1	1	-	1	1	1	8
624936	BNSF	Kerrick	Pine County	M9	1	1	1	1	1	1	-	1	1	8
628810	DMIR		Saint Louis County	CR894	1	1	1	1	1	1	-	1	1	8
628809	DMIR		Saint Louis County	CSAH6	1	1	1	1	1	-	1	1	1	8
626335	DWP		Carlton County	T148	1	1	1	1	1	-	1	1	1	8
628270	BNSF		Saint Louis County	CSAH8	1	1	1	1	1	-	1	-	1	7
628271	BNSF		Saint Louis County	T1061	-	1	1	1	1	-	1	1	1	7
628275	BNSF	Brook Park	Pine County	M2	1	1	1	1	-	1	-	1	1	7
626238	BNSF	Cromwell	Carlton County	M5	1	1	1	1	-	1	-	1	1	7
626330	BNSF	Bruno	Pine County	M12	1	1	1	1	-	1	-	1	1	7
627469	BNSF		Carlton County	CR145	-	1	1	1	1	1	-	1	1	7
626842	DMIR		Saint Louis County	CR874	1	1	1	1	1	1	-	-	1	7
626843	DMIR		Saint Louis County	CR312	1	1	1	1	-	-	1	1	1	7
626852	DMIR		Lake County	CR124	1	1	1	-	1	-	1	1	1	7
626854	DWP		Carlton County	T146	-	1	1	1	1	-	1	1	1	7

Crossing ID	Operator	City	County	Road Designation	Roadway AADT	Total Trains Per Day	Volume Cross Product	Maximum Timetable Speed	Skew	Distance to Nearby Intersection	Distance to Nearest Crossing	Clearing Sight Distance	Approaching Sight Distance	Risk Factors (of 9)
626855	DWP		Saint Louis County	CR223	-	1	1	1	1	-	1	1	1	7
626856	DWP		Saint Louis County	CR694	1	1	1	1	1	-	-	1	1	7
626857	DWP		Saint Louis County	T208	1	1	1	1	-	-	1	1	1	7
626858	DWP		Saint Louis County	CSAH59	-	1	1	1	1	1	-	1	1	7
626860	DWP	Cook	Saint Louis County	M18	1	1	1	1	-	1	-	1	1	7
628785	BNSF	Hibbing	Saint Louis County	M424	-	1	-	1	1	-	1	1	1	6
628272	BNSF		Carlton County	T365	-	1	-	1	1	-	1	1	1	6
626240	BNSF		Pine County	T512	-	1	-	1	1	-	1	1	1	6
626243	BNSF		Pine County	T556	-	1	-	1	1	1	-	1	1	6
626327	BNSF		Pine County	T575	-	1	-	1	1	1	-	1	1	6
626329	BNSF		Pine County	T590	-	1	-	1	1	1	-	1	1	6
627466	BNSF		Pine County	T913	-	1	-	1	1	1	-	1	1	6
627389	BNSF	Duluth	Saint Louis County	M216	1	-	1	-	1	1	-	1	1	6
627390	BNSF	Duluth	Saint Louis County	M151	1	-	1	-	1	1	-	1	1	6
629120	BNSF		Saint Louis County	T5719	-	1	-	1	1	-	1	1	1	6
629119	BNSF		Saint Louis County	CR857	-	1	-	1	1	-	1	1	1	6
629118	BNSF		Saint Louis County	CSAH29	-	1	-	1	1	-	1	1	1	6
629113	BNSF		Saint Louis County	CR207	-	1	-	1	1	1	-	1	1	6
629111	BNSF		Saint Louis County	CR213	-	1	-	1	1	-	1	1	1	6
629110	BNSF		Saint Louis County	CR434	-	1	-	1	1	-	1	1	1	6
629108	BNSF	Hibbing	Saint Louis County	M286	1	1	1	1	-	-	1	-	1	6
629106	BNSF		Carlton County	CR145	-	1	1	1	1	1	-	-	1	6
629101	BNSF	Henriette	Pine County	CSAH12	1	1	1	1	-	1	-	-	1	6
629099	BNSF		Pine County	T56	-	1	-	1	1	-	1	1	1	6
626602	BNSF	Carlton	Carlton County	M9	1	1	1	1	1	-	-	1	-	6
629079	BNSF	Calumet	Itasca County	CSAH84	1	1	1	-	1	-	1	-	1	6
629083	BNSF		Carlton County	UT264	-	1	-	1	1	-	1	1	1	6
629084	BNSF	Cromwell	Carlton County	M4	1	1	1	1	-	-	-	1	1	6
629088	BNSF	Wright	Carlton County	CSAH23	1	1	1	1	-	-	1	-	1	6
629089	BNSF	Wright	Carlton County	CR149	-	1	1	1	1	-	1	-	1	6
629090	BNSF		Carlton County	CR127	-	1	-	1	1	-	1	1	1	6

Crossing ID	Operator	City	County	Road Designation	Roadway AADT	Total Trains Per Day	Volume Cross Product	Maximum Timetable Speed	Skew	Distance to Nearby Intersection	Distance to Nearest Crossing	Clearing Sight Distance	Approaching Sight Distance	Risk Factors (of 9)
629091	BNSF		Aitkin County	CR73	-	1	-	1	1	-	1	1	1	6
624949	BNSF		Pine County	T97	-	1	-	1	1	-	1	1	1	6
628793	BNSF		Pine County	T154	-	1	1	1	1	-	1	-	1	6
628794	BNSF		Pine County	T178	-	1	-	1	1	-	1	1	1	6
628795	BNSF		Pine County	T889	-	1	-	1	1	1	-	1	1	6
628796	BNSF		Pine County	T649	-	1	-	1	1	1	-	1	1	6
628797	BNSF		Pine County	T650	-	1	-	1	1	1	-	1	1	6
628798	BNSF		Pine County	T805	-	1	-	1	1	1	-	1	1	6
628800	BNSF		Pine County	T914	-	1	1	1	-	1	-	1	1	6
628827	BNSF	Deer River	Itasca County	M12	1	1	1	-	1	-	-	1	1	6
628828	BNSF	Deer River	Itasca County	CR139	-	1	-	1	1	1	-	1	1	6
628831	BNSF		Itasca County	CSAH18	1	1	1	1	-	1	-	-	1	6
628832	BNSF	Coleraine	Itasca County	M70	1	1	1	-	1	-	-	1	1	6
628833	BNSF		Itasca County	T4396	-	1	-	1	1	1	-	1	1	6
628836	BNSF		Itasca County	T273	-	1	-	1	1	-	1	1	1	6
628692	BNSF		Itasca County	T258	-	1	-	1	1	1	-	1	1	6
628693	BNSF	Warba	Itasca County	CR426	-	1	-	1	1	1	-	1	1	6
628694	BNSF		Saint Louis County	CR186	-	1	-	1	1	1	-	1	1	6
628695	BNSF		Saint Louis County	T368	-	1	-	1	1	-	1	1	1	6
627758	BNSF		Saint Louis County	T371	-	1	-	1	1	1	-	1	1	6
628927	DMIR		Saint Louis County	CR880	-	1	-	1	1	-	1	1	1	6
628853	DMIR	Mountain Iron	Saint Louis County	CR316	1	1	1	-	-	-	1	1	1	6
628851	NSSR	Duluth	Saint Louis County	M928	1	-	1	-	1	1	-	1	1	6
628850	NSSR		Saint Louis County	CSAH42	1	-	1	-	1	1	-	1	1	6
628849	DMIR		Lake County	UT47	1	1	1	-	-	-	1	1	1	6
628847	DWP		Carlton County	T491	-	1	1	1	-	-	1	1	1	6
628846	DWP		Saint Louis County	CSAH49	-	1	1	1	-	-	1	1	1	6
628845	DWP		Saint Louis County	UT9115	-	1	-	1	1	-	1	1	1	6
628844	DWP		Saint Louis County	CR306	-	1	-	1	1	-	1	1	1	6
628843	DWP		Saint Louis County	CR467	-	1	-	1	1	-	1	1	1	6
628808	DWP		Saint Louis County	CR540	-	1	1	1	-	-	1	1	1	6

Crossing ID	Operator	City	County	Road Designation	Roadway AADT	Total Trains Per Day	Volume Cross Product	Maximum Timetable Speed	Skew	Distance to Nearby Intersection	Distance to Nearest Crossing	Clearing Sight Distance	Approaching Sight Distance	Risk Factors (of 9)
628807	DWP		Saint Louis County	CR505	-	1	-	1	1	-	1	1	1	6
628806	DWP		Saint Louis County	UT8170	-	1	-	1	1	-	1	1	1	6
628804	DWP		Saint Louis County	T1480	-	1	1	1	-	-	1	1	1	6
628803	DWP		Saint Louis County	CR517	-	1	-	1	1	-	1	1	1	6
626509	DWP		Saint Louis County	T3981	-	1	1	1	1	-	-	1	1	6
626508	DWP		Koochiching County	UT180	-	1	-	1	1	-	1	1	1	6
626507	DWP		Koochiching County	CR111	-	1	-	1	1	1	-	1	1	6
626506	DWP		Koochiching County	CR119	-	1	1	1	1	1	-	-	1	6
626504	DWP		Koochiching County	UT195	-	1	1	1	1	-	-	1	1	6
625285	MDW	International Falls	Koochiching County	US53	1	1	1	-	-	-	1	1	1	6
625284	MDW	International Falls	Koochiching County	US53	1	1	1	-	-	-	1	1	1	6
625371	NMCZ		Lake County	T207	-	1	-	1	1	-	1	1	1	6
627467	BNSF		Pine County	T807	-	1	-	1	-	1	-	1	1	5
626841	DMIR	Duluth	Saint Louis County	M214	-	1	-	-	1	1	-	1	1	5
626859	DWP		Saint Louis County	NFD256	-	1	-	1	-	-	1	1	1	5
627419	BNSF		Saint Louis County	CR164	-	1	-	1	1	-	1	-	1	5
627418	BNSF		Saint Louis County	T409	-	1	-	1	1	-	1	-	1	5
627417	BNSF		Saint Louis County	CSAH52	-	1	1	1	-	-	1	-	1	5
627416	BNSF		Saint Louis County	CSAH83	-	1	-	1	1	-	1	-	1	5
627395	BNSF	Hibbing	Saint Louis County	MSAS183	1	-	1	-	1	-	-	1	1	5
627680	BNSF		Carlton County	CR147	-	1	-	1	-	1	-	1	1	5
627681	BNSF		Carlton County	T362	-	1	-	1	1	-	-	1	1	5
627682	BNSF		Carlton County	T367	-	1	-	1	-	-	1	1	1	5
626432	BNSF		Aitkin County	T147	-	1	-	1	-	-	1	1	1	5
626433	BNSF		Aitkin County	T146	-	1	-	1	-	1	-	1	1	5
626434	BNSF		Aitkin County	T791	-	1	-	1	-	1	-	1	1	5
626436	BNSF		Aitkin County	T337	-	1	-	-	1	1	-	1	1	5
626439	BNSF		Carlton County	CSAH7	1	1	1	1	-	-	-	-	1	5
626440	BNSF		Carlton County	T422	-	1	-	1	-	1	-	1	1	5
626441	BNSF		Carlton County	CR127	-	1	-	1	-	1	-	1	1	5
626442	BNSF		Aitkin County	T529	-	1	-	1	-	1	-	1	1	5

Crossing ID	Operator	City	County	Road Designation	Roadway AADT	Total Trains Per Day	Volume Cross Product	Maximum Timetable Speed	Skew	Distance to Nearby Intersection	Distance to Nearest Crossing	Clearing Sight Distance	Approaching Sight Distance	Risk Factors (of 9)
626443	BNSF		Aitkin County	T605	-	1	-	1	-	-	1	1	1	5
626444	BNSF		Aitkin County	T356	-	1	-	1	-	-	1	1	1	5
626446	BNSF		Aitkin County	CSAH5	-	1	-	1	-	1	-	1	1	5
627623	BNSF		Aitkin County	T282	-	1	-	1	-	-	1	1	1	5
627602	BNSF		Carlton County	T123	-	1	-	1	1	1	-	-	1	5
627601	BNSF		Carlton County	T337	-	1	-	1	-	1	-	1	1	5
627599	BNSF		Pine County	T97	-	1	-	1	1	1	-	-	1	5
627597	BNSF		Pine County	CSAH17	-	1	1	1	-	-	1	-	1	5
627596	BNSF		Pine County	T892	-	1	1	1	-	1	-	-	1	5
627595	BNSF		Pine County	T648	-	1	-	1	-	1	-	1	1	5
626690	BNSF	Duluth	Saint Louis County	M312	1	-	-	-	1	-	1	1	1	5
628131	BNSF	Duluth	Saint Louis County	MSAS104	1	-	-	1	1	-	-	1	1	5
628134	BNSF	Duluth	Saint Louis County	MSAS103	1	-	-	1	1	-	-	1	1	5
628135	BNSF	Duluth	Saint Louis County	M184	1	1	1	-	-	-	-	1	1	5
628136	BNSF	Duluth	Saint Louis County	M216	1	1	1	-	-	1	-	-	1	5
628137	BNSF	Duluth	Saint Louis County	M109	1	-	-	-	1	1	-	1	1	5
628138	LSMR	Duluth	Saint Louis County	MN39	1	-	-	-	1	-	1	1	1	5
625193	BNSF		Itasca County	T615	-	1	-	1	-	1	-	1	1	5
625194	BNSF		Itasca County	CR137	-	1	-	1	-	1	-	1	1	5
625195	BNSF	Coleraine	Itasca County	M70	1	1	1	-	1	-	-	-	1	5
625197	BNSF		Itasca County	T42	-	1	-	1	-	-	1	1	1	5
625198	BNSF	La Prairie	Itasca County	M25	1	1	1	-	-	1	-	-	1	5
626221	DMIR		Saint Louis County	T123	-	1	-	1	-	-	1	1	1	5
630352	DMIR		Saint Louis County	T13	-	1	-	1	-	-	1	1	1	5
626223	DMIR		Carlton County	T148	-	1	-	1	1	-	-	1	1	5
624855	DMIR		Carlton County	T146	-	1	1	1	-	-	-	1	1	5
627568	DMIR	Duluth	Saint Louis County	M238	1	1	1	-	1	-	-	-	1	5
627569	DMIR	Duluth	Saint Louis County	M224	1	1	1	-	1	-	-	-	1	5
627537	DMIR		Saint Louis County	T140	-	1	-	1	1	-	-	1	1	5
627540	DMIR		Saint Louis County	CR875	-	1	1	1	-	-	-	1	1	5
630359	DMIR		Saint Louis County	CR726	-	1	-	1	-	-	1	1	1	5

Crossing ID	Operator	City	County	Road Designation	Roadway AADT	Total Trains Per Day	Volume Cross Product	Maximum Timetable Speed	Skew	Distance to Nearby Intersection	Distance to Nearest Crossing	Clearing Sight Distance	Approaching Sight Distance	Risk Factors (of 9)
627542	DMIR		Saint Louis County	CR740	-	1	-	1	-	1	-	1	1	5
627543	DMIR		Saint Louis County	CSAH29	-	1	-	1	-	-	1	1	1	5
627544	DMIR		Saint Louis County	T1073	-	1	-	1	-	-	1	1	1	5
627545	NSSR	Duluth	Saint Louis County	M718	1	-	1	-	1	-	-	1	1	5
627546	NSSR		Saint Louis County	CSAH50	1	-	1	-	-	-	1	1	1	5
627547	DMIR		Saint Louis County	NFD120	-	1	-	-	1	1	-	1	1	5
627548	DWP		Saint Louis County	T144	-	1	-	1	-	-	1	1	1	5
627549	DWP		Saint Louis County	CR846	-	1	-	1	-	-	1	1	1	5
627550	DWP		Saint Louis County	CR541	-	1	-	1	-	1	-	1	1	5
627551	DWP		Saint Louis County	T298	-	1	-	1	-	-	1	1	1	5
627560	DWP		Saint Louis County	CR310	-	1	-	1	-	-	1	1	1	5
627563	DWP		Saint Louis County	CR382	-	1	-	1	-	-	1	1	1	5
627564	DWP		Saint Louis County	CR755	-	1	1	1	-	-	1	-	1	5
627565	DWP		Saint Louis County	CR308	-	1	-	1	-	-	1	1	1	5
627566	DWP		Saint Louis County	CR430	-	1	-	1	-	-	1	1	1	5
627671	DWP		Saint Louis County	UT8146	-	1	-	-	1	-	1	1	1	5
627670	DWP		Saint Louis County	UT3171	-	1	-	1	-	-	1	1	1	5
627669	DWP	Ranier	Koochiching County	CSAH20	1	1	1	-	-	-	-	1	1	5
626651	SOO	Duluth	Saint Louis County	MSAS200	1	-	-	-	1	1	-	1	1	5
625002	NMCZ		Lake County	NFD1923	-	1	-	1	1	-	-	1	1	5
625004	NMCZ		Lake County	UT116	-	1	-	1	1	-	-	1	1	5
629059	BNSF		Saint Louis County	CSAH28	-	1	-	1	-	-	-	1	1	4
629060	BNSF	Hibbing	Saint Louis County	M236	1	-	1	-	-	-	1	-	1	4
625418	BNSF		Pine County	T34	-	1	-	1	-	1	-	-	1	4
628157	BNSF		Carlton County	T115	-	1	-	-	-	-	1	1	1	4
626518	BNSF		Carlton County	UT1055	-	1	-	1	-	-	1	-	1	4
626519	BNSF	Duluth	Saint Louis County	MSAS119	1	-	-	-	1	-	-	1	1	4
626532	BNSF		Itasca County	T226	-	1	-	-	-	-	1	1	1	4
626540	BNSF		Aitkin County	T289	-	1	-	1	-	-	-	1	1	4
626539	BNSF		Aitkin County	T328	-	1	-	-	-	1	-	1	1	4
626538	BNSF		Aitkin County	T1000	-	1	-	-	-	1	-	1	1	4

Crossing ID	Operator	City	County	Road Designation	Roadway AADT	Total Trains Per Day	Volume Cross Product	Maximum Timetable Speed	Skew	Distance to Nearby Intersection	Distance to Nearest Crossing	Clearing Sight Distance	Approaching Sight Distance	Risk Factors (of 9)
627154	BNSF		Carlton County	UT283	-	1	-	1	-	-	1	-	1	4
628504	BNSF		Carlton County	CR121	-	1	1	1	-	-	-	-	1	4
626007	BNSF		Aitkin County	T524	-	1	-	1	-	1	-	-	1	4
626009	BNSF		Aitkin County	T245	-	1	-	1	-	-	1	-	1	4
628106	BNSF		Aitkin County	T180	-	1	-	1	-	-	1	-	1	4
625658	BNSF		Aitkin County	T268	-	1	-	1	-	-	1	-	1	4
627824	BNSF		Aitkin County	T269	-	1	-	1	-	1	-	-	1	4
629350	BNSF		Aitkin County	T279	-	1	-	1	-	-	1	-	1	4
629351	BNSF		Aitkin County	T281	-	1	-	1	-	-	1	-	1	4
630748	BNSF		Carlton County	UT307	-	1	-	1	-	1	-	-	1	4
630750	BNSF		Carlton County	UT305	-	1	-	1	-	1	-	-	1	4
630751	BNSF		Pine County	T893	-	1	-	1	-	1	-	-	1	4
630752	BNSF		Carlton County	CR153	-	1	1	1	-	-	-	-	1	4
625584	BNSF	Duluth	Saint Louis County	MSAS108	1	-	-	1	-	-	-	1	1	4
628767	BNSF	Duluth	Saint Louis County	MSAS104	1	1	1	-	-	-	-	-	1	4
628768	LSMR	Duluth	Saint Louis County	M81	1	-	-	-	-	1	-	1	1	4
628894	BNSF	Hinckley	Pine County	CSAH18	1	-	-	-	-	1	-	1	1	4
628896	SCXY	Rock Creek	Pine County	CR109	1	-	-	-	-	-	1	1	1	4
625009	SCXY		Pine County	CR127	1	-	-	-	-	1	-	1	1	4
624976	BNSF		Itasca County	T617	-	1	-	1	-	1	-	-	1	4
624966	BNSF	Deer River	Itasca County		-	1	-	-	-	1	-	1	1	4
624968	BNSF		Itasca County	T556	-	1	-	1	-	1	-	-	1	4
624970	BNSF		Itasca County	T555	-	1	-	1	-	1	-	-	1	4
624981	BNSF		Saint Louis County	CR260	-	1	-	1	-	1	-	-	1	4
625023	BNSF		Saint Louis County	T372	-	1	-	1	1	-	-	-	1	4
625022	BNSF		Saint Louis County	CR844	-	1	-	1	-	-	-	1	1	4
625021	BNSF	La Prairie	Itasca County	M6	1	1	1	-	-	-	-	-	1	4
628965	DMIR		Saint Louis County	CR694	-	1	-	1	-	-	-	1	1	4
628967	DMIR		Saint Louis County	CR867	-	1	-	1	-	-	-	1	1	4
628968	DMIR		Saint Louis County	T3477	-	1	-	1	-	-	-	1	1	4
625856	DMIR		Saint Louis County	T471	-	1	-	1	-	-	1	-	1	4

Crossing ID	Operator	City	County	Road Designation	Roadway AADT	Total Trains Per Day	Volume Cross Product	Maximum Timetable Speed	Skew	Distance to Nearby Intersection	Distance to Nearest Crossing	Clearing Sight Distance	Approaching Sight Distance	Risk Factors (of 9)
625734	DMIR		Saint Louis County	CR311	-	1	-	1	-	-	-	1	1	4
625642	DMIR	Mountain Iron	Saint Louis County	CR955	-	1	-	-	-	-	1	1	1	4
625637	DMIR		Saint Louis County	CR555	-	-	-	-	1	-	1	1	1	4
625636	DMIR		Saint Louis County	CSAH62	-	-	-	-	1	-	1	1	1	4
625635	DMIR		Saint Louis County	CR451	-	-	-	-	1	-	1	1	1	4
625634	NSSR	Duluth	Saint Louis County	MSAS165	1	-	1	-	-	-	-	1	1	4
625633	NSSR	Duluth	Saint Louis County	M702	1	-	1	-	-	-	-	1	1	4
625631	NSSR	Duluth	Saint Louis County	M946	1	-	1	-	-	-	-	1	1	4
625629	NSSR	Duluth	Saint Louis County	M1059	1	-	1	-	-	1	-	-	1	4
625628	NSSR		Saint Louis County	CSAH33	1	-	-	-	-	1	-	1	1	4
625627	DMIR	Two Harbors	Lake County	M50	1	-	-	-	-	1	-	1	1	4
625586	DMIR		Lake County	CSAH14	1	-	-	-	1	-	-	1	1	4
628408	DMIR		Lake County	CSAH14	1	-	-	-	1	-	-	1	1	4
628409	DMIR		Lake County	CSAH2	1	-	-	-	1	-	1	-	1	4
628411	DWP		Saint Louis County	T290	-	1	-	1	-	-	-	1	1	4
628412	DWP		Saint Louis County	CR776	1	1	1	-	-	-	-	-	1	4
625124	DWP		Saint Louis County	UT8145	-	1	-	-	-	1	-	1	1	4
627648	SOO	Duluth	Saint Louis County	MSAS200	1	-	-	-	1	-	-	1	1	4
626020	SOO	Duluth	Saint Louis County	MSAS200	1	-	-	-	1	-	-	1	1	4
626022	SOO	Duluth	Saint Louis County	MSAS200	1	-	-	-	1	-	-	1	1	4
627137	CTRR	Cloquet	Carlton County	MSAS105	1	-	1	-	-	-	-	1	1	4
627102	CTRR	Cloquet	Carlton County	MSAS105	1	-	1	-	-	-	-	1	1	4
628737	BNSF	Duluth	Saint Louis County	MSAS104	1	1	1	-	-	-	-	-	1	4
628738	BNSF	Duluth	Saint Louis County	MSAS190	1	-	-	-	1	-	-	1	1	4
625695	BNSF	Duluth	Saint Louis County	M147	1	-	-	-	-	-	-	1	1	3
625707	BNSF	Coleraine	Itasca County	M72	-	1	-	-	-	-	1	-	1	3
625709	BNSF		Aitkin County	T330	-	1	-	-	-	1	-	-	1	3
625710	BNSF		Aitkin County	T1002	-	1	-	-	-	1	-	-	1	3
625711	BNSF		Aitkin County	T1001	-	1	-	-	-	1	-	-	1	3
625712	BNSF		Carlton County	UT539	-	1	-	1	-	-	-	-	1	3
627005	BNSF	Duluth	Saint Louis County	M107	1	-	-	-	-	1	-	-	1	3

Crossing ID	Operator	City	County	Road Designation	Roadway AADT	Total Trains Per Day	Volume Cross Product	Maximum Timetable Speed	Skew	Distance to Nearby Intersection	Distance to Nearest Crossing	Clearing Sight Distance	Approaching Sight Distance	Risk Factors (of 9)
627006	LSMR	Duluth	Saint Louis County	M1433	1	-	-	-	-	-	-	1	1	3
627012	SCXY		Pine County	CR117	1	-	-	-	-	-	-	1	1	3
627013	SCXY		Pine County	CSAH16	-	-	-	-	-	1	-	1	1	3
626316	SCXY		Pine County	T181	-	-	-	-	-	-	1	1	1	3
626318	SCXY		Pine County	T306	-	-	-	-	-	1	-	1	1	3
626319	SCXY		Pine County	CR133	-	-	-	-	-	1	-	1	1	3
626320	SCXY		Pine County	T117	-	-	-	-	-	1	-	1	1	3
627992	DMIR	Duluth	Saint Louis County	M250	-	1	-	-	1	-	-	-	1	3
627994	DMIR		Saint Louis County	CSAH28	-	1	-	1	-	-	-	-	1	3
627995	DMIR		Saint Louis County	CR592	-	-	-	-	-	-	1	1	1	3
627996	DMIR	Hibbing	Saint Louis County	M290	-	-	-	-	-	-	1	1	1	3
627997	NSSR	Duluth	Saint Louis County		-	-	-	-	-	-	1	1	1	3
627998	NSSR	Duluth	Saint Louis County	M728	1	-	1	-	-	-	-	-	1	3
628000	NSSR		Lake County	CR104	1	-	-	-	-	-	-	1	1	3
628061	NSSR		Lake County	UT9	-	-	-	-	1	-	-	1	1	3
628062	NSSR		Lake County	UT88	-	-	-	-	-	1	-	1	1	3
628063	NSSR		Lake County	CR101	-	-	-	-	-	1	-	1	1	3
628064	DMIR		Lake County	UT30	-	1	-	-	-	-	-	1	1	3
628065	DMIR		Saint Louis County	CR547	-	1	-	-	-	1	-	-	1	3
628066	DMIR		Saint Louis County	T2199	-	1	-	-	-	-	1	-	1	3
628067	DMIR		Lake County	T5038	-	-	-	-	-	-	1	1	1	3
628069	DWP	Mountain Iron	Saint Louis County	CR372	-	1	-	-	-	-	-	1	1	3
625901	SOO	Duluth	Saint Louis County	MSAS200	1	-	-	-	1	-	-	1	-	3
625906	MDW		Koochiching County	CR144	-	1	-	-	-	-	1	-	1	3
629126	BNSF	Duluth	Saint Louis County	MSAS119	1	-	-	-	1	-	-	-	1	3
629128	MDW	International Falls	Koochiching County	CSAH 155	-	-	-	-	1	1	-	-	1	3
627379	BNSF		Aitkin County	T792	-	1	-	-	-	-	-	-	1	2
627748	SCXY	Rock Creek	Pine County	M11	-	-	-	-	-	-	-	1	1	2
627749	SCXY		Pine County	CSAH55	-	-	-	-	-	-	-	1	1	2
627750	SCXY		Pine County	T1131	-	-	-	-	-	-	1	-	1	2

Crossing ID	Operator	City	County	Road Designation	Roadway AADT	Total Trains Per Day	Volume Cross Product	Maximum Timetable Speed	Skew	Distance to Nearby Intersection	Distance to Nearest Crossing	Clearing Sight Distance	Approaching Sight Distance	Risk Factors (of 9)
627753	SCXY		Pine County	CR130	-	-	-	-	-	1	-	-	1	2
627754	SCXY		Pine County	T1405	-	-	-	-	-	1	-	-	1	2
627755	SCXY		Pine County	T84	-	-	-	-	-	1	-	-	1	2
627756	BNSF	Hinckley	Pine County	M27	1	-	-	-	-	-	-	-	1	2
626392	DMIR		Saint Louis County	CR555	-	-	-	-	-	-	1	-	1	2
626393	DMIR		Saint Louis County	CR592	-	-	-	-	1	-	-	-	1	2
626454	DMIR		Saint Louis County	CR453	-	-	-	-	-	-	1	-	1	2
626455	DMIR	Hibbing	Saint Louis County	M235	1	-	-	-	-	-	-	-	1	2
626456	DMIR	Mountain Iron	Saint Louis County	CR372	-	1	-	-	-	-	-	-	1	2
626457	NSSR		Saint Louis County	T119	-	-	-	-	-	1	-	-	1	2
626458	DMIR		Lake County	UT38	-	1	-	-	-	-	-	-	1	2
626459	DMIR	Hoyt Lakes	Saint Louis County	NFD117	-	-	-	-	-	-	1	-	1	2
626461	DMIR		Lake County	NFD122	-	-	-	-	-	-	1	-	1	2
626116	BNSF	Duluth	Saint Louis County	MSAS104	1	-	-	-	-	-	-	-	1	2
626148	SCXY		Pine County	T1444	-	-	-	-	-	-	-	-	1	1
626154	SCXY		Pine County	T191	-	-	-	-	-	-	-	-	1	1
628729	DMIR	Hibbing	Saint Louis County	CR763	-	-	-	-	-	-	-	-	1	1
628730	NSSR		Lake County	UT2	-	-	-	-	-	-	-	-	1	1
628732	NSSR		Lake County	CR101	-	-	-	-	-	-	-	-	1	1
628307	NSSR		Lake County	UT18	-	-	-	-	-	-	-	-	-	-

Source: MnDOT Rail Grade Crossing Safety Project Selection report. 2016.

Appendix G – Active Railroad Crossing Risk

In 2016 MnDOT developed the Rail Grade Crossing Safety Project Selection report which included a risk factor analysis for active and passive crossings in Minnesota. The risk factors used to evaluate crossing risk included road traffic, rail traffic, speed limits, number of tracks, angle of crossing (or skew), and number of tracks, sight distances, and distance to other crossings or intersections. Based on each of these factors, active and passive crossings were assigned a numbered risk rating between 0 and 9. **Appendix G** provides a list of the risk ratings of active crossings. **Appendix F** provides a list of the risk ratings of passive crossings.

Figure G-1: Active Railroad Crossing Risk

Crossing ID	Operator	City	County	Road Designation	Roadway AADT	Total Trains Per Day	Volume Cross Product	Roadway Speed Limit	Max Timetable Speed	Number of Mainline Tracks	Skew	Distance to Nearby Intersection	Distance to Nearest Crossing	Clearing Sight Distance	Active - Risk Factors (of 10)
625120	BNSF	Cloquet	Carlton County	CSAH3	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	7
625126	DWP		Carlton County	CSAH2	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	7
627483	BNSF	Sandstone	Pine County	MN123	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	7
628382	DMIR	Mountain Iron	Saint Louis County	CSAH7	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	7
628407	DMIR		Saint Louis County	CSAH13	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	7
628437	DWP		Saint Louis County	MN37	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	7
628440	DWP	Mountain Iron	Saint Louis County	CSAH101	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	7
628444	DWP	Mountain Iron	Saint Louis County	CSAH102	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	7
628458	DWP	Cook	Saint Louis County	CSAH24	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	7
625118	BNSF	Carlton	Carlton County	CSAH1	Yes	Yes	Yes	No	Yes	No	Yes	No	No	Yes	6
625128	DWP		Carlton County	CR150	No	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	6
626563	NMCZ	Silver Bay	Lake County	MN61	Yes	No	No	Yes	Yes	No	Yes	No	Yes	Yes	6
627484	BNSF	Sandstone	Pine County	CSAH64	Yes	Yes	Yes	No	Yes	No	Yes	No	No	Yes	6
627485	BNSF		Pine County	MN123	No	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	6
628284	BNSF	Hibbing	Saint Louis County	CSAH5	No	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	6
628285	BNSF	Hibbing	Saint Louis County	CR444	No	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	6
628289	BNSF	Hibbing	Saint Louis County	CSAH60	No	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	6
628332	DMIR	Hermantown	Saint Louis County	CSAH13	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	6

Crossing ID	Operator	City	County	Road Designation	Roadway AADT	Total Trains Per Day	Volume Cross Product	Roadway Speed Limit	Max Timetable Speed	Number of Mainline Tracks	Skew	Distance to Nearby Intersection	Distance to Nearest Crossing	Clearing Sight Distance	Active - Risk Factors (of 10)
628358	DMIR		Saint Louis County	CSAH16	No	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	6
628416	DWP		Saint Louis County	CR21	No	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	6
628419	DWP		Saint Louis County	CSAH6	No	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	6
628425	DWP		Saint Louis County	CSAH15	No	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	6
628442	DWP	Virginia	Saint Louis County	CR657	No	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	6
628453	DWP		Saint Louis County	MN1	No	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	6
628459	DWP		Saint Louis County	CSAH115	No	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	6
625116	BNSF		Carlton County	CSAH8	No	Yes	No	No	Yes	No	Yes	No	Yes	Yes	5
625122	BNSF	Cloquet	Carlton County	MSAS105	No	Yes	Yes	No	Yes	No	No	Yes	No	Yes	5
626251	BNSF	Warba	Itasca County	CSAH10	No	No	No	Yes	Yes	No	Yes	No	Yes	Yes	5
626276	BNSF		Itasca County	CSAH11	No	No	No	Yes	Yes	No	Yes	No	Yes	Yes	5
626478	DWP		Koochiching County	MN217	No	Yes	No	No	Yes	No	Yes	Yes	No	Yes	5
626484	DWP		Koochiching County	CSAH98	No	Yes	No	Yes	Yes	No	Yes	No	No	Yes	5
626485	DWP		Koochiching County	CSAH24	No	Yes	No	Yes	Yes	No	No	No	Yes	Yes	5
626553	DMIR		Lake County	CSAH27	No	No	No	Yes	Yes	No	Yes	No	Yes	Yes	5
627470	BNSF	Brook Park	Pine County	CSAH13	No	Yes	No	Yes	Yes	No	Yes	No	No	Yes	5
627478	BNSF	Hinckley	Pine County	CSAH62	No	Yes	No	No	Yes	No	Yes	Yes	No	Yes	5
627492	BNSF	Bruno	Pine County	CSAH44	No	Yes	No	No	Yes	No	Yes	Yes	No	Yes	5
628234	DMIR	Mountain Iron	Saint Louis County	CSAH101	No	Yes	No	Yes	Yes	No	Yes	Yes	No	No	5
628273	BNSF		Saint Louis County	CSAH47	No	Yes	No	Yes	Yes	No	No	Yes	No	Yes	5
628283	BNSF		Saint Louis County	CSAH27	No	Yes	No	Yes	Yes	No	Yes	No	Yes	No	5
628288	BNSF	Hibbing	Saint Louis County	M382	No	Yes	No	No	Yes	No	Yes	No	Yes	Yes	5
628326	DMIR	Duluth	Saint Louis County	CSAH91	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes	5
628334	DMIR		Saint Louis County	CR223	No	Yes	No	Yes	Yes	No	No	Yes	No	Yes	5
628335	DMIR		Saint Louis County	CSAH98	No	Yes	No	Yes	Yes	No	No	No	Yes	Yes	5
628343	DMIR		Saint Louis County	CSAH8	No	Yes	No	Yes	Yes	No	No	No	Yes	Yes	5
628344	DMIR		Saint Louis County	CSAH47	No	Yes	No	Yes	Yes	No	Yes	No	No	Yes	5
628346	DMIR		Saint Louis County	CSAH133	No	Yes	No	Yes	Yes	No	No	Yes	No	Yes	5
628353	DMIR		Saint Louis County	CSAH27	No	Yes	No	Yes	Yes	No	No	Yes	No	Yes	5
628359	DMIR		Saint Louis County	CR310	No	Yes	No	Yes	Yes	Yes	No	No	No	Yes	5
628360	DMIR	Iron Junction	Saint Louis County	CR452	No	Yes	No	No	Yes	Yes	Yes	Yes	No	No	5
628372	DMIR		Saint Louis County	CSAH44	No	No	No	Yes	Yes	No	Yes	No	Yes	Yes	5
628379	DMIR	Aurora	Saint Louis County	CSAH100	Yes	No	Yes	No	Yes	No	Yes	No	No	Yes	5
628410	DMIR		Saint Louis County	CSAH45	No	No	No	Yes	Yes	No	Yes	No	Yes	Yes	5
628422	DWP		Saint Louis County	CR885	No	Yes	No	Yes	Yes	No	No	No	Yes	Yes	5
628423	DWP		Saint Louis County	CSAH15	No	Yes	No	Yes	Yes	No	No	No	Yes	Yes	5

Crossing ID	Operator	City	County	Road Designation	Roadway AADT	Total Trains Per Day	Volume Cross Product	Roadway Speed Limit	Max Timetable Speed	Number of Mainline Tracks	Skew	Distance to Nearby Intersection	Distance to Nearest Crossing	Clearing Sight Distance	Active - Risk Factors (of 10)
628429	DWP		Saint Louis County	CSAH52	No	Yes	No	Yes	Yes	No	Yes	No	No	Yes	5
628431	DWP		Saint Louis County	CSAH59	No	Yes	No	Yes	Yes	No	No	Yes	No	Yes	5
628434	DWP		Saint Louis County	CSAH16	No	Yes	No	Yes	Yes	No	No	Yes	No	Yes	5
628443	DWP	Mountain Iron	Saint Louis County	M60	No	Yes	No	Yes	Yes	No	No	Yes	No	Yes	5
628446	DWP		Saint Louis County	CR307	No	Yes	No	Yes	Yes	No	No	No	Yes	Yes	5
628448	DWP		Saint Louis County	CSAH68	No	Yes	No	Yes	Yes	No	No	No	Yes	Yes	5
628449	DWP		Saint Louis County	CR302	No	Yes	No	Yes	Yes	No	No	No	Yes	Yes	5
628455	DWP		Saint Louis County	CSAH87	No	Yes	No	Yes	Yes	No	Yes	No	Yes	No	5
628465	DWP	Orr	Saint Louis County	CSAH23	No	Yes	No	No	Yes	No	Yes	Yes	No	Yes	5
632749	DMIR	Hoyt Lakes	Saint Louis County	CR666	No	No	No	Yes	Yes	No	Yes	No	Yes	Yes	5
625121	BNSF	Cloquet	Carlton County		No	Yes	No	No	Yes	No	No	No	Yes	Yes	4
626247	BNSF		Itasca County	CSAH25	No	No	No	Yes	Yes	No	Yes	No	No	Yes	4
626248	BNSF		Itasca County	MN65	No	No	No	Yes	Yes	No	No	No	Yes	Yes	4
626249	BNSF	Warba	Itasca County	CSAH74	No	No	No	Yes	Yes	No	No	No	Yes	Yes	4
626254	BNSF		Itasca County	CSAH71	No	No	No	Yes	Yes	No	Yes	No	No	Yes	4
626266	BNSF	Grand Rapids	Itasca County	US169	Yes	No	Yes	No	No	No	No	Yes	No	Yes	4
626271	BNSF	Grand Rapids	Itasca County	CSAH63	Yes	No	Yes	Yes	No	No	No	Yes	No	No	4
626274	BNSF	Cohasset	Itasca County	CSAH87	No	No	No	No	Yes	No	Yes	Yes	No	Yes	4
626296	BNSF	Keewatin	Itasca County	CSAH16	No	No	No	No	Yes	No	Yes	No	Yes	Yes	4
626297	BNSF	Cohasset	Itasca County	CSAH63	Yes	No	No	Yes	No	No	No	No	Yes	Yes	4
626483	DWP		Koochiching County	CSAH98	No	Yes	No	No	Yes	No	Yes	No	No	Yes	4
626489	MDW	International Falls	Koochiching County	MN11	Yes	Yes	Yes	No	No	No	No	No	No	Yes	4
626548	DMIR		Lake County	CSAH11	No	No	No	No	Yes	No	Yes	Yes	No	Yes	4
626551	DMIR		Lake County	CR111	No	No	No	Yes	Yes	No	Yes	No	No	Yes	4
626554	DMIR		Lake County	CSAH12	No	No	No	Yes	Yes	No	Yes	No	No	Yes	4
627468	BNSF	Henriette	Pine County	CSAH11	No	Yes	Yes	No	Yes	No	No	No	No	Yes	4
627479	BNSF	Hinckley	Pine County	M25	No	Yes	No	No	Yes	No	Yes	No	No	Yes	4
627480	BNSF	Hinckley	Pine County	M19	No	Yes	No	No	Yes	No	Yes	No	No	Yes	4
627486	BNSF	Askov	Pine County	CSAH32	No	Yes	No	No	Yes	No	No	Yes	No	Yes	4
627487	BNSF	Askov	Pine County	M14	No	Yes	No	No	Yes	No	No	Yes	No	Yes	4
627497	BNSF	Kerrick	Pine County	CSAH46	No	Yes	No	No	Yes	No	No	Yes	No	Yes	4
628265	BNSF	Floodwood	Saint Louis County	MN73	Yes	No	No	No	Yes	No	Yes	No	No	Yes	4
628274	BNSF		Saint Louis County	CSAH133	No	Yes	No	Yes	Yes	No	No	No	No	Yes	4
628331	DMIR	Proctor	Saint Louis County	CSAH11	Yes	Yes	Yes	No	No	No	No	No	No	Yes	4
628338	DMIR		Saint Louis County	CR873	No	Yes	No	No	Yes	No	Yes	No	No	Yes	4
628351	DMIR		Saint Louis County	CSAH52	No	Yes	No	Yes	Yes	No	No	No	Yes	No	4

Crossing ID	Operator	City	County	Road Designation	Roadway AADT	Total Trains Per Day	Volume Cross Product	Roadway Speed Limit	Max Timetable Speed	Number of Mainline Tracks	Skew	Distance to Nearby Intersection	Distance to Nearest Crossing	Clearing Sight Distance	Active - Risk Factors (of 10)
628380	DMIR	McKinley	Saint Louis County	CSAH20	No	No	No	Yes	Yes	No	Yes	No	Yes	No	4
628404	DMIR		Saint Louis County	CSAH137	No	No	No	Yes	Yes	No	Yes	No	No	Yes	4
628456	DWP	Cook	Saint Louis County	CR948	No	Yes	No	No	Yes	No	Yes	No	Yes	No	4
628461	DWP		Saint Louis County	CR937	No	Yes	No	No	Yes	No	No	No	Yes	Yes	4
628467	DWP		Saint Louis County	CR180	No	Yes	No	No	Yes	No	No	Yes	No	Yes	4
628476	NSSR	Duluth	Saint Louis County	MSAS170	Yes	No	No	No	No	No	Yes	Yes	No	Yes	4
624870	BNSF	Tamarack	Aitkin County	CSAH6	No	No	No	Yes	Yes	No	No	No	No	Yes	3
625062	BNSF		Carlton County	CSAH5	No	No	No	Yes	Yes	No	No	No	No	Yes	3
625083	BNSF	Cloquet	Carlton County	MSAS108	No	Yes	No	No	Yes	No	No	No	No	Yes	3
625084	BNSF	Cloquet	Carlton County	MSAS106	No	Yes	No	No	Yes	No	No	No	No	Yes	3
626260	BNSF	Grand Rapids	Itasca County	MSAS119	Yes	No	Yes	No	No	No	No	No	No	Yes	3
626262	BNSF	Grand Rapids	Itasca County	MSAS109	No	No	No	No	No	No	Yes	Yes	No	Yes	3
626265	BNSF	Grand Rapids	Itasca County	MSAS107	Yes	No	No	No	No	No	No	Yes	No	Yes	3
626275	BNSF		Itasca County	MN6	No	No	No	No	Yes	No	No	Yes	No	Yes	3
626292	BNSF	Coleraine	Itasca County	CSAH61	No	No	No	No	No	No	Yes	No	Yes	Yes	3
626295	BNSF	Nashwauk	Itasca County	T4285	No	No	No	No	No	No	Yes	No	Yes	Yes	3
626547	DMIR	Two Harbors	Lake County	CSAH61	No	No	No	Yes	Yes	No	No	No	No	Yes	3
626549	DMIR	Two Harbors	Lake County	CSAH27	No	No	No	No	Yes	No	No	Yes	No	Yes	3
626552	DMIR		Lake County	CR111	No	No	No	Yes	Yes	No	No	No	No	Yes	3
627402	SCXY	Rock Creek	Pine County	CR110	No	No	No	Yes	No	No	No	No	Yes	Yes	3
627404	SCXY	Pine City	Pine County	CSAH65	Yes	No	No	No	No	No	Yes	Yes	No	No	3
627414	SCXY		Pine County	CSAH14	No	No	No	Yes	No	No	No	Yes	No	Yes	3
627477	SCXY	Hinckley	Pine County	CSAH61	Yes	No	No	No	No	No	Yes	No	No	Yes	3
628226	BNSF	Hibbing	Saint Louis County	CSAH63	No	No	No	Yes	No	No	No	Yes	No	Yes	3
628266	BNSF	Floodwood	Saint Louis County	CSAH30	No	No	No	No	Yes	No	Yes	No	No	Yes	3
628290	BNSF	Hibbing	Saint Louis County	MSAS219	No	No	No	No	Yes	No	Yes	No	No	Yes	3
628357	DMIR		Saint Louis County	CSAH7	No	Yes	No	Yes	No	No	No	No	No	Yes	3
628375	DMIR		Saint Louis County	CSAH16	No	No	No	Yes	Yes	No	No	No	No	Yes	3
628399	DMIR		Saint Louis County	CR310	No	No	No	Yes	Yes	No	Yes	No	No	No	3
628403	DMIR		Saint Louis County	CR452	No	No	No	Yes	Yes	No	Yes	No	No	No	3
628406	DMIR		Saint Louis County	CSAH25	No	No	No	Yes	Yes	No	No	No	Yes	No	3
628473	NSSR	Duluth	Saint Louis County	MSAS166	Yes	No	No	No	No	No	Yes	No	No	Yes	3
628478	NSSR	Duluth	Saint Louis County	MSAS169	No	No	No	No	No	No	Yes	Yes	No	Yes	3
628479	NSSR	Duluth	Saint Louis County	M979	No	No	No	No	No	No	Yes	Yes	No	Yes	3
628485	NSSR	Duluth	Saint Louis County	MN61	Yes	No	Yes	No	No	No	Yes	No	No	No	3
632031	SOO	Duluth	Saint Louis County	MSAS200	No	No	No	No	No	Yes	Yes	No	No	Yes	3

Crossing ID	Operator	City	County	Road Designation	Roadway AADT	Total Trains Per Day	Volume Cross Product	Roadway Speed Limit	Max Timetable Speed	Number of Mainline Tracks	Skew	Distance to Nearby Intersection	Distance to Nearest Crossing	Clearing Sight Distance	Active - Risk Factors (of 10)
633209	BNSF	Cohasset	Itasca County	M136	No	No	No	No	Yes	No	No	Yes	No	Yes	3
624875	BNSF	McGregor	Aitkin County	CSAH8	No	No	No	No	Yes	No	No	No	No	Yes	2
625073	BNSF	Cromwell	Carlton County	MN73	No	No	No	No	Yes	No	No	No	No	Yes	2
626267	BNSF	Grand Rapids	Itasca County	M62	Yes	No	No	No	No	No	No	No	No	Yes	2
626270	BNSF	Grand Rapids	Itasca County	M290	No	No	No	No	No	No	No	Yes	No	Yes	2
626272	BNSF	Cohasset	Itasca County		No	No	No	No	No	No	No	Yes	No	Yes	2
626291	BNSF	Coleraine	Itasca County	CSAH21	No	No	No	Yes	No	No	No	No	Yes	No	2
626298	BNSF	Taconite	Itasca County	CSAH15	No	No	No	No	No	No	Yes	No	No	Yes	2
626490	MDW	International Falls	Koochiching County	CSAH332	No	Yes	Yes	No	No	No	No	No	No	No	2
627405	SCXY	Pine City	Pine County	CSAH8	No	No	No	No	No	No	No	Yes	No	Yes	2
628260	BNSF	Brookston	Saint Louis County	CSAH31	No	No	No	No	Yes	No	No	No	No	Yes	2
628291	BNSF	Hibbing	Saint Louis County	MSAS219	No	No	No	No	No	No	Yes	No	No	Yes	2
628293	BNSF	Hibbing	Saint Louis County	MSAS183	No	No	No	No	No	No	Yes	No	No	Yes	2
628294	BNSF	Hibbing	Saint Louis County	MSAS178	No	No	No	No	No	No	No	Yes	No	Yes	2
628295	BNSF	Hibbing	Saint Louis County	M36	No	No	No	No	No	No	Yes	No	No	Yes	2
628296	BNSF	Hibbing	Saint Louis County	MSAS181	No	No	No	No	No	No	Yes	No	No	Yes	2
628297	BNSF	Hibbing	Saint Louis County	MSAS182	No	No	No	No	No	No	Yes	No	No	Yes	2
628381	DMIR	Gilbert	Saint Louis County	CSAH97	No	No	No	Yes	Yes	No	No	No	No	No	2
628398	DMIR		Saint Louis County	CSAH7	No	No	No	Yes	No	No	No	Yes	No	No	2
628492	NSSR	Duluth	Saint Louis County	M1399	No	No	No	No	No	No	No	Yes	No	Yes	2
632020	BNSF	Cohasset	Itasca County	CSAH62	No	No	No	No	Yes	No	No	No	No	Yes	2
626268	BNSF	Grand Rapids	Itasca County	M194	No	No	No	No	No	No	No	No	No	Yes	1
626278	BNSF	Deer River	Itasca County	M8	No	No	No	No	No	No	Yes	No	No	No	1
627407	SCXY	Pine City	Pine County	M21	No	No	No	No	No	No	No	No	No	Yes	1
627408	SCXY	Pine City	Pine County	M78	No	No	No	No	No	No	No	Yes	No	No	1
627409	SCXY	Pine City	Pine County	CSAH55	No	No	No	No	No	No	No	Yes	No	No	1
628292	BNSF	Hibbing	Saint Louis County	CSAH63	No	No	No	No	No	No	No	No	Yes	No	1
628311	BNSF	Duluth	Saint Louis County	MSAS119	Yes	No	No	No	No	No	No	No	No	No	1
628483	NSSR	Duluth	Saint Louis County	MSAS195	No	No	No	No	No	No	No	No	No	Yes	1
632026	SCXY	Pine City	Pine County	M99	No	No	No	No	No	No	No	Yes	No	No	1

Source: MnDOT Rail Grade Crossing Safety Project Selection report. 2016.

Appendix H – Bridge Clearance and Condition Ratings

One of the most common potential impediments to truck movements are low bridges over roadways, which require trucks to take circuitous routes to avoid damage to vehicles, cargo, and bridge infrastructure. This Appendix provides information on specific bridge's clearances and condition rating to aid in highlighting potential areas for truck conflicts, based on MnDOT's 2018 bridge condition and clearance data.

Figure H-1: District 1 Roadway Bridge Clearance and Condition

MNDOT_BR_N	ROAD_NAME	Horizontal Clearance	Vertical Clearance	Service On	Deck Rating	Substructure Rating	Superstructure Rating	Total Rating	Rating
69802C	19th & 20th Streets Conn.	31.9	21.9	Highway	7	6	4	17	89%
69802D	19th & 20th Streets Conn.	77.9	21.9	Highway	5	6	5	16	81%
69802A	21st AVE	81.9	17.3	Highway	6	6	5	17	85%
69575	2nd Ave W Ramp	63.1	17.9	Highway-pedestrian	7	7	5	19	78%
69692	32nd AVENUE E	-1	10.8	Railroad	7	7	7	21	78%
69A33	36TH AVENUE E	28	10.8	Railroad	7	8	6	21	89%
7631	3RD ST (MSAS 126)	48.9	21.9	Railroad	6	5	4	15	81%
7632	3RD ST (MSAS 126)	48.4	21.9	Railroad	6	6	5	17	81%
7633	3RD ST (MSAS 126)	86.3	16.5	Railroad	6	6	6	18	89%
69879D	57th Ave W	69.9	20.6	Highway	7	7	5	19	85%
69879E	57th Ave W	69.9	21	Highway	7	6	5	18	85%
69879	59th Ave W (MSAS 104)	39.9	22	Highway	6	7	7	20	85%
69879C	59th Ave W (MSAS 104)	39.9	22	Highway	7	7	7	21	70%
69009	6TH AVE W	47.9	15.7	Highway	7	7	6	20	81%
69010	6TH AVE W	47.9	16.2	Highway	7	7	6	20	81%
69870	Access road	30.9	15	Highway-pedestrian	5	7	7	19	78%

MNDOT_BR_N	ROAD_NAME	Horizontal Clearance	Vertical Clearance	Service On	Deck Rating	Substructure Rating	Superstructure Rating	Total Rating	Rating
7628	CARLTON ST (MSAS 194)	47.1	17	Railroad	6	6	6	18	85%
7626	CARLTON ST (MSAS 194)	47.8	24.9	Railroad	6	6	4	16	78%
7627	CARLTON ST (MSAS 194)	45.9	24.9	Railroad	6	6	5	17	89%
69113	CR 694	69.9	25.4	Highway	7	8	7	22	89%
69114	CR 694	69.9	25.6	Highway	8	7	7	22	89%
88796	CR 931	-1	14.1	Highway	6	4	5	15	96%
69059	CSAH 102	91.9	17.5	Highway	7	7	7	21	67%
69060	CSAH 102	91.9	17.5	Highway	5	5	6	16	48%
5792	CSAH 132	31.9	13.4	Railroad	6	7	6	19	56%
7905	CSAH 4	27.9	15.4	Railroad	7	6	6	19	78%
31003	CSAH 61	38	15.8	Highway	7	8	7	22	74%
69890	CSAH 61	29.9	16.8	Highway	7	7	7	21	78%
09823	CSAH 61	55.9	24	Highway	4	6	6	16	70%
09824	CSAH 61	55.9	25	Highway	8	7	7	22	78%
6823	CSAH 61	32.7	14.5	Railroad	6	7	6	19	70%
69889	CSAH 61	22	16.6	Highway	7	7	7	21	78%
L3811	CSAH 7	59.9	33.9	Railroad	8	7	7	22	85%
7908	CSAH 7	27.9	39.9	Railroad	7	6	6	19	78%
69605	CSAH 76	31.9	14.3	Railroad	7	7	6	20	78%
90748	CSAH 80	35.9	13.2	Railroad	8	8	8	24	81%
7751	CSAH 89	40.6	13.4	Railroad	3	3	5	11	74%
09009	DUNLAP ENT	34.2	18.2	Highway-pedestrian	8	7	7	22	85%
69808	Garfield Ave	49.3	17.6	Highway	6	6	6	18	81%
L1008	GARY ST	14.1	13.2	Railroad	8	8	8	24	81%
69879A	TH 23	53.3	17.6	Highway	7	7	6	20	89%
58814	I 35	54.4	15.9	Highway	7	6	5	18	89%
09832	I 35	64.1	16.1	Highway	7	7	7	21	85%
69826	I 35	41.3	16.1	Highway-pedestrian	5	6	5	16	93%
58806	I 35	57.6	16.2	Highway	7	7	7	21	93%
9786	I 35	52.4	16.2	Highway	7	8	6	21	93%

MNDOT_BR_N	ROAD_NAME	Horizontal Clearance	Vertical Clearance	Service On	Deck Rating	Substructure Rating	Superstructure Rating	Total Rating	Rating
9791	I 35	52.9	16.2	Highway	5	6	6	17	74%
58802	I 35	54.2	16.3	Highway	5	6	7	18	74%
58809	I 35	64.4	16.3	Highway	7	6	7	20	78%
58813	I 35	54.8	16.3	Highway	8	7	6	21	74%
9785	I 35	52.9	16.3	Highway-pedestrian	7	7	5	19	59%
69827	I 35	46.8	16.4	Highway-pedestrian	5	8	5	18	59%
09821	I 35	54.3	16.4	Highway	8	8	8	24	59%
09829	I 35	-1	16.4	Highway	7	7	7	21	63%
58816	I 35	64.3	16.4	Highway	7	7	7	21	81%
69820	I 35	41.1	16.4	Highway	8	7	8	23	78%
69887	I 35	52.9	16.4	Highway	6	6	6	18	56%
9469	I 35	54.2	16.4	Highway	5	5	7	17	78%
09830	I 35	82.5	16.5	Highway	8	7	7	22	70%
58819	I 35	-1	16.5	Highway	8	8	8	24	81%
58801	I 35	54.2	16.6	Highway	7	5	6	18	89%
69821	I 35	49.1	16.6	Highway	7	7	7	21	89%
69829	I 35	68.2	16.6	Railroad	5	4	5	14	89%
58818	I 35	72.4	16.7	Highway	7	7	7	21	85%
9792	I 35	52.9	16.7	Highway	8	8	8	24	63%
69846	I 35	55.4	16.8	Highway	5	7	5	17	78%
09822	I 35	82.5	16.9	Highway	8	7	7	22	59%
09838	I 35	80.4	16.9	Highway	5	8	7	20	41%
69100	I 35	41.5	17.1	Highway-pedestrian	7	7	7	21	85%
09820	I 35	54.1	17.2	Highway	7	7	7	21	33%
58810	I 35	64.1	17.2	Highway	7	6	7	20	78%
09801	I 35	56.9	17.6	Highway	8	6	7	21	85%
09837	I 35	99.8	19.4	Highway	7	6	8	21	81%
69834	I 35	56.9	20.2	Highway-pedestrian	4	6	5	15	85%
69816	I 35	44.7	20.4	Highway-pedestrian	5	7	6	18	52%
69841A	I 35	37.9	23.3	Highway	6	7	7	20	81%

MNDOT_BR_N	ROAD_NAME	Horizontal Clearance	Vertical Clearance	Service On	Deck Rating	Substructure Rating	Superstructure Rating	Total Rating	Rating
69833	I 35	56.1	34.9	Railroad	7	3	5	15	85%
69888	I 35	61.9	16.4	Railroad	7	7	7	21	63%
6888	I 35	34.4	16.7	Railroad	7	5	6	18	48%
69801F	I 35	38.4	17.8	Highway	6	5	6	17	67%
69818N	I 35	39.3	18.2	Highway	7	8	7	22	56%
69882	I 35	37.9	18.2	Highway	6	6	7	19	85%
69882N	I 35	37.5	24.9	Highway	6	6	7	19	78%
69849	I 35	47.9	17.2	Railroad	7	7	6	20	81%
69818S	I 35	39.3	17.6	Highway	7	7	6	20	89%
69881	I 35	38.4	18.9	Highway	7	6	7	20	89%
69801L	I 35	38.4	24.9	Highway	7	8	7	22	89%
69851	I 35 NB off ramp	40.9	16.3	Highway	6	7	7	20	70%
69101	I 35 NB off ramp	31.9	16.1	Highway	7	7	7	21	70%
69887A	I 35 NB off ramp	27.9	18.7	Highway	5	6	6	17	89%
69801H	I 35 NB off ramp	21.4	16.5	Highway	7	7	7	21	85%
69817	I 35 SB off ramp	27.9	16.9	Highway	6	7	7	20	78%
69887B	I 35 SB off ramp	29.9	19.1	Highway	6	7	7	20	74%
69801E	I 35 SB off ramp	21.4	18.7	Highway	7	7	8	22	74%
9030	I 535	29.2	19.1	Highway	6	6	5	17	70%
69824	I 535	22.8	16.7	Highway	7	6	6	19	67%
69801J	I 535	21.4	16.4	Highway	7	6	6	19	67%
69808A	I 535 NB off ramp	38.6	18.4	Highway	7	7	7	21	67%
69801K	I 535 NB off ramp	21.4	16.5	Highway	7	6	7	20	67%
L6119	IDAHO ST	16.9	14.5	Railroad	5	3	5	13	78%
69803	Michigan St (MSAS 194)	55.9	16.3	Highway-pedestrian	7	7	7	21	81%
69892	Midway Road (CSAH 13)	83.9	16	Highway	8	6	7	21	67%
69891	Midway Road (CSAH 13)	83.9	17.1	Highway	7	7	7	21	74%
9189	MN 210	53.1	16.1	Highway	6	6	6	18	81%
9188	MN 210	53.1	16.5	Highway	6	7	7	20	70%
09001	MN 210	32	16.9	Highway-pedestrian	7	7	6	20	63%

MNDOT_BR_N	ROAD_NAME	Horizontal Clearance	Vertical Clearance	Service On	Deck Rating	Substructure Rating	Superstructure Rating	Total Rating	Rating
5468	MN 23	29.9	14.6	Railroad	6	6	6	18	85%
09836	MN 27	61.8	24	Highway	7	8	8	23	81%
09835	MN 27	61.8	24.3	Highway	6	7	8	21	85%
6544	MN 39	22.7	14.1	Highway-railroad	8	6	5	19	74%
09805	MN 45	44.6	16.1	Highway	7	7	8	22	74%
38001	MN 61	39.9	15.8	Railroad	8	8	6	22	78%
6881	MN 61	36.9	15.8	Railroad	6	7	7	20	81%
38006	MN 61	-1	16.2	Railroad	8	8	8	24	78%
6883	MN 61	36.9	21.1	Railroad	7	6	7	20	74%
6882	MN 61	36.9	99.9	Railroad	6	7	5	18	81%
9186	MN 65	51.9	16.2	Railroad	8	6	8	22	78%
9185	MN 65	51.9	16.9	Railroad	7	7	8	22	70%
6334	MN 70	33.9	13.8	Railroad	5	4	3	12	89%
69A22	MORRIS THOMAS RD	12	14.2	Railroad	8	8	8	24	89%
L6118	MSAS 101	71.9	10.4	Railroad	0	6	6	12	78%
L6136	MSAS 109	79.4	18	Railroad	6	6	6	18	74%
L6137	MSAS 109	56.7	19.9	Railroad	6	6	6	18	89%
L6138	MSAS 109	57.3	21.9	Railroad	6	5	6	17	81%
L6116	MSAS 140	23.9	18	Highway-pedestrian	5	7	6	18	81%
L8493	MUN 1121	43.9	17	Railroad	0	5	6	11	81%
31011	MUN 14	44.9	23.8	Highway	7	7	8	22	81%
31012	MUN 14	44.9	24.3	Highway	6	5	7	18	89%
31022N	MUN 19	52.4	16.3	Highway	7	6	5	18	85%
31022S	MUN 19	52.4	16.7	Highway	6	6	5	17	89%
L6008	MUN 26	39.9	16.4	Railroad	4	6	7	17	93%
69A60	MUN 26	45.5	23	Railroad	8	8	8	24	93%
69036	MUN 30	54.4	17.4	Railroad	7	7	7	21	89%
5718	MUN 32	21.9	14	Highway-pedestrian	7	6	6	19	89%
L8477	MUN 361	23.9	11.9	Highway	0	7	7	14	89%
69844	RECYCLE WAY	126.8	16.9	Highway	8	8	8	24	93%

MNDOT_BR_N	ROAD_NAME	Horizontal Clearance	Vertical Clearance	Service On	Deck Rating	Substructure Rating	Superstructure Rating	Total Rating	Rating
69814	S UGSTAD RD (CSAH 45)	55.5	16.2	Highway	7	7	7	21	89%
38533	SCENIC 61	44	16.3	Railroad	7	9	8	24	81%
38007	ST PRK RD	25.9	14.9	Highway-pedestrian	6	7	5	18	81%
R0726	STURGEON ISLAND RD	13.6	13	Highway	4	5	5	14	89%
69801G	SUPERIOR ST	79.9	15.9	Highway	7	7	6	20	96%
5685	SUPERIOR ST	45.9	13.9	Railroad	6	6	6	18	89%
69840	SUPERIOR ST	28	16.4	Highway	6	6	6	18	70%
69127	TH 169	52.9	16.3	Highway	8	8	8	24	81%
69128	TH 169	52.9	16.8	Highway	8	8	8	24	100%
69839	TH 194	28.2	16.8	Highway	9	7	5	21	85%
69089	TH 23	68	16.6	Railroad	9	9	9	27	96%
69090	TH 23	68	17.5	Railroad	9	9	9	27	93%
09811	TH 35	64.3	16.2	Highway	7	7	7	21	85%
09819	TH 35	64.2	16.2	Highway	6	7	7	20	89%
9493	TH 37	30.1	15.1	Highway	6	4	7	17	96%
9494	TH 37	30.1	15.3	Highway	7	4	7	18	93%
09806	TH 45	44.6	16.2	Highway	5	5	6	16	96%
69084	TH 73	69.9	16.6	Highway	7	6	6	19	93%
69083	TH 73	69.9	16.7	Highway	7	6	7	20	100%
09825	TR 370	53.9	16.1	Highway	7	8	7	22	96%
09826	TR 370	53.9	16.1	Highway	7	8	7	22	100%
31004	US 169	36.7	16.1	Highway-pedestrian	7	6	6	19	100%
31017	US 169	73.4	16.3	Railroad	7	7	7	21	96%
69080	US 169	93.1	16.6	Railroad	7	7	8	22	96%
69565	US 169	73.9	16.9	Highway-pedestrian	7	8	6	21	59%
5332	US 169	32.7	17.1	Railroad	6	6	5	17	56%
9233	US 2	43.7	15.1	Railroad	7	6	7	20	59%
31031	US 2	39.4	16.3	Railroad	7	6	8	21	74%
69116	US 2	99.8	16.5	Highway	7	7	7	21	81%
69115	US 2	99.8	17.3	Highway	7	7	8	22	81%

MNDOT_BR_N	ROAD_NAME	Horizontal Clearance	Vertical Clearance	Service On	Deck Rating	Substructure Rating	Superstructure Rating	Total Rating	Rating
5204	US 2	27.9	14.5	Railroad	4	5	7	16	63%
69109	US 2	25.3	16.3	Highway	8	8	8	24	85%
69850	US 2	50.3	16.5	Railroad	7	6	6	19	78%
69861	US 2	37.3	17.1	Highway	8	8	8	24	63%
69102	US 2	34.9	18.4	Highway-pedestrian	8	7	6	21	89%
9530	US 53	62.5	14.8	Highway	5	5	5	15	78%
9481	US 53	39.3	15.1	Railroad	6	5	5	16	48%
69035	US 53	62.5	16.2	Highway-pedestrian	9	7	9	25	78%
69014	US 53	71.4	16.7	Railroad	7	8	7	22	81%
69038	US 53	37.9	16.8	Highway-pedestrian	7	8	8	23	81%
69130	US 53	78.7	16.8	Highway	8	8	8	24	67%
69123	US 53	47.1	18	Highway-pedestrian	7	8	8	23	89%
69802	US 53	38.3	19.4	Highway	5	7	5	17	89%
69065	US 53	37.5	16.7	Highway	8	8	8	24	89%

Source: MnDOT Bridge Condition and Clearance Data. 2018.