
District 2 Freight Plan

WORKING PAPER #2: ECONOMIC AND FREIGHT SYSTEM PROFILES

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Introduction

The Minnesota Department of Transportation (MnDOT) is currently in the process of updating freight plans for multiple regional districts. This document represents Working Paper #1, Document Synthesis and Data Analysis, as shown in Figure 1.

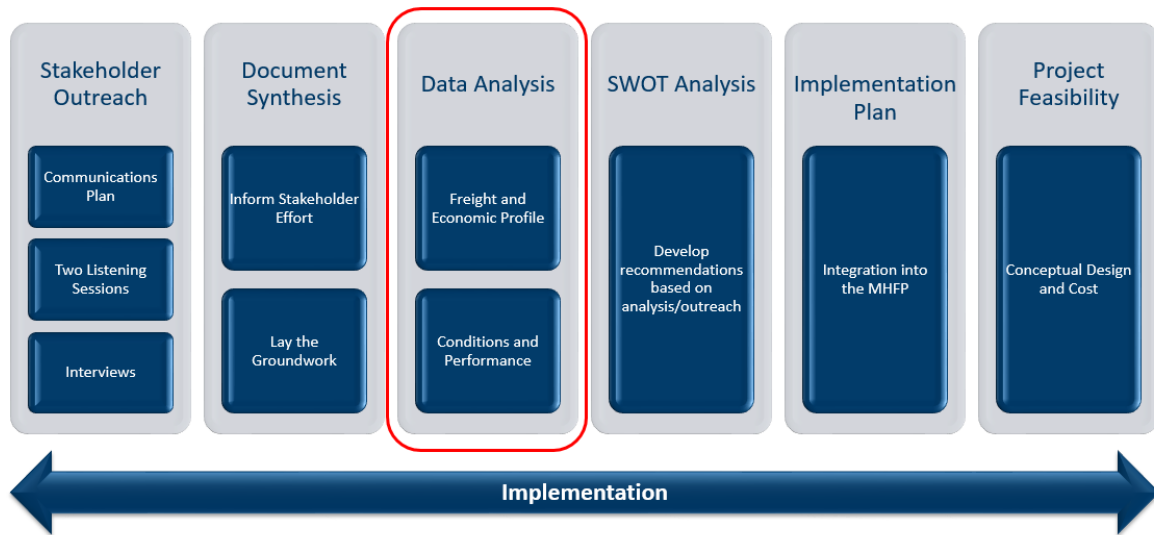


Figure 1: MnDOT District 2 Freight Plan Development Process

MnDOT Freight Planning

In January 2018, MnDOT completed the Minnesota Statewide Freight System and Investment Plan (SFSP). Among the plan's key recommendations was for MnDOT to work with each region of the state to create more detailed regional plans that would identify improvements to connect with the Minnesota Highway Freight Program.

The MnDOT District 2 Freight Plan outlines how the District, and its public and private sector freight stakeholders could improve freight mobility in Northwest Minnesota. Specifically, the plan will prioritize freight-related projects and develop conceptual design/cost estimates for high priority projects. The intent of the District 2 Freight Plan is to leverage, validate and expand upon existing studies and plans with relevant and current data analysis. This plan will:

- Provide an up-to-date assessment of freight needs and issues specific to District 2;
- Identify a list of strategies to improve freight mobility in the District; and
- Roll up long-term planning and programming into the next Statewide Freight System Plan.

The District 2 Freight Plan also needs to integrate with state wide freight planning and the flow chart below depicts the steps to identify needs and ultimately recommendations to advance to become part of the Minnesota Highway Freight Program.



Figure 2: MnDOT Freight Planning Process

MnDOT District 2

MnDOT is divided operationally into eight regional districts. Each district plans, designs, constructs, and maintains the state and federal highways within that respective district. Additionally, the districts manage the aid and assistance provided to local governments that qualify for state and federal transportation funding for roadways, bridges, trails, and transit systems.

District 2 is located in Northern and Northwest Minnesota and consists of following the counties of Kittson, Roseau, Lake of the Woods, Marshall, Beltrami, Polk, Pennington, Red Lake, Clearwater, Norman, Hubbard, parts of Cass, Itasca, Mahnomen (maintenance only) and Koochiching.

Outside of being a mostly rural district, it has several unique attributes, including:

- No interstate highways
- 185 roadway miles in tribal areas
- 35 percent of the District's highway have substandard shoulders
- 5 US/Canada border crossings
- Non-National Highway System (NHS) routes make up 62 percent of the District's responsibility

In alignment with the Minnesota Highway Investment Plan priorities and the Minnesota GO Vision, the District's top highway priorities are to preserve the existing road and bridge systems and to make cost-effective safety improvements. The District's construction program emphasizes pavement and bridge repair and replacement, in addition to low-cost safety improvements.

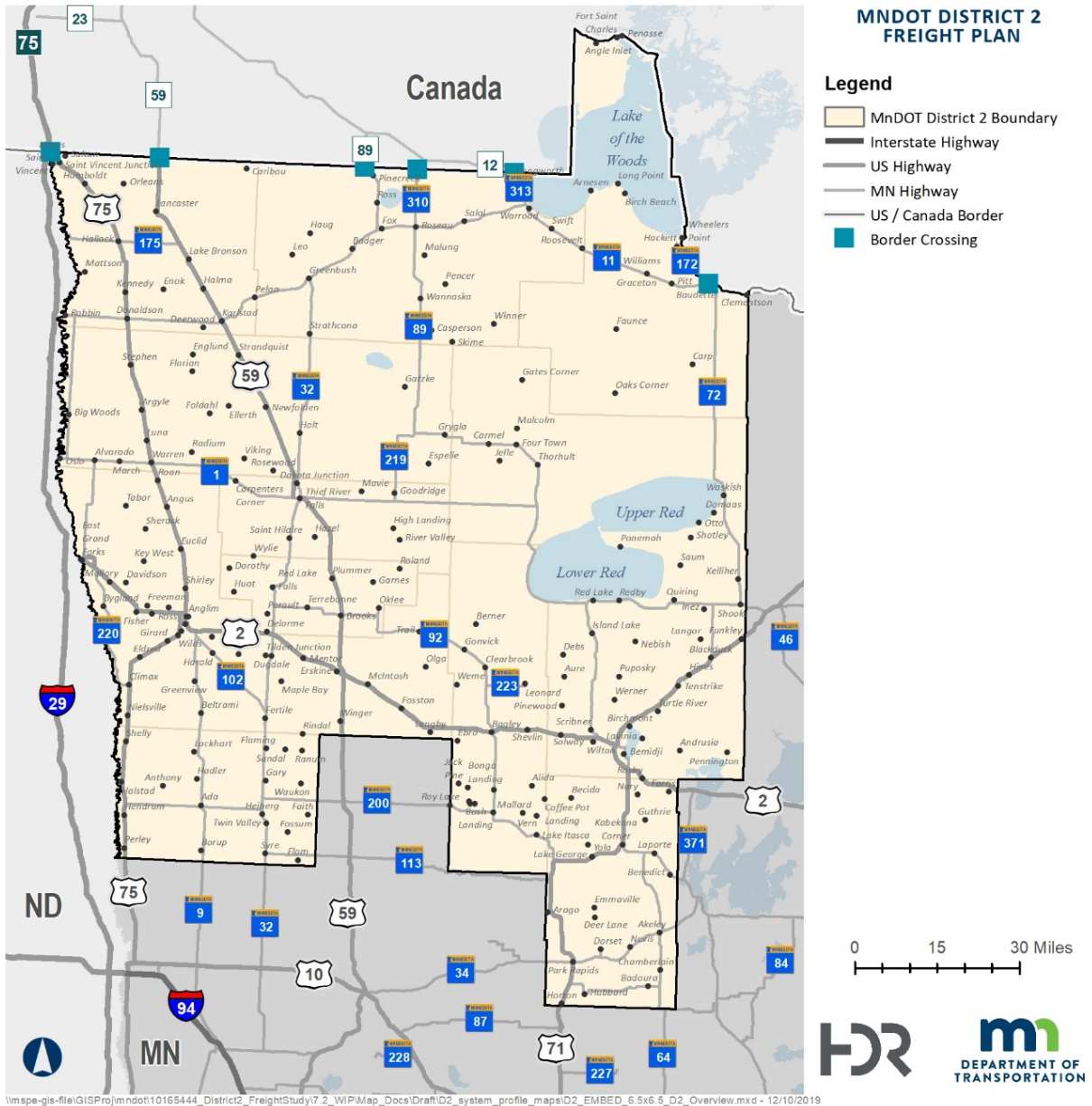


Figure 3: MNDOT District 2

Economic Profile

The District 2 Freight Plan is designed to identify and prioritize freight projects that support the economy of Northwest Minnesota. To do so, it is important to understand the region’s economy and the role freight plays in supporting it. This information provides a foundation for further discussions of freight transportation needs and issues in the District.

Minnesota's Economy

In 2018, freight-dependent industries (defined as industries primarily focused on the manufacture or distribution of physical goods) created 37 percent of Minnesota's Gross Domestic Product (GDP) (Figure 4). These freight-dependent industries comprise the backbone of Minnesota's economy and also have a multiplier effect on the broader economy as a whole by supporting other industries such as local restaurants and service businesses.

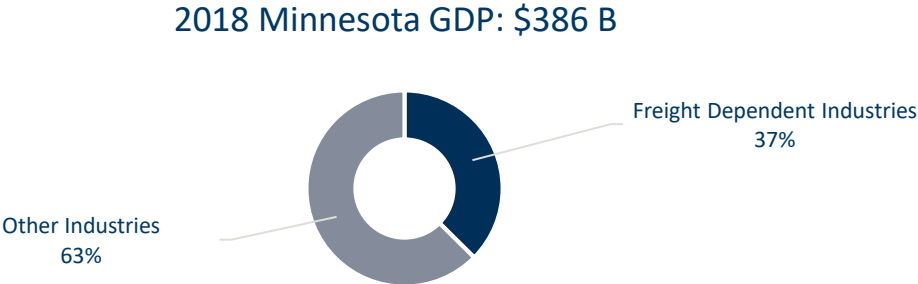


Figure 4: Minnesota Gross Domestic Product

Among the freight-dependent industries in Minnesota, the manufacturing sector produces the highest levels of GDP, following closely by Wholesale and Retail Trade (Figure 5). Other freight-dependent industries in the state include Construction; Transportation and Warehousing; Utilities; Agriculture, Forestry, Fishing and Hunting; and Mining, Quarrying, and Oil and Gas Extraction. With the state's economic future relying on these freight-dependent industries, investment in freight infrastructure will be key to a prosperous future

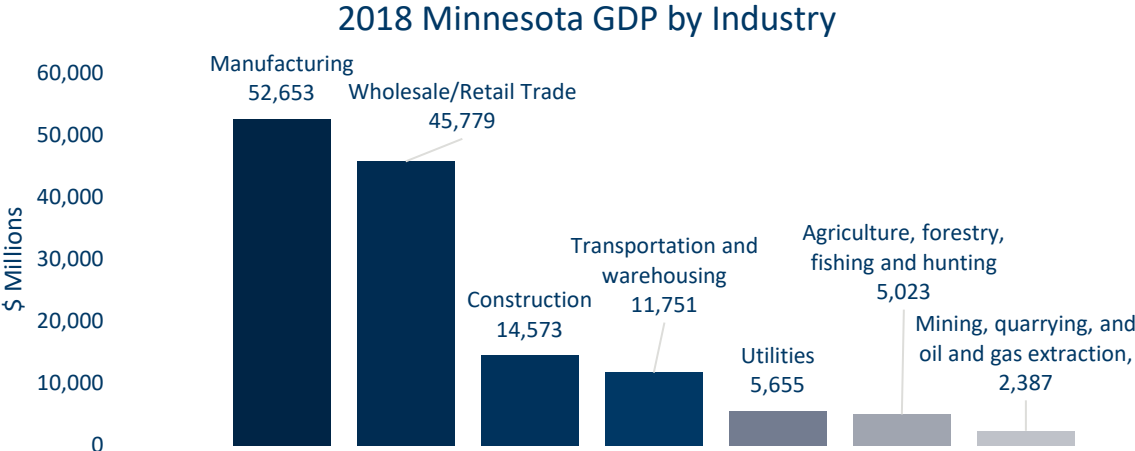


Figure 5: Minnesota GDP by Industry, Source: Bureau of Economic Analysis, 2018

District 2 Population

District 2's estimated population of 164,940¹ accounts for approximately 3 percent of Minnesota's population as a whole. With a population density of 12 people per square mile, it has both the lowest

¹ American Community Survey 5-year estimates, District 2 ATP Counties Only

population and lowest population density of any Minnesota District. With four cities over 5,000 in population, the district is characterized as largely rural or natural open space. Between the years 2010 and 2017, population levels in the District have remained steady.

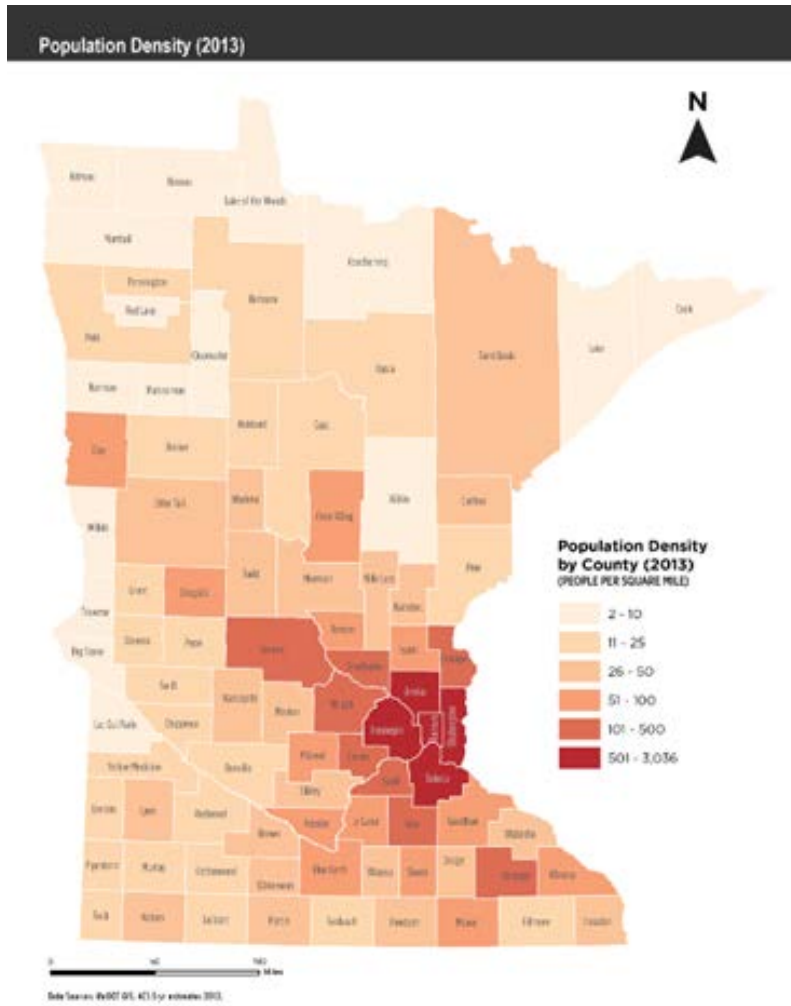


Figure 6: Minnesota Population Density, Source: Minnesota GO

District 2 Population by County

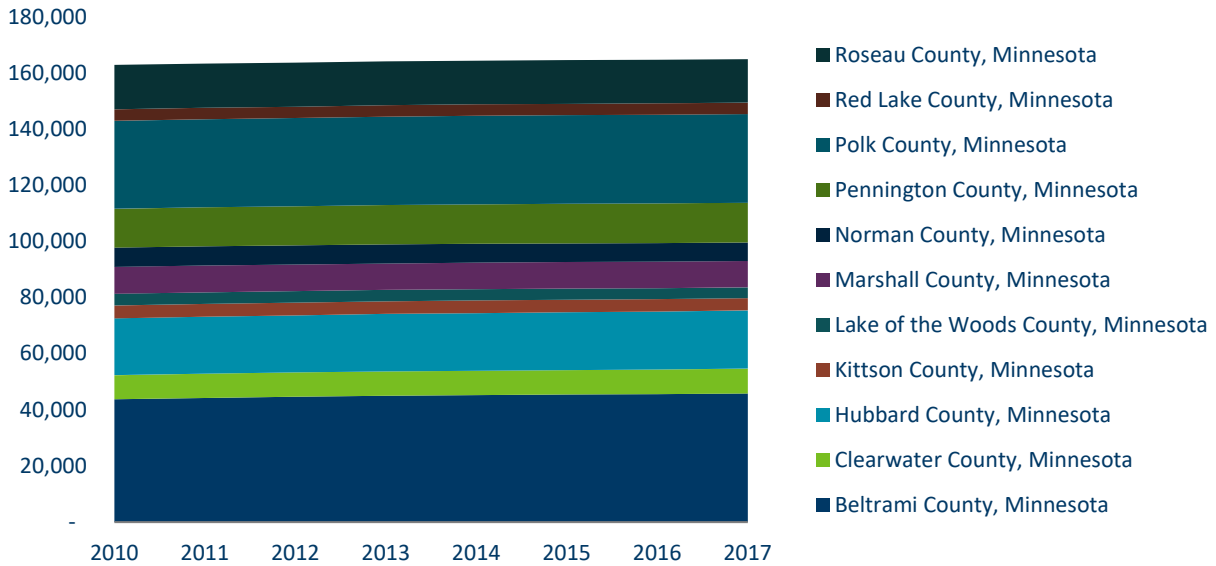


Figure 7: District 2 Population by County, Source: American Community Survey 5-year estimates (ATP Counties)

District 2 Employment

Due to business confidentiality issues, county-level GDP figures are not publically available from the U.S. Bureau of Economic Analysis (BEA). Instead, this section will focus on jobs as a measure of economic activity at the district and county levels.

Overall, the District 2 economy supports 53,444 jobs across all industries.² More than half (52 percent) of this employment is attributable to freight-dependent industries. Similar to Minnesota’s economy as a whole, the majority of the 38,049 freight related jobs in the district are associated with the industries of manufacturing and wholesale and retail trade. Employment in these freight-dependent industries has risen substantially in recent years, growing nearly 50 percent from 2010 to 2017.

More than half of all jobs in District 2 are attributable to the freight industry.

² Based on analysis of Census Business Pattern data for full-time, year-round civilian employees.

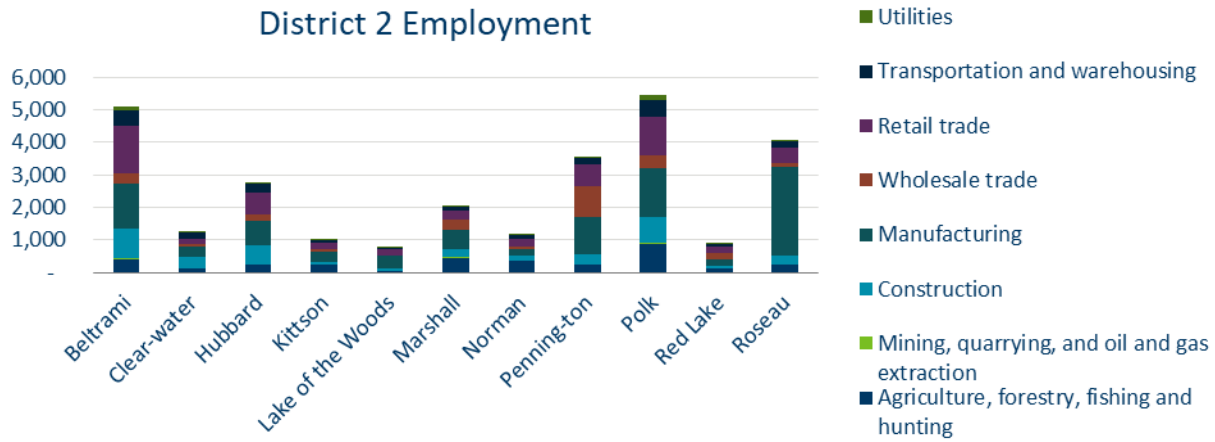


Figure 8: District 2 Employment by Freight-Dependent Industry and County, Source: US Census Business Pattern Data

Table 1 summarizes employment with each industry by County. The counties in District 2 with the highest levels of freight-dependent employment are Beltrami (5,087), Polk (5,461), and Roseau (4,072). These three counties account for more than half of all freight-dependent employment in the district:

- **Beltrami:** Freight-dependent jobs in this county are predominantly in the Retail Trade, Manufacturing, and Construction sectors
- **Polk:** While an overall small share of total jobs, this county has the highest employment in the Agriculture, Forestry, Fishing, and Hunting sector.
- **Roseau:** Approximately 60 percent of freight-dependent employment in this county is within the Manufacturing sector. This is a result of large manufacturers, such as Polaris, located in the area.

Freight-dependent employment density is shown in the Figure 9. The highest employment density for these jobs are clustered around Thief River Falls, Bemidji, and Warroad. There are also several areas with little to no freight-dependent employment. Of note is the large area located south of MN Highway 11 and north of Red Lake which is home to both the Beltrami State Forest and the Red Lake Wildlife Management Area.

Table 1: District 2 Employment by Industry

Industry	Lake of the											
	Beltrami	Clear-water	Hubbard	Kittson	Woods	Marshall	Norman	Penning-ton	Polk	Red Lake	Roseau	
Agriculture, forestry, fishing and hunting	392	132	227	246	56	453	352	246	863	118	246	
Mining, quarrying, and oil and gas extraction	54	9	14	3	-	9	-	15	44	1	1	
Construction	899	344	602	87	65	268	173	293	808	86	255	
Manufacturing	1,381	315	737	307	386	578	173	1,135	1,474	192	2,724	
Wholesale trade	313	59	184	72	14	331	113	971	409	216	120	
Retail trade	1,475	166	695	201	194	257	217	659	1,170	188	497	
Transportation and warehousing	474	187	261	57	29	129	104	191	518	91	193	
Utilities	99	33	46	10	7	20	37	16	175	26	36	
Freight-Dependent Total	5,087	1,245	2,766	983	751	2,045	1,169	3,526	5,461	918	4,072	
Information	159	22	84	-	5	58	43	43	152	18	29	
Finance and insurance/real estate	759	78	328	49	29	176	126	146	405	41	184	
Professional/management/administrative	603	67	296	63	10	109	88	191	490	55	174	
Educational services/health care/social assistance	3,842	478	1,612	192	188	585	513	811	2,618	213	779	
Recreation/Accommodation and food services	961	129	408	11	377	99	145	211	684	57	300	
Other services, except public administration	533	131	267	28	23	130	72	185	518	45	150	
Public administration	1,159	142	415	85	55	150	90	114	599	52	185	
Non-Freight-Dependent Total	8,016	1,047	3,410	428	687	1,307	1,077	1,701	5,466	481	1,801	
TOTAL	13,103	2,292	6,176	1,411	1,438	3,352	2,246	5,227	10,927	1,399	5,873	53,444

Note: The table cells have been highlighted proportionately to employment numbers. Darker shading indicates higher relative employment.

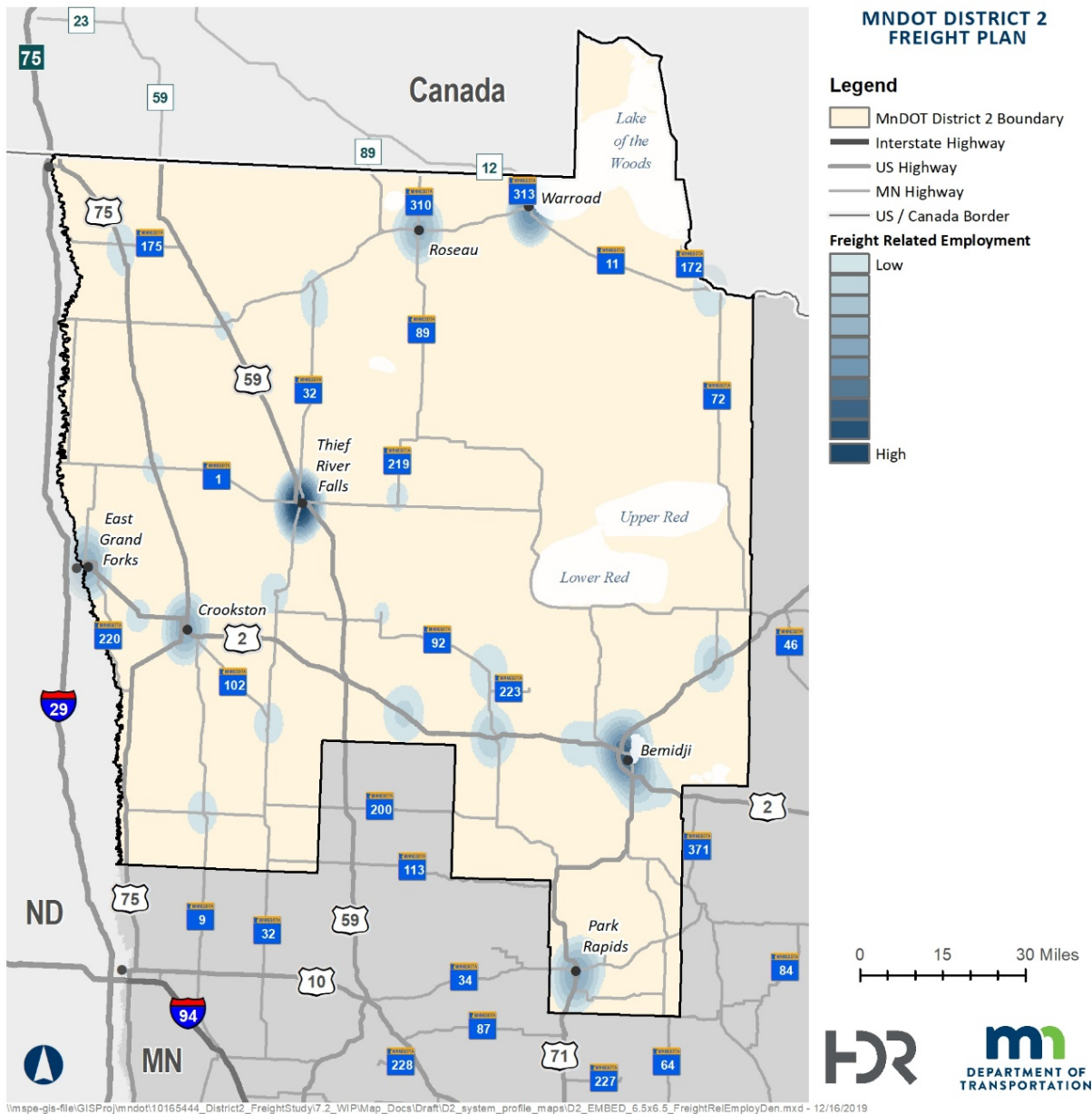


Figure 9: District 2 Freight-Related Employment Density

Economic Specialization

One method of evaluating the importance of each freight-dependent industry to District 2's economy is by measuring the degree of specialization of that industry compared to the state or nation as a whole. For this analysis, a location quotient approach was used to calculate the ratio of each industry employment share within the district to the share of that industry throughout the state of Minnesota. A location quotient of 1.0 means that the district has exactly as much employment for that industry as would be expected based on statewide employment. A location quotient of 2.0 would indicate that the district has twice the expected level of employment for that industry. The location quotient results for year 2017 are shown in Figure 10 below. This figure also highlights the change in location quotient between 2010 and 2017.

Equation 1: Location Quotient Formula

$$LQ = \frac{\left(\frac{\text{Industry Employment in D2}}{\text{Total Employment in D2}} \right)}{\left(\frac{\text{Industry Employment in MN}}{\text{Total Employment in MN}} \right)}$$

The figure highlights the following findings regarding the specialization of freight-related industries in District 2 relative to the State of Minnesota as a whole:

- The industry with the highest level of economic specialization is **Agriculture, Forestry, Fishing, and Hunting**. Specific industries affecting this result include sugar beet farms in the Red River Valley and the forestry operations throughout the region.
- While relatively small compared to the other industry sectors, **Mining, Quarrying, and Oil and Gas Extraction** saw the highest levels of growth in terms of location quotient, increasing from a quotient value of 0.36 in 2010 to a quotient value of 1.35 in 2017.
- While the **Manufacturing** sector has the highest employment figure in District 2, its location quotient value is only slightly above the statewide average at 1.2. It also experienced the smallest growth in location quotient (excluding the Utilities sector).

It is notable that nearly all of the freight-dependent industries in District 2 have a location quotient above 1 and have experienced an increase in their location quotient between 2010 and 2017. This reinforces the importance of these industries to the region. The exception to this finding is the Utilities Sector which has a location quotient of 0.24 and has experienced a reduction in location quotient of 1.09 from 2010 to 2017. Note that this sector is not displayed in Figure 10.

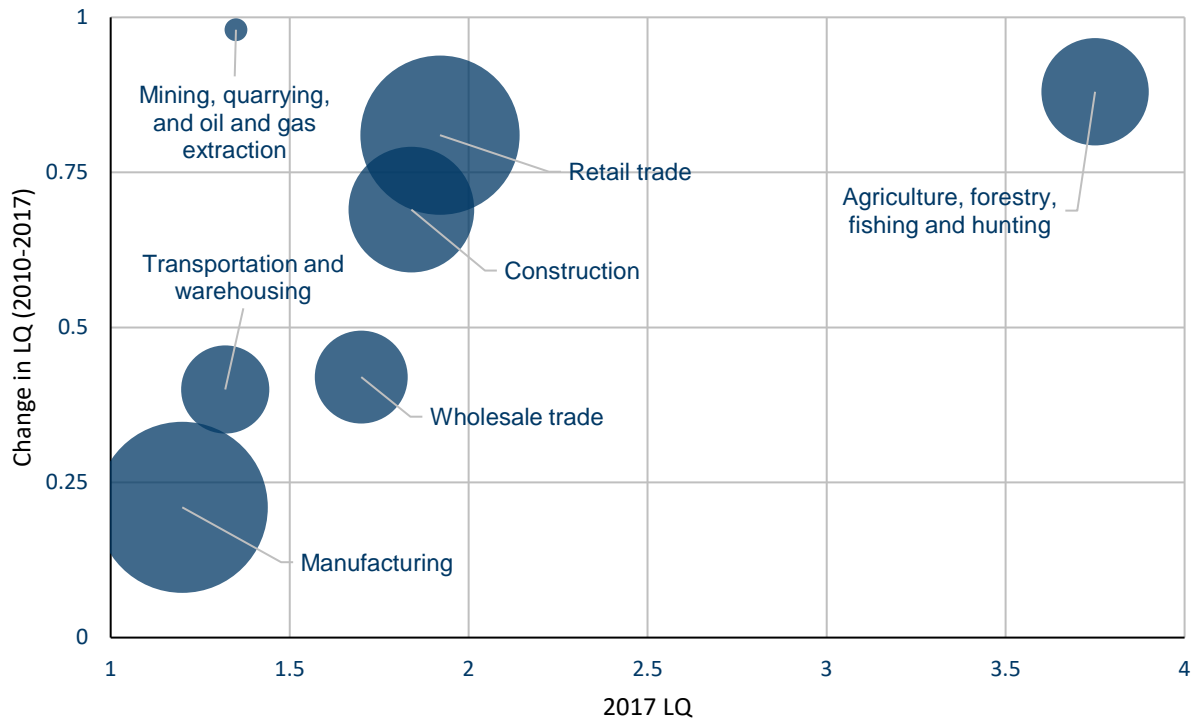


Figure 10: District 2 Industry Location Quotients

Freight System Profile

MnDOT District 2 is served by several freight modes including highway, rail, pipeline, and aviation. A snapshot of key District 2 freight system components is summarized in Figure 11. The locations of freight infrastructure within District 2 is shown in Figure 13.

Key highways for freight access include US-2, US-75, and US-59. However, no interstates are located in the district.

Class 1 railroads in the district include BNSF, CP (SOO), and CN they, predominantly parallel the highways noted above. Class 3 railroads that operate in the district include the Minnesota Northern Railroad (NRR) and Northern Plains Railroad (NPR). Four intermodal terminals throughout the district facilitate freight movement from rail to truck.

Air cargo service in the District is provided via two regional airports in Bemidji and Thief River Falls.

Several pipelines extend through District 2 from North Dakota towards the Twin Cities carrying petroleum, crude oil, hydrocarbon gas liquid, and natural gas. A total of five border crossings facilitate goods movement between Minnesota and Canada.



Figure 11: District 2 Multimodal Freight System Summary

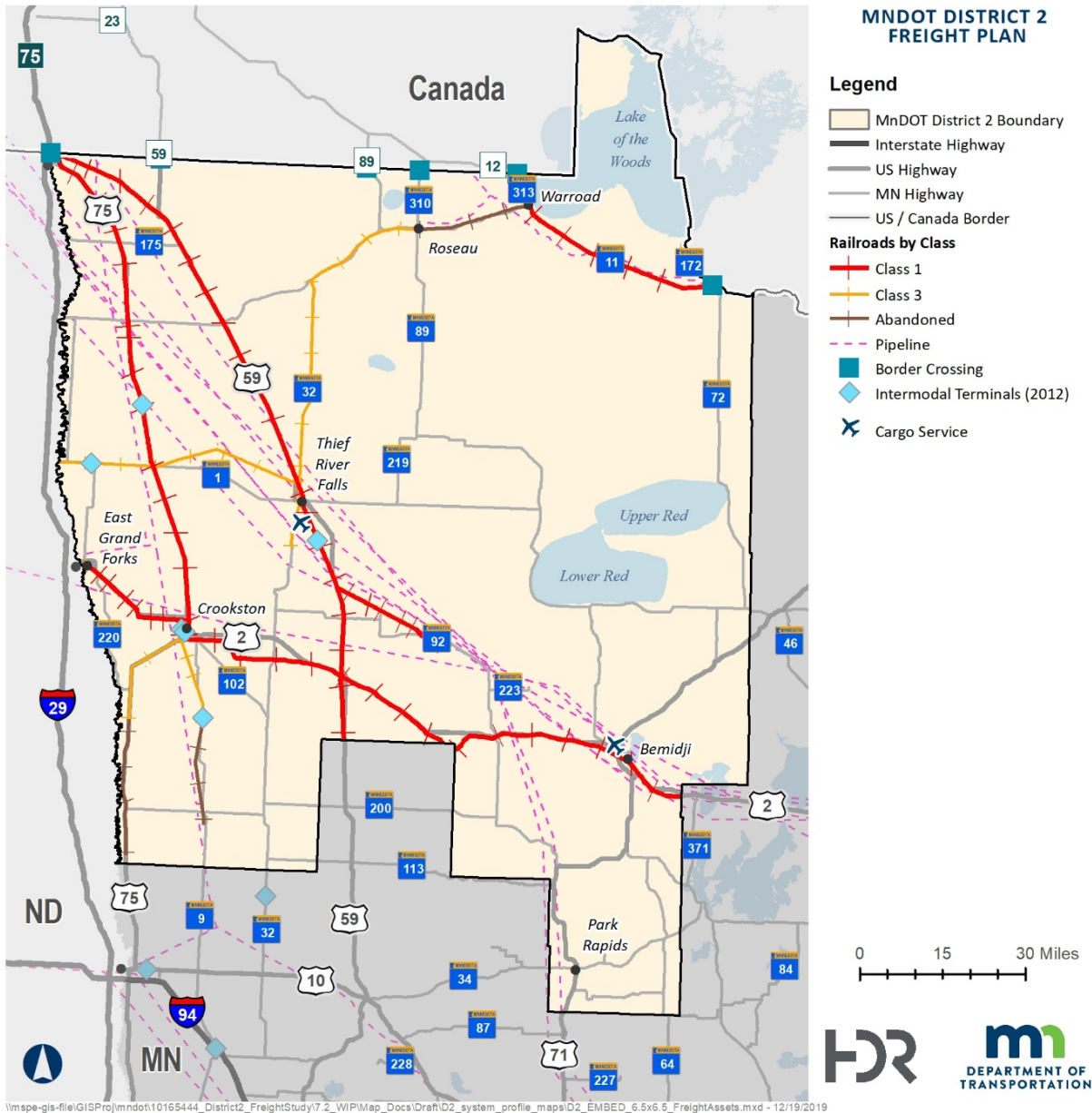


Figure 12: MnDOT District 2 Freight Transportation Assets

Statewide Freight Trends

At a statewide level today, freight moved by truck far surpasses other modes of rail, pipelines, and other multiple modes (Figure 13). This trend is anticipated to continue into the future with forecasted truck tonnage comprising 63 percent of the total statewide tonnage in 2040. The overall volume of freight statewide is anticipated to increase by 80 percent by 2040 to 1.8 billion tons.³ An even greater increase is anticipated for the value of freight, from \$912 billion in 2012 to \$2.3 trillion by 2040. The modal split is only

³ MnDOT “Statewide Freight System Plan” (2016).

expected to change in terms of a slight decrease in truck freight value and a slight increase in air and multiple modes freight value.

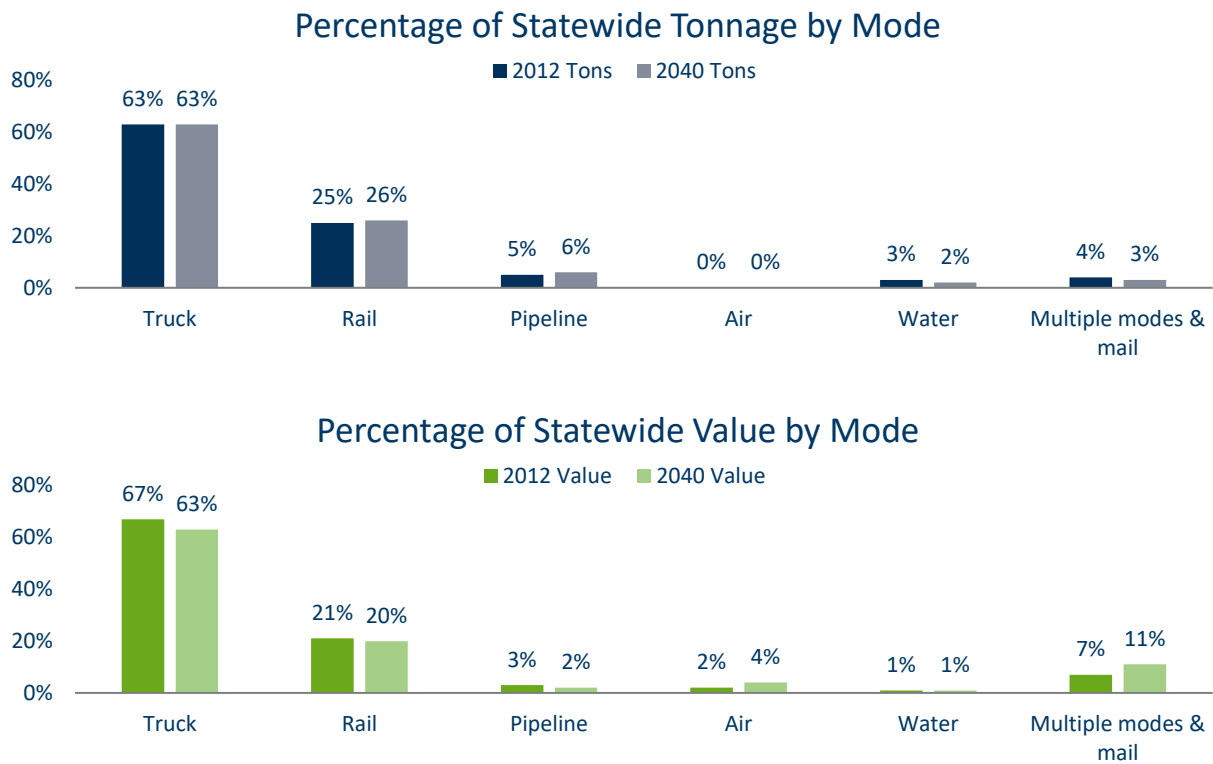


Figure 13: Statewide Freight Movements by Mode. Source: MnDOT “Statewide Freight System Plan” (2016)

Freight tonnage across all commodities is anticipated to nearly double by 2040. Cereal Grains comprise nearly one quarter of Minnesota’s freight tonnage, followed by Metallic Ores, Coal, and Gravel, which comprise an additional 23 percent of freight tonnage (Figure 14). In terms of value by commodity, the precision instruments commodity is expected to rapidly grow to 23 percent of the total value of commodities statewide by 2040 (Figure 15). This estimated growth is largely driven by Minnesota’s strong medical device manufacturing cluster. The value of freight related to the Pharmaceuticals category is also projected to increase substantially by 2040.

Percentage of Major Freight Commodities by Tonnage

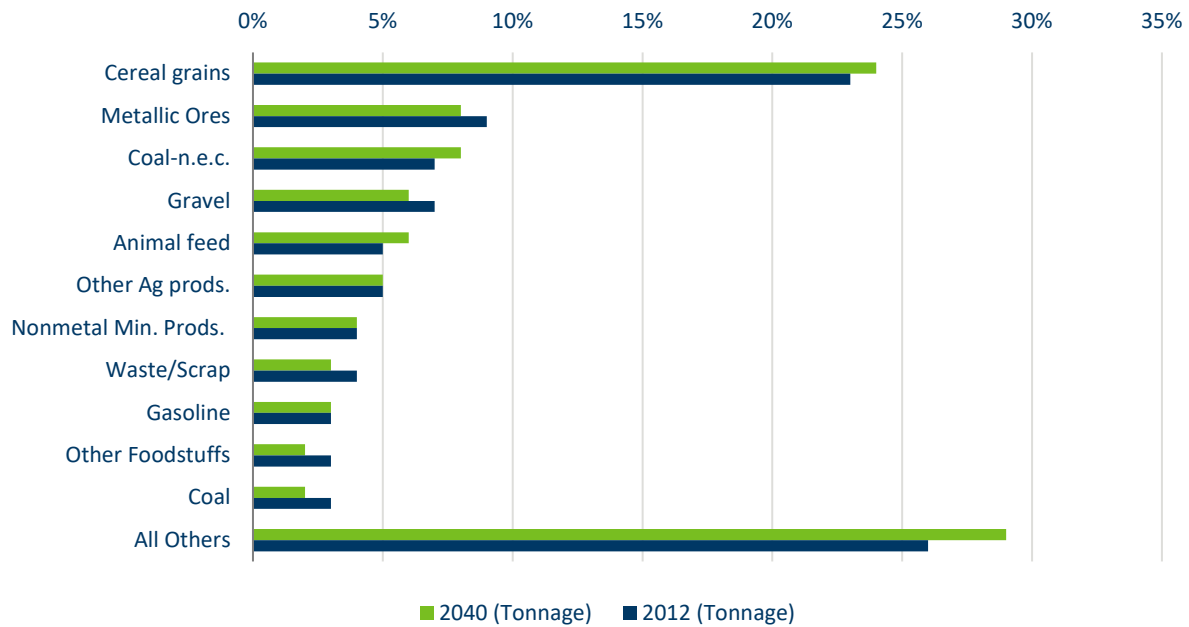
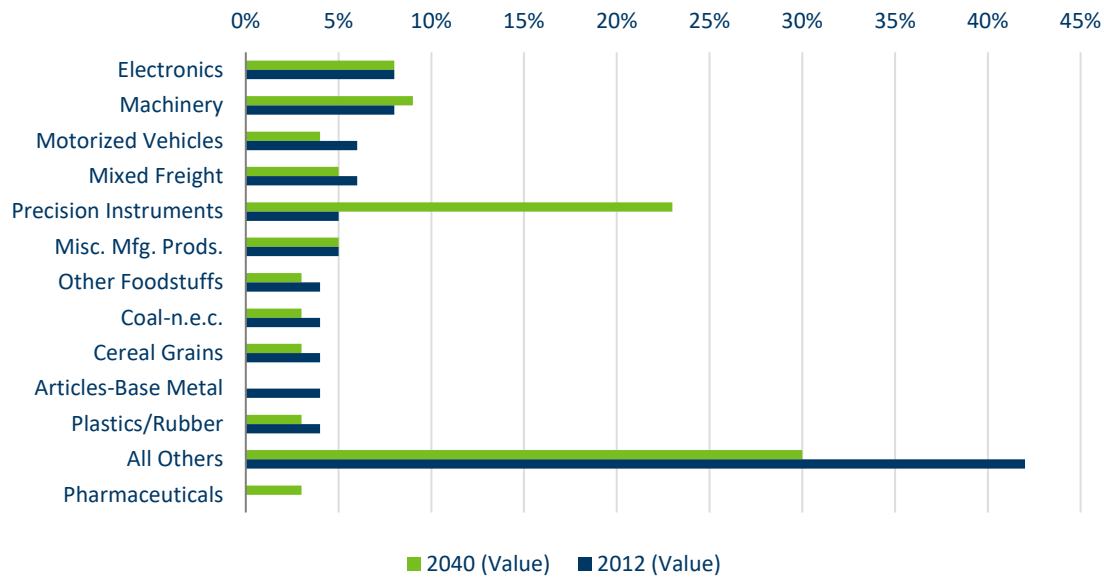


Figure 14: Major Freight Commodities by Tonnage. Source: MnDOT “Statewide Freight System Plan” (2016)

Percentage of Major Freight Commodities by Value



Border Crossings

Minnesota has several border crossings into Canada and trade with Canadian industries makes up 28 percent of the state’s total exports, 41 percent of total imports, and 36 percent of overall trade. However, the majority of this trade (94 percent by value) is conducted via ports of entry in bordering states such as North

Dakota and Michigan. The top three Minnesota ports of entry in terms of value are International Falls, Roseau, and Grand Portage (Figure 15). Note that the Noyes border crossing was closed in 2006.

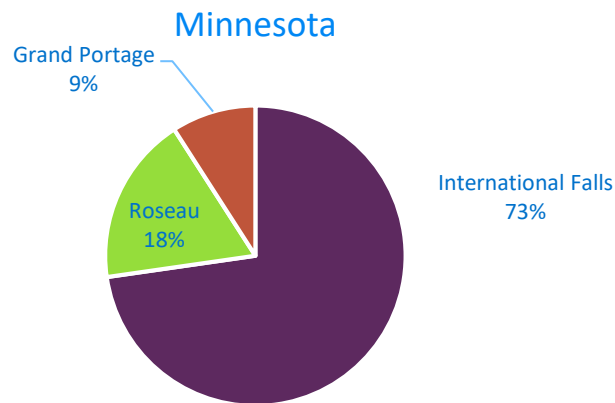


Figure 15: Top Ports of Entry for Minnesota-Canada Trade by Value, 2013. Source: MnDOT “Statewide Freight System Plan” (2016).

Five border crossings are located in District 2, including crossings in Lancaster, Pinecreek, Roseau, Warroad, and Baudette. Two additional border crossings in close proximity to District 2 are International Falls in District 2 and Pembina, located in North Dakota.

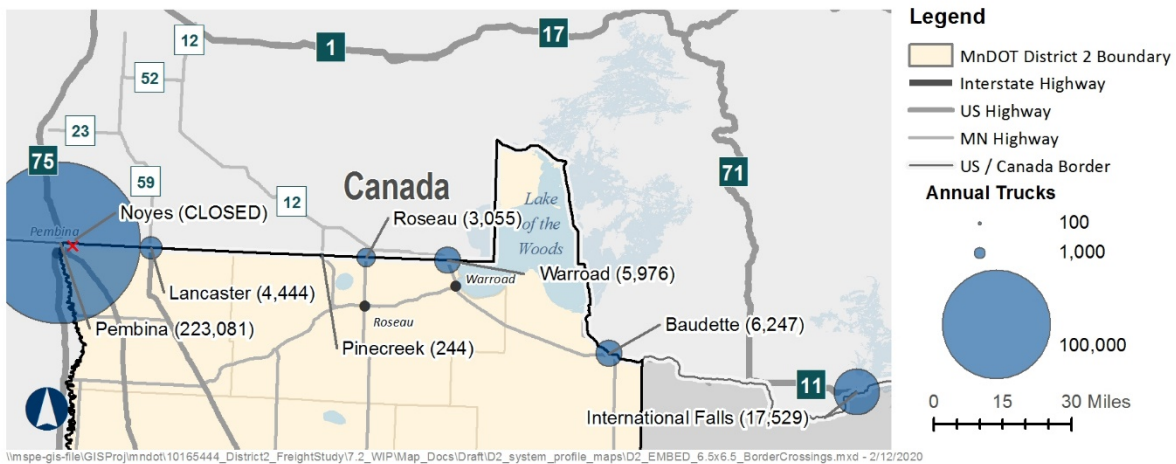


Figure 16: Canadian Border Crossings (Truck Only) in and near District 2. Source: USDOT, 2018

All five border crossings in District 2 have experienced a decline in truck volumes over the past five years (Figure 17). Roseau in particular has seen a sharp reduction from nearly 9,000 trucks per year in 2014 to only 3,055 trucks in 2018. The border crossings at Baudette and Warroad have the highest truck volumes in District 2 with approximately 6,000 trucks per year at each. Decreases in truck border crossings can be attributed in part to reduced hours of operation at these locations. While Baudette and Warroad remain open 24 hours per day, hours at Roseau, Pinecreek, and Lancaster are generally limited to daytime and early evening.

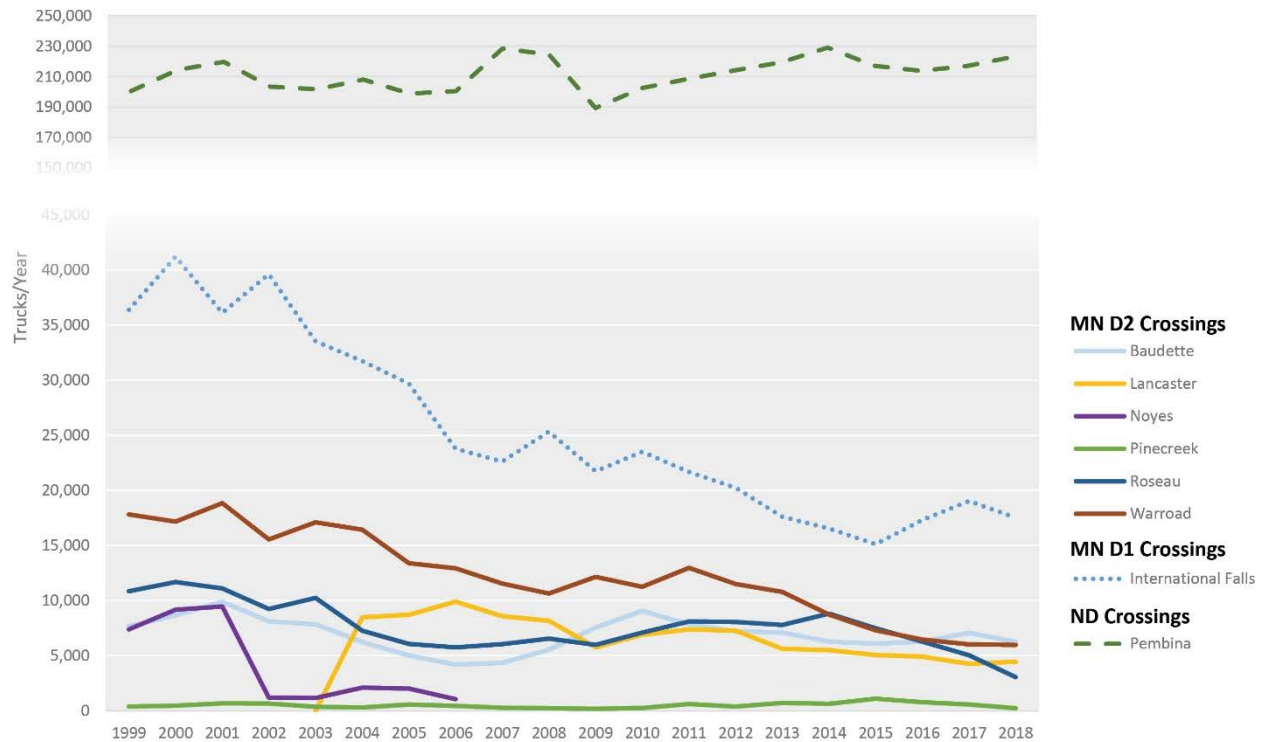


Figure 17: Historic Border Crossing Volumes (Trucks). Source: USDOT, 2018

Truck volumes are significantly higher at the two border crossings just outside of the District 2 boundary:

- The **Pembina, ND** crossing experiences over 220,000 trucks per year.
- The **International Falls, MN** crossing is the busiest crossing in Minnesota and handles approximately 17,000 trucks per year.

Each of these two major crossings is open 24/7 and provides a more direct link between the US Interstate system and the Canadian National Highway system. In particular, the I-29 approach to the Pembina crossing functions as a regional collector for freight movements throughout much of the upper Great Plains area. The Pembina crossing is also in the process of upgrading and expanding facilities through projects such as the reconfiguration of border crossing geometry and roadway approaches to better handle commercial vehicles, improvements to commercial inspection capacity, and renovation of buildings to house additional staff.⁴

In addition to commercial truck volumes, there is also substantial freight rail traffic between Minnesota and Canada. In contrast to the declining truck volumes in the region, the volume of containerized rail traffic has increased substantially in recent years (Figure 18). Ports of entry with rail service in District 2 include Warroad and Baudette. Each of these crossings is served by CN railroad’s Sprague subdivision.

⁴ Border Infrastructure Investment Plan, Canada – United States, December 2015.

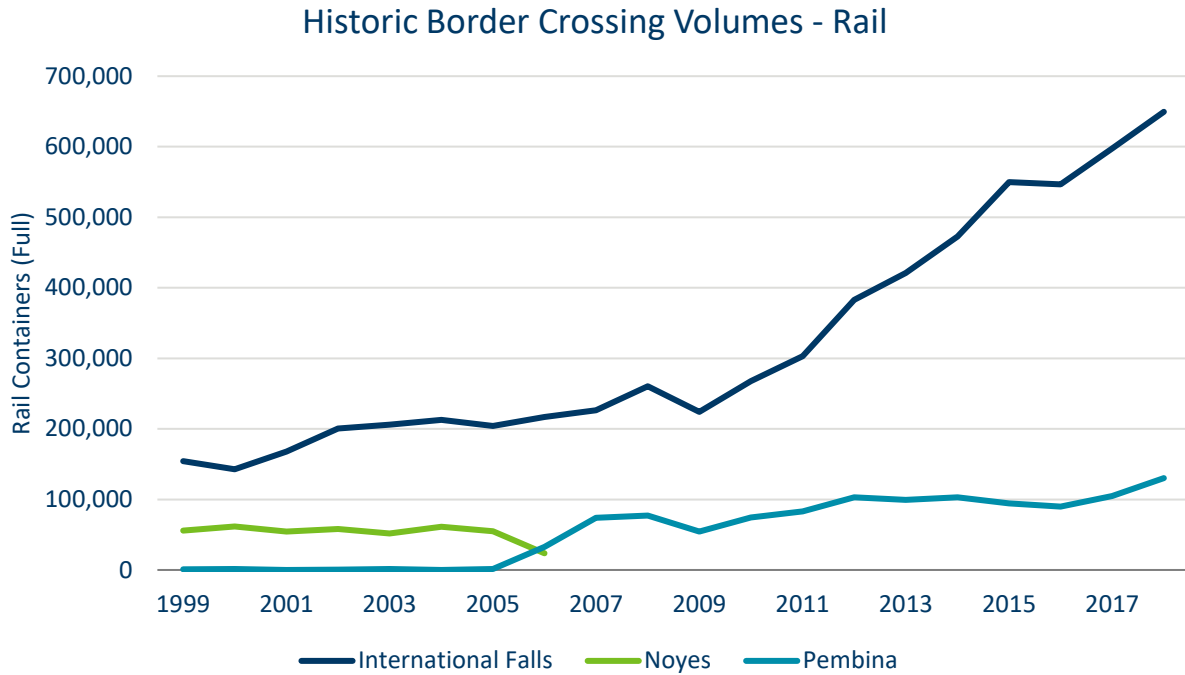


Figure 18: Historic Border Crossing Volumes (Rail Containers Full). Source: USDOT, 2018

This rail line is part of the critical intermodal link between the Port of Prince Rupert in British Columbia and CN’s intermodal rail hub in Chicago. This corridor provides access to key import and export markets in Asia and the Pacific region. Note that the Bureau of Transportation Statistics maintains statistics for the final CN border crossing located in International Falls, but does not maintain statistics for Warroad and Baudette.

Rail container volumes exceeded 600,000 at the International Falls crossing in 2018. Rail container volumes have also increased at the Pembina, ND crossing, with more than 100,000 rail containers in 2018. This crossing is served by the BNSF and CP (SOO) railroads.

In terms of the value of commodities being traded through the five ports of entry within District 2, more than half (61 percent) of the commodity value is related to the transport of Mineral Fuels: Oils and Waxes (Figure 19). This is followed by Computer-Related Machinery and Parts (11 percent) and Vehicles Other than Railway (10 percent).

Border crossings are critical to freight related businesses in District 2 as Canada is one of Minnesota’s largest trading partners. Providing adequate access to Canadian markets will be critical to ensuring the economic vitality of industries located in District 2.

Minnesota Border Crossing Value (\$ Millions) by Commodity

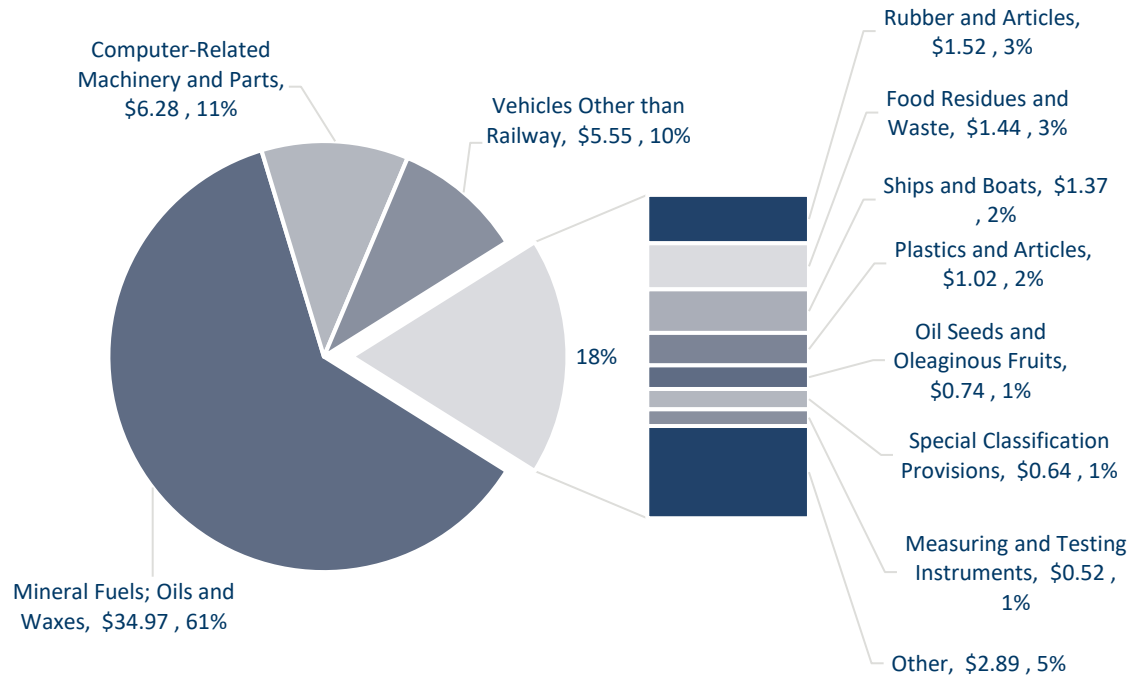


Figure 19: Minnesota Border Crossing Value by Commodity. Source: USDOT, 2018

Freight Mode: Highway

In MnDOT District 2, there are multiple US highways and state highways, but no interstates (Figure 22). The closest interstate is I-29, which extends along the western border of District 2 in North Dakota, and I-94, which extends along the southern border of the district through Fargo-Moorhead.

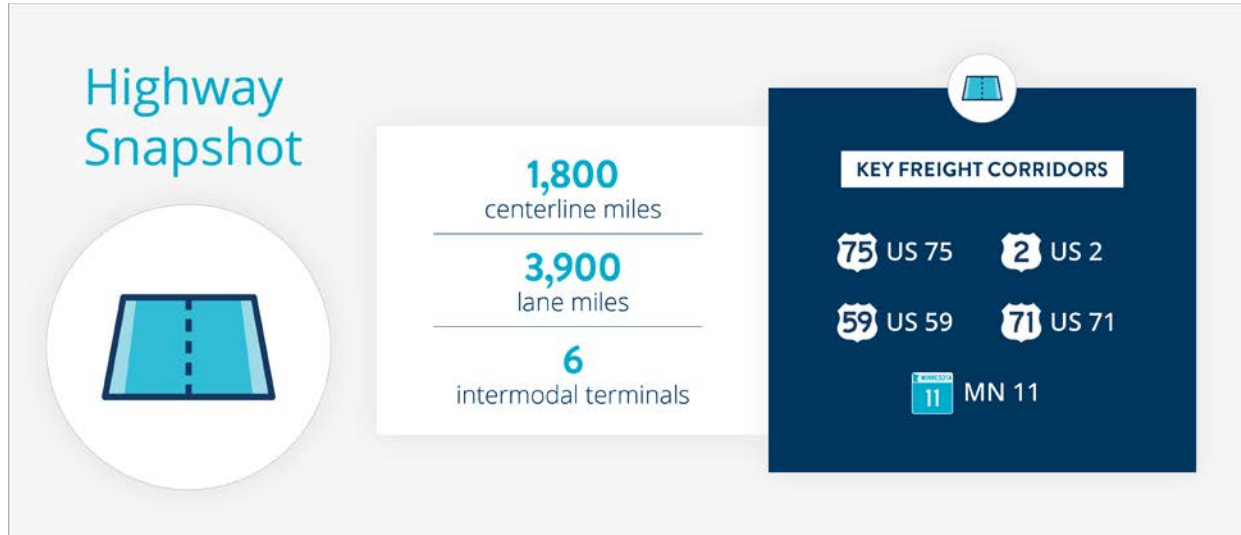


Figure 20: District 2 Highway Freight System Summary

According to the 2019 District 2 Fact Sheet, the district includes about 1,800 centerline miles and about 3,900 lane miles. District 2 experiences harsh winters and seasonal flooding in the Red River Valley, which contributes to challenges in keeping the extensive roadway system functioning and well-maintained throughout the year.

The district also includes six intermodal terminals distributed on key highway and railroad corridors. A majority of the highway freight movement is outbound (Figure 21), which corresponds to export-heavy industries in the district that have the largest location quotient, specifically Agriculture, Forestry, Fishing and Hunting.

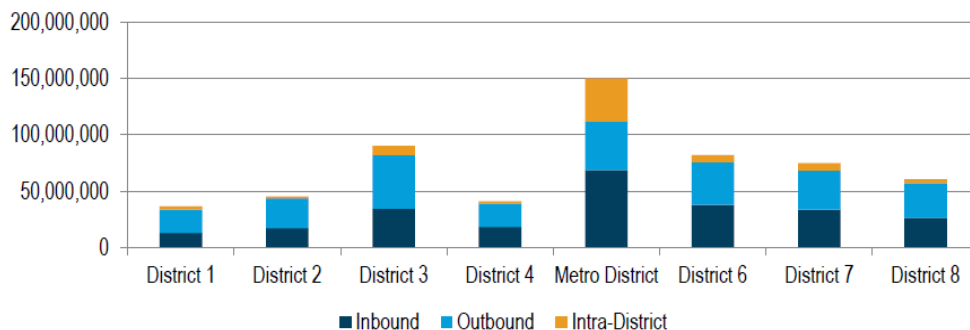


Figure 21: Truck Freight Flow by Direction, Tons, by District, 2012. Source: MnDOT "Statewide Freight System Plan" (2016).

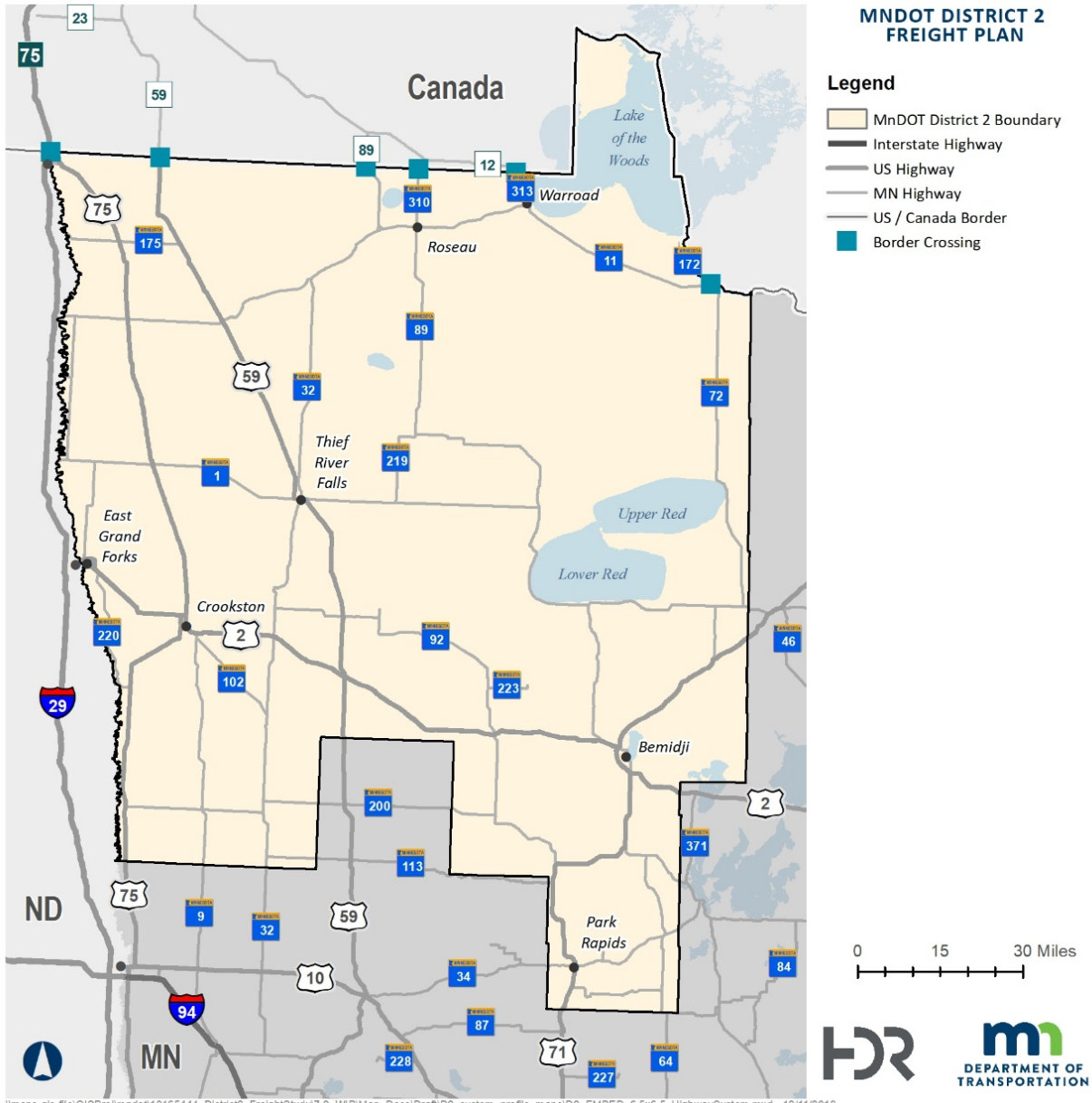


Figure 22: District 2 Highway System

Key Corridors

The following key highway corridors connect major population and freight employment centers within District 2 and also to other destinations including North Dakota, Canada, and statewide. Table 2 summarizes daily traffic volumes, including Heavy Commercial vehicles along the major corridors throughout District 2.

- **US 75** starts in the Northwest corner of the state (and District) and extends north/south through Crookston, Fargo, and to other destinations in western and southwestern Minnesota. US 75 also connects to Pembina, ND, a major border crossing into Canada via I-29
- **US 59** is a similar to US 75 as a parallel north/south route through the district extending through Thief River Falls, Fergus Falls, and to other destinations in western and southwestern Minnesota
- **US 2** connects Grand Forks with Bemidji and extends east/west across the state. US 2 connects with I-29 in Grand Forks. Other nearby destinations include Duluth and northern Wisconsin
- **US 71** is a north/south route that extends through the Pine Island State Forest and connects to Bemidji
- **TH 11** is an east/west route that connects the cities of Warroad, Roseau, and Donaldson

Compared with the rest of the state, District 2 generally has lower Heavy Commercial vehicle volumes. The majority of the key D2 corridors have Heavy Commercial Average Annual Daily Traffic (HCAADT) volumes between 50 and 500 vehicles per day (Figure 28). Short segments of roadway in Bemidji, East Grand Forks, and Park Rapids have HCAADT volumes exceeding 1,000 vehicles per day.

Table 2: Key Corridors in District 2

Route	Average Annual Daily Traffic (AADT) Range ⁵ (in D2)	Heavy Commercial Average Annual Daily Traffic (HCAADT) Range ⁶ (in D2)	Average Percent HCAADT (by segment in D2)
US 75	470 – 3,950	50 - 450	15 percent
US 59	330 – 10,100	35 – 140	6 percent
US 2	2,600 – 18,700	225 – 1,300	9 percent
US 71	1,200 – 10,200	115 – 710	9 percent
MN TH 11	640 – 8,200	105 – 840	11 percent

⁵ MnDOT 2017 Counts

⁶ MnDOT 2017 Counts

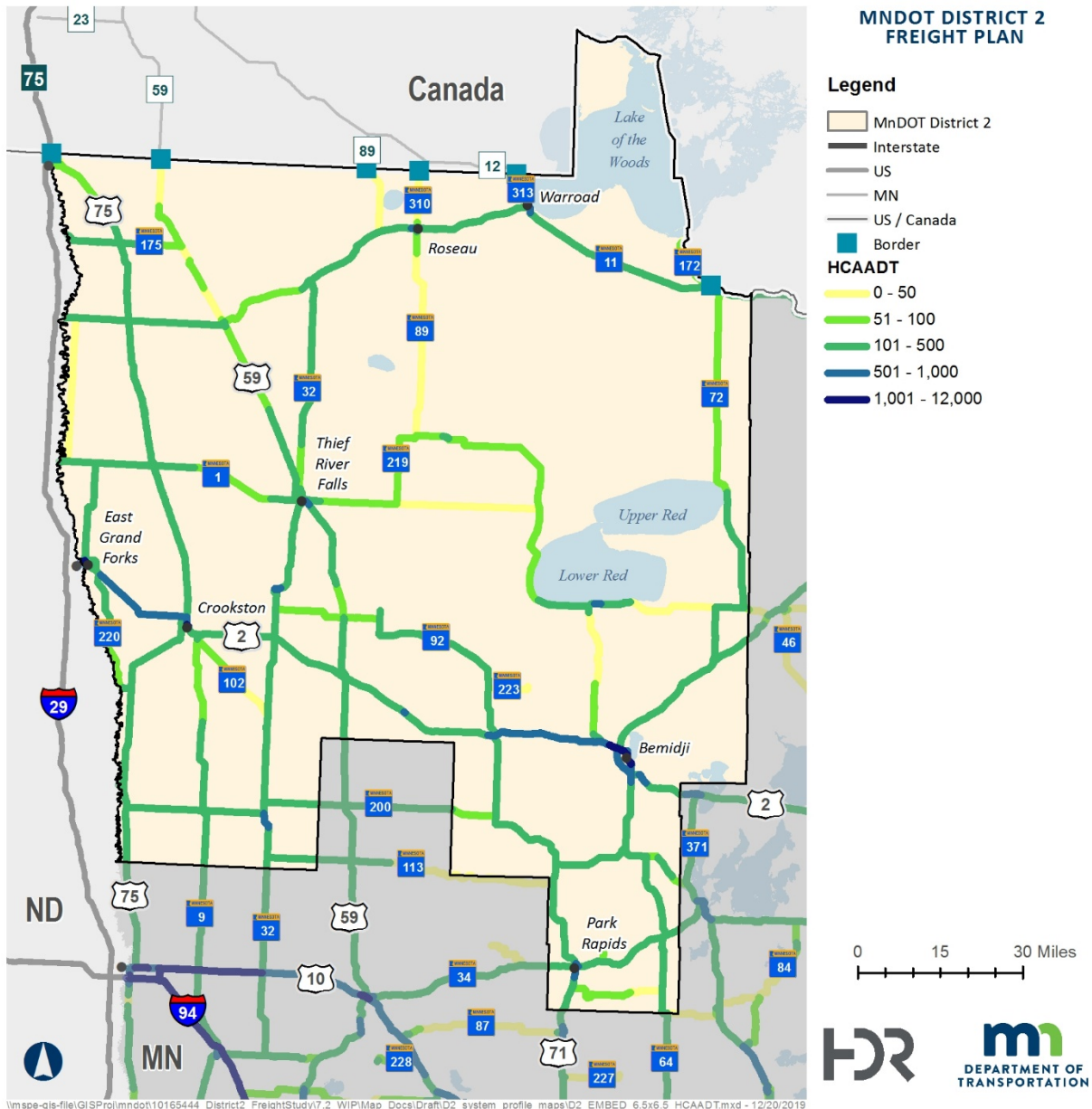


Figure 23: Heavy Commercial Average Annual Daily Traffic

Truck Origin/Destination Analysis

StreetLight Insight was used to analyze trip origin and destination patterns for District 2. StreetLight software utilizes cell phone location-based services data for personal vehicle traffic and INRIX truck GPS navigational data for truck trips (motor vehicles 14,000 lbs. or greater). The StreetLight Trip Index was the output type used to analyze origin and destination patterns. It can be used to measure the relative volume of trip activity, but does not estimate an actual count of trips or vehicles. Note also that the StreetLight Index values cannot be compared between countries due to varying sampling rates and analysis methodologies. Therefore, this analysis cannot provide a direct comparison of trips starting/ending in the US vs. trips starting/ending in Canada.

The data was aggregated to a census block group level for 2018 US truck activity and dissemination areas for Canadian truck activity. Since the data was aggregated at the relatively small geographic level, it is expected to show a low percentage of trip volume for any given block group.

- District 2 Origin Truck Trips:** Figure 24 shows the destinations of trips that originated in District 2. One key finding is that 75 percent of trips starting within D2 also end in D2, highlighting the large volume of local truck traffic. Trip destinations outside of D2 extend throughout the Midwest, primarily in northern Minnesota, North Dakota, and portions of Wisconsin and South Dakota. For trips originating in District 2 and travelling to Canada, more than half end near the CP Intermodal Yard in Winnipeg. Other Canadian areas with large proportions of trips are the Emerson area (opposite Pembina/Noyes) and Morris, a city on Canadian Highway 75 between Pembina and Winnipeg.
- District 2 Destination Truck Trips:** Figure 25 shows the origins of trips that end in District 2. As noted above, 75 percent of trips ending in District 2 also begin their trip within the district. The distribution of trip origins largely matches the distribution of trip destination discussed above. Trucks originating in Canada predominantly come from areas near Winnipeg, Winkler (a city west of Morris), and Rainy River (opposite Baudette, MN).

Of the trip volumes identified in the StreetLight data, 99 percent of block groups with trip volume either originating or ending in District 2 do not extend beyond the Midwest (extent shown on figures including Montana and Missouri). With a majority of truck freight trips for District 2 operating in the Midwest, some of the key corridors that support District 2’s freight related movement are outside of the district: I-29, I-90, I-94, and US 2.

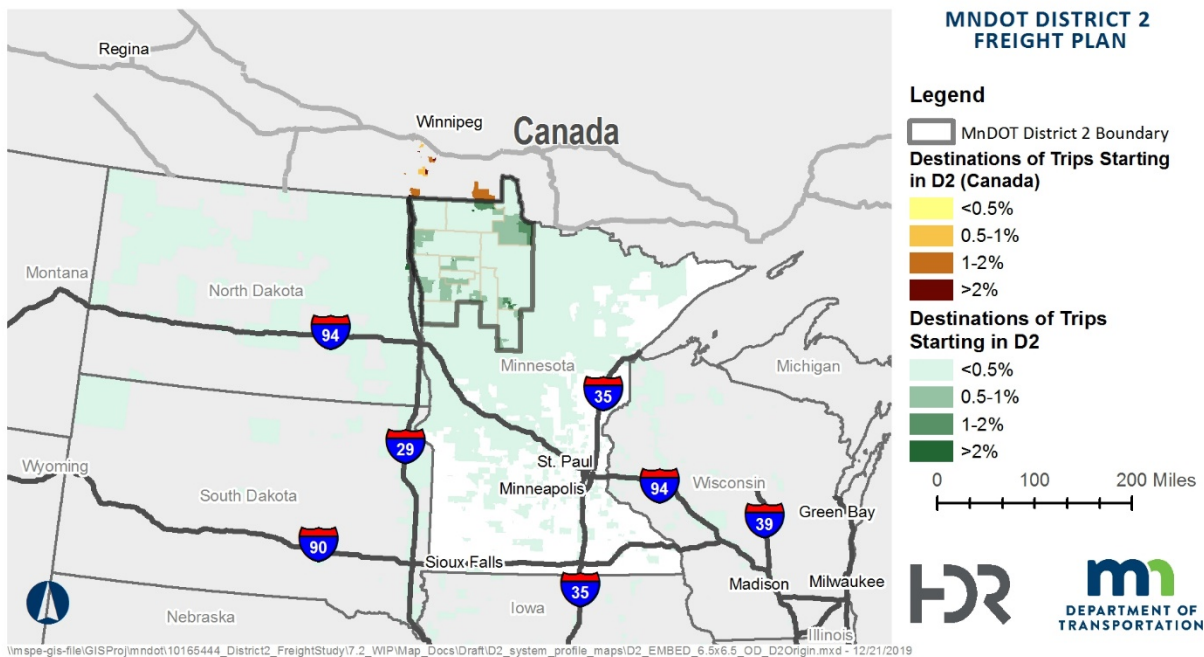


Figure 24: Destinations of Freight Trips Originating in District 2

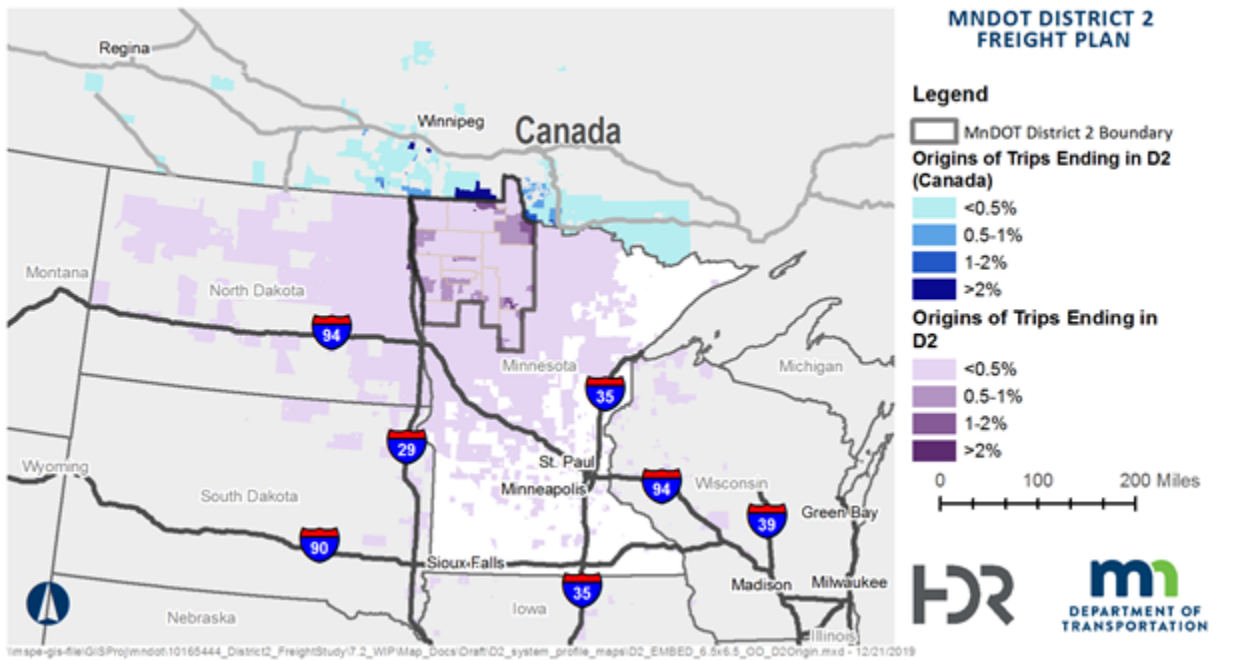


Figure 25: Origins of Freight Trips Ending in District 2

Truck Travel Time Reliability

StreetLight Insight data was also used to assess Truck Travel Time Reliability (TTTR) along roadways throughout District 2. TTTR is a federal performance measure primarily targeted towards an assessment of conditions on the Interstate Highway System. TTTR on a roadway segment is defined as the ratio between the 95th percentile travel speed (representing traffic when it is slow and congested) and the 50th percentile speed (representing average traffic conditions). A higher TTTR value indicates more variability in travel time, and therefore less reliability. A TTTR of 1.0 indicates a roadway segment that never varies in travel time (very reliable) while a TTTR of 2.0 indicates a roadway segment where the travel times during the slowest conditions are twice as slow as on average (less reliable).

Travel time reliability is an especially important performance measure for commercial truck trips, in some cases being more important than overall travel speeds. If a truck travels on a roadway segment that is not reliable, this often means the trucking company will have to choose between leaving “on-time” and risking a late delivery, or leaving early and potentially wasting potentially productive time while they wait for their destination location to open for business.

In applying TTTR measures to non-interstate roadways, it is important to note that the measure can be heavily influenced by both low trip sample counts in the data and by short roadway segments which often have more variable speeds than longer sections of access-controlled highways. For this reason, this analysis excluded all roadway segments with fewer than 100 trip samples recorded over the analysis period (year 2018) and roadway segments less than one quarter-mile.

The results of this analysis are shown in Figure 26. The analysis found that the majority of roadways throughout District 2 exhibit TTTR values between 1.0 and 2.0, indicating that travel time reliability is not a major issues on these routes. Some areas which exhibit higher TTTR values include US 75 south of Pembina, and some short segments of roads in the Bemidji area.

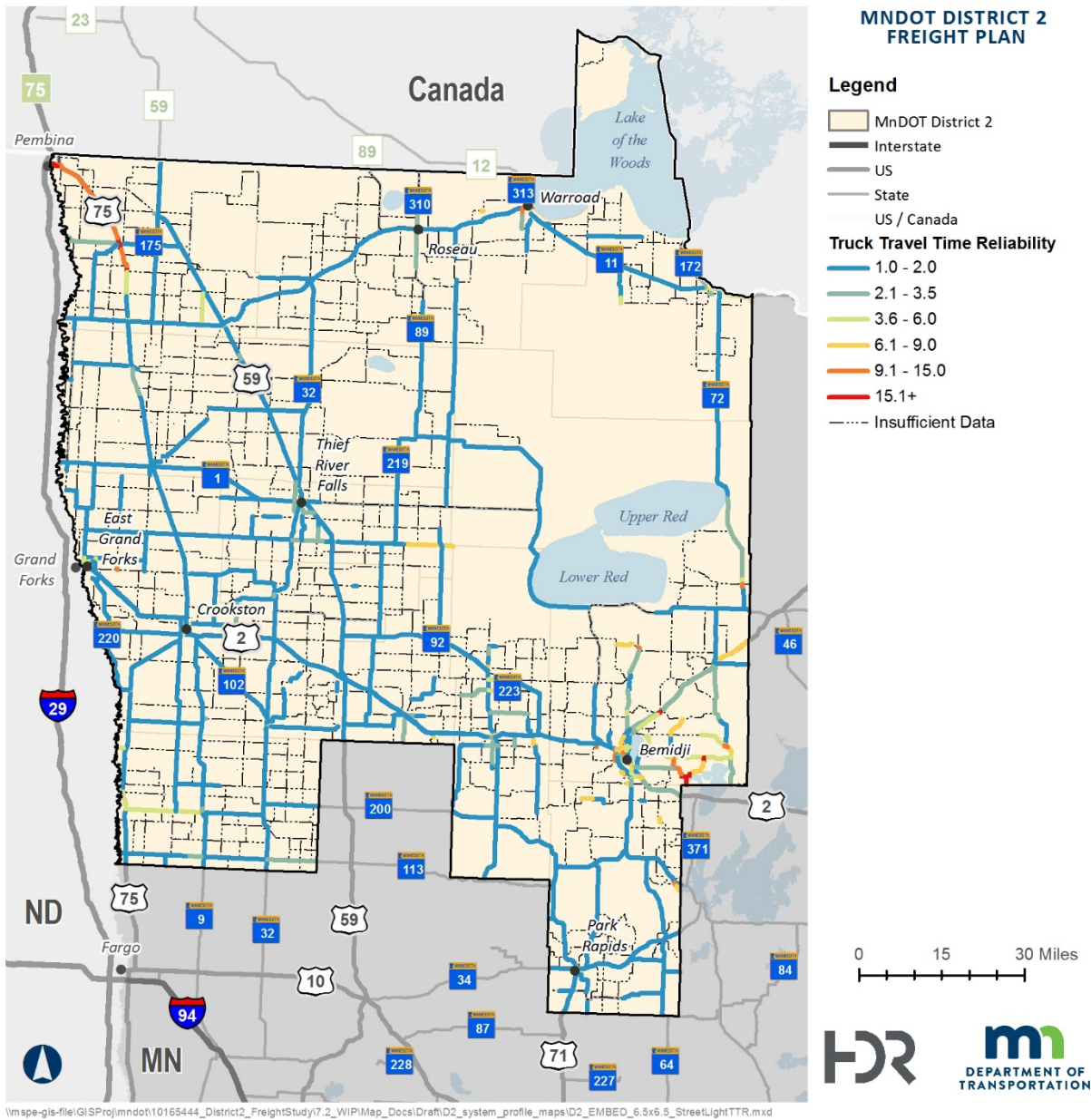


Figure 26: Truck Travel Time Reliability

Critical Urban/Rural Freight Corridors

Critical urban and rural freight corridors have been identified by MnDOT in accordance with the Fixing America's Surface Transportation (FAST) Act. Minnesota may designate up to 75 miles of urban corridors and 150 miles of rural corridors for eligible federal freight funding.

These roadways are non-interstate roadways with a demonstrated freight need that were designated by the freight investment plan advisory group. Figure 27 shows Minnesota's critical urban and rural freight corridors, however, none have been designated in District 2. A few National Truck Network routes are designated in District 2: MN TH 1, MN TH 11, MN TH 32, MN TH 34, MN TH 220, MN TH 175, US 2, US 71, US 75, and US 59.

These corridors are located along routes where selected transportation projects from the Minnesota Highway Freight Program have been selected. Within the Minnesota State Freight System and Investment Plan, MnDOT committed to updating these corridors as new projects are identified. The designation of a roadway as a critical corridor is not permanent and does not imply special status under this current framework.

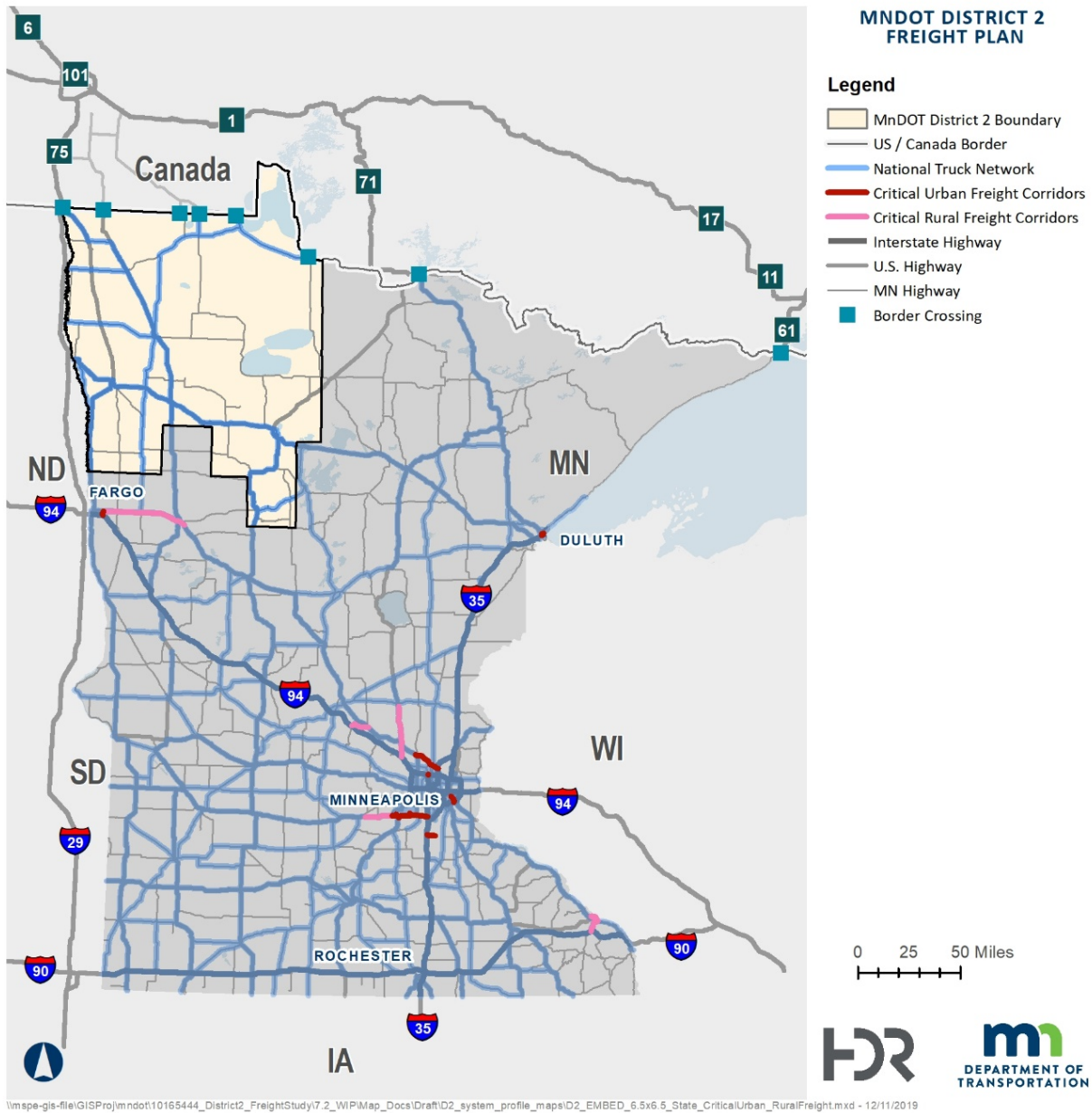


Figure 27: Critical Urban and Rural Freight Corridors

Bridges and Superload Corridors

District 2 has very few roadway bridges overall, with the largest concentration in Bemidji (Figure 28). Only two bridges are considered to have a low clearance (less than 14 feet, six inches). These are both railroad bridges located on local roads in the southern portion of the District. Many of the bridges in the District have a relatively high clearance (more than 16 feet, 6 inches), making them ideal for handling oversize/overweight (OSOW) and superloads. MnDOT's designated Superload Corridors are shown on the map below. Superload corridors provide key connections across the district for oversized loads between Thief River Falls, Grand Forks, Crookston, and Bemidji.

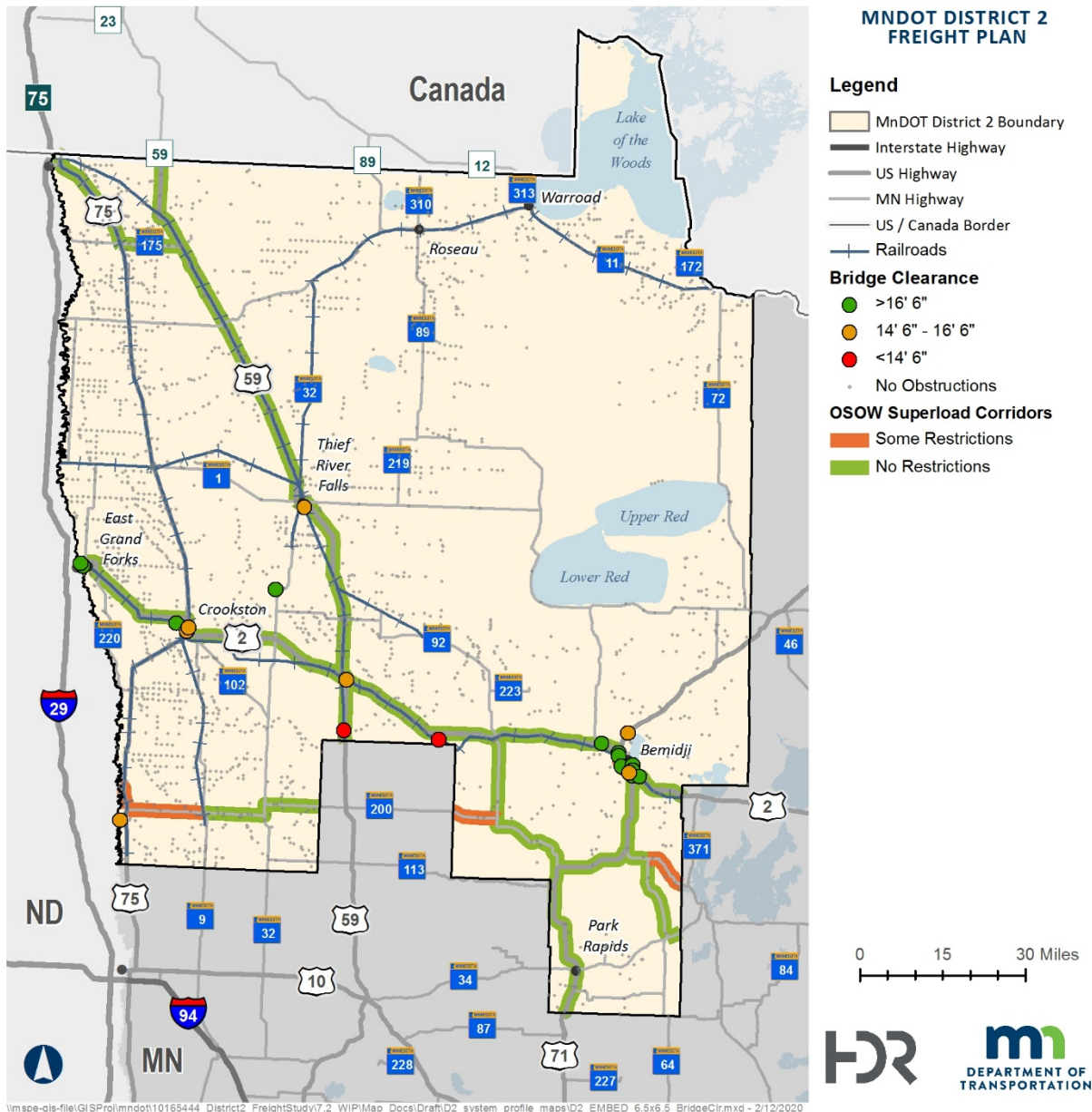


Figure 28: Bridge Clearance and OSOW/Superload corridors. Source: MnDOT Superload Corridors; MnDOT Bridge Office

Pavement Condition

MnDOT's Asset Management group maintains annual reporting on pavement condition throughout the state. Figure 29 shows the 2018 Pavement Quality Index within District 2. Most of the roadways are in "Good" condition, with a few in "Fair" condition including: MN TH 32, MN TH 11, MN TH 87, US 2 EB, and US 71.

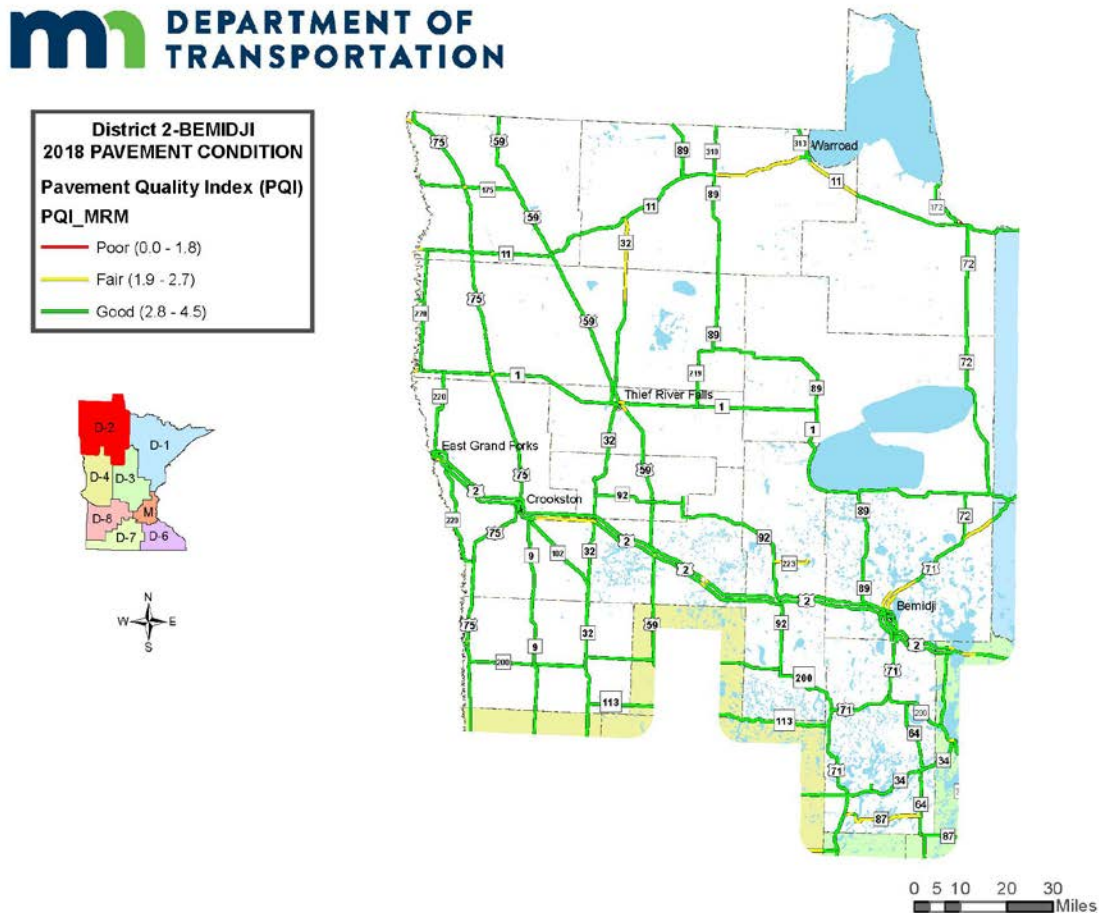


Figure 29: District 2 Pavement Quality Index (PQI) 2018

Weigh Stations

District 2 includes one weigh station in Erskine, MN on US 2 (Figure 35). MnDOT and Minnesota Department of Public Safety are responsible for enforcing the commercial motor vehicle size, weight, and safety program⁷. Three weigh-in-motion (WIM) sites are also located in District 2: Site 31 on US 2 east of Grand Forks, Site 41 on CSAH 14 south of Crookston, and Site 35 on US 2 west of Bemidji. Additional weight enforcement facilities were identified as a need in District 2, including near Warroad on MN TH 11.

⁷ MnDOT "Minnesota Weight Enforcement Investment Plan." (2018) (<http://www.dot.state.mn.us/ofrw/weightplan/pdf/WEIP.pdf>)

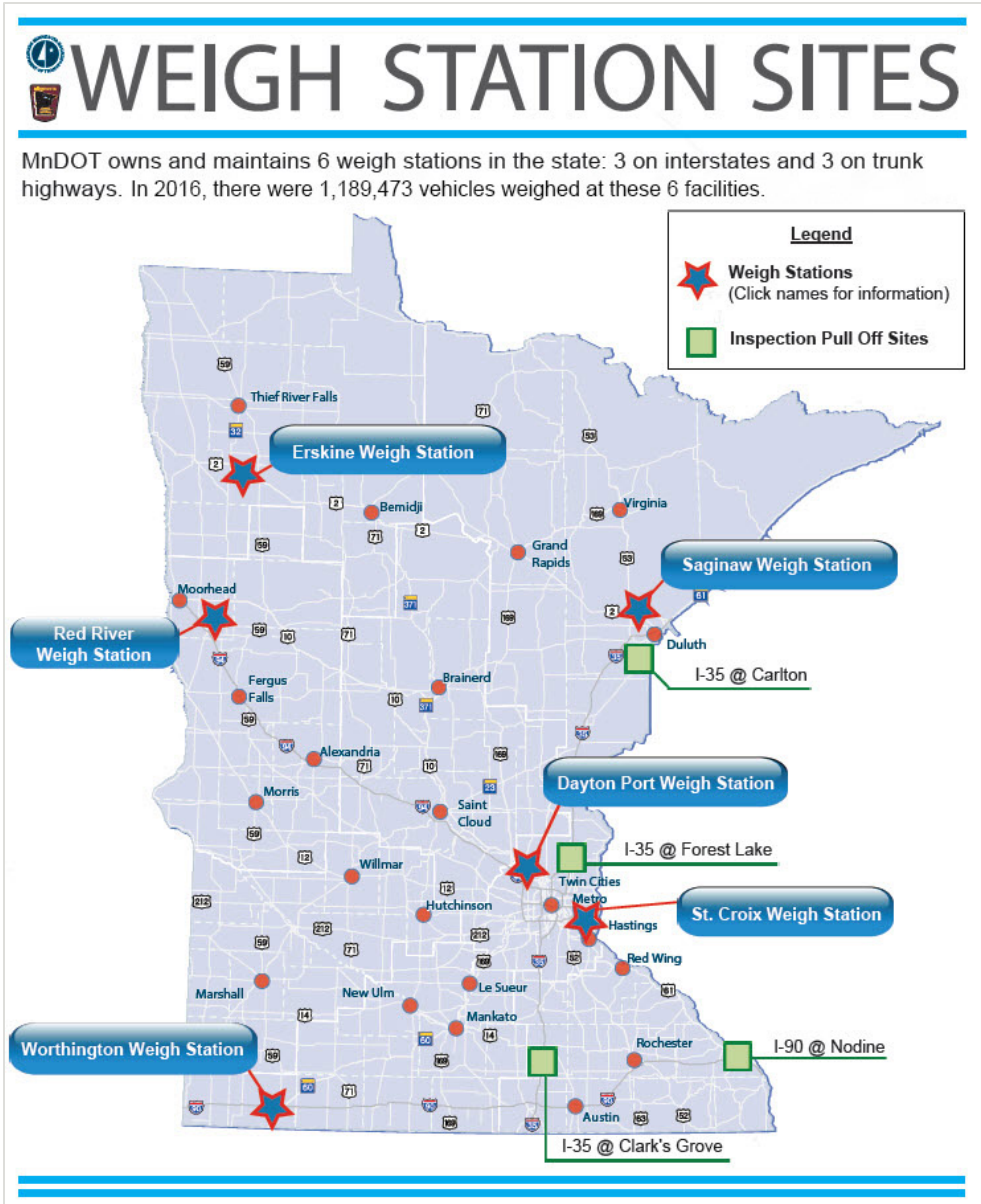


Figure 30: Weigh Stations in Minnesota

Truck Parking

MnDOT published the Statewide Truck Parking Study in 2019, identifying existing truck parking areas and estimated demand for truck parking. Figure 31 from the report shows mostly private truck stops within District 2 with capacities of approximately 100 trucks. Three public rest areas are located in the district in Erskine, Park Rapids, and Fisher, MN. Figure 32 shows minimal demand for truck parking in District 2.

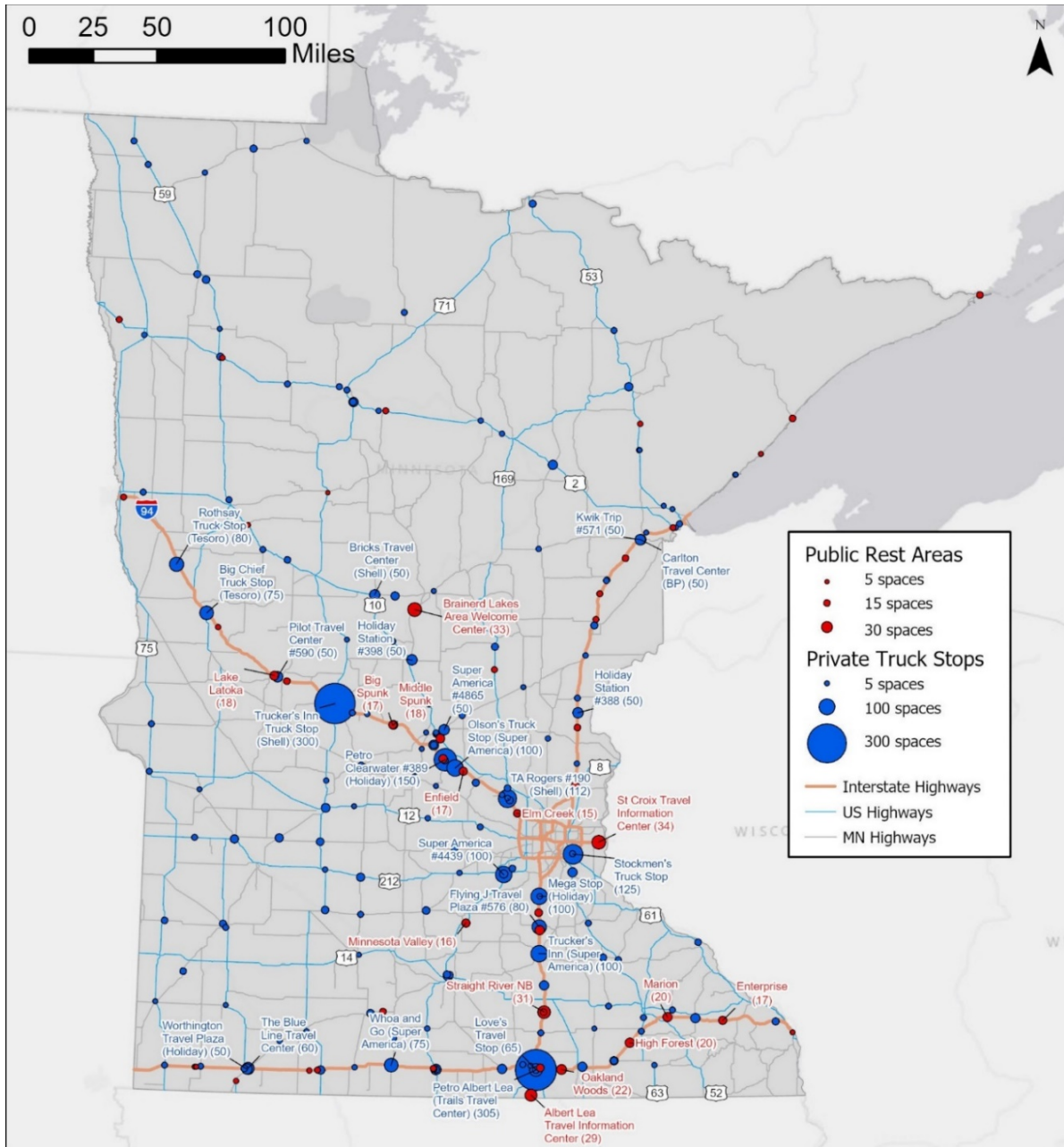


Figure 31: Statewide Truck Parking and Rest Stops. Source: Minnesota Truck Parking Study

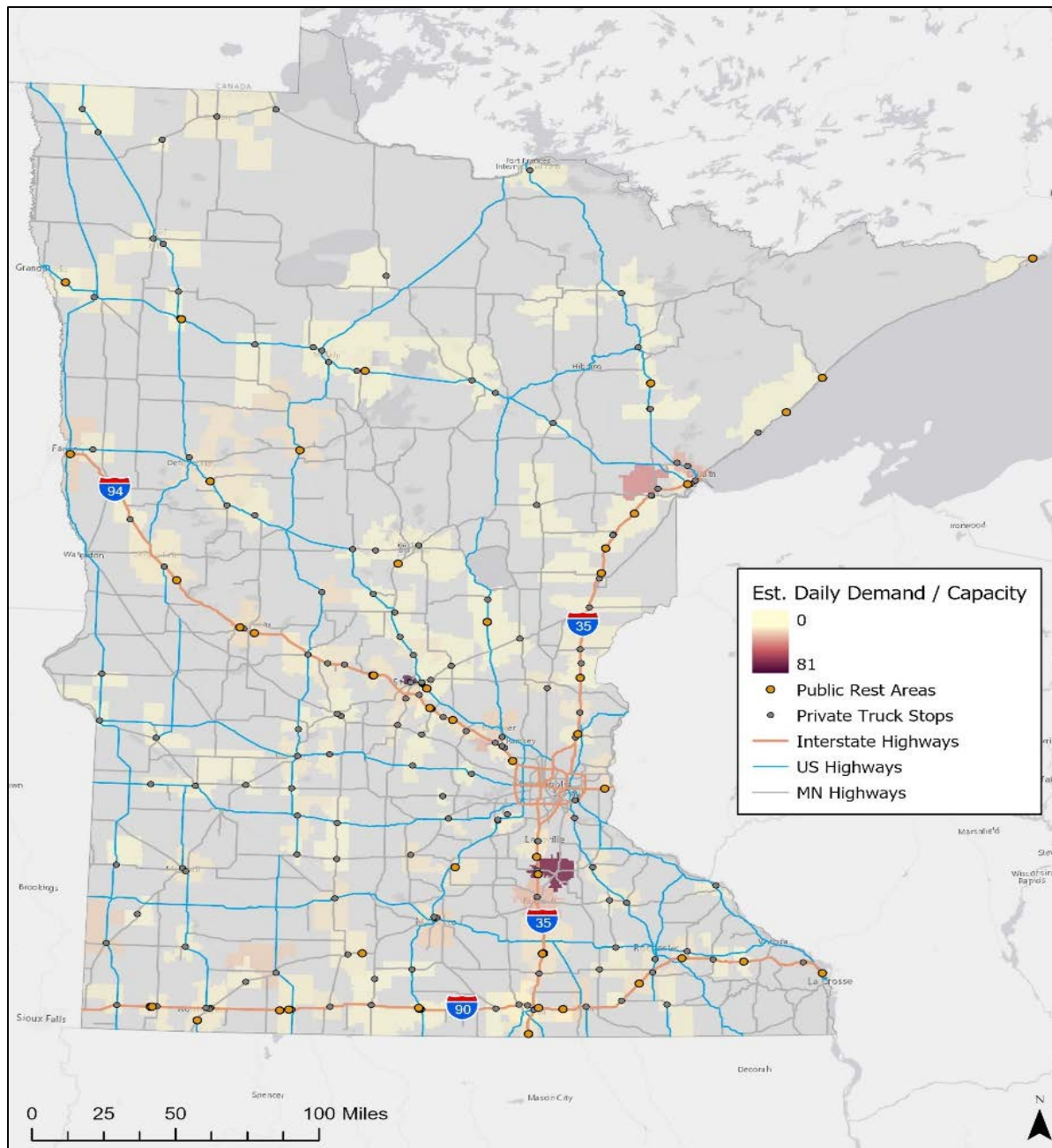


Figure 32: Truck Parking Demand. Source: Minnesota Truck Parking Study analysis of 2015 Jason’s Law Survey, 2017 Trucker’s Friend National Truck Stop Directory, NATSO Park My Truck app, TA-Petro TruckSmart app, Pilot-Flying J myPilot app and Trucker Path app data

Freight Mode: Railroad

Rail plays a crucial role in District 2’s movement of goods coming from the Bakken in North Dakota, heading to and from destinations such as the Twin Cities and across the nation. There are three Class 1 operators in District 2: BNSF, CN and CP (SOO). Class 3 operators include MNN and NPR (Figure 35). These lines run parallel to US highway routes US 75, US 59, and US 2.

Railroad	Miles	At Grade Crossings
BNSF	243	214
CP(SOO)	169	157
CN	43	48
MNN	110	138
NPR	45	51
Abandoned Track ⁸	65	10
Total	675	718

Figure 33: Railroad Miles in District 2 by Railroad Operator (Source FRA)



Figure 34: District 2 Railroad Freight System Summary

⁸ Note: Abandoned track locations were informed by the stakeholder Policy Advisory Committee.

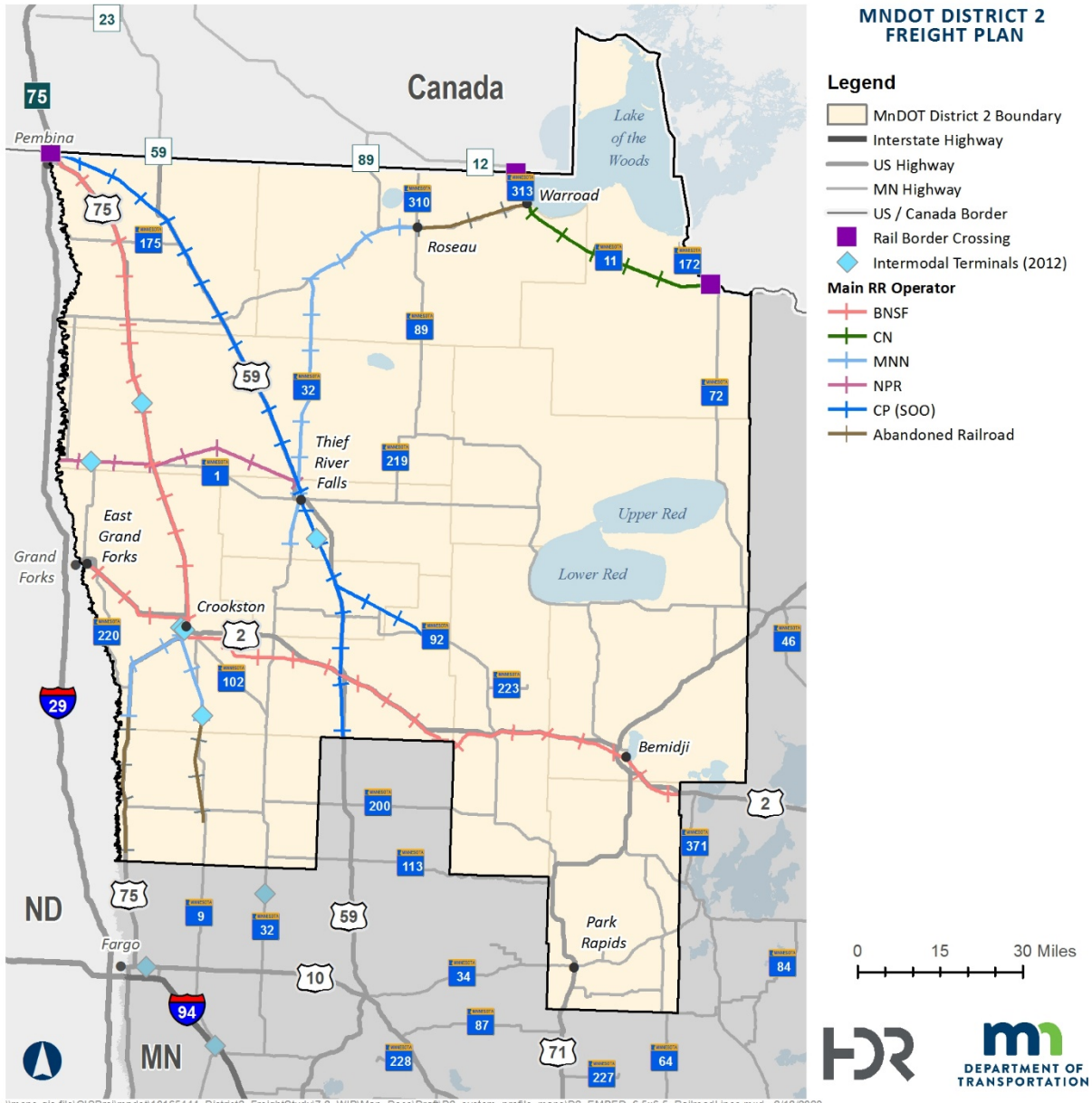


Figure 35: Railroad Lines in District 2

Rail Average Daily Traffic

Of the 718 at-grade rail crossings, the highest volume is concentrated on the CN line in the northern portion of the district. This line accommodates up to 18 trains per day (Figure 36) and also has the highest speeds, with trains traveling up to 60 mph through crossings (Figure 37).

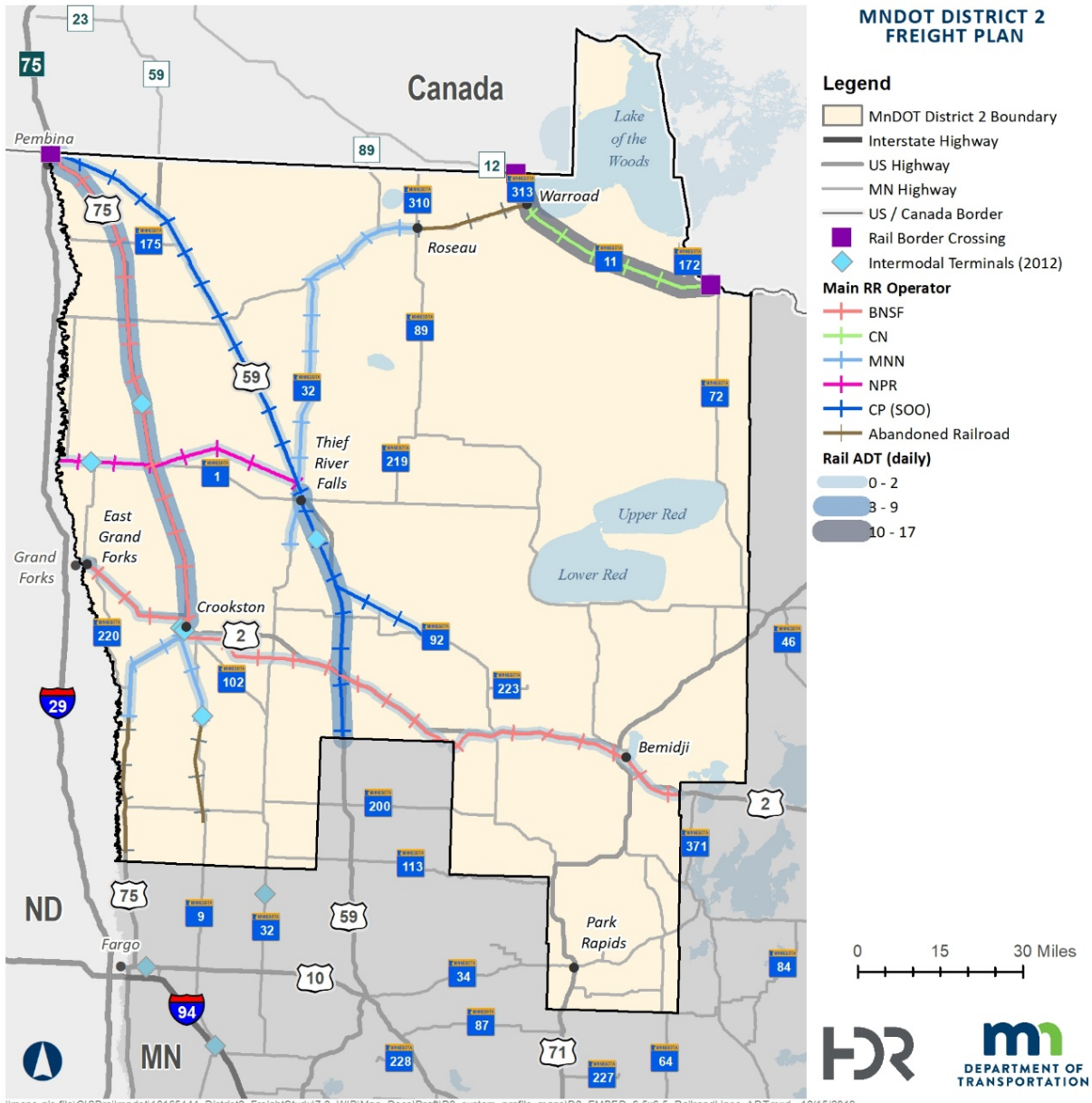


Figure 36: Rail Average Daily Traffic by Crossing

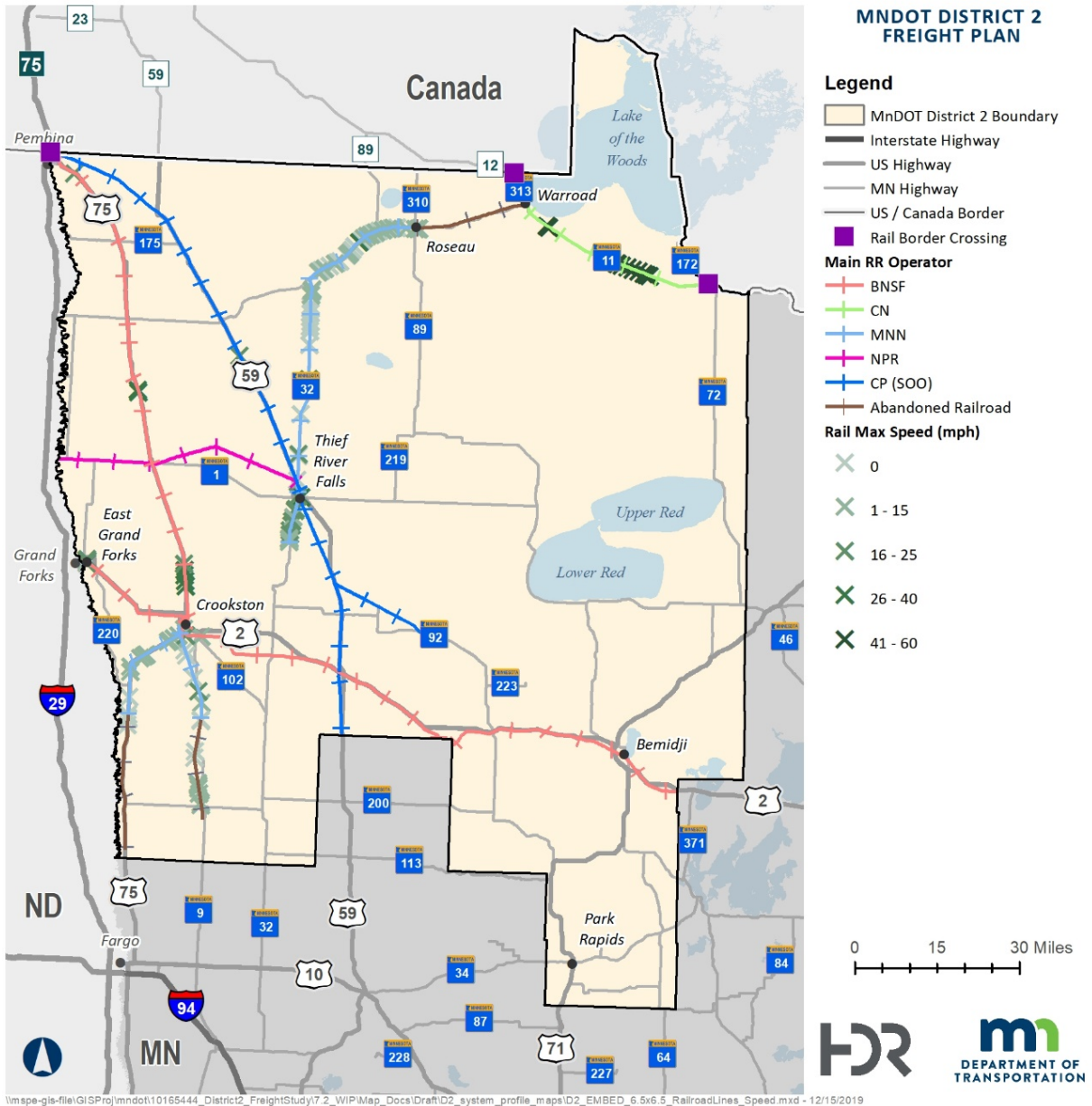


Figure 37: Rail Speed at Crossings

Rail Vertical Clearance

Minimum vertical clearance for railroad bridges is typically 23 feet above the track. Figure 37 displays clearance information for rail bridges in District 2. The BNSF line extending from Crookston to Bemidji has several bridges that are less than 23 feet high. The remaining rail lines do not have any rail bridges within the District.

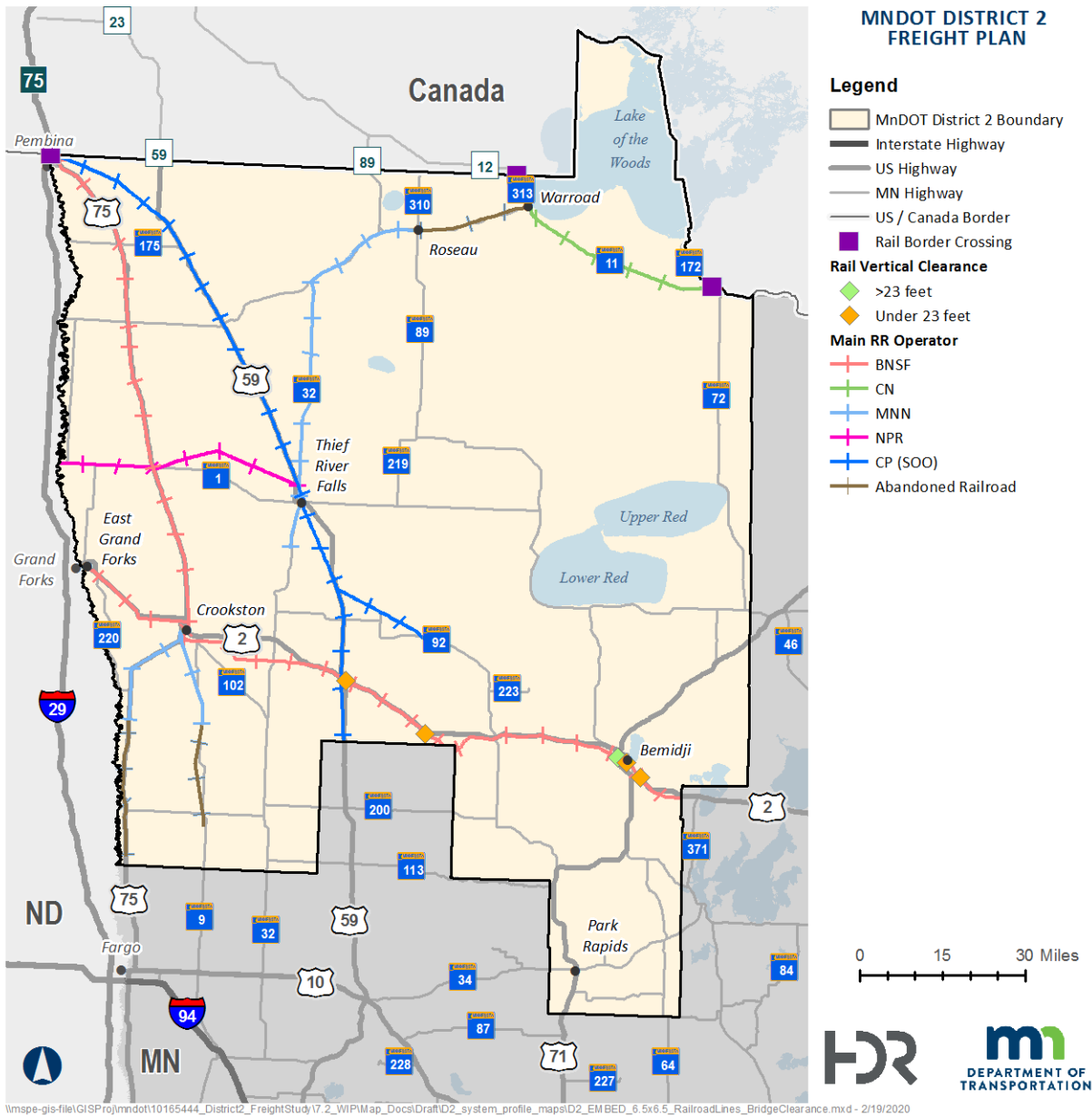


Figure 38: Rail/Roadway vertical clearance bridges

Intermodal

District 2 has six intermodal terminals in the district, including five grain shuttle terminals, and one pipeline terminal (Figure 39). These connection points play a critical role in providing the ability to move freight efficiently and cost-effectively. In particular, the grain shuttle terminals are key components for District 2, allowing agricultural products to be shipped via rail throughout the country. These facilities and the roadways connecting to them are susceptible to large seasonal fluctuations in demand and congestion, typically peaking around the fall harvest season. Major shippers in District 2 include companies such as American Crystal Sugar Company.

Table 3: Intermodal Terminals (2012) Source: MnDOT

Name	City	State	County	Type	Commodities	Roadway	Rail
Magellan Pipeline	Crookston	MN	Polk	Pipeline Terminal	Oil Products	US 75	BNSF
Solar Gas	Mentor	MN	Polk	Pipeline Terminal	Oil Products	US 2	BNSF
Farmers Elevator Co. of Alvarado	Alvarado	MN	Marshall	Grain Shuttle Terminal	Wheat, barley, soybeans, sunflower seed, corn	MN 1	NPR
Markit County Grain, LLC	Argyle	MN	Marshall	Grain Shuttle Terminal	Corn, soybeans, wheat	US 75	BNSF
Northwest Grain	Hazel	MN	Pennington	Grain Shuttle Terminal	Wheat, soybeans, corn	MN 32, 3rd St E	CP
Beltrami Farmers Elevator	Beltrami	MN	Polk	Grain Shuttle Terminal	Wheat, soybeans, corn	MN 9 (Atlantic Ave)	MNN
Mid Valley Grain Co-Op	Crookston	MN	Polk	Grain Shuttle Terminal	Corn, soybeans, wheat	US 2, Fairfax Ave, 3rd Ave S, S Main St	BNSF

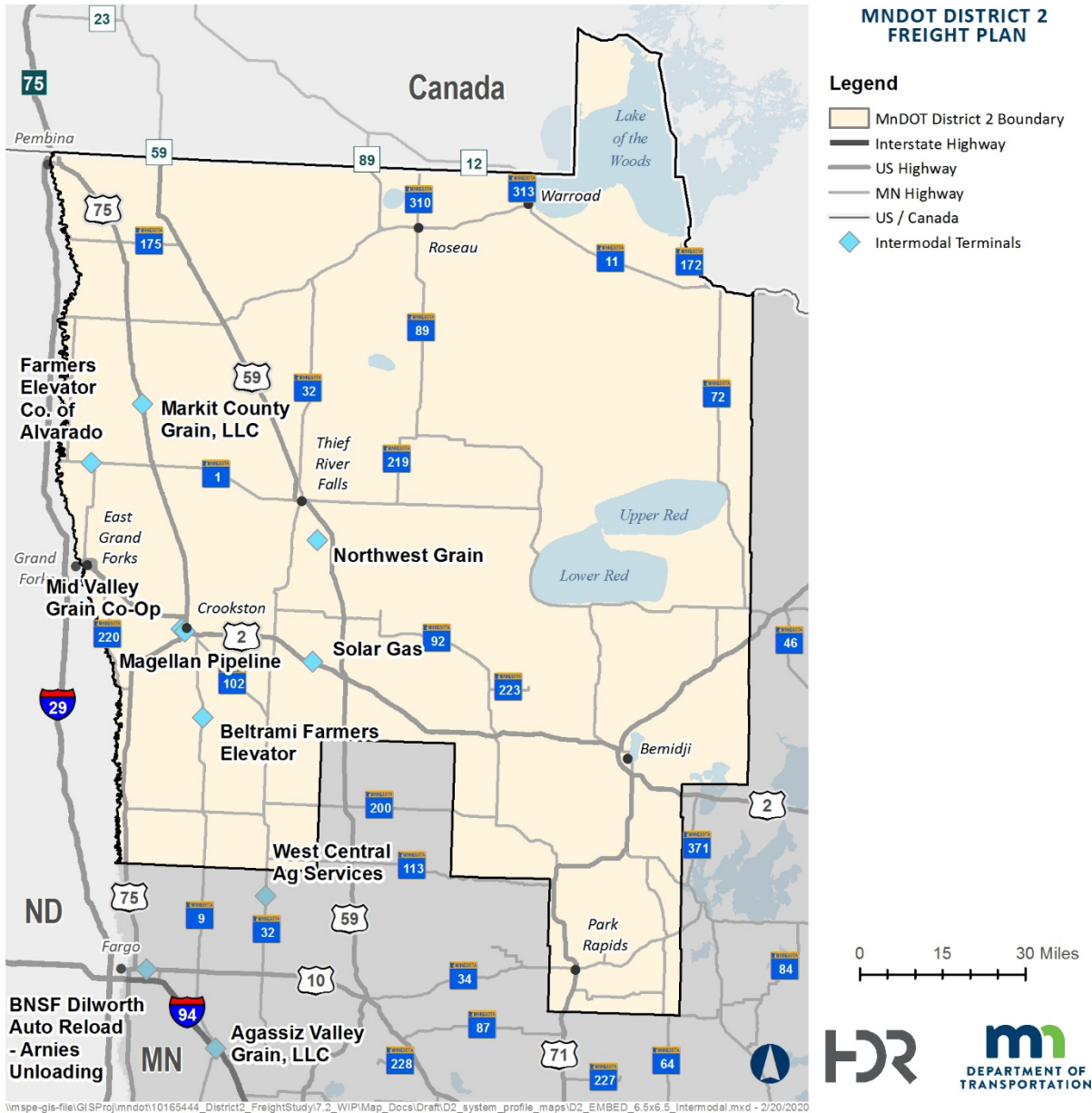


Figure 39: Intermodal Terminals. Source: MnDOT 2012

Freight Mode: Water

There are no direct access points to navigable waterways in District 2. However, access to these facilities may be gained via other modes:

- Access to the **Port of Duluth-Superior** and the **Great Lakes Waterway** system can be reached by truck, predominantly via US-2. BNSF and CN railroads also have rail terminals at this port. Taconite accounts for more than two-thirds of this ports freight tonnage, followed by coal and other commodities such as grain, salt, and wind generator components.⁹

⁹ MnDOT Commercial Waterways: <https://www.dot.state.mn.us/ofrw/waterways/commercial.html>

- Access to the barge terminals on the **Mississippi River System** can be accessed by truck, primarily via I-94 or US-10. Rail access is provided at some locations, notably the Red Rock River Terminal which provides access to the CP rail system.

While the District is landlocked from the Great Lakes and other major navigable waterways, water-based freight transportation still plays a major role in District 2’s economy. As an example, the Mississippi River system accounts for more than 50 percent of Minnesota’s agricultural exports.

Freight Mode: Aviation

Freight aviation in District 2 is growing for both cargo and commercial use. Airports with cargo service are located in Thief River Falls and Bemidji. Both airports have seen substantial growth in in recent years. In the five years from 2013 to 2018, the volume of freight shipped out of the Bemidji airport grew 24 percent while the volume of freight shipped out of the Thief River Falls airport grew 305 percent.

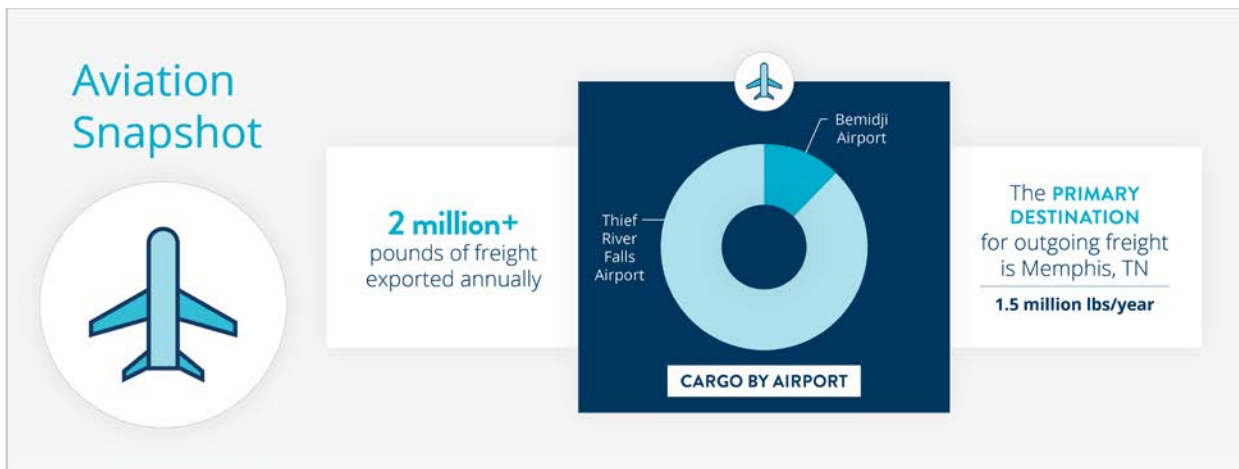


Figure 40: District 2 Aviation Freight System Summary

Much of this growth is driven by local businesses such as DigiKey, an online-based electronic component distributor which uses air freight services to fulfill their e-commerce orders. The highest air freight volumes being shipped from District 2 airports are between Thief River Falls and Memphis, Tennessee with nearly 1.5 million pounds of freight shipments in 2018. The majority of this freight can likely be attributed to FedEx shipments traveling to and from the FedEx freight hub in Memphis. In recent years, air freight shipments from the District 2 airports have also increased to airports in Des Moines, Fargo, Little Rock, and Minneapolis-St. Paul. These shipments appear to be associated with small cargo aircraft feeder flights operating on behalf of UPS and FedEx to connect with regional airport hubs.

Table 4: Freight Exported from District 2 Airports (Lbs. Annually), Source: HDR analysis of BTS T-100 dataset

Origin	Brainerd	Des Moines	Fargo	Little Rock	Memphis	Minneapolis-St. Paul	St. Louis	Total
Bemidji	15,202		333,516			75,533		242,251
Thief River Falls		41,112	198,008	5,729	1,480,026	2,473	5,041	1,732,389
TOTAL								2,156,640

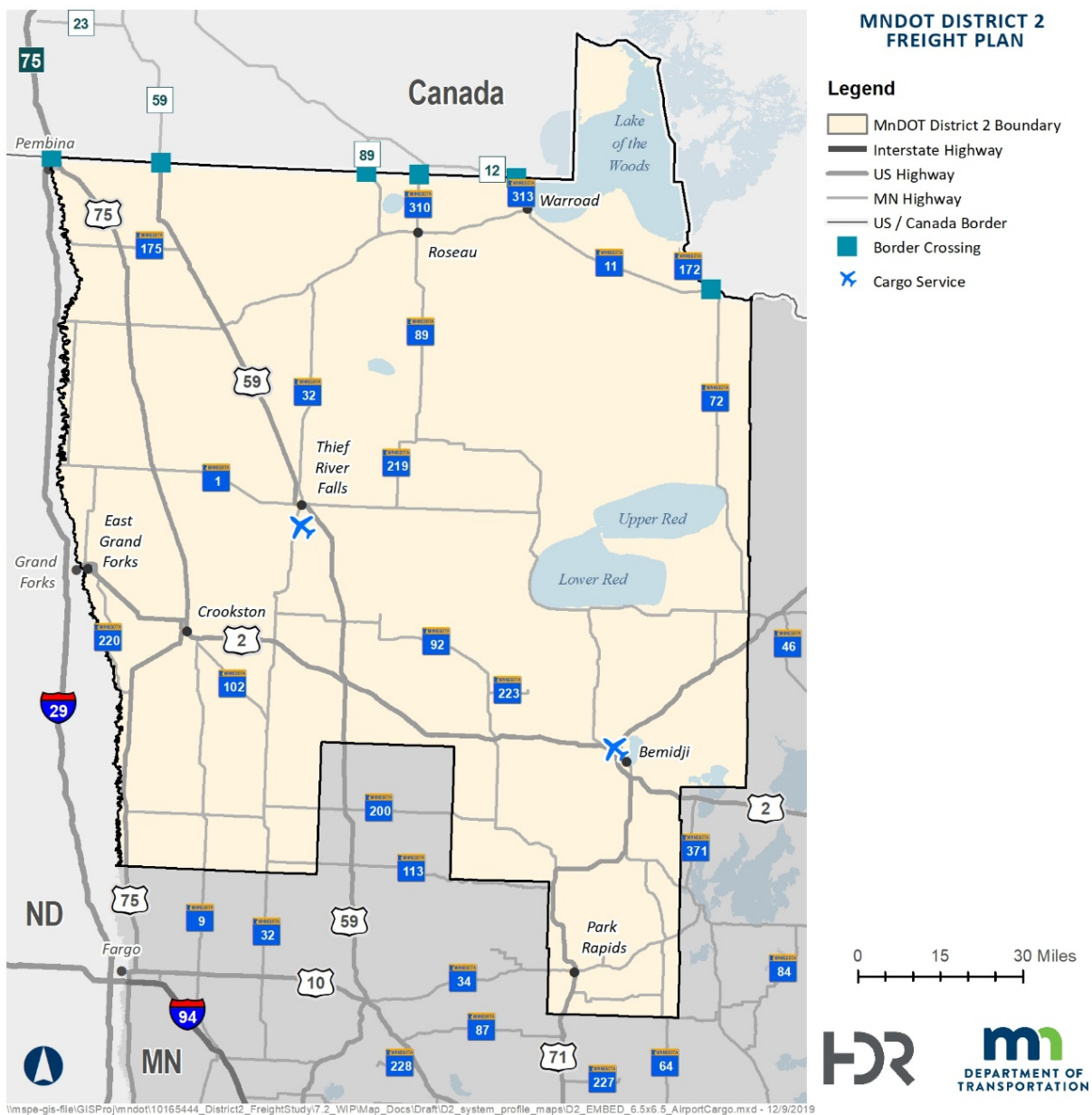


Figure 41: District 2 Airports with Cargo Service

District 2’s airports play a key role in allowing local industries to access regional, national and international markets via the integrator networks. Ensuring that the freight capacity of these airports can keep up with the rapidly rising demand will be an important step in maintaining economic competitiveness.



Figure 42: 2018 District 2 Air Freight. Source: HDR analysis of BTS T-100 dataset

Commercial air is also increasing in District 2 with airports in Bemidji and Thief River Falls both increasing passenger service by 14 percent and 62 percent, respectively (Table 10). While an increase in passenger service could potentially represent an increase in opportunities to carry mail and other time sensitive cargoes in the belly hold of passenger aircraft, there are some significant challenges in making such services commercial viable, especially on the relatively low volume routes typical at the District 2 airports. These challenges include cargo screening charges and the cost and availability of cargo handling facilities.

Table 5: Commercial Airports in Minnesota (District 2 airports in bold)

Airport Code	City	Airport Name	2016 Enplanements	2017 Enplanements	Percent Change
MSP	Minneapolis	Minneapolis-St Paul International/World-Chamberlain	18,123,844	18,409,704	1.58 percent
RST	Rochester	Rochester International	112,864	143,675	27.30 percent
DLH	Duluth	Duluth International	124,284	122,726	-1.25 percent
BJI	Bemidji	Bemidji Regional	25,510	29,038	13.83 percent
BRD	Brainerd	Brainerd Lakes Regional	18,328	21,383	16.67 percent
STC	St. Cloud	St. Cloud Regional	15,615	20,918	33.96 percent
HIB	Hibbing	Range Regional	12,654	15,377	21.52 percent
INL	International Falls	Falls International-Einarson Field	13,831	15,278	10.46 percent
TVF	Thief River Falls	Thief River Falls Regional	3,524	5,735	62.74 percent

Freight Mode: Pipelines

Four categories of pipelines extend through District 2, totaling approximately 1,259 miles (Table 6). All but two of the pipelines extend in a northwesterly/ southeasterly direction (Figure 45). While MnDOT has little direct influence on the development of pipeline infrastructure, the capacity and functionality of the pipeline network is important to understand as it can have

significant impacts on other modes such as rail. For example, in the past year, the number of shipments of crude-by-rail has increased sharply in response to a number of bottlenecks in the pipeline network.¹⁰

Pipe Type	Miles
Crude Oil	583
Hydrocarbon Gas Liquid (HGL)	150
Natural Gas	378
Petroleum Product	148
Total	1,259

Table 6: Pipelines in District 2

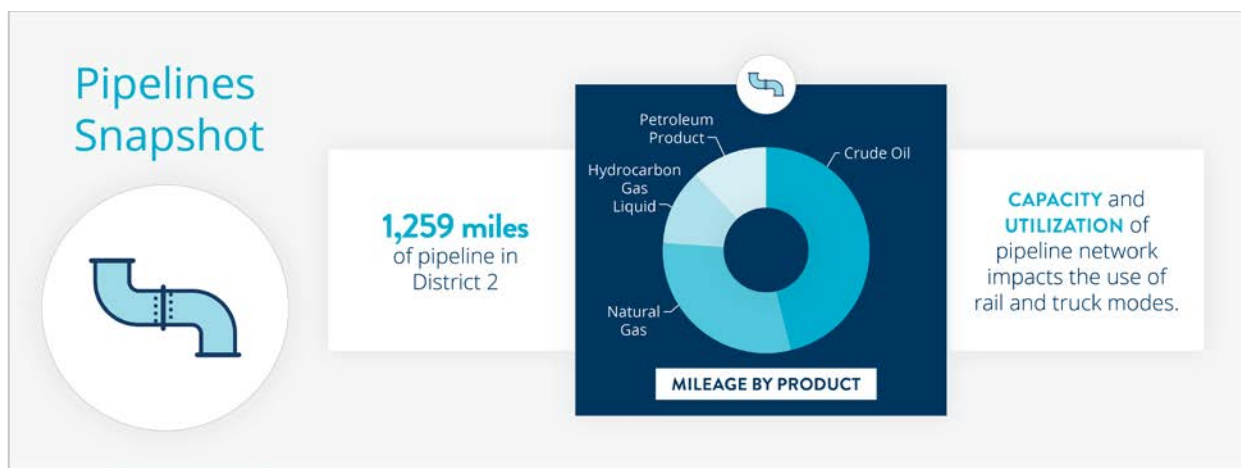


Figure 43: District 2 Pipeline Freight System Summary

According to the Energy Information Administration, about 30% of all U.S. crude oil imports enter the nation through Minnesota, largely by pipeline. One of the more notable pipelines in the District is the Enbridge Line 3 oil pipeline which transports crude oil between the Canadian oil sands and oil depots in Superior, WI. In 2018, the Minnesota Public Utilities Commission approved a plan to replace the aging pipeline with a new one that would follow a slightly altered alignment through District 2 (Figure 44). The realigned pipeline will carry up to 760,000 barrels of crude oil per day.

¹⁰ [Wall Street Journal: Oil Trains Make Comeback as Pipeline Bottlenecks Worse: https://www.wsj.com/articles/oil-trains-make-comeback-as-pipeline-bottlenecks-worsen-11548930600](https://www.wsj.com/articles/oil-trains-make-comeback-as-pipeline-bottlenecks-worsen-11548930600)

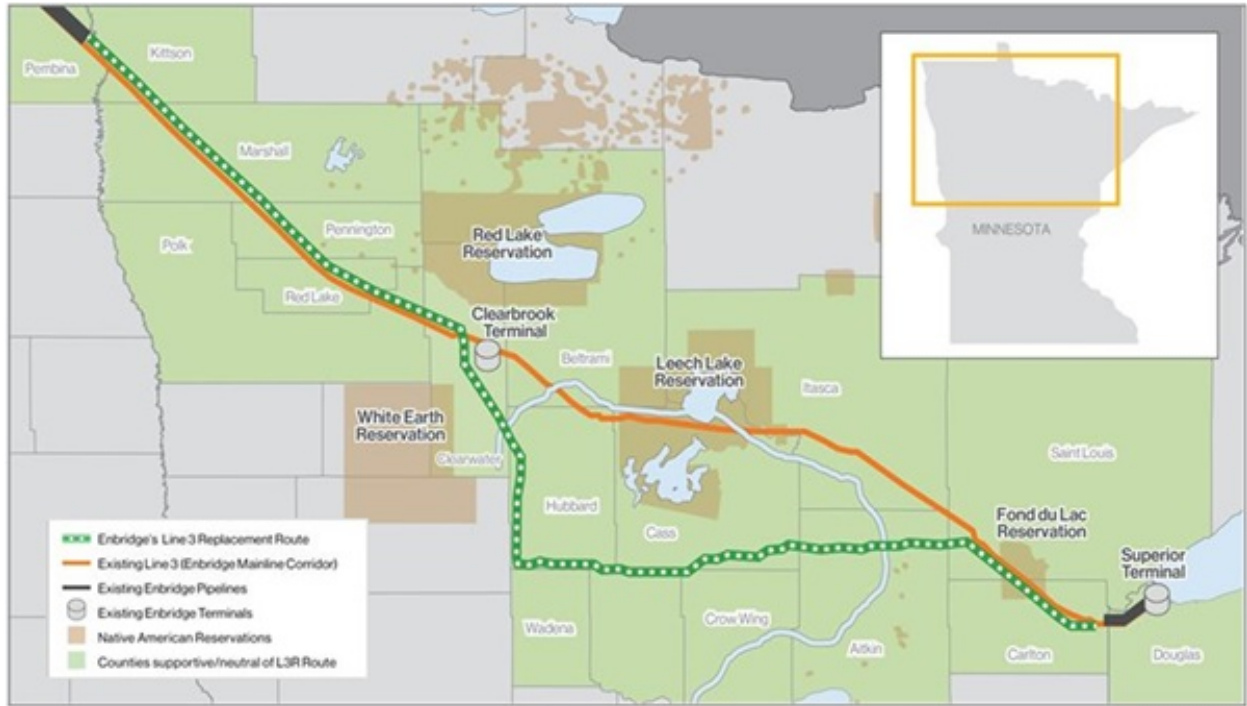


Figure 44: Proposed Enbridge Line 3 Pipeline Route. Source: Enbridge, Inc.

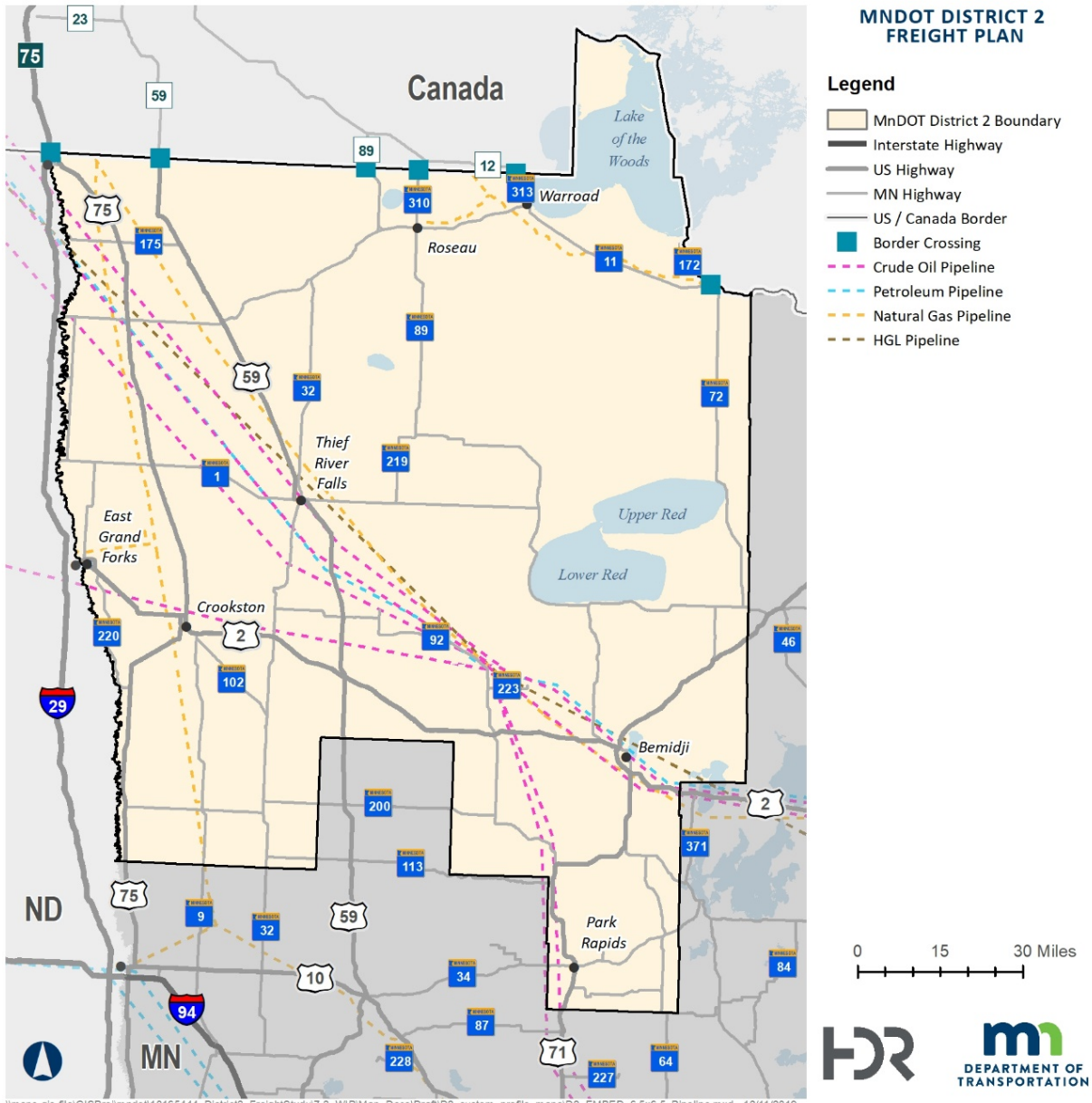


Figure 45: Pipelines in District 2

Freight System Crash Analysis

Highway Crash Analysis

This highway crash analysis for the freight system was based on MnDOT data from a 10 year period from 2009-2018. A freight vehicle is defined as any medium or heavy truck over 10,000 pounds. A total of 872 freight related crashes occurred over the 10 year period (Table 7), representing approximately 7 percent of all crashes (Figure 46). See Figure 47 for a heat map showing crash locations.

Crash Type	Crashes
Freight-Related Crashes from 2009 - 2018	872
All Other Crashes from 2009 - 2018	11,573
Total Crashes in District 2 from 2009 - 2018	12,445

Table 7: Truck Related Crashes 2009-2018

Percentage of Total Crashes in District 2: 2009 - 2018

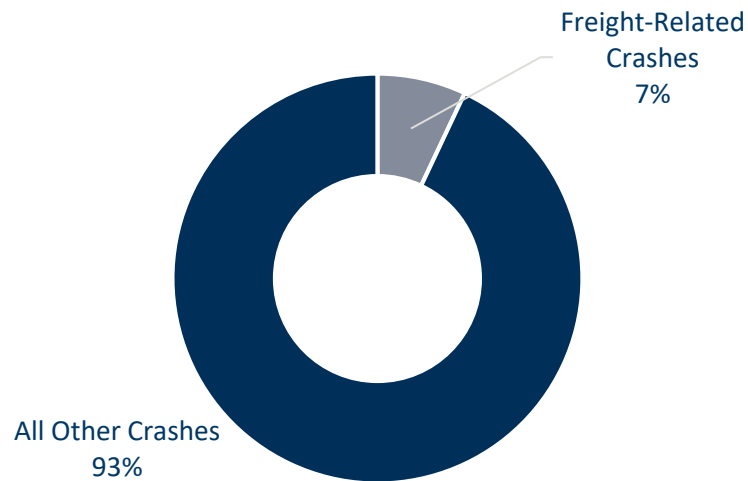


Figure 46: Truck related crashes as a proportion of all other crashes 2009-2018

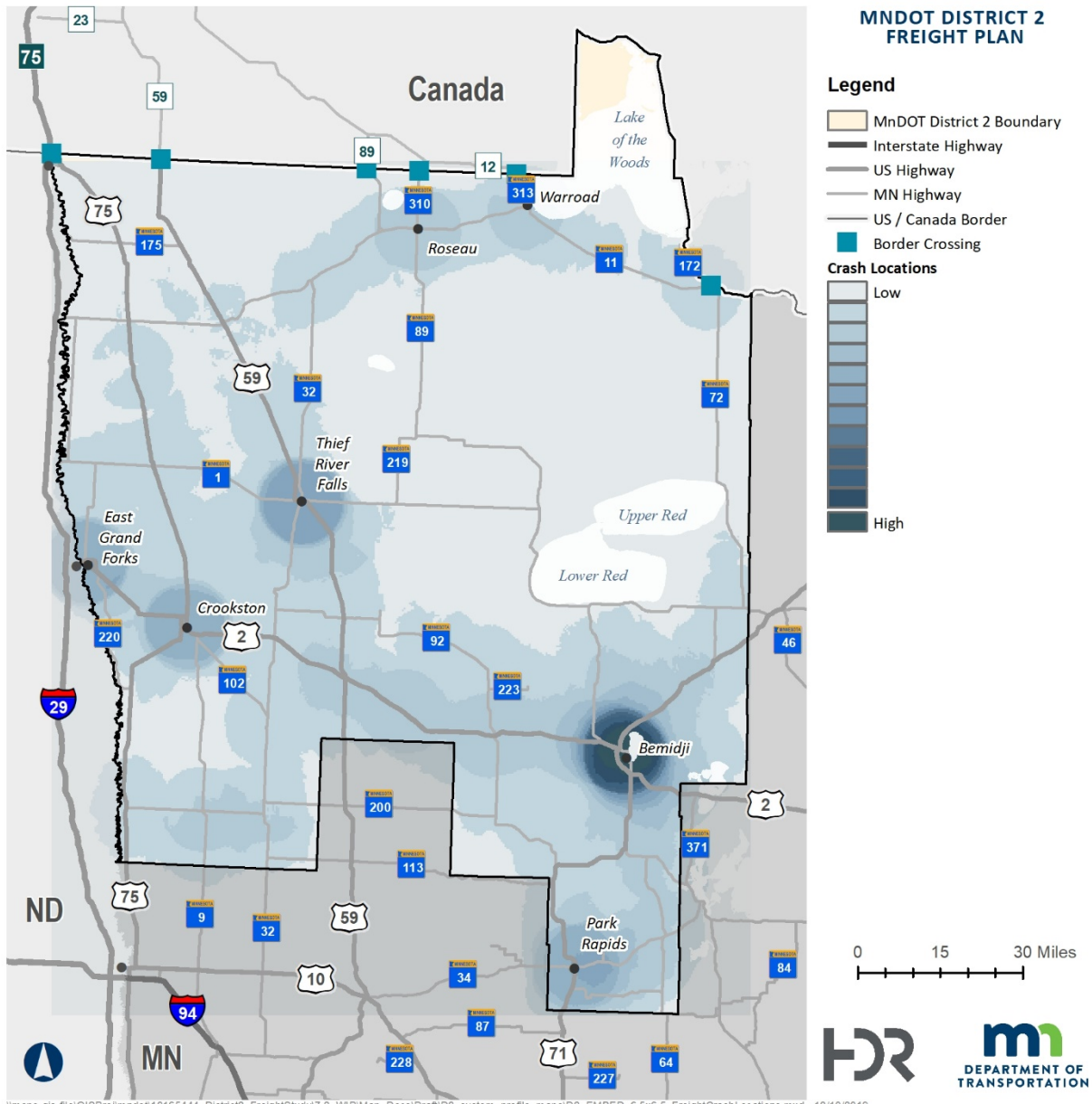


Figure 47: Freight related crash locations (no PDO) 2009-2018

Crashes by Roadway Classification Type

Crashes occurring on the US Trunk Highway System and the State Trunk Highway system had more crashes than the County and Municipal State aid systems (See Table 8). This is to be expected as truck volumes are generally higher on the US and State Trunk Highway systems. Crashes are common at both intersections/interchanges and non-intersection locations on the US and State Trunk Highway systems (Figure 48).

Roadway Classification	# of Crashes
U.S. Trunk Highway - USTH	291
State Trunk Highway - MNTH	251
County State Aid Highway - CSAH	110
Municipal State Aid Street - MSAS	17
Other/Unknown	203
Total	872

Table 8: Freight related crash summary by Roadway Classification 2009-2018

Total Freight-Related Crashes by Roadway Type in District 2: 2009 - 2018

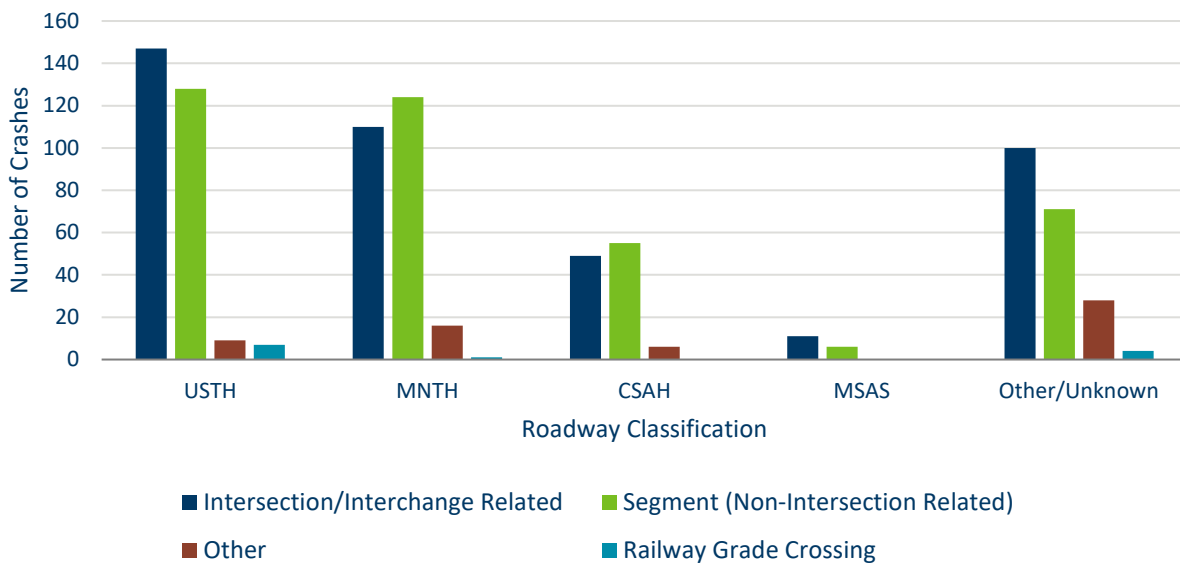


Figure 48: Freight related crashes by roadway type and location 2009-2018

Crashes by Manner of Collision and Severity

The most frequent type of freight crash was “unreported/other” followed by an “angle collision” type crash (Table 9). Property Damage Only (PDO) type crashes were the most common, followed by “B” and “C” type injuries, which are considered non-incapacitating or possible injury, respectively. Crashes are dispersed throughout the District, with concentrations of fatal and severe crashes near Bemidji, between Crookston and Grand Forks, and Ada (Figure 49).

Manner of Collision	Fatal	"A-Injury" Incapacitating	"B-Injury" Non- incapacitating	"C-Injury" Possible Injury	Property Damage Only "PDO"	Unknown
Head-On Collision	10	6	10	8	37	-
Angle Collision	9	10	32	43	109	-
Ran-Off-the-Road	2	1	16	17	75	-
Rear-End	9	9	17	25	92	-
Sideswipe	-	2	8	10	91	1
Unreported/Other	2	12	21	19	169	-
Total	32	40	104	122	573	1

Table 9: Freight-related crashes by manner of collision and severity 2009-2018

Freight Crash Rates

Crash rates are based on crash totals over the 10-year period (2009-2018), vehicle miles traveled (VMT) data for all vehicles, as well as heavy-vehicles. MnDOT's publically available information only had heavy vehicle VMT data for US Truck Highways (USTH) and Minnesota Trunk Highways (MNTH), so this analysis is focused on those two route systems. Heavy vehicle VMT data was based on the District 2 construction boundary rather than the Area Transportation Partnership boundary in order to match the boundary used to collect the crash data. It was assumed that the proportion of heavy-vehicle VMT to the all-vehicle VMT for the construction boundary for each year within the study period was the same for the ATP boundary as well.

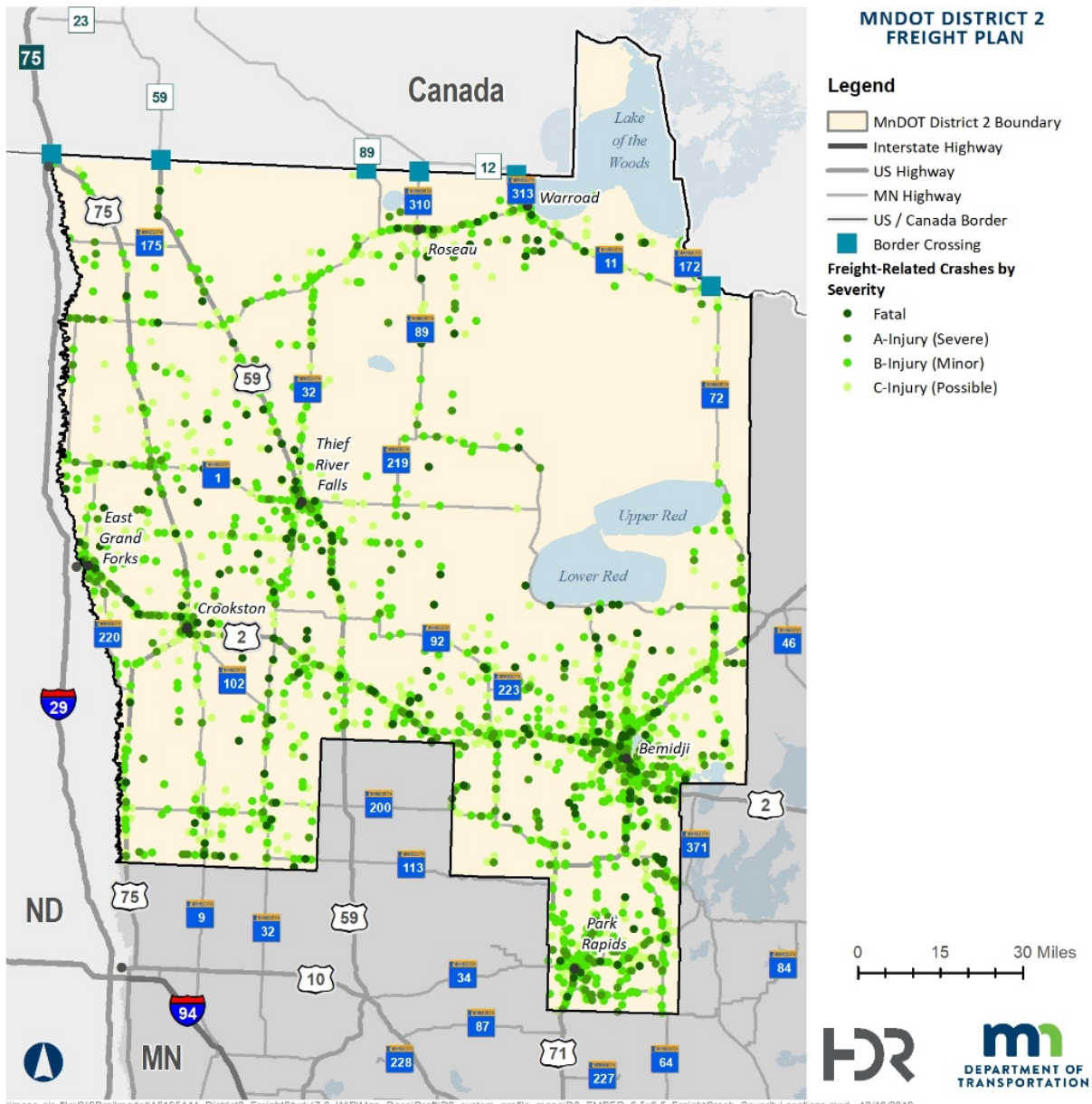


Figure 49: Freight related crashes by severity and location 2009-2018 (Does not include PDO Crashes)

Crash Rates by Route System

There were 5,255 total vehicle crashes on District 2 USTH and MNTH combined. 542 of those crashes were freight-related (involved heavy vehicles). With crash rates developed using the VMTs described above, freight crashes were found to have a slightly higher crash rate than all vehicles at 0.56 crashes per million VMT (MVMT) compared to 0.51 crashes/MVMT (Table 10). Heavy vehicle VMT on USTH and MNTH contributed to 52 percent of all heavy vehicle VMT, while freight-related crashes occurring on USTH and MNTH contributed to 62 percent of all freight-related crashes.

Scenario	Crash Rate (Crashes/MVMT)
All Vehicles	0.51
Heavy Vehicles	0.56

Table 10: Crash Rate - US TH and MN TH Combined

A breakout between the two route systems is provided below (Table 11 and Table 12). The biggest difference was seen for USTH, where freight-related crashes had a crash rate of 0.62 crashes/MVMT compared to 0.53 crashes/MVMT for all vehicles.

Scenario	Crash Rate (Crashes/MVMT)
All Vehicles	0.53
Heavy Vehicles	0.62

Table 11: Crash Rate US TH only

Scenario	Crash Rate (Crashes/MVMT)
All Vehicles	0.48
Heavy Vehicles	0.51

Table 12: Crash rate MN TH only

Crash Rates by County

Crash rates were also analyzed by County (Table 18). Using the ATP boundary, District 2 consists of 11 counties. The crash rate comparison between all vehicles and heavy vehicles is provided below for USTH and MNTH. The K+A (Fatal and Severe Injury) crash rate comparison is provided as well. The freight-related crash rates highlighted in red signify that the freight crash rate is higher than the all-vehicle crash rate. The counties with the most significant increase in USTH and MNTH freight crash rates are Norman and Red Lake Counties. Counties with the highest increase in severe K+A crash rates involving heavy vehicles are Clearwater, Norman, Polk, Red Lake and Roseau.

County	Crash Rate (Crashes/MVMT) for All Vehicles	Crash Rate (Crashes/MVMT) for Heavy Vehicles	K + A Crash Rate (Crashes/MVMT) for All Vehicles	K +A Crash Rate (Crashes/MVMT) for Heavy Vehicles
Beltrami	0.75	0.47	0.03	0.02
Clearwater	0.44	0.44	0.02	0.07
Hubbard	0.48	0.45	0.02	0.04
Kittson	0.25	0.48	0.03	0.03
Lake of the Woods	0.24	0.14	0.01	0.00
Marshall	0.27	0.45	0.03	0.03
Norman	0.39	0.72	0.03	0.06
Pennington	0.58	0.59	0.03	0.03
Polk	0.56	0.82	0.03	0.09
Red Lake	0.30	0.63	0.02	0.08
Roseau	0.38	0.63	0.02	0.07

Table 13: Crash rates by county (USTH and MNTH Combined)

Figure 50 and Figure 51 show comparisons for crash rates and K+A crash rates between Heavy Vehicle crashes and all Vehicle Crashes on USTH and MNTH in District 2. For total crashes on USTH and MNTH roadways, Red Lake and Norman Counties have higher than average freight crash rates when compared to all vehicles. When looking specifically at K+A crashes (fatal and severe injury), Polk, Red Lake, Roseau and

Clearwater have higher than average K+A freight crash rates. Red Lake, Polk and Roseau counties have consistently higher freight crash rates than average for both comparisons. While Kittson and Marshall Counties have higher than average overall freight crash rates, their rate of severe injury crash rates are very low. In comparison, Clearwater measures very low in overall crash rates, however of those crashes it has higher severity crash rates than average.

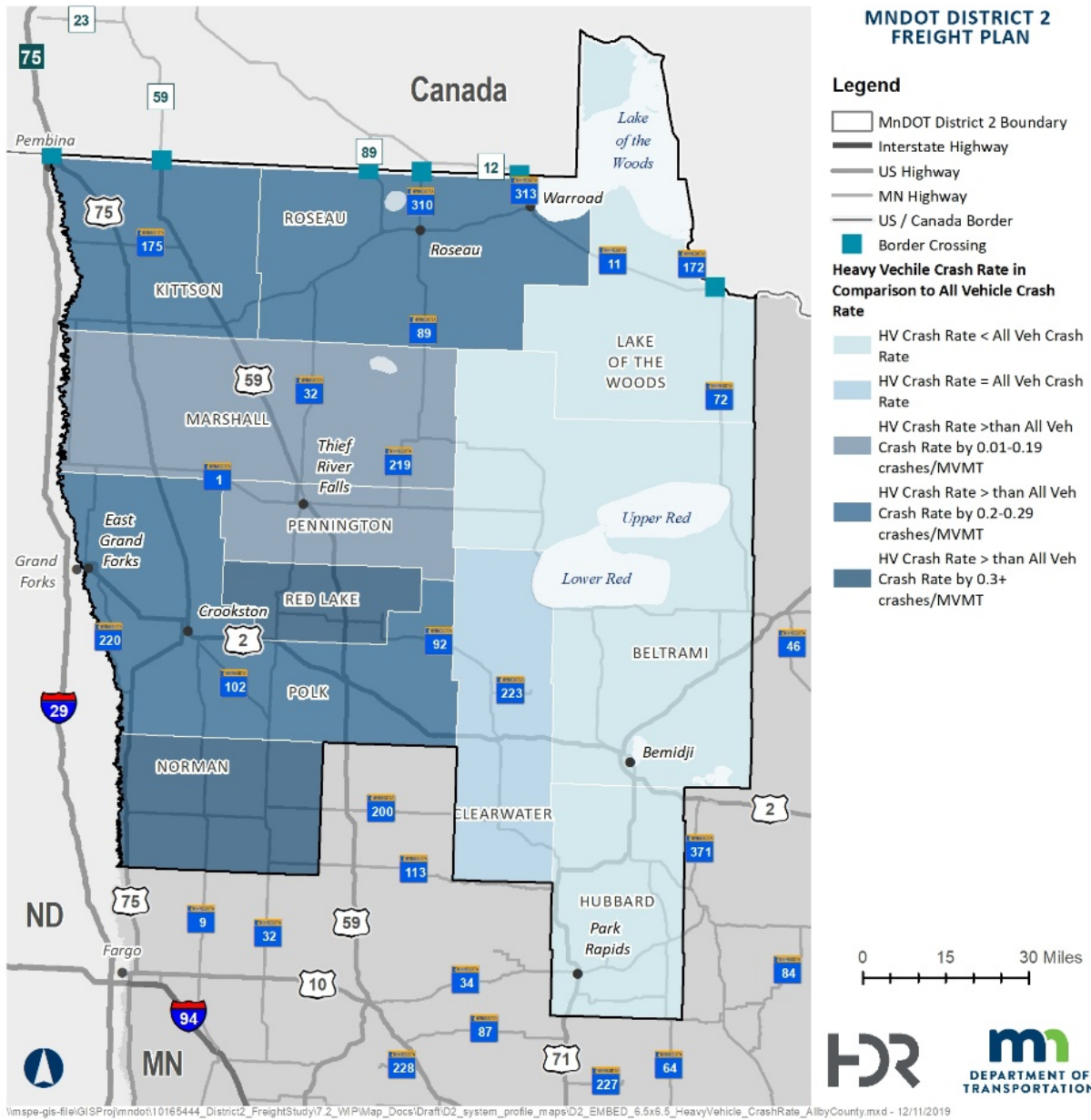


Figure 50: Heavy vehicle crash rate as a proportion of all vehicle crash rate by county

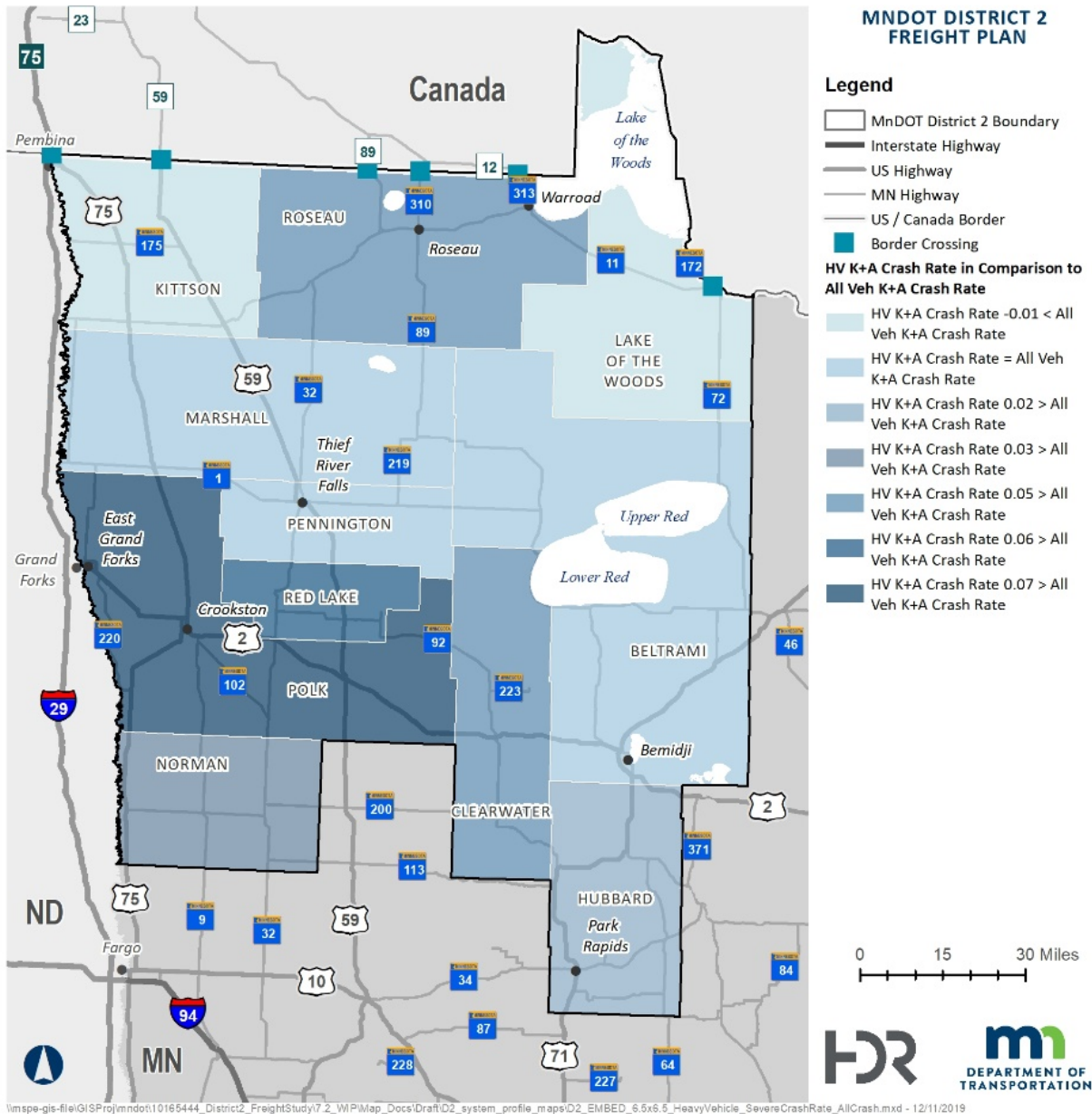


Figure 51: Heavy vehicle severe crashes rate as a proportion of all vehicle severe crashes

Rate of Fatalities between Freight Crashes and Non-Freight Crashes

Two percent of all crashes that occurred in District 2 between 2009 and 2018 were fatal. In comparison, four percent of all freight-related crashes that occurred in District 2 between the same 10-yr time period were fatal. **Freight-related crashes are 2 times more likely to be fatal.**

If looking at K+A crashes (fatal + severe injury), the comparison is that eight percent of freight crashes result in a K+A outcome, while five percent of all vehicle crashes are K+A. When looking at both fatal and severe injury-related crashes, freight vehicles are 1.6 times more likely to be involved.

Other Crash Trends

Trends over Time

Non-severe crashes appear to be on the rise from 2014 to 2018 (Figure 52). The frequency of severe crashes (Fatal + A-Injury) remains relatively constant over time.

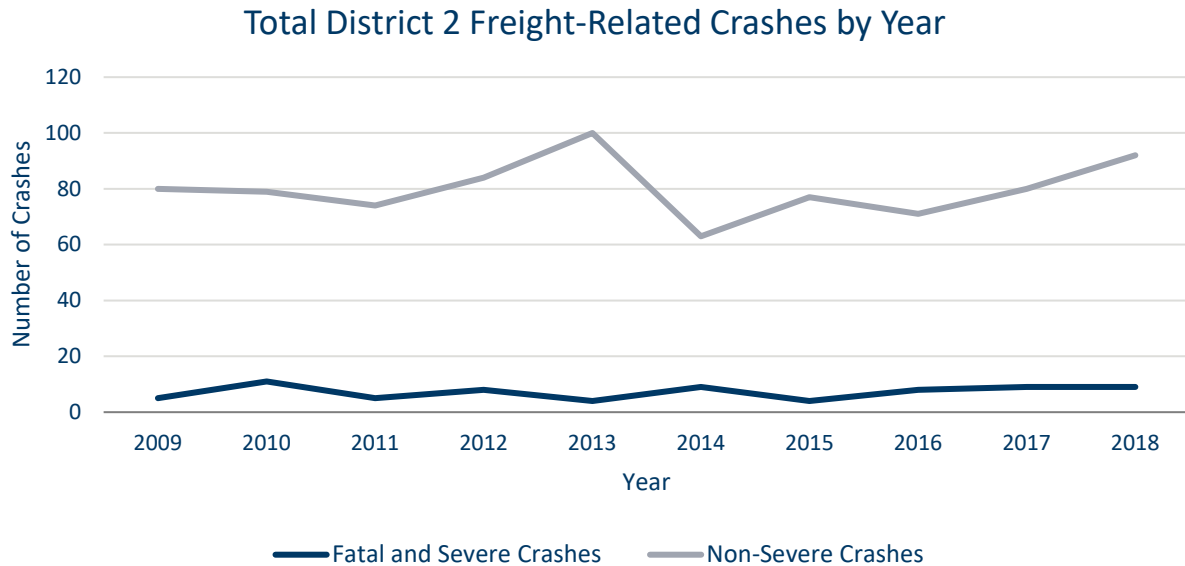


Figure 52: Freight crash trends over time 2009-2018

Roadway Surface Conditions and Lighting

Roadway surface conditions and lighting conditions had minimal effects on crashes. Approximately 63 percent of crashes were under dry conditions, and only 27 percent under snowy conditions (Table 14). Over three quarters of crashes occurred during daylight hours (Table 15).

Roadway Surface Condition	Number of Crashes	Percent of Total Freight-Related Crashes
Dry	548	63 percent
Mud/Dirt/Gravel	19	2 percent
Wet	61	7 percent
Snow/Slush/Ice/Frost	235	27 percent
Other/Unknown	9	1 percent
Total	872	100 percent

Table 14: Freight crashes by roadway surface condition 2009-2018

Lighting Conditions	Number of Crashes	Percent of Total Freight-Related Crashes
Dark Conditions	169	19 percent
Daylight	661	76 percent
Sunrise	28	3 percent
Sunset	13	1 percent
Other	1	<1 percent
Total	872	100 percent

Table 15: Freight crashes by lighting conditions 2009-2018

Drivers' Age

Of the 872 reported freight-related crashes, there were 887 drivers of freight vehicles (some crashes had multiple freight-related vehicles involved). Approximately two percent of the freight-truck drivers were under the age of 18 (Figure 53). MN Commercial Driver's License Requirements requires a minimum age of 18 for intrastate operations, while 21 is the minimum age required for interstate operations. Seven percent of truck drivers involved in District 2 freight-related crashes were between the ages of 18 and 20. Sixteen percent were between the ages of 21 and 29 years old. Seventy-five percent of truck drivers involved in freight crashes were between the ages of 30 and 64, while the remaining thirteen percent consisted of drivers 65 years and older.

Ages of Freight Truck Drivers Involved in Crashes in District 2: 2009 - 2018

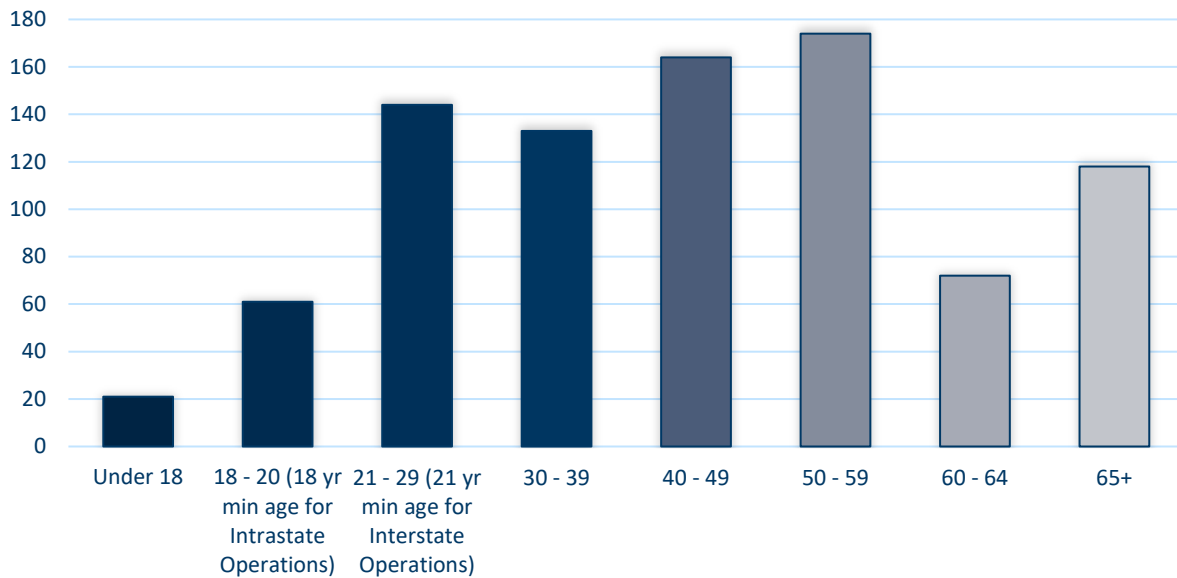


Figure 53: Age of freight truck drivers involved in crashes

Crashes during Harvest Season

Approximately 30 percent of crashes from 2009-2018 occurred during harvest season, from August to October (Figure 54). The month of October had the most reported crashes of all months, but combined, the harvest season has marginally higher crashes compared with other 3-month periods of the year (Table 16).

Month	# of Crashes
January	87
February	84
March	63
April	56
May	43
June	57
July	54
August	74
September	89
October	102
November	75
December	88
Total	872

Table 16: Crashes during harvest season

Percentage of Freight-Related Crashes During Harvest Season (August-October) in District 2: 2009-2018

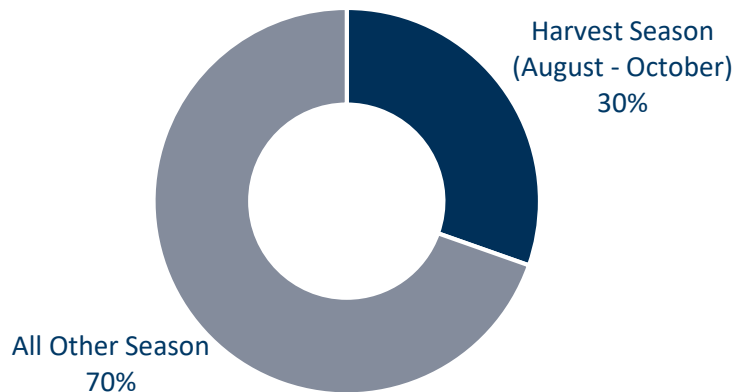


Figure 54: Freight related crashes during harvest season

Other Notable crash data facts

- 27 of the 872 (three percent) District 2 freight-related crashes involved more than 1 heavy truck.
- 23 of the 872 (three percent) District 2 freight-related crashes occurred in work zones.
- 12 reported freight-related crashes at railway grade crossings

County	Fatal	A-Injury	B-Injury	C-Injury	PDO	Unknown	Grand Total
Beltrami	2	3	11	18	114		148
Cass					1		1
Clearwater	1	3	2	2	27	1	36
Hubbard	2	8	19	13	57		99
Kittson		1	5	1	19		26
Lake of the Woods	1		2	1	4		8
Marshall	2	1	3	3	10		19
Martin		1	5	5	23		34
Norman	2	3	10	12	35		62
Pennington	5		12	13	35		65
Polk	12	15	21	39	184		271
Red Lake	1	1	2	3	14		21
Roseau	4	4	12	12	50		82
Total	32	40	104	122	573	1	872

Table 17: Crashes by county in District 2

Highway-Rail At-Grade Crossing Crash Analysis

Over the 10-year period of 2009-2018, there were a total of 32 crashes as reported by the FRA at at-grade highway-rail crossings in District 2 (Figure 55). Seven of the 32 crashes occurred at private at-grade rail crossings while the remaining 25 crashes occurred at public at-grade rail crossings.

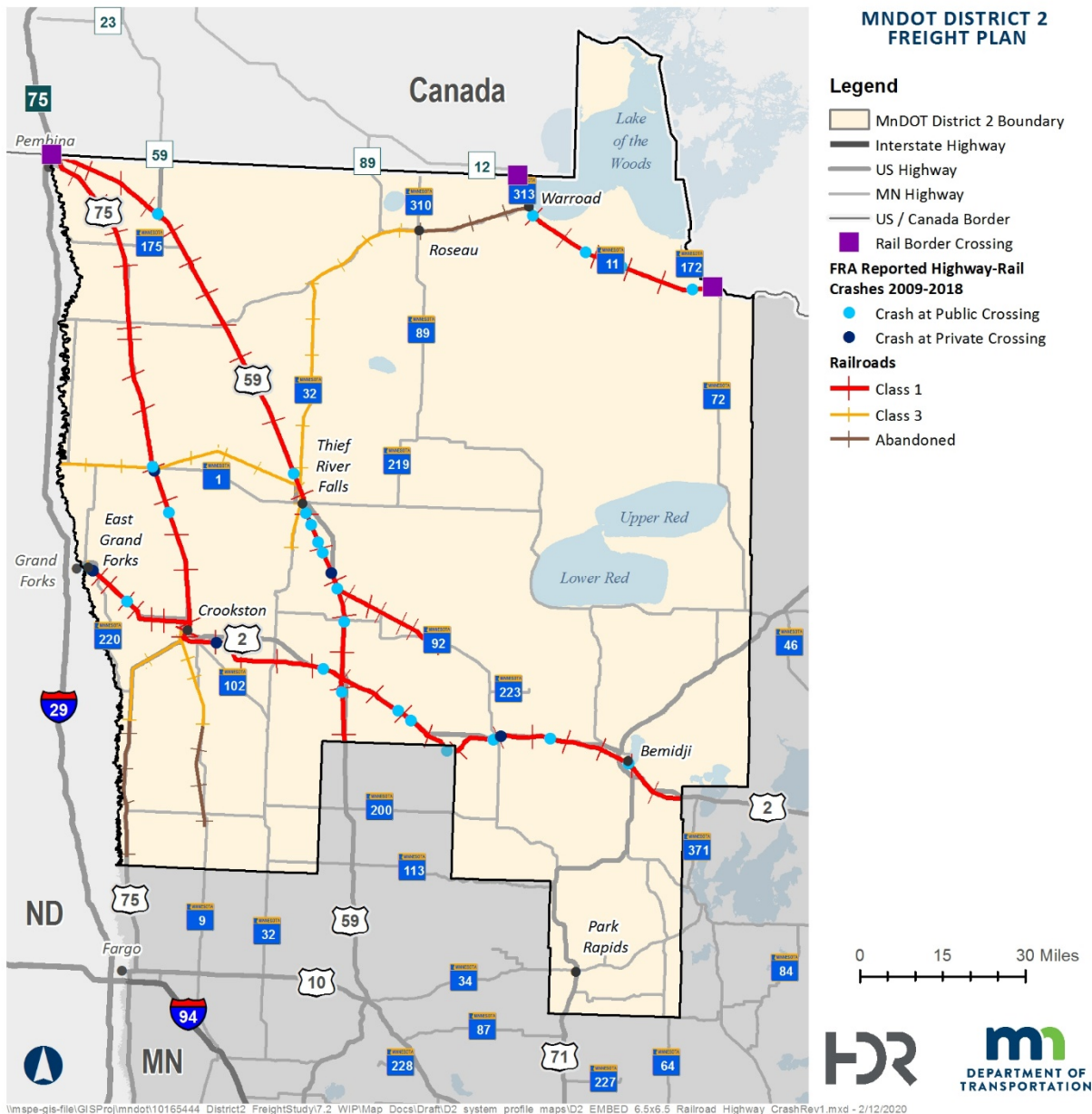


Figure 55: Highway-Rail Crashes. Source: FRA 2009-2018

Railroad Crash Trends

The following analyses focuses on public at-grade highway-rail crossings only. Over the 10-year period, the frequency of crashes at at-grade crossings have been increasing for both private and public crossings (Figure 56). All crossing locations experienced only one crash during the 10-year period except for two locations:

- A private at-grade crossing located in Polk County (1 crash in 2013 and 1 in 2018)
- A public at-grade crossing located in Beltrami County (1 crash in 2013 and 1 in 2017)

District 2 Crashes at At-Grade Highway-Rail Crossings: 2009 - 2018

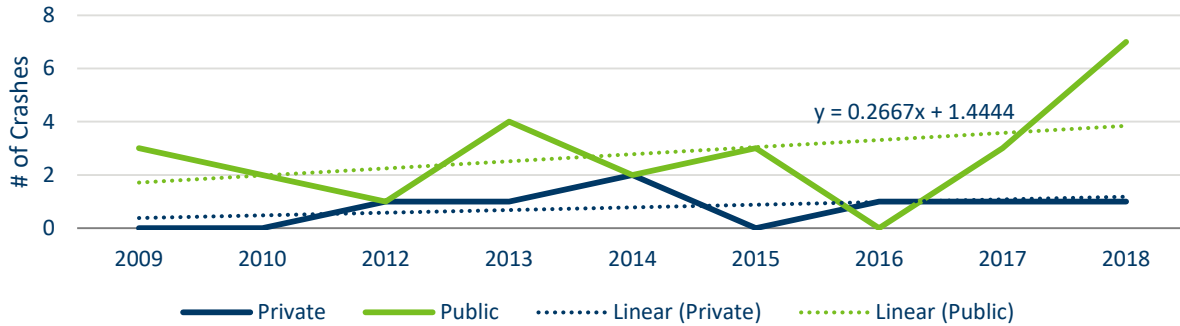


Figure 56: Frequency of crashes at at-grade intersections 2009-2018

Polk County experienced the highest total number of crashes, with seven over the 10-year period (Figure 57 and Figure 58). Those seven crashes consisted of 5 PDOs, 1 injury and 1 fatality. Roseau County experienced the highest number of fatalities than any other county in District 2, totaling 3 fatalities. One fatality occurred in 2009, the other two fatalities occurred during the same incident (different at-grade crossing) during 2014.

Total Highway-Rail Crash Injuries and Fatalities by County

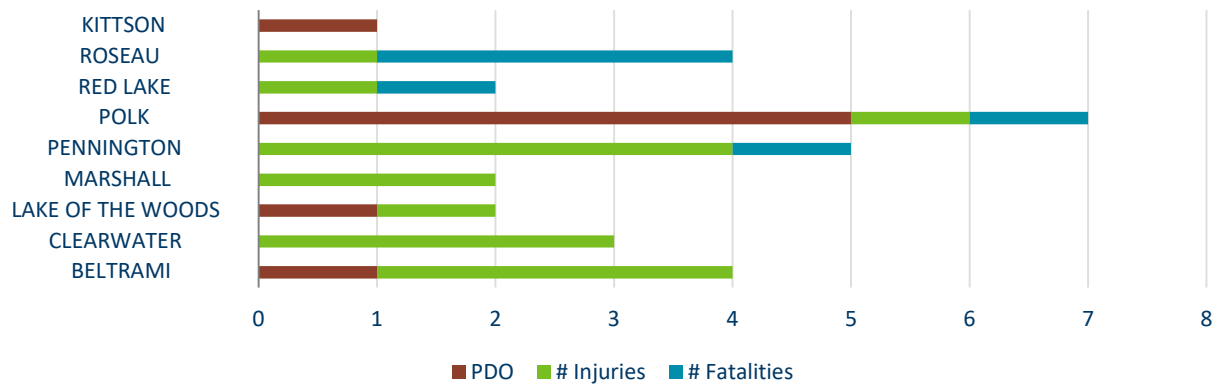


Figure 57: Highway-rail crashes by county

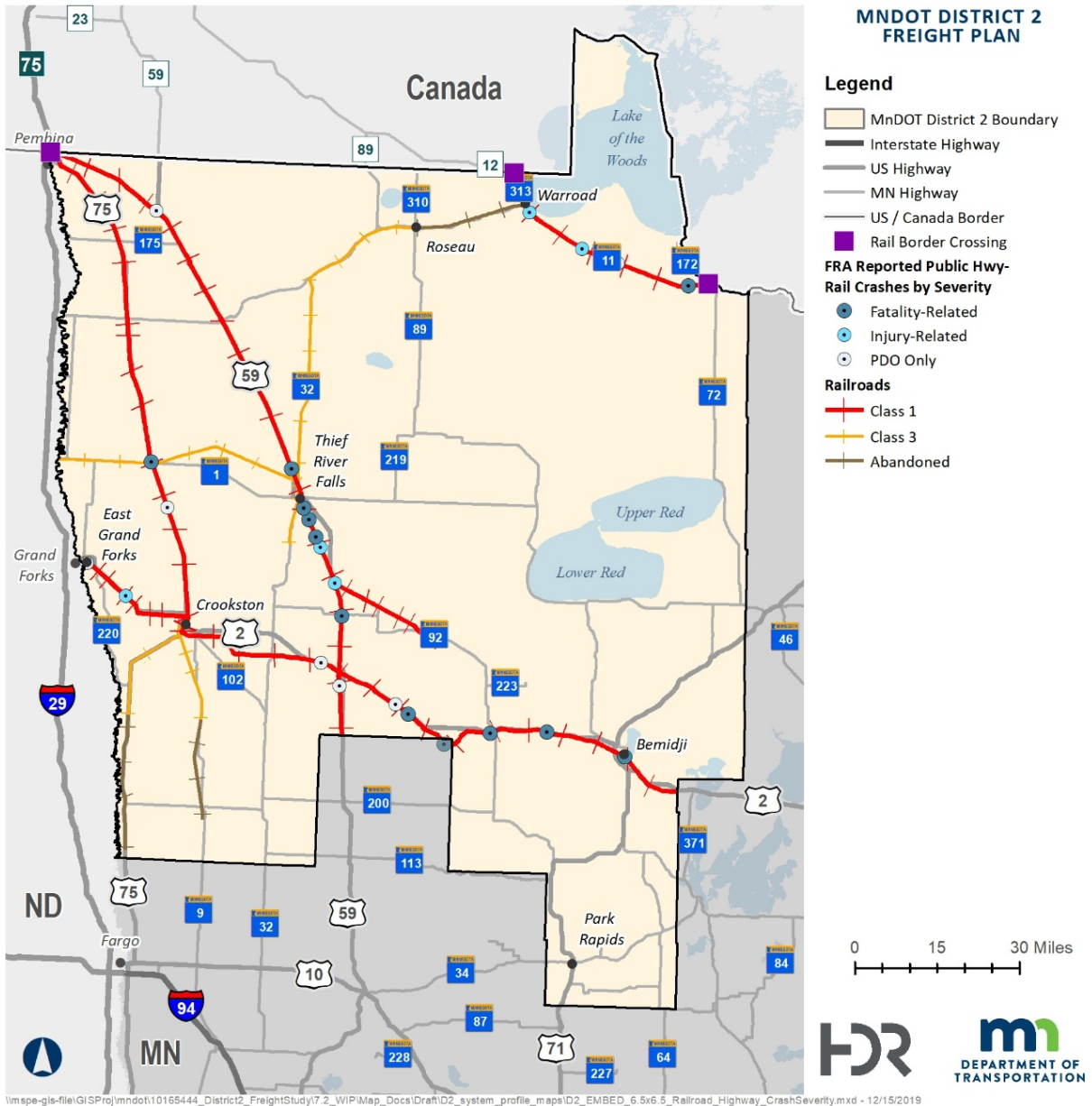


Figure 58: Highway-rail crashes by severity

The majority of vehicles involved in public at-grade highway-rail crashes were passenger vehicles (Figure 59). There was only one incident that involved a pedestrian. Also, the majority of incidents were due to motorists not stopping at the crossing (Figure 60).

Percentage of Rail Crashes by Vehicle Type

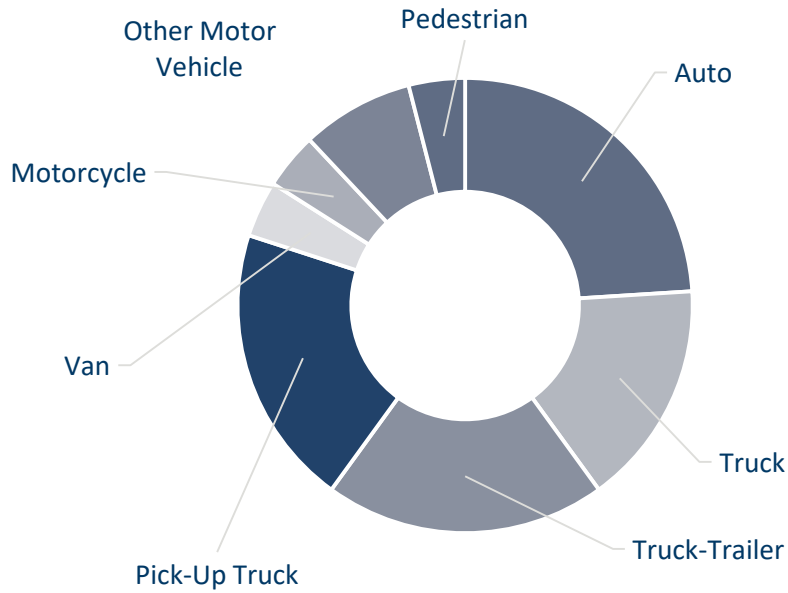


Figure 59: Rail crashes by vehicle type

Percentage of Rail Crashes by Motorist Behavior

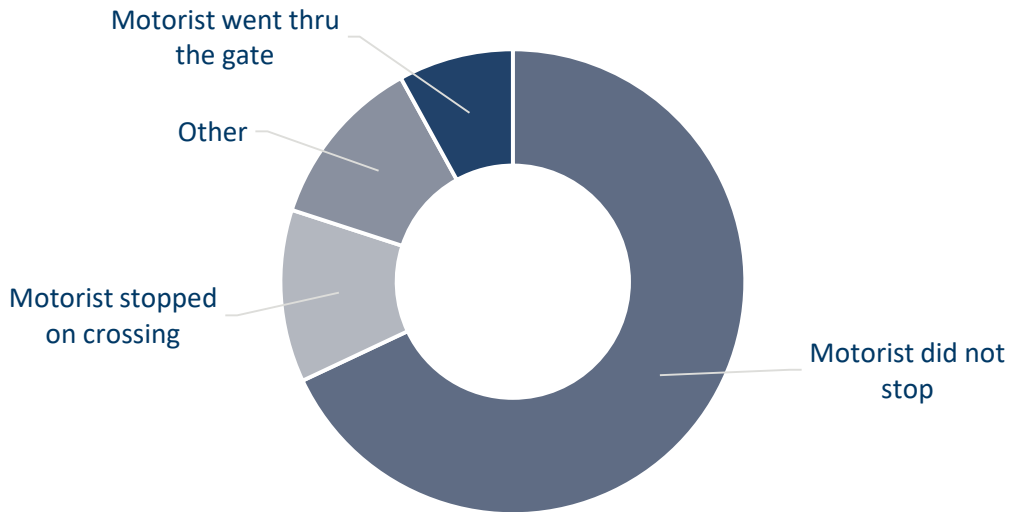


Figure 60: Rail crashes by motorist behavior

Lighting and Roadway Surface Conditions

Of the 25 crashes, only one took place at a location where roadway lighting was present. Eighteen (72 percent) of the 25 crashes took place during daytime conditions, while the remaining seven (28 percent) took

place during periods associated with low visibility (ex: dawn, dusk, or dark). Weather was also not a major factor, with 15 (60 percent) of the 25 crashes occurring during dry roadway surface conditions. Five (20 percent) crashes were described as occurring during wet, snow, or slushy roadway surface conditions. Five (20 percent) were reported as unknown.

Hazardous Material

Ten (40 percent) of the 25 public at-grade highway-rail crashes involved hazardous material either by the highway user (one) or by rail equipment (nine). Only one incident reported spilling of the hazardous material. The incident took place in Red Lake County and involved Aromatic Concentrate.

Warning Devices

There were six (24 percent) crashes described as occurring at active crossings, involving warning devices that include: gates, standard flashing light signals (FLS), and audible warning devices. Nineteen (76 percent) crashes were described as occurring at passive crossings, involving warning devices limited to cross bucks and stop signs.

Speed

Speeds of both motorists and trains involved at the time of each crash is documented below. Only 11 crashes involved either a motorist or train traveling at speeds higher than 40 mph (Table 18).

Rail Property Damage Costs

Between 2009 and 2018, highway vehicle property damage reported by FRA totaled to \$214,500 (Table 19).

Vehicle Speed	<20 mph	20-29 mph	30-39 mph	40-49 mph	Grand Total
<10 mph	1	5	3	7	16
15	1	-	1	1	3
20	-	-	1	1	2
25	1	-	-	1	2
30	-	-	1	-	1
60	-	-	-	1	1
Grand Total	3	5	6	11	25

Table 18: Train speed at time of collision

Hwy Vehicle Property Damage in \$	# Crashes	Total \$ Amount
1,000	1	1,000
2,000	8	16,000
2,500	1	2,500
3,000	2	6,000
4,000	1	4,000
5,000	5	25,000
10,000	3	30,000
30,000	1	30,000
50,000	2	100,000
Not Reported	1	-
Total \$ Amount Associated with District 2 Crashes from 2009-2018:		214,500

Table 19: Highway vehicle property damage from rail crashes

Summary of Key Freight Issues and Trends

This document provides a summary of freight infrastructure within MnDOT District 2 and also provides economic context behind the types of freight-related businesses operating in northwestern Minnesota. The findings from this working paper will be combined with findings from the stakeholder interview process and used to help set the framework for future working papers and meetings of the District 2 Freight Plan Advisory Committee. Some key findings from this District 2 System Profile are summarized below:

- Importance of Air Cargo:** The airports at Bemidji and Thief River Falls handle more air cargo than any other airports in Minnesota with the exception of MSP. The high quality air cargo service provided at these airports allows District 2 business to access national and international markets.
- Manufacturing Industries are Critical to the District 2 Economy:** Manufacturing and freight-related businesses make up a larger share of District 2 employment than they do within the State as a whole. Industries such as agricultural and forestry products are uniquely important to the local economy.
- Limited Canadian Border Crossing Options:** Many of the border crossings between District 2 and Canada have limited operating hours, forcing many carriers to detour to crossings outside the District such as Pembina and International Falls. This indirect routing increases travel time and shipping costs for District 2 businesses.
- Desire for Multi-Lane Highways:** District 2 has no Interstate highways and has only limited segments of multi-lane highway. As noted by many respondents in the District 2 Manufacturers’ Perspectives Study, expansion of some roadways to multi-lane configuration would increase safety and the efficient movement of goods.