

Rural Freight Rail and Multimodal Transportation Improvements – the Upper Peninsula of Michigan

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16. Abstract Affordable freight transportation is a requirement for survival for rural industries, and in many cases requires the presence of freight rail systems. This study investigated the transportation system in the Upper Peninsula of Michigan (U.P.). The main outcomes of the study included development of interactive map of the U.P. rail system and facilities, analysis of truck and freight rail commodity flows, shipper and railroad input collected via shipper survey and interviews, and investigations on potential transload facility development. Some of the main findings and conclusions included; 1) there is a lack of accurate data on U.P. businesses and commodity flows, 2) while the overall rail system outlook is positive, some light density spur lines may be in jeopardy, 3) shippers and railroads share similar concerns, offering common ground for potentially low-cost improvements, if collaborative environment can be established, 4) there is great interest for a local intermodal/transload facility, but low individual shipper volumes suggest collaborative approach for facility development.			
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Executive Summary

Affordable freight transportation is a requirement for survival and growth for rural industries. In many cases this is challenging to accomplish without the presence of freight rail systems. Even though transportation by itself is not a sufficient condition for economic development, the availability of transportation infrastructure is regarded as one of the essential factors. Michigan's railroad network is unique in its operations and track mileage ownership as well as its geographic orientation within the Great Lakes region. Separated into two peninsulas, each with its own unique operating characteristics, the analysis of the state's rail network as a whole becomes quite difficult. In addition, the geographic separation and lack of rail connection between the two peninsulas does not facilitate peninsula-to-peninsula rail traffic. The result is that the State of Michigan has two separate rail systems, each with links to the U.S. national and Canadian rail networks, and with quite different system properties and ownership patterns.

This study investigated the transportation system in the Upper Peninsula of Michigan (U.P.), concentrating on identifying challenges faced by rural freight rail service providers and shippers along light-density lines and on identifying tools and methods that facilitate the current and future rail and multimodal transportation alternatives in the study area. Despite a significant reduction in track mileage over the past several decades, the U.P. rail system consists of almost 700 miles of privately owned and operated track, accounting for almost 20 percent of total track mileage in the State of Michigan.

The study consisted of six separate, but interrelated tasks. Task 1 consisted of the development of a proof-of-concept interactive map for the U.P. rail lines and facilities. Lack of easily available information of rail infrastructure and operations has been commonly mentioned by shippers as a challenge for increased rail transportation. Railroads graciously volunteered their information to be incorporated in the map and more than 60 businesses expressed their interest toward the map, providing input on the key parameters. A screenshot of the map is provided in Figure 1. Since the development of the map was completed, there have already been inquiries on a potential expansion of the map to also cover northern parts of Wisconsin and Minnesota.

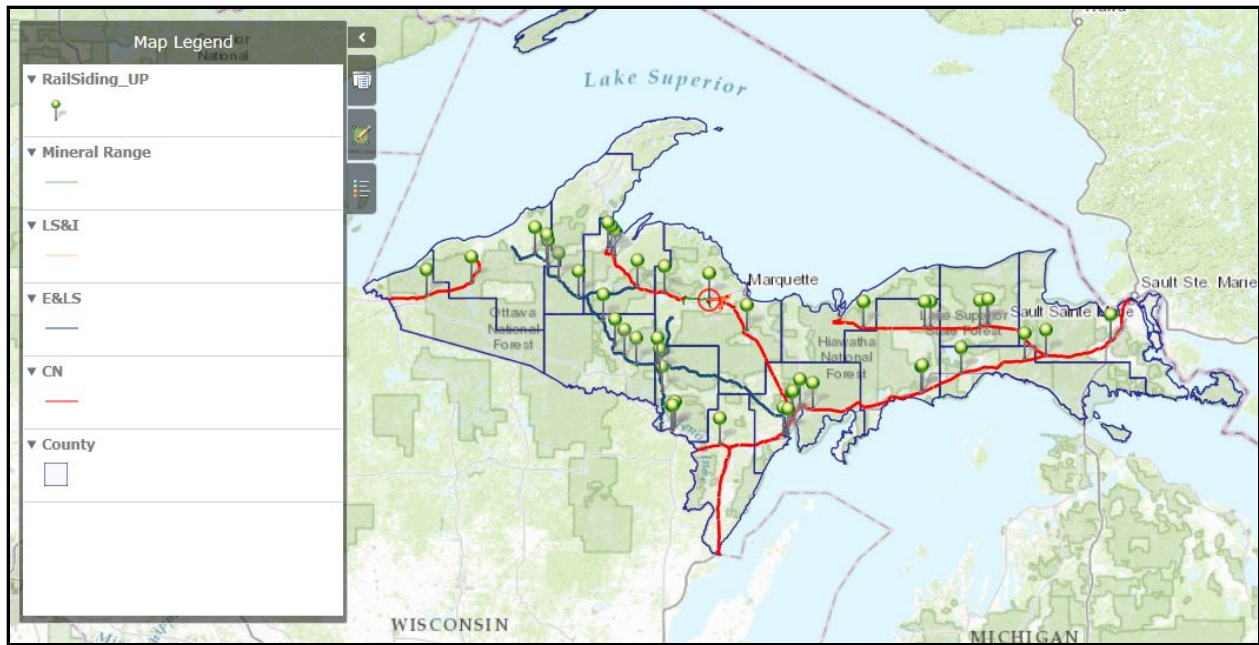


Figure 1: Upper Peninsula freight rail interactive map

Task 2 concentrated on analyzing the data on inbound, outbound and internal commodity movements in the U.P. From volume perspective, almost 20 percent of Michigan’s statewide freight tonnage (or value) moves by rail, but in the U.P., the importance of rail is significantly higher in terms of absolute tonnages. While U.P. accounts for only 3-5% of the Michigan total truck tonnage, it is responsible for 20% of all outbound rail tonnage from the state (including international), 4% of inbound rail tonnage and 94% of the intrastate rail tonnage. According to TRANSEARCH data, the annual tonnage (inbound, outbound and internal) moved by rail in the U.P. in 2009 exceeded the truck tonnage, 13.25 million versus 10.16 million tons, respectively. This is mainly due to U.P.’s high dependence on natural resource industry, especially iron ore movements that account for a great majority of the total tonnage. Lumber and wood products and pulp and paper mill products account for high rail volumes in the region as well. In addition to volumes, transportation distance was also analyzed, especially for truck movements. Almost one million tons were trucked for over 500 miles and close to two million tons for over 300 miles. These movements are the likely candidates for potential modal shifts, but the inaccuracy of data hinders a more detailed analysis of shift potential.

Task 3 interviewed all four railroads operating in the study area; Class 1 Railroad (CN) and three shortline railroads (Escanaba and Lake Superior Railroad, Lake Superior and Ishpeming Railroad and Mineral Range Railroad) that interchange with CN. CN owns a great majority of active trackage. Most of it belongs to the Federal Railroad Administration (FRA) track classes 1-3 and there are significant portions of the system that cannot handle 286,000 lbs. railcars, the current industry standard. Excluding the iron ore movements, most of the traffic moves on manifest trains that handle multiple commodities. The rail terminal facilities in the region are limited.

There are currently no intermodal terminals in the U.P. and transloading opportunities are limited to KK Integrated Logistics in Menominee. The long-term outlook by freight operators was generally positive for most rail segments in the region, but there are significant challenges in justifying needed maintenance expenditures on certain light-density branch lines. Railroads also advised on several service and operations related improvements they are planning to implement in the U.P.

Task 4 developed a survey instrument to obtain input from rail and non-rail shippers. The survey was offered in online, mail-in and phone interview formats over a several month period, leading into 127 responses, some of which used an abbreviated form developed half-way through the process. Approximately 70 percent of all responses were from the U.P. The largest representation came from the manufacturing industry, followed by logging and service sectors. 63% of survey respondents used only truck for their freight transportation while 28% businesses use both truck and rail. The overall outlook on rail shipments was positive, as a great majority of companies reported either steady or increasing rail usage over past three years and for the next three years. The greatest challenges for increased rail shipments were related to issues with rail service and/or access. An interesting fact was that a great majority of companies made shipping mode decisions by themselves.

Task 5 concentrated on analyzing the concerns that railroads and shippers voiced over each other's performance. After reviewing the data, the research team noticed that most of the concerns by shippers and railroads alike circulated around the same topics, but approached them from a slightly different angle. The concerns were divided to nine categories addressed by each side. The categories included;

- Equipment,
- Operations,
- Loading/unloading,
- Infrastructure/utilization,
- Rates,
- Quantities,
- Intermodal/rates,
- Quantities,
- Intermodal/transloads,
- Information and
- Customer service/communication.

Task 6 included more detailed case studies and interviews with shippers and industries selected earlier in the study. There were three main topics of interest to the case studies:

- Future of core industry shipments by rail, namely mining and forest products industry
- Perspective of trucking companies to rail competition/collaboration.

- Investigation of a potential transload facility in the region, conducted as a parallel graduate student study.

The mining industry case study attempted to inventory key active and proposed mines and aggregate quarries in the region. The study concentrated on identifying potential volumes and rail routes used in the U.P. Overall, the outlook for the continuing operation of active mines seems secured, at least for the next decade and there are various projects in exploratory or development phase for limestone quarry, crushing operations for frac sand and railroad ballast, and for copper and iron ore mining. While there is a great level of uncertainty in the implementation schedules and the freight potential from these developments varies significantly from a few potential rail cars per week to complete unit trains, the rail transportation is considered an integral part of all projects and in many cases a base requirement to any planning. The forest products industry is highly dependent on rail as well. It is a much more mature industry, but also has high elasticity for modal shifts. There is great interest by stakeholders to increase the use of rail in forest products shipments, if current challenges can be resolved. Recently, the Wisconsin Central Group (WCG) was formed as a collaborative effort by the industries and CN to address some of the key challenges, such as balance of service with demand, segments with low utilization, availability and condition of rail cars, seasonal demand fluctuations, etc. The structural changes of the forest products processing industry (such as potential merger between NewPage and Verso), and the role of rail in the potential new industries utilizing forest resources, such as biomass power plants, pellet production, etc. are issues that further complicate the overall outlook of rail shipments in the industry.

While the trucking companies consider rail as a competitor, they indicated strong support for multimodal/intermodal service with transload capability to supplement their needs as carriers. The companies considered multimodal/intermodal freight to be necessary to support shipping in the U.P. and that success would be dependent on strong collaboration with the railroad companies. This enthusiasm was shared by shippers and to a certain degree, rail service providers. Today, the nearest terminal for U.P. shippers is located 200-450 miles away (depending on origin within U.P.) in Chippewa Falls, Wisconsin, but it handles only outbound traffic for international markets, forcing most intermodal freight to/from the U.P. to move through terminals in Chicago or Minneapolis. A parallel graduate student study was conducted to evaluate the benefits of a potential transload facility in the region. The study used three alternative truck/rail transload facility locations; Nestoria (or vicinity), Ishpeming, and Amasa (Figure 2). Due to lack of detailed data on freight flows, comprehensive analysis of the benefits could not be completed. Instead, the study concentrated on using two company case studies (DA Glass America and Northern Hardwoods) as examples, evaluating their potential shipping benefits from cost and emission perspective, based on actual truck and rail rates obtained from stakeholders.

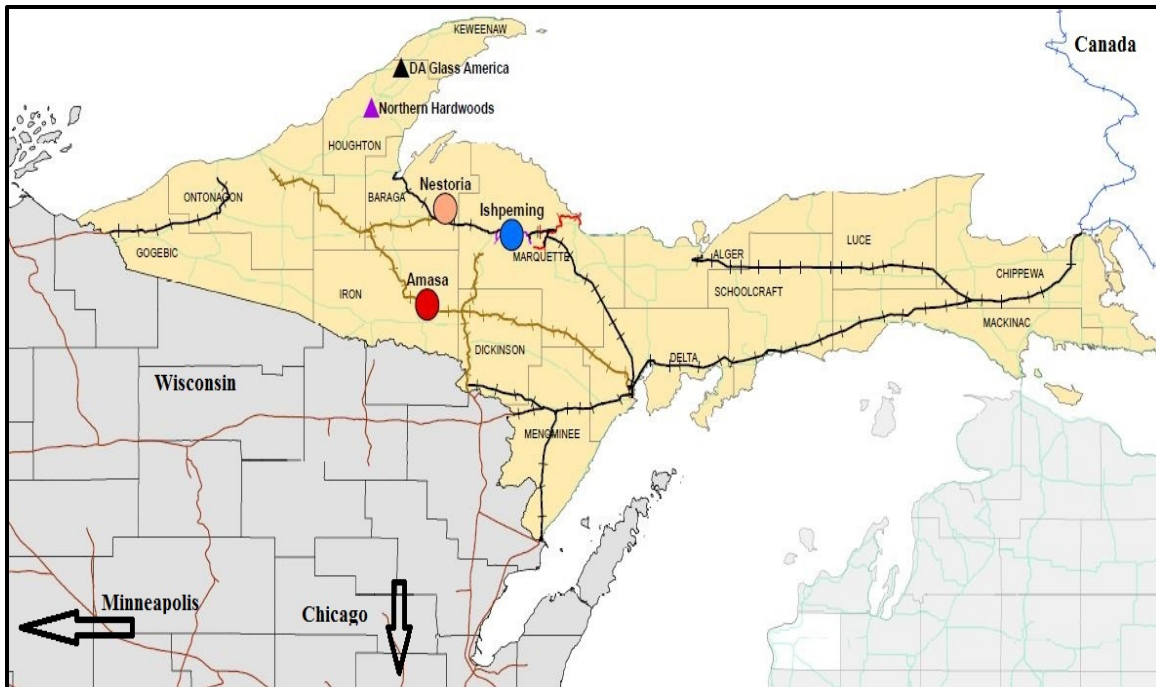


Figure 2: Case study companies and transload facility locations

The study found that most movements to Wisconsin would not receive cost benefits from any of the three locations. However, carload movements by Northern Hardwoods to distant Wisconsin locations and Minneapolis would have potential for cost savings, especially if final destination had rail access. Since the study investigated the problem purely from rate perspective, none of the capital investments necessary to establish a transload facility, or the minimum volumes to keep such facility sustainable were included in the analysis.

Besides the individual tasks summarized above, the following paragraphs provide the general conclusions of the study, including some recommendations for future development:

1. **Rail transportation has an important role in the U.P.** The surrounding lakes isolate the region and limit the interconnectivity with adjacent regions and states, but it also makes rail access in and out of the region more comparable to trucks. Absence of an east-west interstate highway in the U.P. offers an interesting possibility for increased competition by rail, but the lack of rail connection with the Lower Peninsula practically eliminates any rail intrastate rail traffic between the peninsulas.
2. **The mainline rail infrastructure in the U.P. is in satisfactory condition** and traffic levels justify maintaining them in the current track levels. However, the majority of U.P. lines cannot accommodate the 286,000 lbs. rail cars (current industry standard) and there are no plans to increase the carrying capacity, partially due to high investment cost to upgrade the bridges in the Sault Ste. Marie.

3. **Lengthy spur lines may be in jeopardy.** Especially lines between Ishpeming – Baraga and Trout Lake – Munising are in poor condition and have insufficient traffic levels (minimum 75-100 rail cars per mile per year) to meet the industry investment criteria. Public funding is one potential avenue of assistance, as demonstrated by the funding provided to Mineral Range Railroad for track rehabilitation by the State of Michigan.
4. **The strong presence of a Class 1 railroad (CN)** can be considered an advantage, as it provides direct rail access from the U.P. to the national network without a rail to rail interchange. On the other hand, CN network structure provides limited coverage to Eastern and Western U.S. and there are questions whether the Class 1 business model can meet the service and rate expectations of region’s shippers.
5. **General business outlook is positive, but growth is challenging.** The U.P. system relies heavily on mining and forest products as backbone commodities and this dominance is expected to continue, likely providing sufficient future traffic levels for most mainline segments. However, excluding iron ore movements, the freight moves in mixed trains with carloads from various businesses and numerous origins/destinations, complicating the operational patterns and in many cases increasing the overall shipment time. Increasing the rail market share is challenging due to the small size and geographical fragmentation of individual businesses.
6. **Data on businesses and freight flows is insufficient.** Neither the main source of freight flow data used in the analysis (TRANSEARCH), nor the attempt to collect the data directly from shippers proved sufficient for analyzing freight movements in the region with confidence. The lack of a single, accurate source for information on region’s businesses and related numerous economic development agencies makes data collection and analysis even more challenging.
7. **Trucking has a stronghold on most shipments (excluding iron ore).** Considering the geographical location of the U.P. and the main commodities shipped to/from the region, one would expect most interstate movements to be candidates for rail, or intermodal/multimodal movements, but this is not the case. While it is often speculated that 164,000 lbs. total truck weights offer competitive edge to trucks, this applies only to limited interstate movements. Instead, the current situation is most probably due to a combination of already mentioned fragmented business structure, inadequate access to rail and intermodal/multimodal facilities, tumultuous long-term relationship between rail providers and shippers, and the limited understanding of the U.P. rail system and rail operations.
8. **Limited understanding of rail business/operations by decision makers.** Most businesses make their shipping decisions internally, but despite clear evidence toward increased interest in rail transportation in shipper survey responses, shippers also acknowledged limited understanding of rail as a shipping mode. Economic development agencies recognize the importance of rail to the region as well, but they share the lack of

understanding and tools to address the requirements and limitations caused by rail for economic development.

9. **Shippers and railroads share common concerns.** The analysis of shipper and railroad complaints/concerns revealed common topics of interest related to car conditions, operations, communication, etc., but viewed them from different perspectives. There is limited documented evidence on these issues, but they provide a promising foundation for potential improvements, if compromise solutions are sought collaboratively.
10. **Poor access to transload/intermodal facilities** is considered a competitive disadvantage to the region, especially by manufacturing companies. There is a great interest toward intermodal facilities, but feasibility of an intermodal terminal would be questionable due to fairly low overall container volumes and lack of direct access to Eastern/Western U.S. rail networks (rail to rail interchanges happen more rarely for intermodal shipments). There is an equal interest toward development of transload facilities, but the existing KK Integrated Logistics facility in Menominee witnesses only limited truck/rail transloading activities. A parallel study attempted to evaluate the benefits of a multi-shipper transload facility, but lack of data of freight flows limited the study to individual company case studies.

Based on the study outcomes, the following recommendations are made for future development and research related to the U.P. freight (rail) transportation

1. **All freight rail recommendations provided in the Michigan Rail and Freight Plans are well aligned and compatible with needs by the U.P. system.** Even though the recommendations are not specifically developed for the region, preservation of rail corridors, rail accessibility and railcar shortage are all topics of importance to the U.P. system. The strategies identified in the plans provide potential solutions, but will only have value, if there is sufficient funding to implementation. Alternatively, incremental approaches should also be considered.
2. **Public funding to support rail development.** Current and past State funding levels to dedicated rail/freight related programs are fairly low, as demonstrated by the total amount invested in the two main rail programs in Michigan between 1995 and 2010 (approximately \$35 million total, with two million applied to the U.P. during this period). The recent funding to the Mineral Range Railroad and potentially to Michigan Mining, LLC (currently under review) show promise toward increased rail development in the U.P. with State support. However, it should also be investigated, whether more aggressive rural and light density rail funding programs by other states, such as the State of Wisconsin, have provided expected benefits to those states.
3. **Secure future operations on lines under threat.** As mentioned, the greatest challenges in sustaining the current U.P. rail system include the two light density line segments (Ishpeming – Baraga and Trout Lake – Munising). It should be carefully evaluated

whether these lines have potential to succeed as they exist today and what alternatives, such as development of a transload facility at a strategic location along the line to consolidate the flows (with potential abandonment of lines beyond the facility), transfer of lines to a regional/local operator, or public funding to improve the lines/facilities, could be considered to secure future operations. Local economic development agencies should also be included in initiatives to identify new business along the lines.

4. **Improving the understanding of industries and freight flows.** Comprehensive understanding of the industries and related freight patterns in the region is of great importance when considering the future of the U.P. freight transportation system including rail, truck, Great Lakes maritime shipping, and even air freight. Developing this understanding should extend beyond transportation to include the complete supply chains and economic development demands. This should be done collaboratively by transportation and economic development experts. It should also be investigated, if data available from the Michigan Treasury or other state or federal (even commercial) sources could offer better insight into the industries, employees, and related freight flows in the region.
5. **Field study of truck movements.** Absent a comprehensive study (see previous recommendation), a comprehensive field study on truck movements with concentration on the main U.P. entry exit points could be used to increase understanding of freight movements and reasons for truck dominance in the region. While TRANSEARCH and shipper survey fell short on providing a solid understanding of the freight flows, they could be used with the field data in statistical analysis to validate the field survey data. The newer 2012 TRANSEARCH database could add an improved set of data for analysis, as it aggregates origin/destination data based on zip codes (the 2009 database used counties).
6. **More robust stakeholder communication/dialog and collaboration.** Railroads, shippers and external stakeholders would benefit from a better understanding of each other's supply chains, logistics, business models and operations. Shippers have interest to rail, but with limited understanding of rail as transportation mode may not recognize that use of rail transportation requires changes to the overall supply chain, while railroads need to be able to understand the restrictions placed by the business environment on their customers. The majority of the companies in the region make their shipping decisions internally, so access to the local businesses is a key to identify expansion opportunities. Economic development agencies could play an important role in "consolidating" the individual interest to larger units with more appealing business case for a rail solution, but a concentrated educational/communication effort, coordinated by a single entity, should be developed to improve the understanding and collaborative interest between stakeholders. This could also be advanced by integrating rail business development to some of the existing initiatives, such as the Wisconsin Central Group (WCG),

Northwoods Rail Transit Commission, the Western Upper Peninsula Regional Prosperity Initiative, and/or The establishment of a sixth Next Michigan Development Corporation (NMDC) in the U.P.

7. **Expanding the proof-of-concept interactive map** is one approach to improve the understanding of the U.P. rail system and its opportunities. The map should be extended to include the northern Wisconsin/Minnesota (WI/MN) area. This was supported by the Wisconsin Central Group (WCG) and Northwoods Rail Transit Commission and will reflect the regional nature and interconnectedness of the U.P. and Northern WI/MN rail systems. Pending collaboration from rail service providers, this could be done with minimal effort.
8. **Attacking the “low-hanging” fruit.** The common topics of interest identified as part of analysis of shipper and railroad complaints offer some of the greatest potential for immediate improvements in shipper/railroad interactions. The research team believes that a proper documentation of issues, such as challenges with rail car conditions, would allow development of low-cost solutions that not only could save in costs, but also provide a common ground for improved relationships. The team provided some initial comments on the topics, but a more in-depth analysis of the concerns should be conducted either by researchers, or by shippers/railroads as the next step in the search for potential solutions.
9. **Transload/intermodal opportunities** warrant additional investigations from a regional perspective. If a more accurate freight and business data can be secured through increased collaboration (as proposed earlier in the recommendations), the true potential for benefits from one or more multi-user facilities should be investigated in more detail.

Chapter 1

1.1. Background and Introduction

In this time of globalization, urbanization, congestion and increasing fuel prices, the growing importance of both freight and passenger transportation has been widely acknowledged. However, the importance of competitive transportation for rural America has received less attention. Affordable freight transportation is a requirement for survival for many rural industries, and in many cases this is challenging to accomplish without the presence of freight rail systems. Many of these industries are located along light-density rail lines where loss of a single shipper may negate the economic profitability of the line and lead to threat of abandonment. Without rail services, many industries would be required to consider relocation of their facilities to a location with better transportation alternatives.

The State of Michigan has numerous rail lines that meet these characteristics, both in the northern part of Lower Peninsula and throughout the Upper Peninsula (U.P.). This report investigates the transportation system in the U.P., concentrating on identifying challenges faced by rural freight rail service providers and shippers along light-density lines and on developing tools and methods that facilitate the current and future rail and multimodal transportation alternatives in the study area.

The report will provide an introduction to the rail systems for both the entire state of Michigan, provide greater detail on the U.P., and includes a brief review of selected past studies in related topics. It will also discuss the methodology used for the various study tasks, the outcomes and findings of each task and finally offer discussion and conclusions of the study findings.

Michigan's railroad network is unique in its operations and track mileage ownership as well as its geographic orientation within the Great Lakes region. Separated into two peninsulas, each with its own unique operating characteristics, the analysis of the state's rail network as a whole becomes quite difficult. The geographic separation of the two peninsulas does not facilitate peninsula-to-peninsula rail traffic. Additionally, commodities shipped into, out of, and through each of the peninsulas differ in type and volume.

1.2. Michigan Freight (Rail) System

This report utilizes material from two recent documents by the State of Michigan that provide an excellent introduction to the freight and rail systems in the State: the Michigan State Rail Plan, released in 2011 (HNTB Co., 2011) and Michigan Freight Plan, released in 2013 (Michigan Freight Plan, 2013). The Michigan Rail Plan was prepared to guide the development of the rail system and rail services in the State. It provides a comprehensive picture of both passenger and freight rail transportation in the State, including a long-term vision and a recommended program

of priority improvements, as well as approaches to financing those improvements. The plan also discusses benefits of rail and provides a detailed inventory of both freight and passenger systems.

Michigan Freight Plan is a supplement to the 2035 Michigan Transportation Plan (MI Transportation Plan – Moving Michigan Forward, 2035 State Long-Range Transportation Plan, 2012). As a multi-modal plan providing a comprehensive overview of the state’s freight transportation system it includes a description of existing assets and system performance, and the investments required to ensure long-term success. The following introduction to the Michigan Rail System is based on information from these plans and other relevant sources.

Michigan’s railroad network is composed of 28 freight railroads operating over 3,632 miles of active track. The State of Michigan is ranked 12th in nation for total freight rail miles, based on this amount of active track (Figure 3).

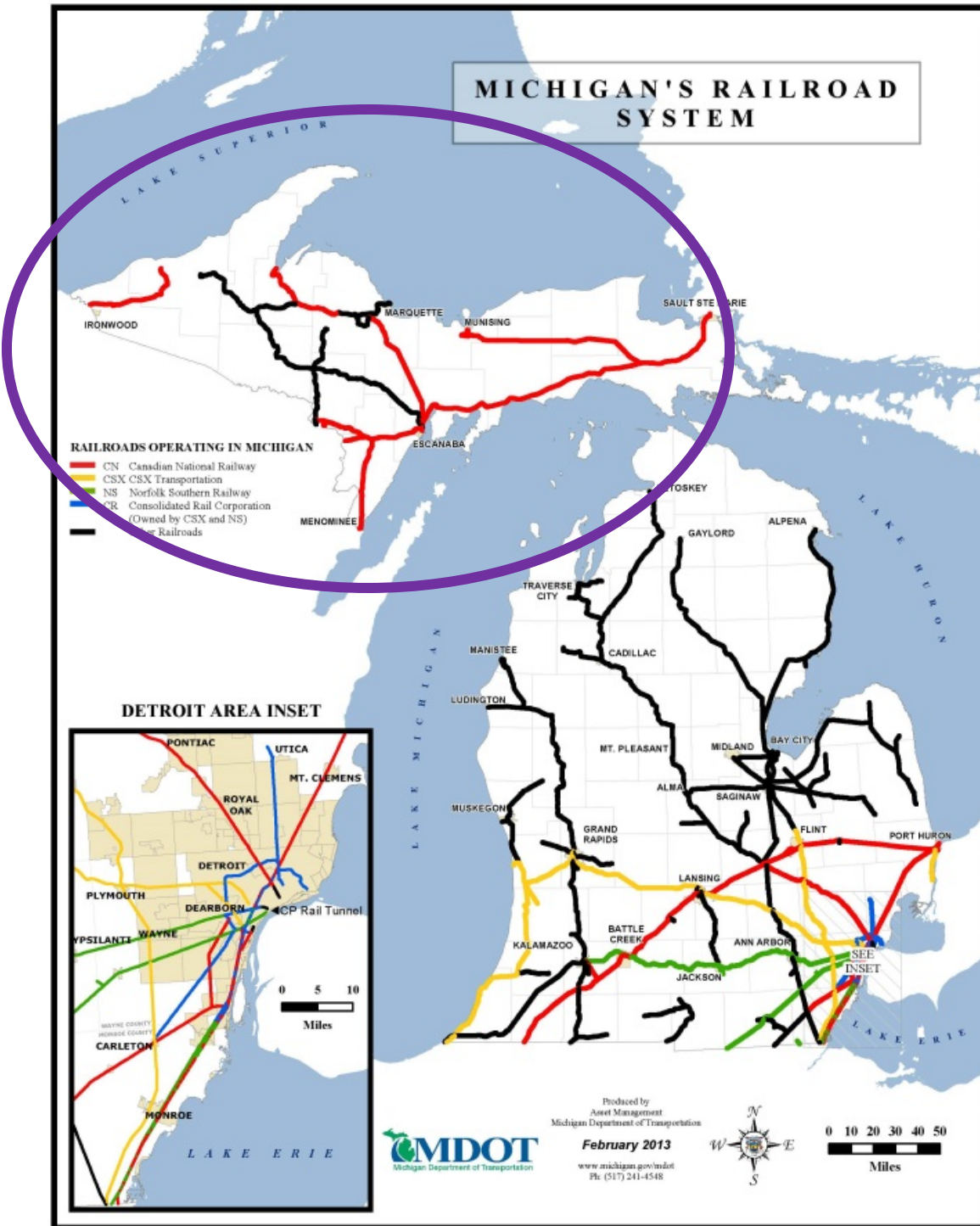


Figure 3: Michigan rail system map (Upper Peninsula Highlighted)

Source: (Michigan Railroad System Map)

Michigan's freight railroads contribute greatly to the state through employment opportunities and benefits. The 28 freight railroads in Michigan employ 175,940 individuals. These railroads provide their employees with an average of \$109,030 annually in wages and benefits. In addition, there are 525,691 Michigan freight railroad retirees receiving benefits from their former railroad employers.

Figure 4 shows the modal split for commodity movements in Michigan, as presented in the Michigan Freight Plan. This includes movements into and out of the State, and between points within the State. According to the Plan, rail traffic totaled nearly 84 million tons in 2009, with an expected 58.1% increase by 2030. Railroad transportation's share of freight tonnage in 2009 was 18.7% and is expected to increase to 19.3% by 2030. In comparison, Michigan truck freight totaled at over 290 million tons in 2009 with an expected 55% increase by 2030 and maritime traffic totaled over 74 million tons with an expected increase of 38.5% by 2030.

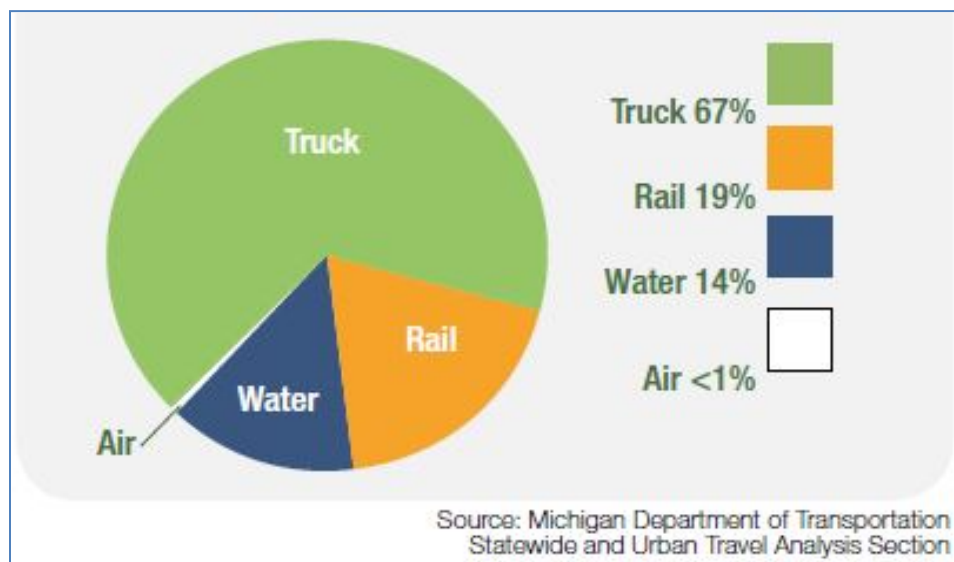


Figure 4: Michigan commodity movement totals: modal split by tonnage (2009)

The commodities that mainly travelled by truck were nonmetallic minerals, farm products and secondary traffic (mixed freight to and from distribution centers and warehouses). Rail, on the other hand, carried mainly coal, chemicals and metallic ores (from iron mines in Marquette County). Northern Michigan limestone quarries were the primary maritime shippers in 2009.

1.3. The Upper Peninsula and its (Freight) Rail System

The Upper Peninsula of Michigan includes 15 of Michigan's 83 counties. The only land border with the 48 states is with Wisconsin in the southwestern portion of the Western Upper Peninsula. Additional land connections to the peninsula are to Ontario, Canada through Sault Ste. Marie and to Lower Peninsula of Michigan through Mackinac Bridge. The peninsula covers 16,452 square

miles (17 percent of Michigan total), but only three percent of its population (approximately 308,000). There are total of 218 major employers, employing approximately 118,000 employees (Upper Peninsula Economic Development Alliance, 2010)

With its 673 miles of active track, the Upper Peninsula of Michigan (U.P.) accounts for almost 20 percent of total track mileage in the State of Michigan (Figure 5). The U.P. is served by one Class 1 Railroad (CN) and three shortline railroads (Escanaba and Lake Superior Railroad, Lake Superior and Ishpeming Railroad and Mineral Range Railroad). There is only one short segment of freeways in the U.P. (between Mackinac Bridge and Sault Ste. Marie) which restricts the speed to 55 mph (max). There is one international border connection to Canada at Sault Ste. Marie and connections with the rail network in the State of Wisconsin, but there has not been a rail connection to the Lower Peninsula of Michigan, since the last rail ferry ceased its operations in 1984. A more detailed description of the current U.P. rail network has been provided in Section 4.3 – Freight Rail Interviews.

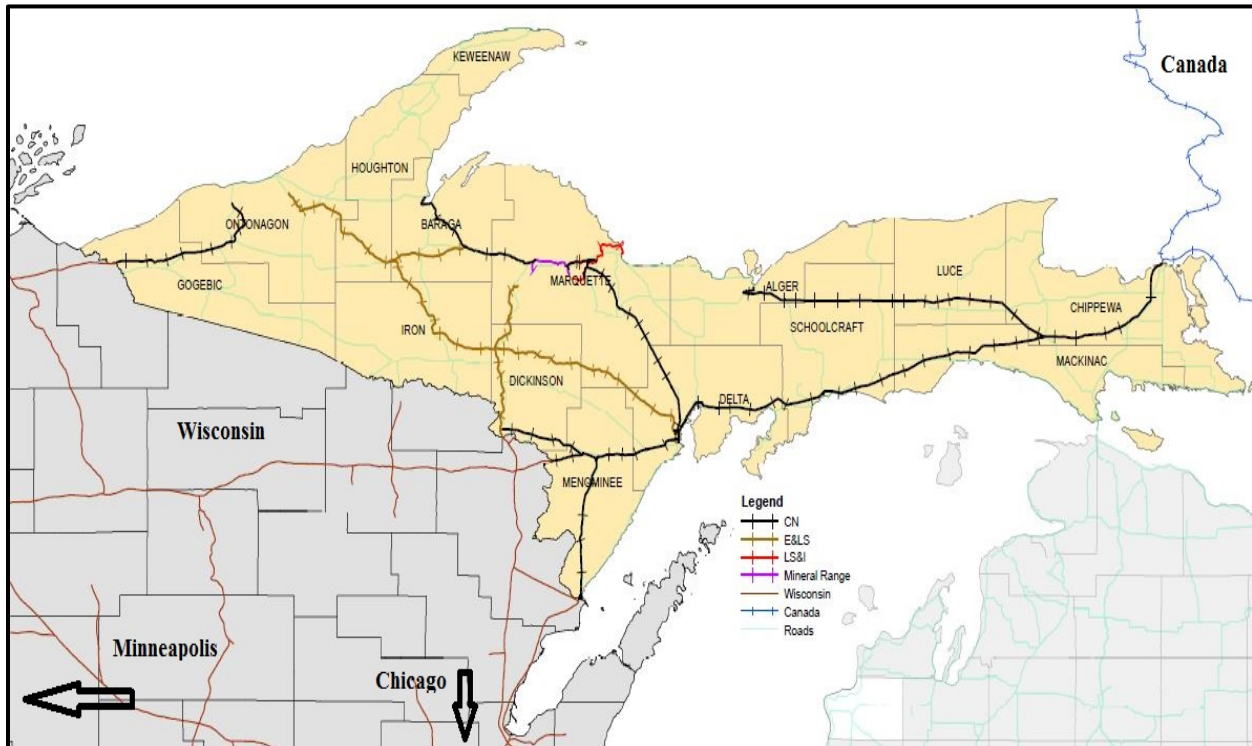


Figure 5: Current Upper Peninsula railroad network and connections

In total, almost 20 percent of Michigan's freight tonnage (or value) moves by rail, but the importance of rail for the U.P. is significantly higher. The U.P. accounts for only 3-5% of the Michigan total truck tonnage, but for 20% of outbound rail tonnage, 4% of inbound rail tonnage and 94% of the intrastate rail tonnage. From commodity perspective, the U.P. accounts for almost all lumber, wood, paper and pulp, and iron ore movements, and more than half of other non-metallic ore and mineral movements and outbound agricultural rail movements. According

to the Michigan Freight Plan, the intrastate rail tonnage is expected to increase by 174.5% by 2030, potentially causing significant increases to U.P. freight volumes. In addition, lumber, wood, paper and pulp, and iron ore movements are all expected to increase by over 40% each.

1.4. Study Objectives, Scope and Tasks

The general study objectives included: 1) Increasing the visibility of rural rail alternatives among current and potential shippers and other stakeholders, 2) better understanding of operational characteristics of rural freight rail in Michigan, 3) market analysis of current and potential shippers and 4) comparative analysis of specific commodity shipments. The specific tasks and deliverables included:

1. Development of GIS-based rural rail infrastructure inventory map of the Upper Peninsula of Michigan. The task will use current MDOT map as basis and collect data on basic parameters for rail segments (rail weight, speeds, weight limits). It will also locate transload/transfer points and incorporate relevant key parameters (private vs. team track, car capacity, transload equipment, special considerations). This task is collaborative effort with a separate MDOT funded project conducted in the Lower Peninsula. **Deliverable:** Web-based interactive map of the Upper Peninsula of Michigan rural rail lines that can be searched for basic information such as line ownership, siding locations and track parameters.
2. Commodity flow analysis. Data collection of flows of key commodities that move (or could potentially move) by rail from the TRANSEARCH database that includes 1% waybill data. **Deliverable:** Commodity flow maps and analysis as part of the final report. New market potential analysis.
3. Railroad interviews (performed simultaneously with Task 4). Identification of the main concerns and challenges of shipper behavior and suggestions for improvements. Identification of operational characteristics of rural freight rail companies in Michigan and general evaluation of how rural freight rail operates (service levels, capacity utilization, changes in use, interchanges, etc.). **Deliverable:** Operations summary report.
4. Development and implementation of an online shipper survey instrument to research current and potential rail shippers. Topics to include commodities, volumes, O-D pairs currently shipped or those not shipped by rail, main reasons for shipping OR not shipping by rail, main concerns and challenges of using rail service and suggestions for improvements. This task is a collaborative effort with a separate MDOT funded project conducted in the Lower Peninsula. **Deliverable:** Online survey instrument.
5. Analysis of shipper/rail service provider concerns. Follow-up interviews to obtain responses from shippers and rail providers. **Deliverable:** Analysis summary in final report and challenge matrix to highlight shipper/rail concerns and potential solutions.

6. Comparative analysis of identified new opportunities for rail/multimodal shipping. Case studies to be selected based on shipper surveys and interviews for existing and potential new commodity flows. A modeling tool, such as Mineral Occurrence Revenue Estimation and Visualization (MOREV) tool will be used to conduct the comparisons from cost and emissions point of view. **Deliverable:** Case study summaries and comparative analysis section as part of the final report.

1.5. Report Organization

The report has been organized to six different chapters, a bibliography and several appendices:

- **Chapter 1, Introduction.** This section defines the goals of the study, provides an overview of rural freight rail transportation, and describes the organization of the report.
- **Chapter 2, Literature Review.** This section provides a brief introduction to the literature review of past rail transportation related studies in the region.
- **Chapter 3, Methodology.** This section provides a summary of how the rural freight rail study was undertaken. Detailed descriptions of the tasks and the data collection activities are included in appendices.
- **Chapter 4, Findings.** This section summarizes the main findings from each individual study task.
- **Chapter 5, Discussions.** This section provides a brief discussion of the findings.
- **Chapter 6, Conclusions.** This section provides recommendations and next steps for rural freight rail development in the Upper Peninsula.

Chapter 2 – Literature Review

Literature review was not included in the main project tasks, but a limited literature review was completed to investigate the history of rail lines in the U.P. and to identify relevant past studies in freight (rail) transportation in the region. The following sections provide a brief history of the U.P. rail lines from 1960s to today and past studies in the region related to rail transportation.

2.1. History of Upper Peninsula rail lines & service closures

The availability and use of rail transportation and services in Michigan's Upper Peninsula region has steadily declined since the explosive growth it experienced during the copper boom of the early 1900's. The available railroad track has shrunk over 50 percent from 1,500 miles in 1960 to less than half of it today, as the result of a long series of abandonments. This can be clearly seen by comparing the current U.P. rail network map in 1960 and today (Figure 6). Until 1984, the rail system in the Upper Peninsula was linked to the rail system in the Lower Peninsula by railroad car ferries operating between Mackinaw City and St. Ignace (railroad tracks were removed in 1991).

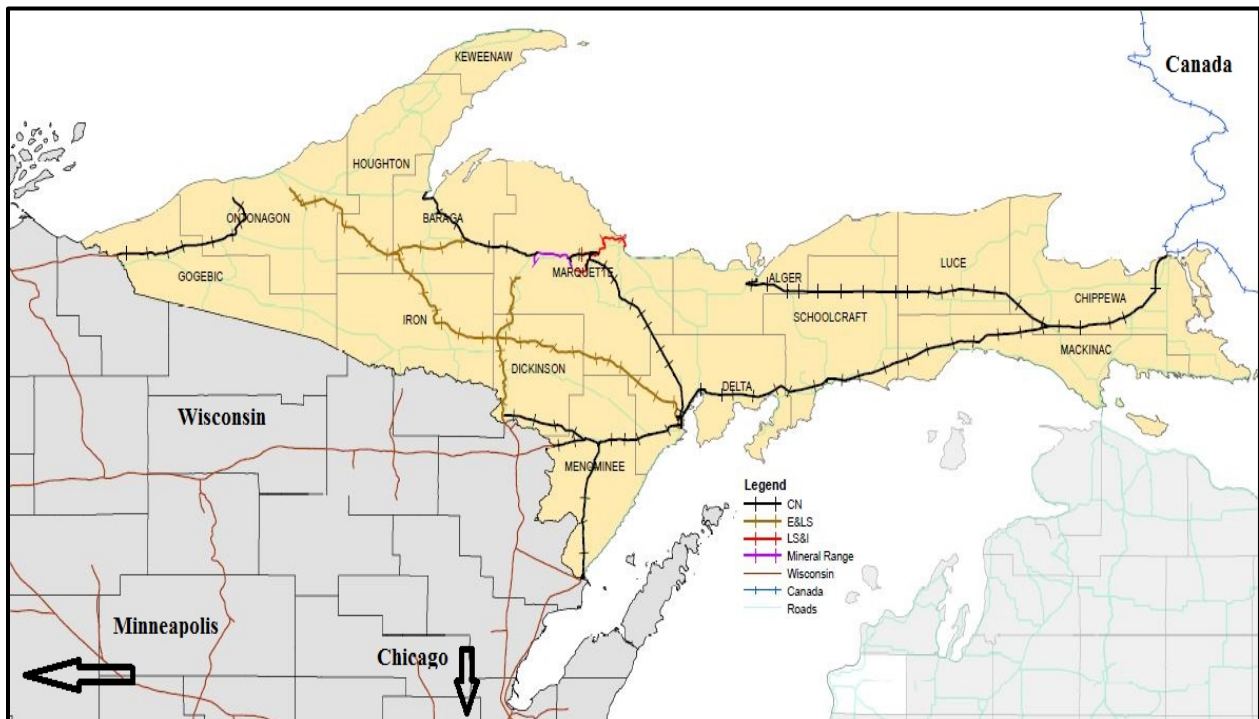
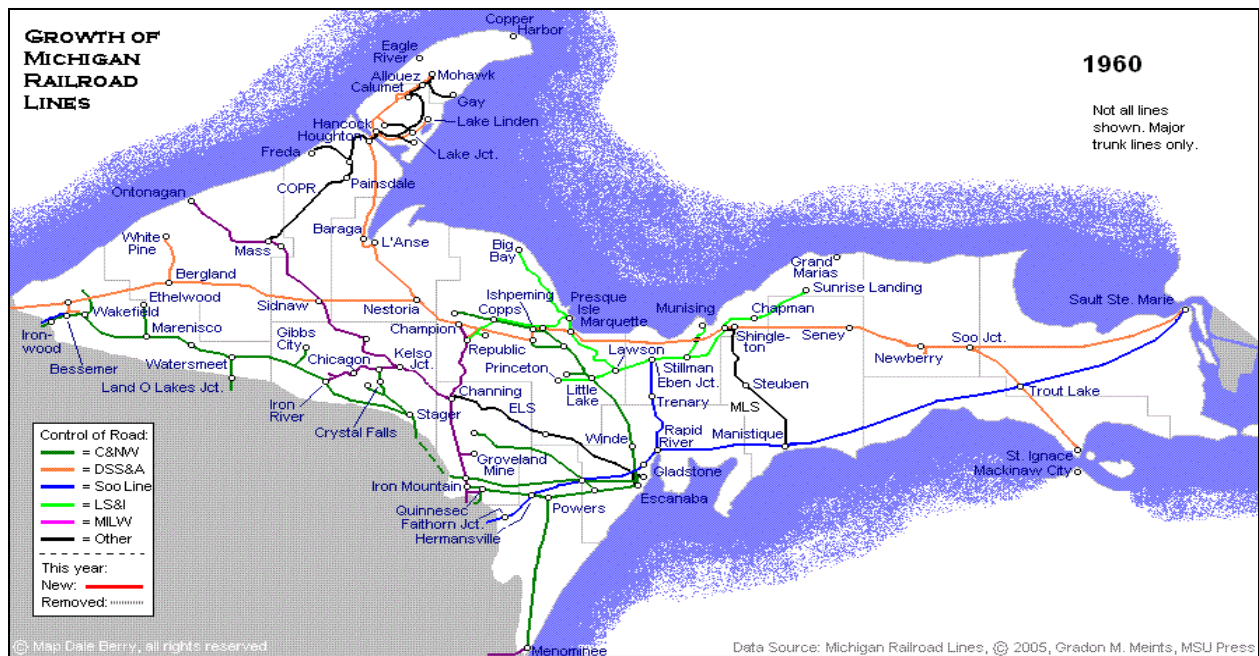


Figure 6: the Upper Peninsula railroad network in 1960 (top) (Berry, 2005) and today (bottom)

When compared to the total loss of track mileage in the State of Michigan over the same time period, it can be seen that the U.P. has faced similar reduction in overall track mileage, approximately 45 percent (storage track is still considered active in the calculation). In general, the General Accounting Office report to Congress (GAO, 1987) and other studies have identified increased competition from trucks, mergers, and bankruptcies as the main reasons that have influenced railroads' decisions to abandon lines, but in the U.P., additional contributing factors included the collapse of the region's mining industry. This effect can be seen by breaking down the pace of line abandonments from 1960 to today. The great majority of the abandonments took place between 1960-1990, but even the new millennium has seen abandonment of almost 150 miles (Table 1). It should be also noted that unlike in the Lower Peninsula, there are no rail lines under the State ownership in the U.P.

Table 1: Discontinued railroads in the Upper Peninsula region after 1999 (HNTB Co., 2011)

Name	County	Approx. Miles	Date
Escanaba & Lake Superior Railroad	Ontonagon, Houghton	43	2010
Sault Ste. Marie Bridge	Dickinson	1	2008
Lake Superior & Ishpeming Railroad	Marquette	9	2004
Wisconsin Central	Marquette, Alger	37	2001
Wisconsin Central	Marquette	9	2001
Wisconsin Central	Marquette, Alger	37	1999
Wisconsin Central	Marquette	1	1999
Lake Superior & Ishpeming Railroad	Marquette	4	1999

During the research, questions were raised by stakeholders, whether a correlation exists between past mine, mill, or other major operation closures and subsequent railroad abandonments. To investigate the matter, the research team compiled the limited available data. Based on data, no strong correlation exists between the time of closures and abandonments, but in most cases, the rail operations were abandoned within a decade (see Appendix A).

2.1.1.Rails-to-trails Program in the Upper Peninsula

One of the most successful ways in the nation to preserve abandoned railroad corridors for potential future use has been rails-to-trails program that converts the corridors to public use trails with potential reversion to rail use, as necessary. According to Rails-to-Trails Conservancy, 108

rail corridors in the State of Michigan has been opened for trail use with another 25 projected for future conversion (Rail Trail Statistics, 2014). According to Conservancy, there are 25 rail-trails in the U.P., totaling 716 miles. Currently, there are also negotiations under way for a transaction between E&LS Railroad and Michigan Department of Natural Resources (MDNR) to convert a 13 mile section between Ontonagon and Rockland to a trail use (Department Of Natural Resources, 2014). This section is part of a 43 mile abandonment between Ontonagon and Sidnaw, the most rail abandonment in the Upper Peninsula (Surface Transportation Board, 2014).

Despite the fact that most conversions have been from rails to trails, U.P. also witnessed recently an opposite transaction when 1.9 mile section of trail was converted back to rail use to access the Eagle Mine LLC facility in Humboldt Township (Detroit Free Press, 2013). This is only one of the handful reversals that have taken place, since the law was signed in 1976. As part of reversal, the township is developing an alternate trail to maintain the public access.

2.1.2.Recent Changes in Rail Ownership

The rail system ownership in the U.P. has remained fairly constant over the past several decades. However, some adjustments have taken place over the time. The following summarize some of the key ownership changes since 1980s.

- **Wisconsin Central Railroad acquisition by CN.** In 1987, the Soo Line trackage in the Upper Peninsula was purchased by the Wisconsin Central Railroad (WCR) (Carter, 2001). WCR acquired several additional lines in the region until it was purchased by the Canadian National Railway Company (CN) in 2001 for \$800 million, plus assumption of \$400 million in WCR debt (Bonneville, et al., 2013). At the time of its sale, WCR operated over 2,850 miles of track in the Great Lakes region (Reilly, 2011). WCR network is still owned and operated by CN and it forms the majority of U.P. rail system, including most connections to and from the region.
- **Escanaba and Lake Superior Railroad (E&LS).** The Escanaba and Lake Superior Railroad (E&LS) is a privately held shortline railroad Chartered in 1898 (**Duchaine, 1950**). It ran a logging and lumber line on some 65 miles from Escanaba to Channing & Wells. In 1980, it leased the lines from Channing to Green Bay, Ontonagon, and Republic (**Lewis, 1996**). It later purchased them from Milwaukee Road in 1984, increasing total trackage to more than 200 miles. Today it operates 124 miles of those tracks and additional 106 miles is used for storage purposes.
- **Lake Superior and Ishpeming Railroad.** LS&I was built in 1892 by the back then “Cleveland-Cliffs Iron Company” to carry iron ore from the mines directly to company-owned docks on Lake Superior (2007). The original line between Presque Isle (Marquette) and Ishpeming was completed in 1896. After a cycle of growth and reduction, LS&I is today owned by Cliffs Natural Resources, Inc. and it operates mainly

iron ore trains over a 20 mile segment from Cliffs Natural Resources Empire-Tilden Mine south of Ishpeming to the ore dock located in Marquette.

- **Mineral Range Railroad.** Mineral Range Railroad is a short line railroad that currently provides service to a small explosive company and scrap metal yard in Marquette County. In 2013; Mineral Range Inc (MRI) purchased from Cliffs Natural Resources a 12.06-mile segment between Landing Junction in Ishpeming Rail Yard and Humboldt Junction that is also used by CN for their L'Anse/Baraga operations. MRI has also acquired a 1.90-mile segment between Humboldt Junction and Humboldt mill which LS&I has an agreement with the Michigan Department of Natural Resources (MDNR) for railbanking (2011). MRI has been rebuilding the segment to serve Eagle Mine LLC, which is opening a mill at Humboldt to process nickel and copper ore from Eagle Mine.

2.2. Past Studies on Upper Peninsula Freight/Rail

Several freight (rail) transportation related studies over the past decade have included the U.P. as part of the study region. As described in the following list, these studies have ranged from investigations of region's freight shippers to more specific studies in multimodal and intermodal opportunities, log truck movements, forest product and biomass transportation, and in the effects of potential shortline closures to roadway pavements. A brief summary of each study and its findings is provided in Appendix B – Past Studies on Upper Peninsula Freight/Rail

- A comparison of Alternative Rail Routes in Northern Michigan and Wisconsin, (Wilbur Smith Associates, 1990)
- Evaluation of Shipper Requirements and Rail Service for Northern Wisconsin and the Upper Peninsula of Michigan, (University of Wisconsin-Superior's Transportation and Logistics Research Center and Michigan Technological University, 2006)
- Rail to Truck Modal Shift: Impact of Increased Freight Traffic on Pavement Maintenance Costs, (University of Wisconsin-Superior's Transportation and Logistics Research Center, 2008). A summary of U.S. Department of Transportation Truck Size and Weight Study is also included in the Appendix
- Study of Greenhouse Gas Savings Associated with Congestion Reduction Using Multi-Modal Optimization of Timber Shipments in the North Central United States, (University of Wisconsin-Superior's Transportation and Logistics Research Center and Michigan Technological University, 2010)
- Michigan Economic Development - Forestry Biofuel Statewide Collaboration Center: Task B1 – Evaluation of Michigan Biomass Transportation Systems, (Michigan Technological University, 2012)

- Improving Log Transportation with Data Based Monitoring and Analysis in Northern Wisconsin and Upper Peninsula of Michigan, (University of Wisconsin-Superior's Transportation and Logistics Research Center and Michigan Technological University, 2012)
- Summary of Evaluating Export Container Pooling Options in MN, WI, and MI's Upper Peninsula , (University of Wisconsin-Superior's Transportation and Logistics Research Center and Michigan Technological University, 2013)

Chapter 3- Methodology

As presented in the project scope and tasks, the study included six interrelated tasks. The following sections summarize the study methodology for each task and the interrelationships between the tasks.

3.1 Task 1: Data collection and implementation of interactive map

Figure 7 presents the process for interactive map development. Internet search of existing interactive rail maps and basic requirements from MDOT were used to develop the initial list of interactive map parameters and a base map was obtained from MDOT. Shippers were requested to provide feedback on important parameters as part of Task 4 - Shipper Survey and available data on specific rail segment and siding parameters were collected from railroad companies as part of Task 3 – Railroad Interviews. The map was implemented for public viewing in ArcGIS Explorer Online.

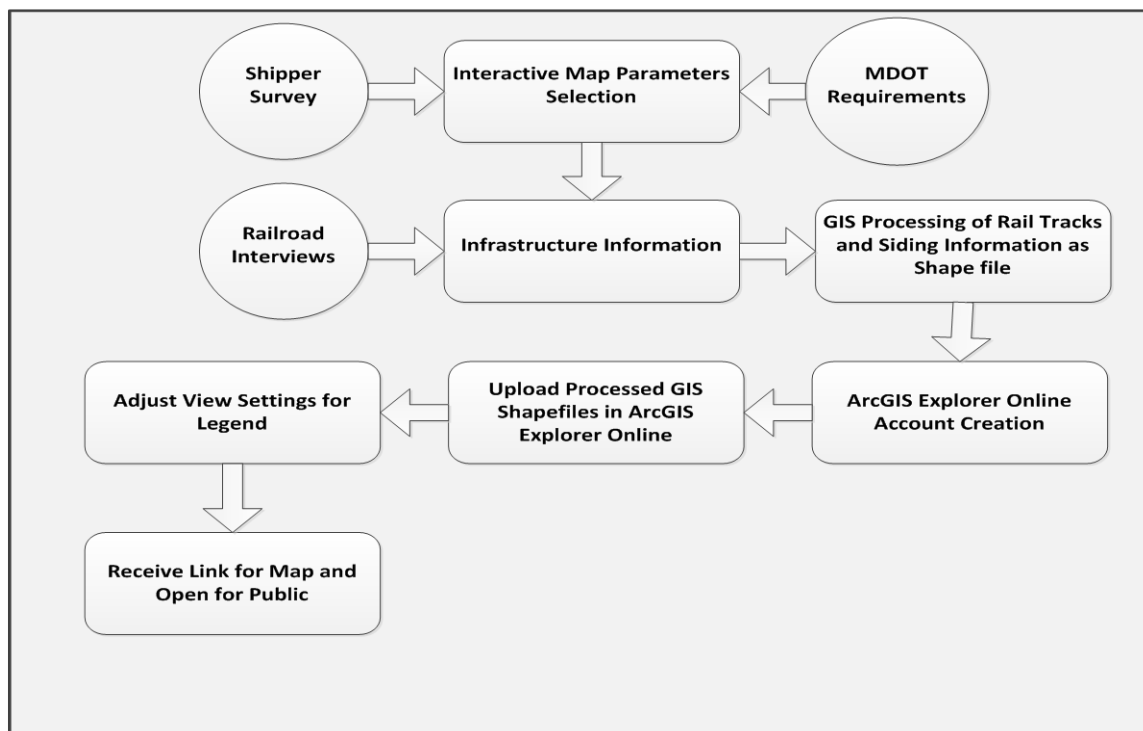


Figure 7: Development process of the interactive Upper Peninsula rail infrastructure map

3.2 Commodity Flow Analysis

The 2009 TRANSEARCH Database, provided by MDOT and developed by IHS Global Insight was the main tool for commodity flow analysis. After analysis revealed some challenges with the data, two additional data sources were used as part of an attempt to validate and supplement the TRANSEARCH data. Those included truck driver surveys conducted by MDOT at Sault Ste. Marie and Powers, and the volume data obtained from the shipper survey, conducted as part of Task 4 – Shipper Survey.

Figure 8 presents a flowchart of the commodity flow data collection and analysis process. The three data sources were used to analyze truck data for inbound, outbound and internal traffic for all 15 U.P. counties. Rail data was only available through TRANSEARCH database.

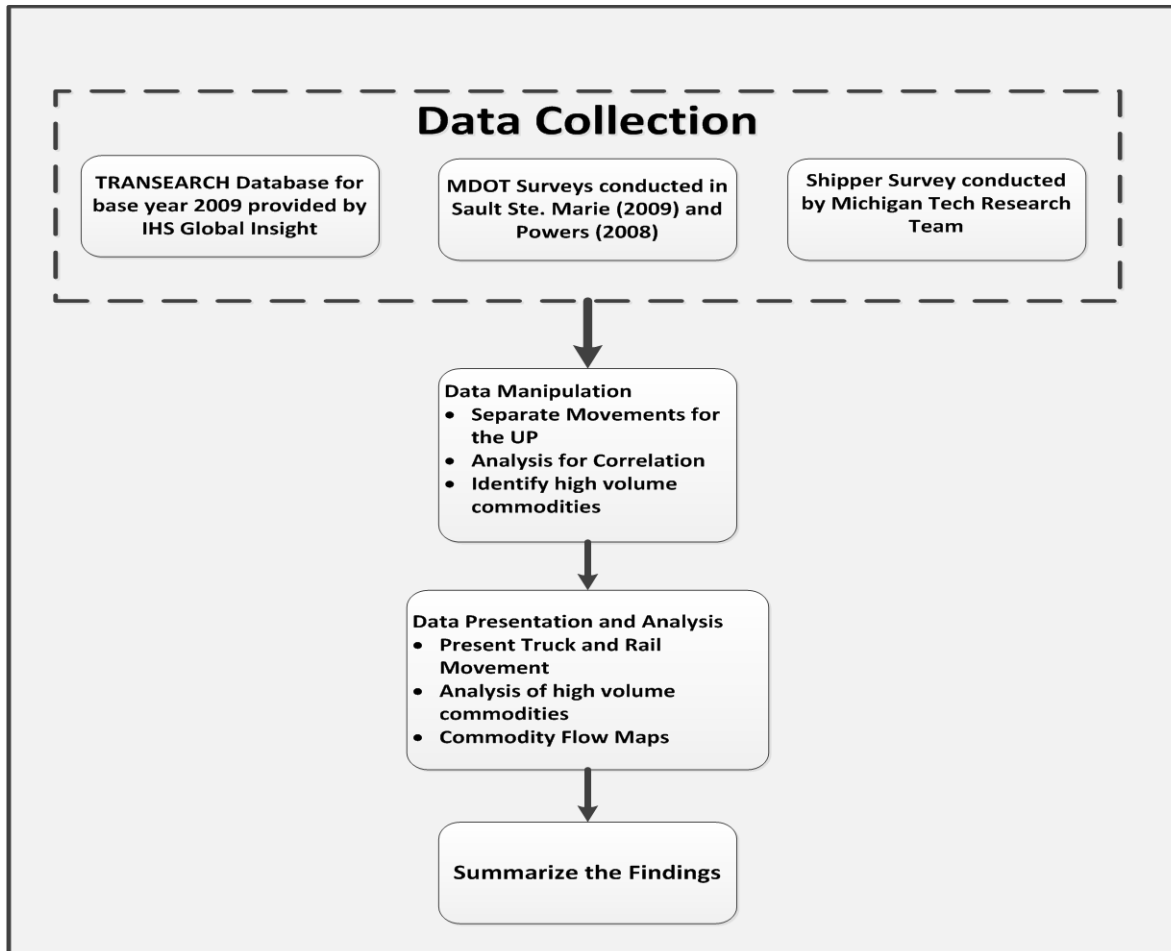


Figure 8: Flowchart of commodity flow analysis

3.3 Railroad interviews

Railroad interviews were closely interrelated with several tasks (Figure 9). The base maps of the rail lines in the U.P. and the current siding information were sent to the railroads to collect and validate infrastructure information for the U.P. rail system. The inquiry was complemented by a questionnaire (Appendix C) to discuss past and future improvements in the region.

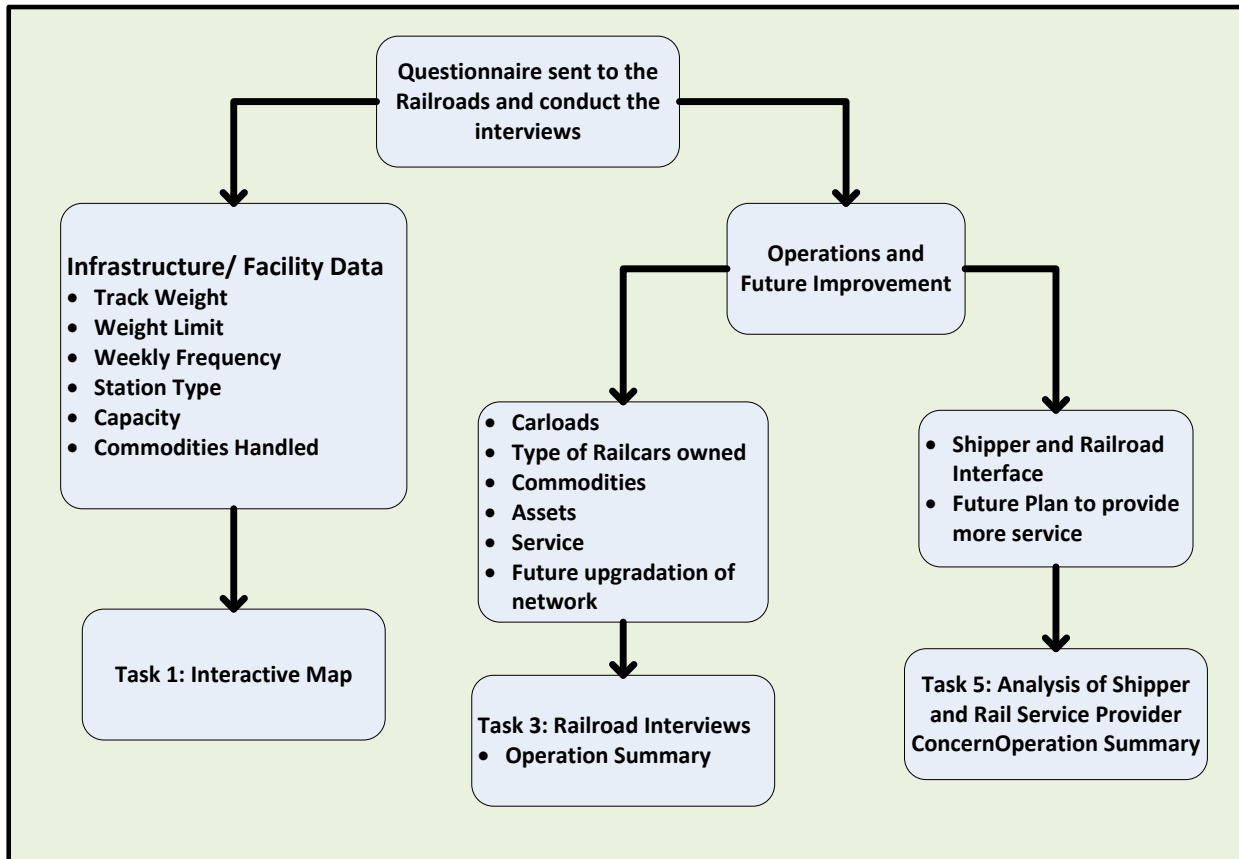


Figure 9: Railroad interview data collection and analysis procedure

3.4 Shipper Survey and Outreach

Experiences from several past surveys were used to develop a shipper survey was implemented to gather information on commodities shipped (or with potential to ship) by rail, on shipping patterns and modal selections and on the challenges perceived by shippers with using rail services in the study area. Figure 10 presents the structure and flow of the final survey instrument.

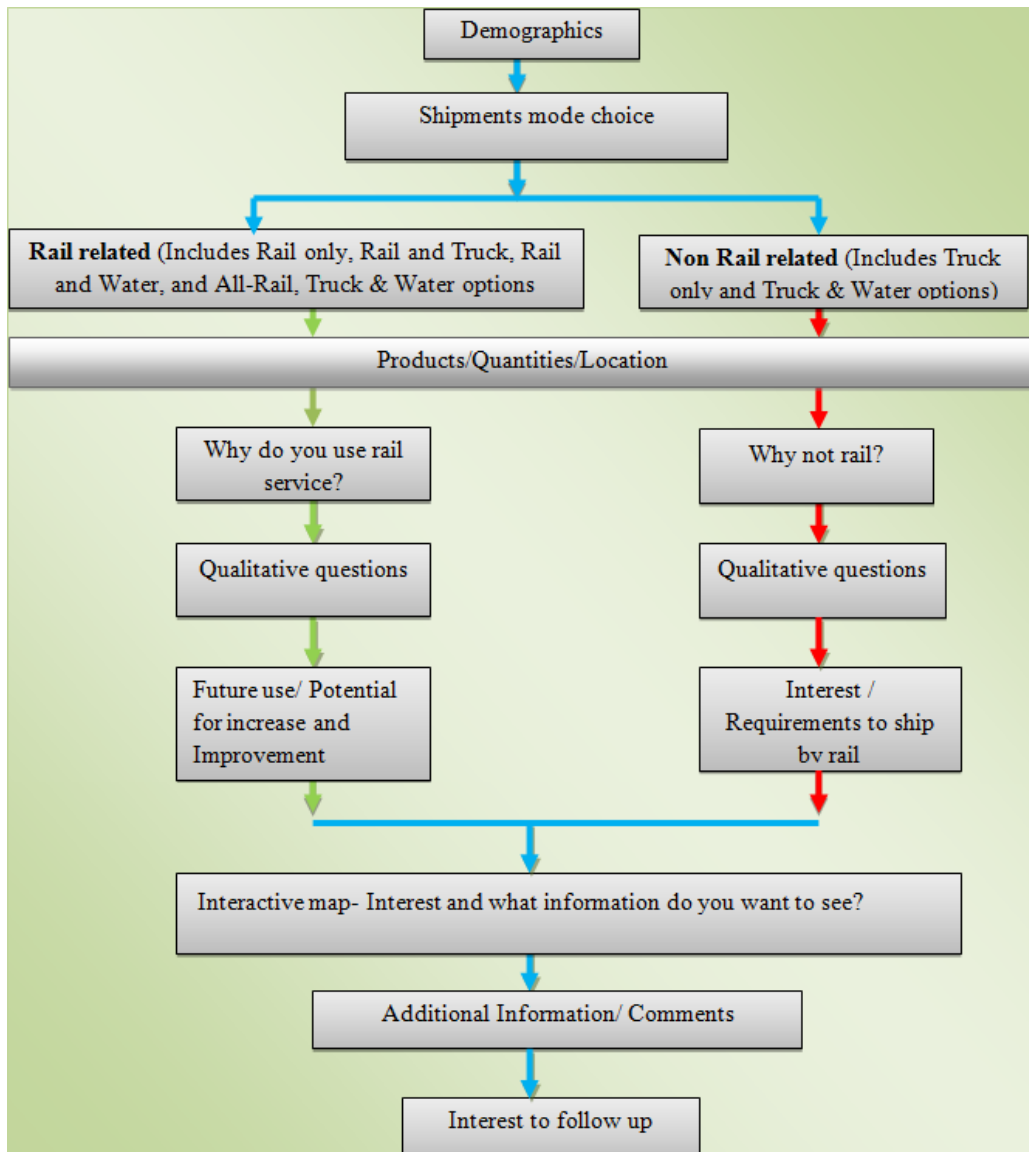


Figure 10: Structure/flow of the shipper survey

The instrument was initially developed only in online format, based on efficiency to reach more target audiences and simplicity to collect and analyze responses. In addition, the online format allowed “branching”, channeling respondents to appropriate questions based on their response to previous questions. After feedback from a test group, the final survey was released to stakeholders in a collaborative effort with local and regional economic development agencies on June 28, 2013 at

https://www.surveymonkey.com/s/Northern_Michigan_Rail_and_Truck_Freight_Study_Shipper_s_Survey. A complete list of survey questions is provided in Appendix D.

Despite the fact that the survey was distributed and promoted through different portals including MDOT, Michigan Economic Development Corporation (MEDC), Upper Peninsula Economic

Development Alliance (UPEDA), County Chambers-of-Commerce, Railroads, and Shipper groups (such as forest products associations), the response rate to the initial survey was poor. This led into development of paper surveys and personal solicitations via phone and in person, as part of the 68th Annual Lake States Logging Congress and Equipment Expo in Escanaba, September 6–7, 2013. A shorter form of the survey form was developed in an attempt to make it less intimidating. The evolution of the survey instrument and identifies the topic categories dropped in the later versions is provided in Appendix E.

3.5 Analysis of Shipper and Rail Service Provider Concerns

The analysis of shipper and rail service provider concerns used Task 3 – Railroad Interview and Task 4 – Shipper Survey outcomes to combine and categorize the concerns identified by each group into a single table for direct comparison and analysis.

3.6 Case Studies and Comparative Analysis

The purpose of conducting case studies of selected U.P. companies was to investigate certain industries and other potential opportunities for new and/or increasing existing rail transportation services. There were two main types of case studies:

1. Deeper look into industries with high impact to rail transportation, mainly mining and forest products industry.
2. Transload Facility Study, conducted as a complimentary graduate student study. Transload study included selected existing or potential shippers (with or without current rail shipments).

The study method combined literature and online searches with industry and agency interviews. A mining survey case study survey instrument (Appendix F) was constructed and used in semi-structured interviews to guide the interviewer in addressing all relevant and pertinent issues.

Chapter 4 – Study Findings

This Chapter will present the findings of the six main tasks completed as part of the study. A brief summary of past work is also provided as appropriate, as well as conclusions from each task.

4.1. Task 1: Rural Rail Infrastructure Map

In Task 1, the Michigan Tech research team developed an interactive map of the Upper Peninsula rail infrastructure and facilities. Increased visibility of rail facilities has been of interest to various stakeholders, especially for the forest products industry. Interactive maps offer users easy and interactive access to necessary information. The information provided in the map is expected to assist shippers and economic development professionals to better investigate options available to ship their commodities by rail. Michigan Tech used several rail industry examples of existing maps (Appendix G), including an interactive map by CN, as a foundation for the solution.

The map used data from Tasks 3 - Railroad interviews and Task 4 - Shipper Surveys and includes basic parameters for rail segments (rail weight, car capacity, weekly frequency, speeds, weight limits) and rail siding facilities (type of siding, ownership, contact info, commodities handled). While the map is fully functional, some of the facility data was not received from the rail companies at the time of completion and should be added later to the map.

4.1.1. Map Coverage

The interactive U.P. rail map covers all 15 counties in the U.P. (study area). The objective of the map is not to duplicate the data in current CN interactive map, but rather expand on more detailed information for all railroads operating in the U.P. More specifically, the map presents:

- Parameters of all rail segments and sidings /loading sites in the study area.
- Additional information requested by current/future shippers. Specific parameters were identified using information from the shipper survey and stakeholder interviews.

4.1.2. Map Parameters

Two main types of parameters are provided in the infrastructure inventory map.

a) Rail Track Parameters:

- Railroad Operator (s)
- Location (longitude and latitude)
- Weekly Service Frequency

- Track Class and Speed
- Car weight limits

b) Rail Siding Parameters:

- Facility Information
 - Type of facility (private vs. team track)
 - Main commodities handled
 - Capacity
 - Contact information

4.1.3. Proof-of-Concept Map

The implemented interactive map can be accessed at

<http://www.arcgis.com/explorer/?open=eef1aec195849198fd72853cb6bcf80&extent=10504654.3982735,5487884.54286327,-9179485.05827342,6110092.95953516>

The link above is temporary and should be changed by MDOT during final implementation. The map has been developed using the ArcGIS Explorer online platform, a free service that users can easily access with basic internet connection through any web browser. Access does require a free of charge installation of Silverlight software. A snapshot of the map is presented in Figure 11.

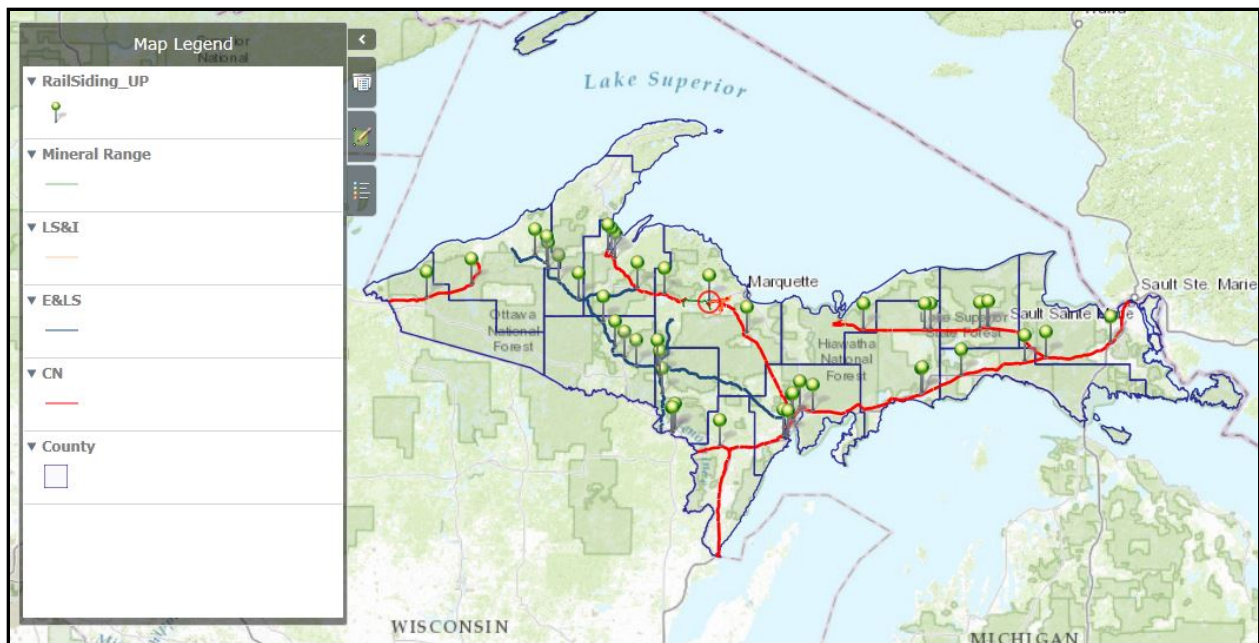


Figure 11: Upper Peninsula freight rail interactive map

While exploring the map, clicking on any specific rail line segment will reveal parameters of the line, as presented in Figure 12.

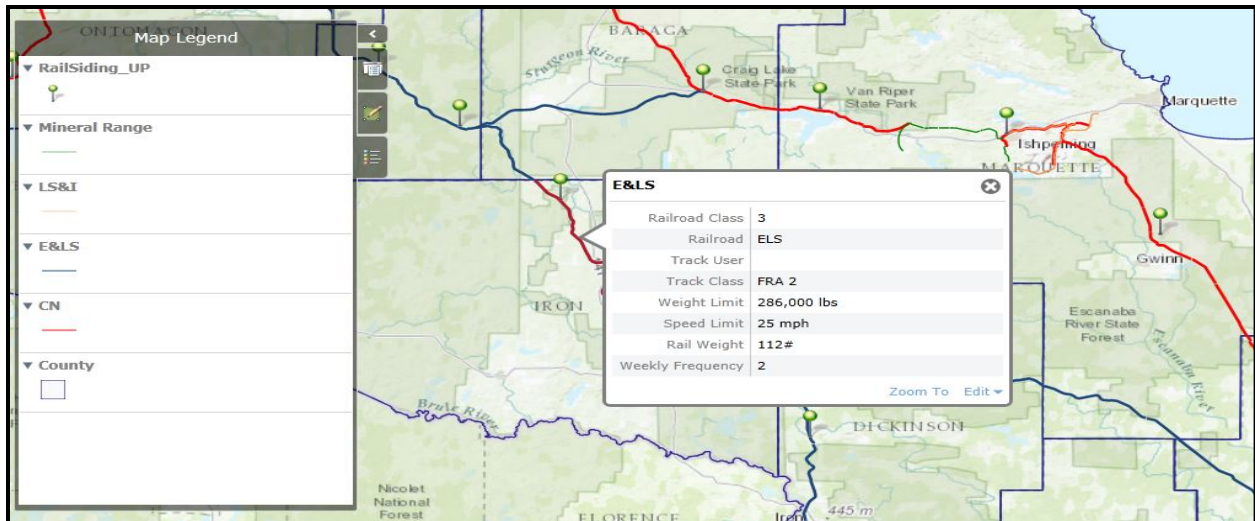


Figure 12: Track parameters included in the interactive map

Clicking any specific rail siding will open information of that siding (Figure 13). In addition, hovering cursor over the line or rail siding will pop up the name of the railroad operator, or the siding.

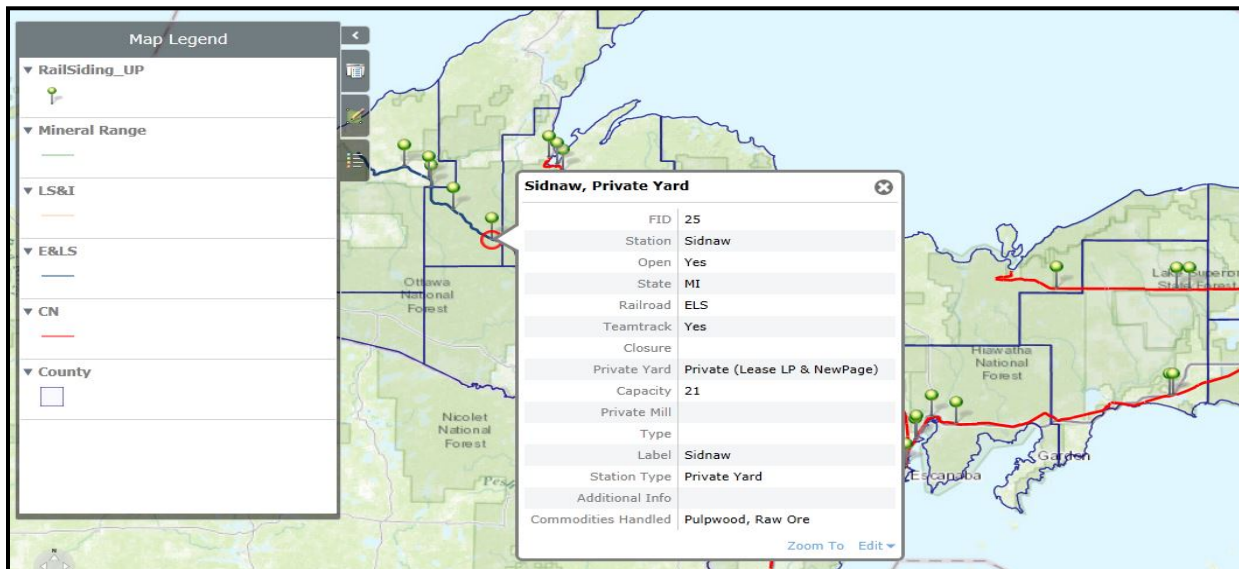


Figure 13: Rail siding information presented in the interactive map

4.1.4. Recommendations for Map Maintenance and Updates

The implemented interactive map will be transferred to be managed by the MDOT. Additional instructions for final implementation and recommended maintenance and updates are provided in Appendix H.

4.2. Task 2: Commodity Flow Analysis

Task 2 concentrated on identifying and quantifying key commodities moving by truck and rail in the U.P. The analysis was based on TRANSEARCH 2009 database, provided by MDOT and developed by IHS Global Insight Inc. TRANSEARCH is a unique planning tool that helps strategic transportation planners, transportation providers, and government agencies to analyze current and future freight flows by origin, destination, commodity, and transport mode. It is based on more than 100 sources including waybills, the Commodity Flow Survey, etc. (Everett, 2001) The commodities are classified by “4-digit Standard Transportation Commodity Code” (STCC4) and origins and destinations are classified with Commodity Analysis Zone (CAZ). Commodity movements are measured in tons and the percentage of commodities traveled by different modes can be compared by looking at the movements (Baker & Chen, 2008). The 2009 TRANSEARCH database used year 2030 for its long term analysis and developed forecasts of cargo flows for that year.

4.2.1. Limitations with TRANSEARCH Data

During the analysis, some discrepancies were identified in the TRANSEARCH database. **First**, there were errors in the distance parameters for some shippers. For example, all intrastate movements had a common distance of 16 miles and numerous interstate movements were given a distance of 64 miles. **Second**, the rail waybill data used in TRANSEARCH is based on data collected only from Class I railroads (Everett, 2001). The waybill data contains some information for regional and short-line railroads, but only in regards to interline service associated with a Class I railroad (Cambridge Systematics, 2012). It is unclear whether the internal shortline movements are accounted for properly in the database and how much they affect the overall volumes in the U.P. **Third**, TRANSEARCH consists of a national database built from company-specific data and other available databases. To customize the dataset for a given region and/or project, local and regional data sources are often incorporated in past studies. This incorporation requires assumptions that sometimes compromise the accuracy of the resulting database. Different data sources use different classifications; most economic forecasts are based on SIC codes while commodity data are organized by STCC codes. **Fourth**, the level of detail is lacking in the database, as origins and destinations within the state are provided on county level accuracy and outside state, only on state-level accuracy. 2012 database would provide an improvement to this, as origins and destinations can be generated for each zip codes. **Fifth**, intermodal movements may sometimes be accounted for insufficiently in TRANSEARCH. “If a shipper moves a shipment intermodally, one mode must be identified as the primary method of movement and the second mode may be in some cases omitted by the reporting companies”.(p. 44) (Everett, 2001)

4.2.2. Flow and Commodity Classifications

The analysis included intrastate and interstate commodity movements by both truck and rail with origin and/or destination in the Upper Peninsula of Michigan (U.P.). The overall volume data was categorized to main commodities, and a more detailed analysis was conducted on key commodities with significant volumes. The report does not include movement by OGV (Ocean Going Vehicles) or inland waterways.

The report divides the movements in three main categories:

- Inbound (Destination in the U.P.)
- Outbound (Origin in the U.P.)
- Internal (Origin and Destination in the U.P.)

Commodities have been classified according to Standard Transport Classification Code (STCC). The 2-digit general categories in the U.P. include agriculture, primary forest products, metallic ores, non-metallic ores and minerals, food products, lumber and wood products, pulp and paper mill products, printed matter, chemical products, petroleum or coal products, rubber and plastics, clay, cement, glass, stone products, primary metal products, fabricated metals, machinery, waste or scrap material, mail and secondary traffic. The 4-digit STCC presents a more detailed breakdown by commodity within each general category.

4.2.3. Truck Movements

Table 2 summarizes commodity movements by truck in 2009 and the forecasted values by TRANSEARCH for 2030. Internally, Lumber and Wood products account for 91 percent of the internal truck movements in the U.P. and the 2030 forecast suggests extensive growth for the inbound and internal movements in the category (200 and 149 percent, respectively). Pulp and Paper Mill Products by truck is worth noting. Lumber and wood products are a majority of outbound movements, while inbound movements are much more evenly distributed among numerous categories. It is noteworthy that the total truck tonnage is fairly equally distributed between inbound, outbound and internal categories in 2009, but the internal movements are forecasted to grow substantially faster than inbound and outbound movements.

Table 2: Top commodities (volume in tons) in Upper Peninsula for truck, 2009 and 2030

Commodities	STC C	Inbound		Outbound		Internally in the U.P.	
		2009	2030	2009	2030	2009	2030
Agriculture	1	268,608	241,708	38,218	276,197	0	5,936
Iron Ores	10	264,050	233,297	0	2	12,451	20,029
Nonmetallic Ores and Minerals	14	418,265	651,703	64,296	137,470	220,649	595,035
Food Products	20	338,867	435,473	75,056	112,928	0	11,763
Lumber and Wood Products	24	149,875	444,296	1,713,462	1,925,218	3,288,699	7,815,825
Pulp and Paper Mill Products	26	138,128	212,382	299,795	411,036	0	5,708
Chemical Products	28	242,987	270,453	194,486	258,912	0	2,638
Petroleum or Coal Products	29	219,072	205,274	216,511	206,083	22,663	70,634
Rubber and Plastics	30	31,286	55,537	16,965	29,050	0	1
Clay, Cement, Glass, Stone Products	32	153,794	305,823	137,063	221,060	71,044	381,507
Primary Metal Products	33	105,414	148,866	54,732	98,262	0	399
Fabricated Metals	34	55,229	94,104	55,111	76,307	0	337
Machines	35	31,294	67,495	34,814	63,612	0	0
Secondary Traffic	50	550,150	1,365,482	81,441	175,472	0	1,103
Other		222,241	387,453	364,271	343,527	6,092	112,350
Total		3,189,260	5,119,346	3,346,220	4,335,136	3,621,598	9,023,265
% increase		61		30		149	

4.2.4. Rail Movements

Table 3 presents the main commodities moved by rail in the U.P. in 2009 and 2030. Iron ore was the main commodity for both outbound and internal rail movements, but it was almost equaled by forest products (lumber, wood, pulp and paper) for outbound movements. Clay, cement, glass, and stone products made almost half of the inbound movements. Extensive growth is forecast by TRANSEARCH for iron ores, lumber and wood products, and clay, cement, glass, and stone products by 2030. Internal movements especially are expected to almost triple, mainly due to

substantial forecasted increases in iron ore movements. Rail movements are much more unbalanced between inbound, outbound and internal categories, partially due to high iron ore tonnages. Overall, inbound movements account for only ten percent of the overall movements in 2009 and even lower percentage in 2030 forecasts.

Table 3: Top commodities (volume in tons) in U.P. for rail, 2009 and 2030

Commodities	STCC	Inbound		Outbound		Internally in the U.P.	
		2009	2030	2009	2030	2009	2030
Iron Ores	10	0	0	1,460,308	2,793,444	8,334,341	24,722,228
Lumber and Wood Products	24	193,920	383,343	576,560	581,918	257,640	604,043
Pulp and Paper Mill Products	26	105,480	155,994	908,160	1,030,201	56,360	82,663
Chemical Products	28	0	203,309	0	0	0	0
Clay, Cement, Glass, Stone Products	32	499,680	859,900	68,600	76,468	0	0
Primary Metal Products	33	67,920	148,091	38,080	20,923	0	0
Waste or Scrap Material	40	2,800	2,871	49,200	76,918	0	0
Other		306,928	138,200	4,080	5,163	322,184	136,766
Total		1,176,728	1,891,708	3,104,988	4,585,035	8,970,525	25,545,700
% increase		61		48		185	

4.2.4.1. Interstate Movements by Truck and rail

Figure 14 presents a breakdown of the inbound and outbound trucks movements to and from the 15 U.P. counties in 2009 and 2030. In 2009, Marquette and Dickinson received the highest inbound volume (approx. 21 percent of the total each). On the other hand, Menominee originated the most volume (approx. 18 percent of the total truck U.P. outbound movement) from the U.P. By 2030, trucking volumes are forecast to increase by 61 and 30 percent (inbound/outbound respectively). All the counties, but especially Delta, Dickinson and Menominee, are projected to witness increased inbound/outbound truck volumes.

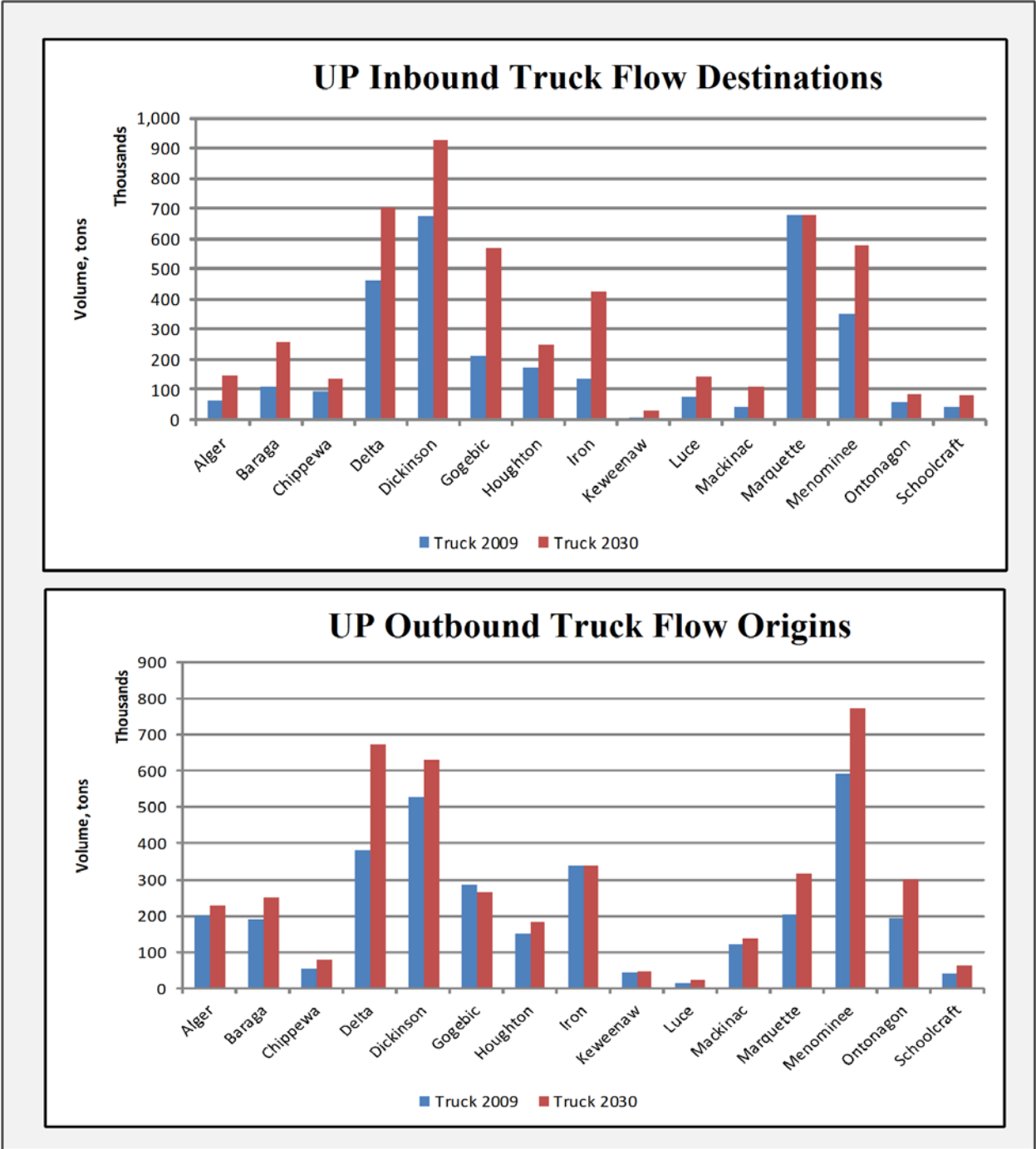


Figure 14: Inbound and outbound interstate flow by truck in the Upper Peninsula in 2009 and 2030

Figure 15 presents the inbound and outbound (excluding internal U.P.) movements by rail in 2009 and 2030. Delta and Dickinson receive the majority of inbound movements, while Marquette has the greatest outbound volume (approx. 47 percent of the total in the U.P.). By 2030, the overall inbound/outbound tonnages are forecasted to increase by 61 and 48 percent, 26

respectively, led by the three counties mentioned above. Especially, outbound movements from Marquette County are expected to almost double to 3,000,000 tons based on the TRANSEARCH forecast.

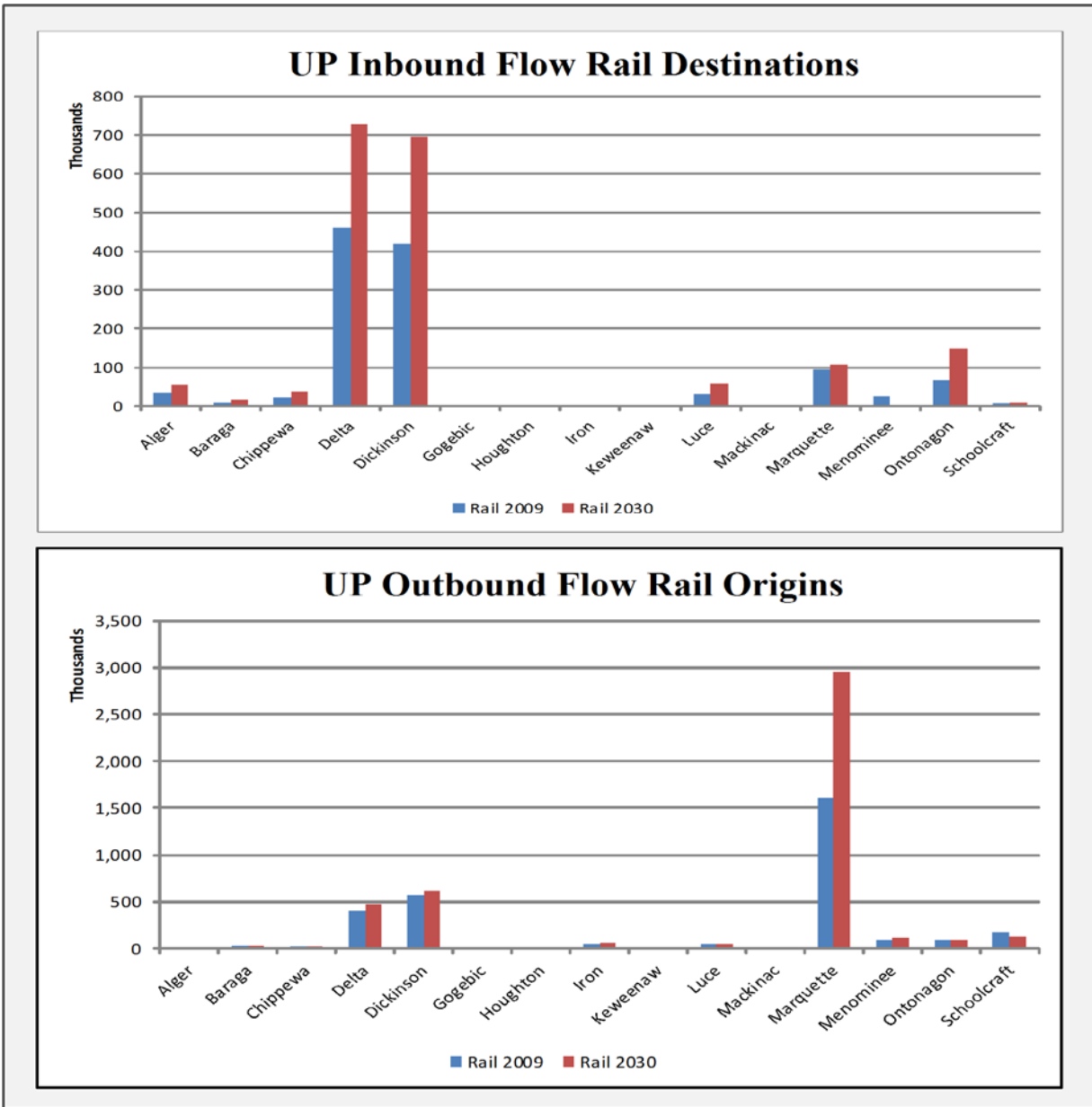


Figure 15: Inbound and outbound interstate flow by rail in the Upper Peninsula in 2009 and 2030

4.2.4.2. Trucking Distances

Distance of truck movements is an important component when considering opportunities for potential modal shift. Figure 16 divides inbound, outbound and internal trucks movements based on transportation distance. Due to some constant errors in the TRANSEARCH database (for example, internal movements in the U.P. are given as 16 miles), distances for certain movements were checked and modified using google maps. Almost all internal movements and a great majority of interstate movements were for distances below 200 miles. On the other hand, there were almost 2,000,000 million tons trucked for over 300 miles and almost 1,000,000 tons for over 500 miles.

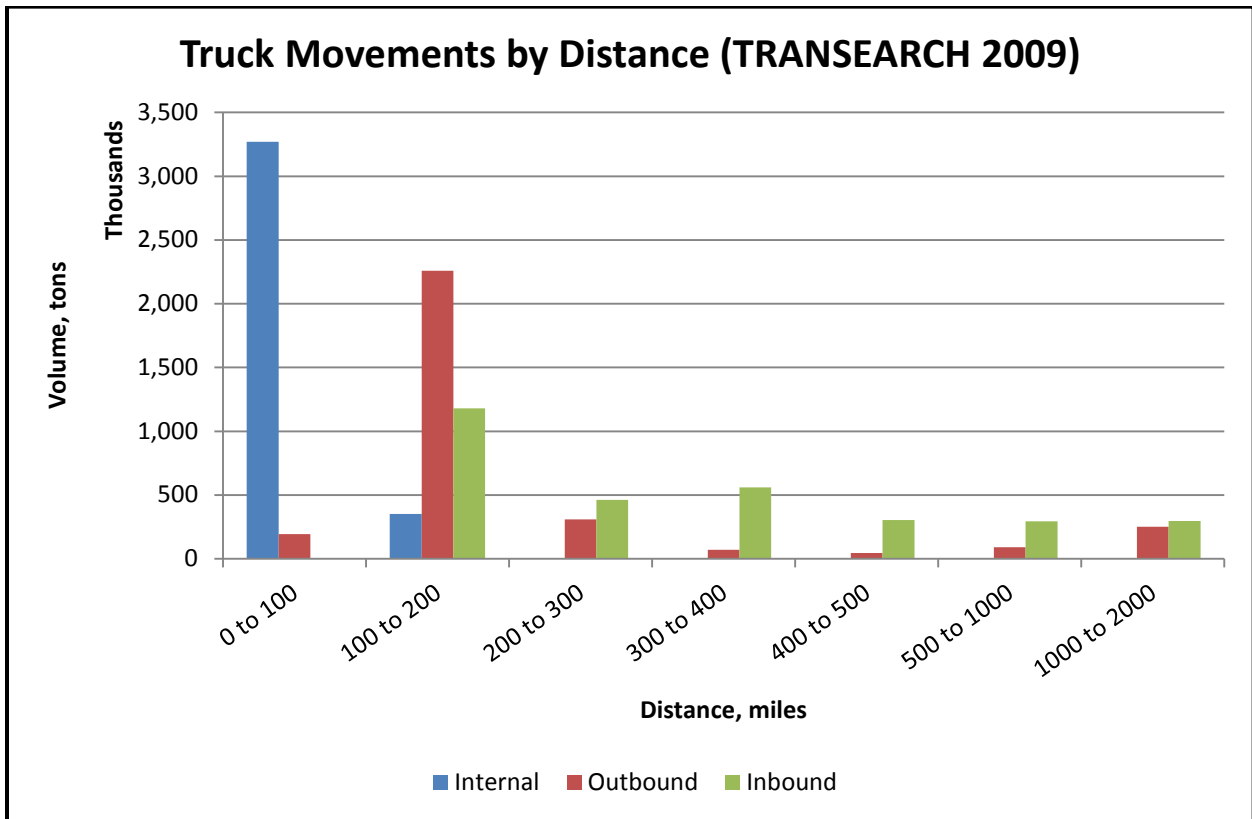


Figure 16: Truck movements by distance in 2009

While interstate movements pose the highest potential for a modal shift, an earlier study by Justin Hicks demonstrated that forest product movements by rail can become cost efficient already at distances over 150 miles (Hicks, 2009). Lumber and wood products make some of the 3,300,000 tons of internal forest product movements a potential target for new rail business, as distances between counties in the U.P. often exceed the limit defined by Hicks. Figure 17 presents the breakdown of internal lumber and wood product truck movements by distance. While the great majority of the movements is less than 100 miles, there are almost 250,000 tons

exceeding the 100 mile limit. It should also be remembered that these values are forecast to more than double by 2030.

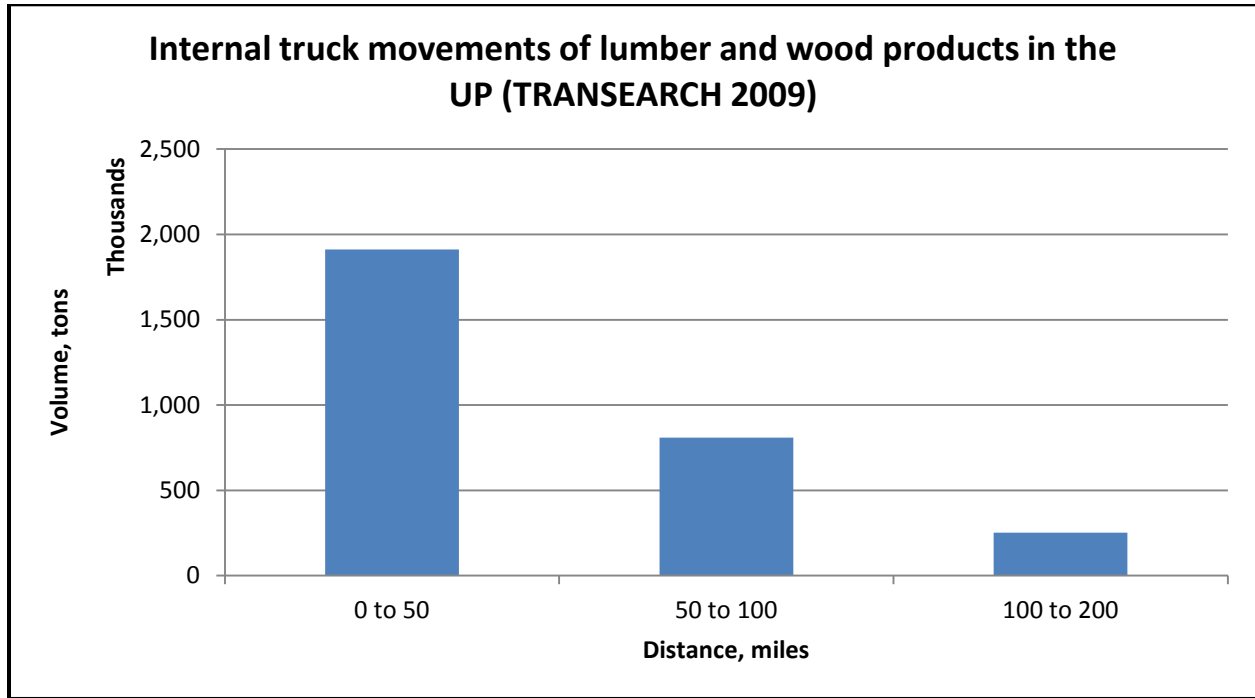


Figure 17: Internal movements of lumber and wood products in the Upper Peninsula in 2009

4.2.5. Other data sources for movements

The revealed discrepancies and limitations of TRANSEARCH data led the team to use two additional sources; driver surveys performed by MDOT and movement and quantity data from Task 4 – Shipper Survey, in an attempt to validate the TRANSEARCH analysis and to get additional insight to commodity flows. MDOT conducted truck driver surveys in Powers (2008) and Sault Ste. Marie (2009) to analyze the movement of the commodities. Table 4 presents the summary of the movements derived from MDOT surveys, side by side with TRANSEARCH data. Even though some correlation exists between main commodities, it was recognized that the potential to use MDOT data for data validation was limited due to only two data collection points and short data collection period. It would not be feasible to scale up the surveyed volume for a full year, as Annual Average Daily Traffic (AADT) values were not available for the time period of the survey.

Table 4: Comparison of TRANSEARCH and MDOT surveys

	Commodities	STCC	Inbound			Outbound			Internal	
			TRANSEARCH	Powers (MDOT)	Sault Ste. Marie (MDOT)	TRANSEARCH	Powers (MDOT)	Sault Ste. Marie (MDOT)	TRANSEARCH	Powers (MDOT)
Top Commodities	Agriculture	1	268,608	0	0	38,218	5,274	12,828	0	17,280
	Iron Ores	10	264,050	0	0	0	0	0	12,451	0
	Nonmetallic Ores and Minerals	14	418,265	0	0	64,296	0	0	220,649	20,562
	Food Products	20	338,867	16,120	0	75,056	6,560	12,828	0	41,205
	Lumber and Wood Products	24	149,875	87,590	90,576	1,713,462	192,958	43,732	3,288,699	80,397
	Pulp and Paper Mill Products	26	138,128	16,157	12,218	299,795	42,533	109,551	0	6,559
	Chemical Products	28	242,987	15,106	0	194,486	499	0	0	2,030
	Petroleum or Coal Products	29	219,072	18,472	0	216,511	11,786	0	22,663	20,284
	Rubber and Plastics	30	31,286	1,879	0	16,965	318	0	0	68
	Clay, Cement, Glass, Stone Products	32	153,794	0	42,553	137,063	10,661	0	71,044	8,477
	Primary Metal Products	33	105,414	750	25,104	54,732	4,678	27,093	0	18,132
	Fabricated Metals	34	55,229	0	0	55,111	3,412	0	0	15,384
	Machines	35	31,294	34,017	0	34,814	6,371	0	0	19,213
	Secondary Traffic	50	550,150	14,798	0	81,441	11,678	0	0	43,477
	Other			222,241	35,326	50,506	364,271	21,907	49,563	6,092
Total			3,189,260	240,214	220,957	3,346,220	318,634	255,594	3,621,598	354,587
% Captured by the Surveys				8	7		10	8		10

The Michigan Tech research team also looked to correlate interstate movements between data collected as part of Task 4 – Shipper Survey with TRANSEARCH data (Table 5). Shipper survey captured approx. 47 and 63 percent of total inbound and outbound truck volumes, respectively. There were great variations on the percent captured from county to county, ranging from none to counties where the volume from the shipper survey significantly exceeded TRANSEARCH numbers. For example, outbound truck traffic from Marquette was more than five times higher than the volume presented in TRANSEARCH.

For rail, less than 30 percent was captured for both inbound and outbound flow from shippers, but data from railroad interviews confirmed the general accuracy of overall TRANSEARCH volumes. In general the study team concluded that available freight databases did not provide adequate detail for the study effort and there is a genuine lack of accurate data on U.P. businesses and on commodity flows.

Table 5: Comparison of interstate movements (TRANSEARCH vs. Michigan Tech shipper survey)

County	Inbound (Tons)				Outbound (Tons)			
	Rail		Truck		Rail		Truck	
	Shipper Survey	TRANSEARCH (2009)	Shipper Survey	TRANSEARCH (2009)	Shipper Survey	TRANSEARCH (2009)	Shipper Survey	TRANSEARCH (2009)
Alger		36,080	3,300	64,493	4,800	3,160	10,800	201,896
Baraga	38,400	11,520	177,120	110,131		30,760	2,340	191,584
Chippewa		23,280	28,800	94,040		16,640	41,760	55,897
Delta	43,760	460,680	94,425	464,228	39,175	407,720	31,665	382,755
Dickinson		418,768	26,130	676,158	27,240	567,600	165,468	528,084
Gogebic	12,900	0	83,437	210,292		10,600	5,475	286,028
Houghton		0	43,710	173,661		7,200	151,940	149,767
Iron		0		136,489	4,300	45,040	158,700	338,713
Keweenaw		0		5,601		0		45,726
Luce	13,500	30,800	33,910	76,120	258,000	46,840	150,980	15,012
Mackinac		0		46,052		2,920		123,014
Marquette	5,000	95,480	296,200	678,394	385,440	1,607,348	1,174,930	204,381
Menominee		24,280	565,053	350,258	96,000	95,000	246,710	590,788
Ontonagon		67,920		60,531		87,920		192,661
Schoolcraft	15,600	7,920	140,400	42,810	1,000	176,240	9,000	39,914
Total	129,160	1,176,728	1,492,485	3,189,258	815,955	3,104,988	2,149,768	3,346,220
% captured	11		47		26		64	

4.3. Task 3: Railroad Interviews

Task 3 included interviews of railroads currently serving the Upper Peninsula to get insights on current and future status of infrastructure and operations in the study area. The research team visited several rail facilities and met with the railroad officials. The data collected as part of the interviews also formed the foundation to the infrastructure mapping effort.

4.3.1. Infrastructure

As mentioned earlier, the current U.P. network includes approximately 800 total track miles with almost 700 of them in regular operations. The Peninsula is served by one Class 1 Railroad (CN) and three shortline railroads (Escanaba and Lake Superior Railroad, Lake Superior and Ishpeming Railroad and Mineral Range Railroad). In addition there are two industrial railroads that operate within Carmeuse facilities in Port Inland and in Cedarville. Table 6 provides a brief summary of the U.P. rail infrastructure and Figure 18 presents a map of the U.P. rail system, including different railroads, rail sidings and yards, and current and potential interchange locations. CN owns and operates over 75% of the total mileage, but there are trackage right agreements between companies at several locations. There are no state owned lines in the U.P. Tracks that are currently not in active operation have been identified with dashed line. Detailed tables that describe the key parameters of each track segment and sidings are included in Appendix I.

Table 6: Summary of rail infrastructure in the Upper Peninsula

Parameters		Railroads			
		CN	E&LS	LS&I	Mineral Range RR
Railroad Type		Class 1 railroad	Shortline	Shortline	Shortline
Track Mileage		463 miles active and 48 miles out of service in white pine	124 miles of active track in operation and 106 miles of storage track	20 current operating miles (Tilden to docks)	16.5 miles
FRA Track Classes		1, 2, 3	1, 2	2	1
Rail Weight		80# - 115#	65# - 112#	115#	80# - 112#
Typical Weight Limit of Rail Car (lbs) (Figure 23)	263,000	X	X	X	X
	268,000	X			
	286,000	X	X		

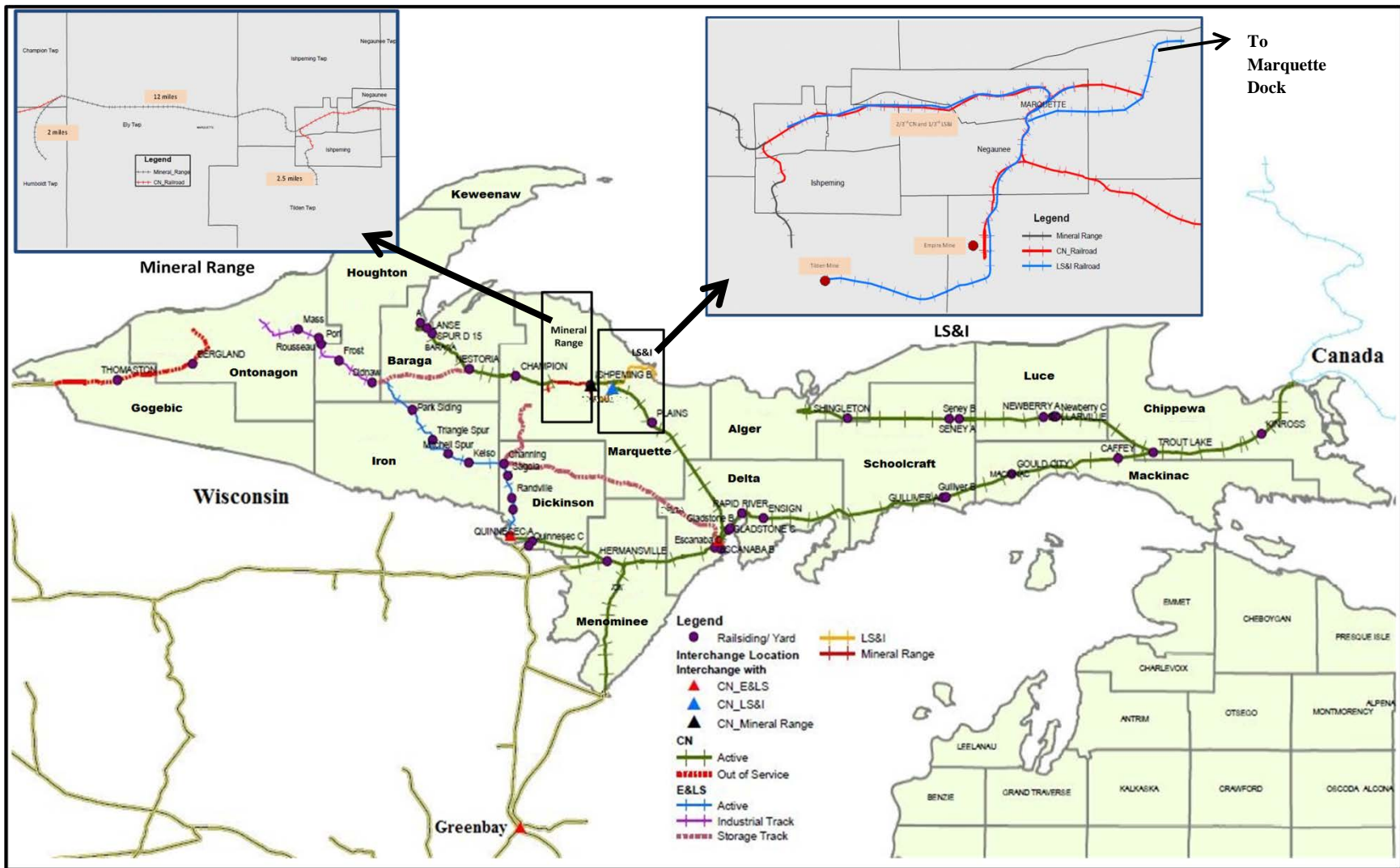


Figure 18: Rail Infrastructure in the Upper Peninsula

4.3.1.1. CN

CN owns 511 miles which includes the out of service White Pine line. It also has trackage rights at various locations. CN also has operational trackage rights on the Mineral Range for 12 miles from Landing Junction to Humboldt Junction. CN and L&SI have nine miles of joint track from Landing Junction to Partridge Junction, and two miles from Partridge Junction to Empire Mine. E&LS operates 48 miles on CN track from North Escanaba to Pembine, WI. The main yard in the U.P. is located in Gladstone and CN has various active and potential interchange locations with all other U.P. railroads, both in the U.P. and in Green Bay, Wisconsin (E&LS). CN serves currently approximately 30 private and public sidings in the U.P., as presented in Figure 19.

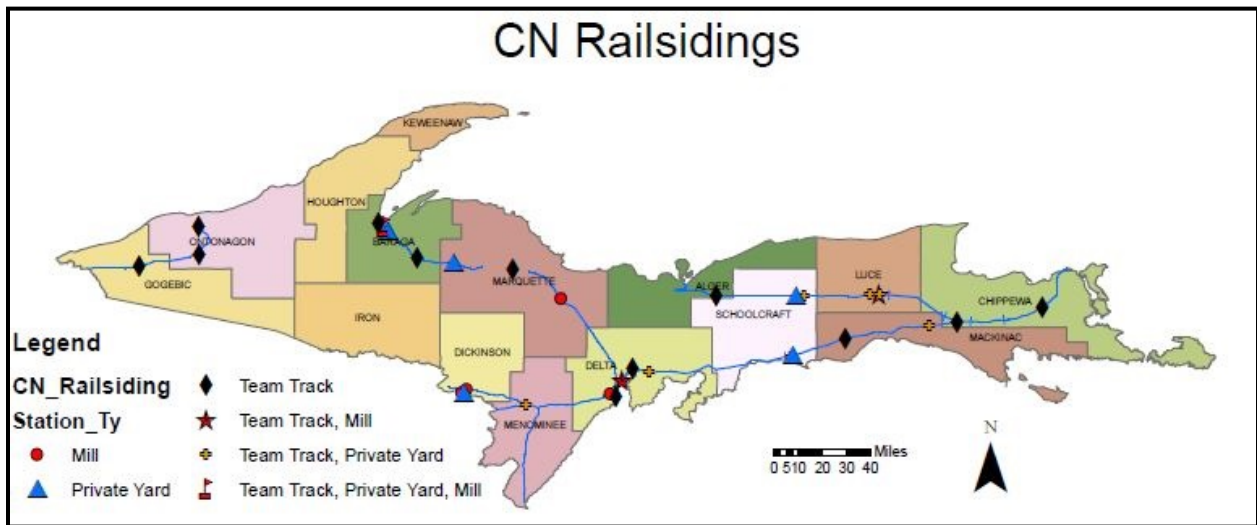


Figure 19: CN rail sidings and yards in the Upper Peninsula

4.3.1.2. Escanaba & Lake Superior (E&LS)

Escanaba & Lake Superior (E&LS) has 124 miles of active track in operation. It also has another 106 miles of storage track between; Channing and Republic (22 miles), Channing and Wells (63 miles), and Sidnaw towards Nestoria (21 miles). E&LS line to Ontonagon currently ends in Rockland (12 miles from Ontonagon) and segment from Sidnaw to Rockland is in the process of being classified as “industrial trackage”. There are on-going negotiations to convert Rockland to Ontonagon segment to a trail use. E&LS serves currently approximately 13 private and public sidings in the U.P., as presented in Figure 20.

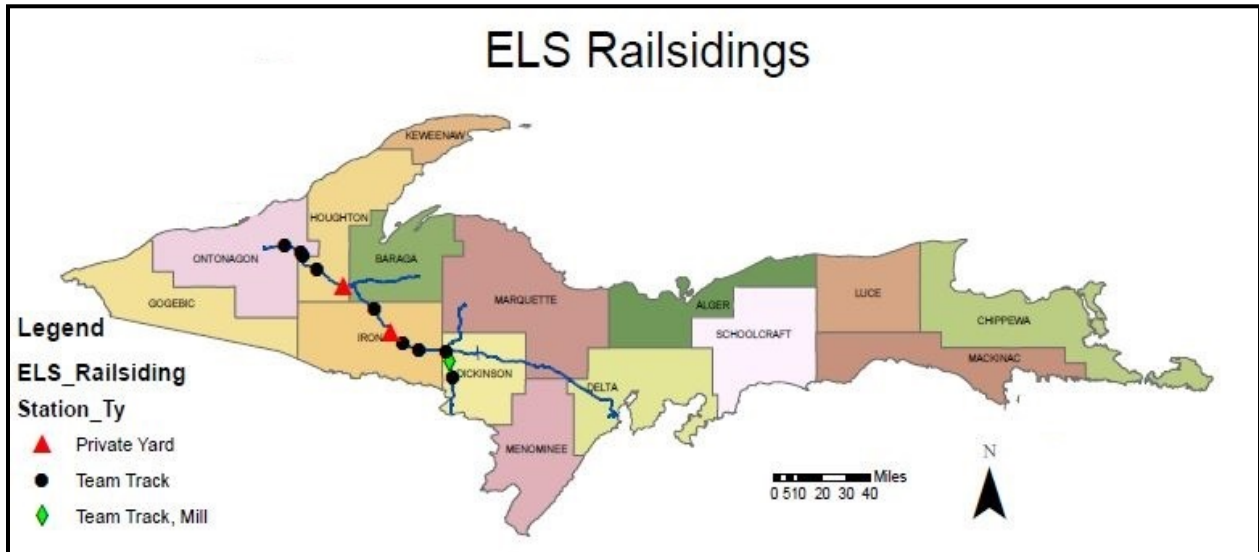


Figure 20: E&LS rail sidings and yards in the Upper Peninsula

4.3.1.3. Lake Superior & Ishpeming (LS&I)

Lake Superior & Ishpeming (LS&I) operates currently on 20 miles of track between Tilden mine and ore docks in Marquette. There is a short segment of track (approximately 300 yards) with shared ownership between LS&I and CN. CN has trackage rights to Eagle Mills and to Empire mine. The operating network of LS&I railroad is presented in Figure 21

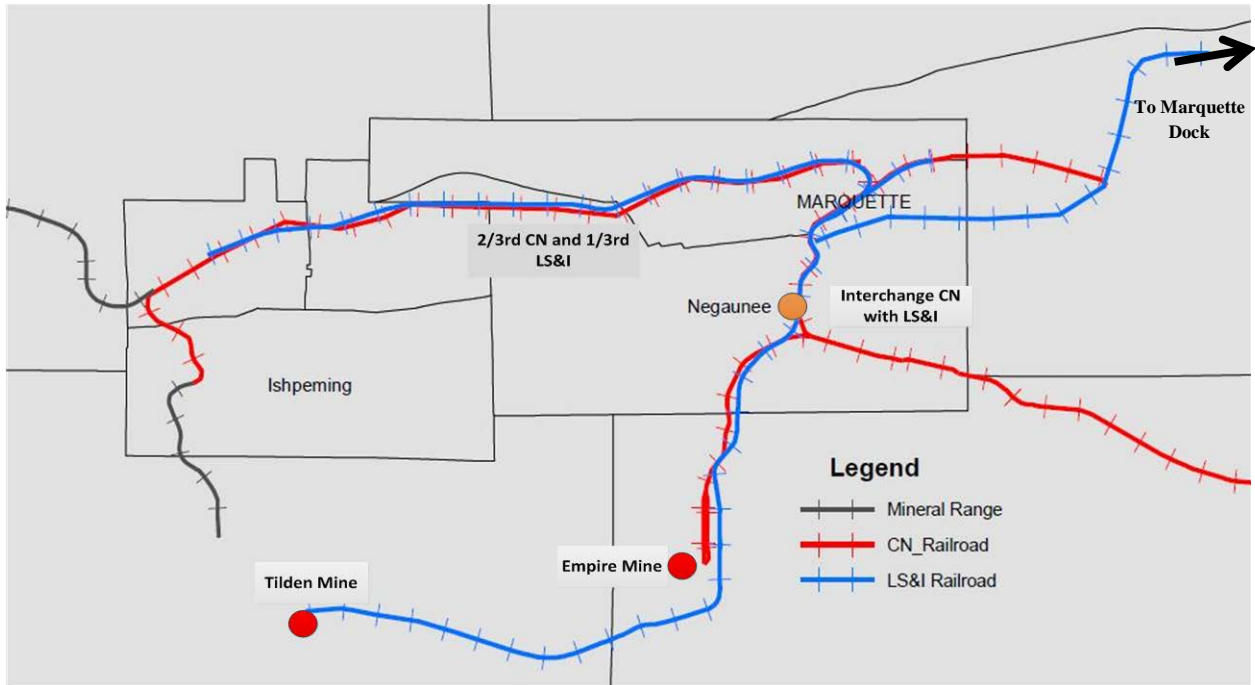


Figure 21: LS&I operating network in the Upper Peninsula

4.3.1.4. Mineral Range Railroad

Mineral Range Railroad (MRI) operates 2.5 miles from Winthrop Junction to customers in Pluto SUB. On January 1, 2013, Mineral Range purchased 12 miles of track from LS&I Railroad and after 1.9 miles of additional track construction is completed, it will serve Eagle Mine’s Humboldt mill on 14 miles of track from Landing Junction to Humboldt facilities. Figure 22 presents the operating network of Mineral Range.

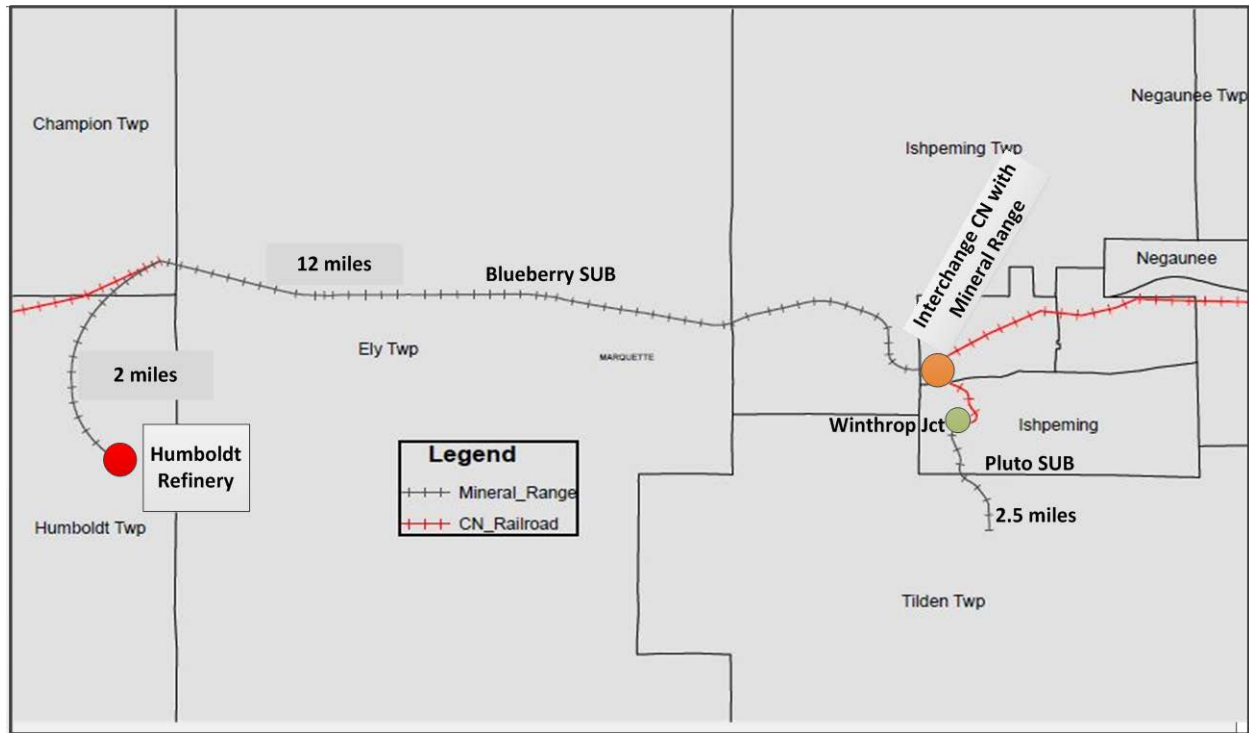


Figure 22: Mineral Range operating network in the Upper Peninsula

4.3.1.5. Carmeuse Operations (Port Inland and Cedarville)

In addition to common carrier railroads, Carmeuse has internal industrial rail operations at their Port Inland and Cedarville limestone mines. The Port Inland facility consist of 15-20 miles of track and is operated by RailInc who also interchanges with CN at Gulliver. Cedarville has five miles of track and is operated by the Carmeuse employees. There are no interchanges with common carriers.

4.3.1.6. Infrastructure Conditions and Challenges

The majority of U.P. rail network belongs to FRA Track classes 1 or 2, with maximum operating speeds of 10-25 mph (Figure 23).



Figure 23: FRA track class in the Upper Peninsula

The actual rail weight varies significantly between line segments; all the way from 65 lbs. to 115 lbs. A limited portion of the U.P. rail system is capable of handling 286,000 lbs. carloads, but the majority of the network is restricted to either 263,000 or 268,000 lbs. (Figure 24). According to industry representatives, it is doubtful that any major updates to increase the weight can be justified in near future. According to rail companies, some of the bridges are unable to handle 286,000 lbs. carloads, including the bridges on U.S. - Canada border (Sault Ste. Marie). However, detailed records for bridges with limited capacity was not readily available by the railroad companies.

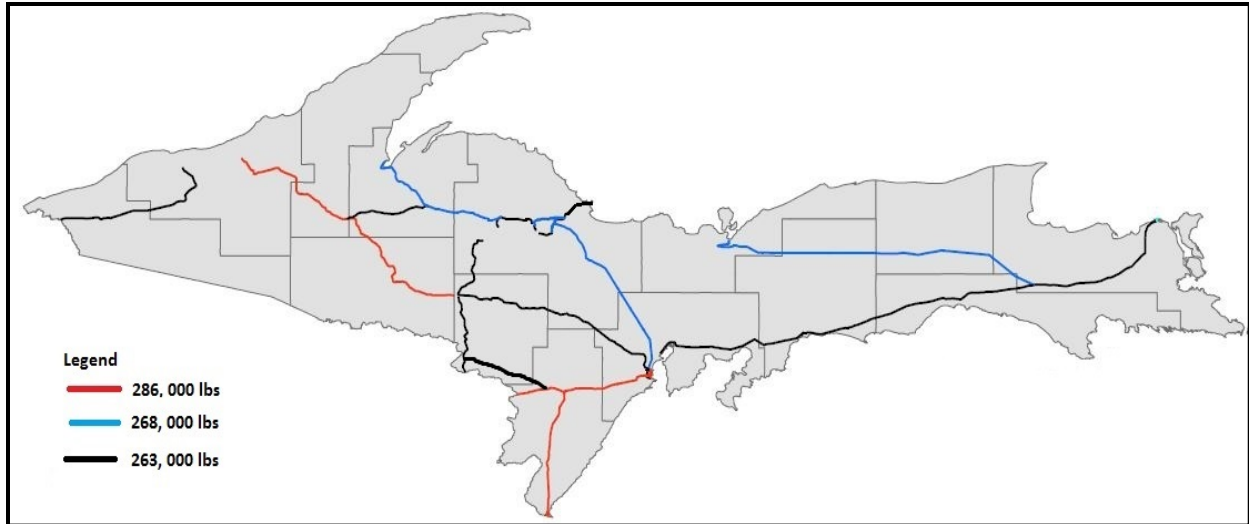


Figure 24: Weight limit for single rail car in the Upper Peninsula

The main infrastructure issues railroads are facing today include:

- CN noted that capital to maintain the branch lines (especially Ishpeming – Baraga and Trout Lake – Munising) at current traffic conditions is difficult to justify.
- LS&I has issues with track length restrictions. Service at the Marquette west yard is limited, as the dock is constrained in space and length of pockets.
- E&LS has similar track capacity restrictions around their car maintenance facility in Escanaba.
- Mineral Range has witnessed challenges on their 12 mile line to Humboldt Junction, but a recent grant/loan from the MDOT will be used to improve the infrastructure on the segment.

4.3.2. Operations and Services

Table 7 summarizes some of the key operational parameters of the U.P. system, followed by discussion of each category. The two internal railroads by Carmeuse are excluded from the investigations.

Table 7: Summary of rail operations in the Upper Peninsula

Parameters	Railroads			
	CN	E&LS	LS&I	Mineral Range RR
Operating Frequency (Figure 25)	<ul style="list-style-type: none"> • Trout Lake – Newberry – 5 days/week • Newberry-Munising – 6 days per week (3 days each direction) • Ishpeming – Baraga - 6 days per week (3 days each direction) • Soo – Gladstone – 7 days per week • Powers-Iron Mountain – 7 days per week 	<ul style="list-style-type: none"> • Rockland – Channing, 2 days/week • Channing – Kingsford, 4-6 days/week • Menominee, 3 days/week (serves Marinette & Menominee), Kimberly-Clark • Escanaba, 5 days per week 	<ul style="list-style-type: none"> • 3 trains per day by CN to Escanaba • 3 trains per day to docks 	3 days/week (future operations)
CN Interchange Locations	ELS – Quinnesec, North Escanaba (MI), Marinette, Pembine, Green Bay (WI) LSI – Eagle Mills Mineral Range – Soo Jct, Ishpeming RailInc. – Gulliver			
Main Commodities Handled	Iron ore, Paper and Logs	Pulpwood, Oriented Strand Board (OSB) and raw ore	Iron ore pellets, CO ₂ to mines, Coal and Limestone	Ammonium Nitrate and Mineral concentrates
No of carloads/ tonnages handled in recent years	80,000 to 95,000 carloads (>8 million tons). 70% is iron ore, paper and logs	Logs/pulpwood – 3,200 carloads, OSB – 800 carloads, and raw ore/chemicals – 150 carloads (400,000+ tons)	8.6 million tons	N/A
Notes	Handles all interstate rail movements in and out of region (excluding EL&S movements to Wisconsin)	Car shop in Escanaba is a significant employer (80+ employees)	<ul style="list-style-type: none"> • Mainly serves Empire and Tilden mine • Owned by Cliffs Natural Resources 	Serves Kennecott facility in Humboldt Jct. (under construction)

4.3.2.1. Frequencies, Interchanges and Pricing

The service frequencies in the U.P. have remained fairly consistent over the past several years, ranging from three days a week to daily operations. Figure 25 represents the operating frequency of the U.P. lines in number of days operated per direction per week.

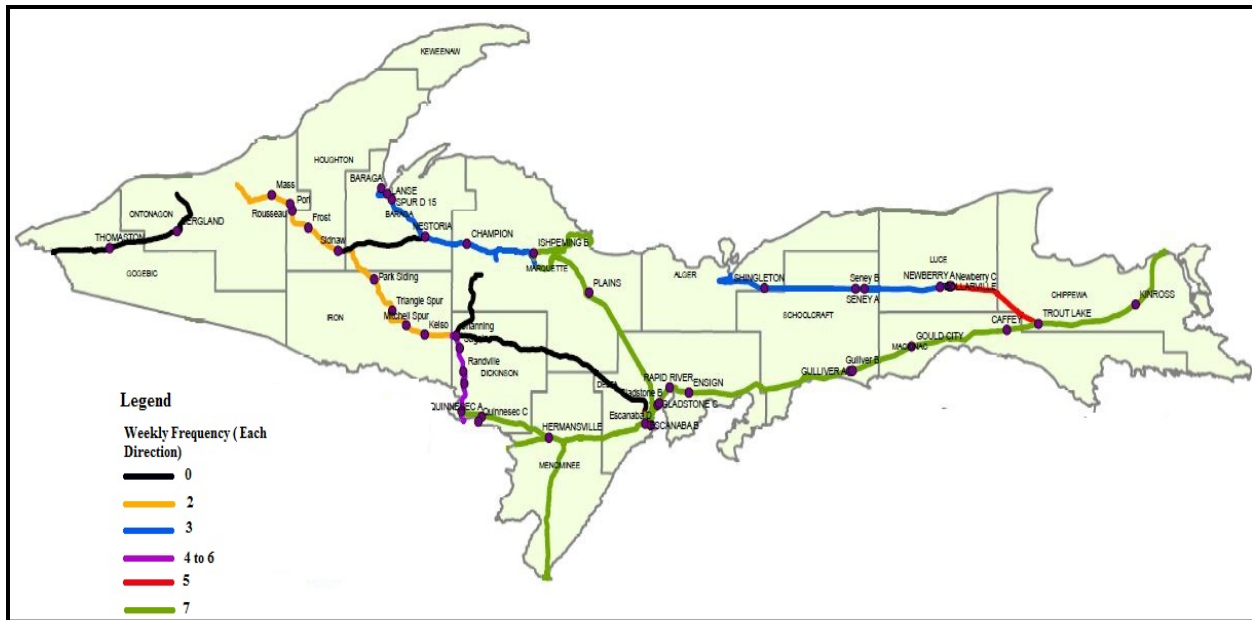


Figure 25: Weekly frequency of the operation of railroads in the Upper Peninsula

The majority of U.P. traffic is carload traffic moving on manifest trains. The iron ore unit trains that run on LS&I and on CN from Marquette to Escanaba or Sault Ste. Marie are an exception. Railroads didn't specify a minimum length for a train, but average train lengths are maximized to the extent possible to reduce unit costs, especially on the branch lines with limited traffic. Mineral Range is planning to operate trains up to 25 car loads; E&LS mentioned 30-50 cars as a typical train length, and 50-80 as desired. Although some of the U.P. rail traffic still moves under negotiated contract rates, the trend in railroad industry is moving toward openly announced tariff rates.

Excluding the iron ore movements from Marquette mines to the docks, most interstate rail movements require an interchange with CN (see Figure 18 for interchange locations) and can leave the state either to/through Wisconsin or to Canada through Sault Ste. Marie. Most internal U.P. movements that originate on E&LS also require an interchange with CN for final delivery to the mills.

The research team did not get a detailed breakdown of traffic between various lines and segments, but the railroads expressed no concerns on traffic levels on most of the lines. However, the CN-owned segments between Ishpeming and L'Anse and Newberry to Munising do not meet the "75-100 rail cars per mile per year" volume, a generally accepted industry rule for a sustainable line.

4.3.2.2. Main Commodities Handled

As presented in Task 2 - Commodity Flow Analysis, iron ore and various types of forest products form the bulk of commodities moved in the U.P. CN hauled total of 80,000 to 95,000 carloads in 2012 with majority of commodities being iron ore, paper and logs. Based on the volume data, approximately 50 percent of CN volume consists of inbound and outbound movements to Cliffs Natural resources, majority of movements taking place between Escanaba and Marquette, but significant volume also going to Sault Ste. Marie. In addition to CN moves, LS&I handled about 8.6 million tons of iron ore in 2011 between the mines and Marquette dock and is estimating similar numbers for 2014. LS&I also hauls some of the inbound products to the mines that get interchanged from CN. E&LS handles Pulpwood, Oriented Strand Board (OSB) and raw ore, and hauled close to 5,000 carloads (logs/pulpwood – 3,200 cars, OSB – 800 cars, and raw ore/chemicals – 150 cars). E&LS is starting to also move railroad ballast in 2014. Mineral Range Railroad moves Ammonium Nitrate in their Pluto SUB and will start hauling mineral concentrates for Eagle Mine, a subsidiary of Lundin Mining (previously known as Kennecott Eagle mine), starting in late 2014.

4.3.2.3. Types of Railcars Available

Table 8 summarizes the main types of railcars available in the U.P. Cars used for LS&I operations are captive to the U.P., but the majority of other rail cars are provided by railroads and operate as part of their national fleet. There were no major concerns on car availability by the railroads, although it was recognized that log cars are facing challenges related to age of the cars and availability during peak seasons. A limited number of shipper-owned cars are also in operation, especially by the forest products industry and more are expected to arrive as part of the mining development. Shippers with private or leased cars have better control of their car supply and condition, although financial incentives beyond demurrage are limited.

Table 8: Main types of railcars operating on Upper Peninsula Railroads

Railcar Type	Railroad				Shippers
	CN	E&LS	LS&I	Mineral Range	
Open Top Hoppers	X		X		X
Covered Hoppers					X
Side Staked Bulkhead Flatcars	X	X			X
Boxcar	X	X			
Rack Flat		X			
Bulk Flat		X			
Gondolas		X		X	
Center beam Lumber cars		X			
Intermodal		X			
Tank Cars			X		

4.3.2.4. Operational Challenges

In addition to the challenging climate, the railroads identified the following as the most critical challenges affecting rail operations in the U.P.:

- Overweight cars especially loaded with pulpwood are common and create both a derailment risk and increase the degradation of track and bridge structure.
- LS&I mentioned that freezing is an issue in winter for potential coal hauling, as it must be wet before transporting and left in an open atmosphere for 12 hours or more.
- Rail interchange to deliver logs to paper mills is a major challenge, as additional cost stifles most business development opportunities.
- There have also been some challenges at times in securing timely interchange operations between railroads and in coordination with interline movements.

Railroads also noted several challenges in the interactions with shippers. The issues included:

- Abuse of rail cars by not maintaining the standards of loading and handling.
- Leaving empty cars unclean when returned to the railroads.
- Taking excessive time to load/unload the cars which becomes an obstacle in maintaining a regular schedule for railroads.
- Not loading/unloading consecutive cars, which cause excessive switching.

- Railroads receive large unplanned inbound shipments which causes congestion. Shippers buy excess commodities at times when they get good pricing, but the shipments are not on the schedule for railroads.
- Not operating seven days/week, which causes a backup of cars waiting to load/unload on off days.
- Restricting railroad access to shippers' facilities (no 24/7 access), thus restricting their ability for service during off hours.
- Poor management of their product pipeline moved by rail, creating congestion at destinations.
- Improper track maintenance and lighting at the facility.
- Wanting to ship before they have a rate or before the rate is published.
- Inadequate shipping instructions or lead time for changes in shipments.

These challenges and potential solutions are discussed in more detail in Section 4.5. – Analysis of Shipper/Rail Provider Concerns.

4.3.3. Future Improvements and Expectations for the Upper Peninsula Rail Business

Railroads in the Upper Peninsula provided their future plans for infrastructure updates in the U.P. and for other operational and service efforts in the study area. They also briefly discussed their expectations for the future operations in the region.

4.3.3.1. Infrastructure

Excluding the two miles of new track construction around Humboldt Junction, there have not been significant infrastructure improvements recently (beyond regular track maintenance). The majority of investment goes to maintaining existing infrastructure at current levels, but there are also some plans for future upgrades.

- CN noted potential rail and tie replacement on the Manistique Subdivision and tie replacement between Escanaba and Partridge.
- E&LS is working on a project to build staging tracks and runaround track around the Escanaba car shop complex (using some of the track materials from Ontonagon). E&LS is also interested in adding a log sidings/intermodal facility in Amasa.
- E&LS also has secured a multi-million dollar grant from the State of Wisconsin toward major mainline improvements from south side of Wausaukee (in Wisconsin) to the Wisconsin-Michigan state line, a distance of 33 miles. Major project components include 1,050 new ties per mile, installing 45,000 tons of ballast, grade crossing rebuilds,

surfacing, and replacing six bridges in Wisconsin. Post project, the main line must be maintained up to FRA Class II track with 25 MPH operating conditions.

- LS&I is looking for new yards in Marquette and Negaunee and for Marquette west yard track expansion. They are also considering weigh-in-motion scale relocation to Marquette.
- Mineral Range Railroad (MRI) has received a loan to rehabilitate 12 miles of track between Humboldt Junction and Ishpeming. The loan comes from the State of Michigan Freight Economic Development Program, and covers half of the \$1.3 million costs for the line upgrade. Some, or all of the loan, may be forgiven if MRI generates the anticipated number of carloads on the line in each of the five years of the loan period. Track improvements must be completed by February, 2016 to meet the loan contract requirements.

4.3.3.2. Rolling Stock, Operations and Service

Planned improvements related to rolling stock, operations and service include:

- CN plans to introduce a “First Mile – Last Mile” program to provide more timely and consistent train service and related information to the customers.
- CN is also launching an **iAdvise** initiative to provide better communication from a single point to the customer and to be more proactive in communicating issues as soon as they are known.
- In collaboration with the forest products industry, CN has established log and intermodal committees under the Wisconsin Central (WC) Group – a new innovative way to address specific challenges and opportunities in a collaborative format. Additional discussion on the group is under case study section on forest products industry
- E&LS is looking to increase train speed and turn trains more quickly by upgrading track and adding more pulpwood cars to their fleet using an interchange service which would improve their capacity.
- LS&I is interested in potential to haul heavier rail cars, as their current track structure can carry up to 315,000 lbs. LS&I is also looking to increase train speeds from 20 to 30 mph.
- LS&I is investigating methods to increase the capacity of the line including new locomotives and more frequent service, as needed.
- LS&I is looking into introducing remote control locomotives to ease the yard and switching operations.
- LS&I is also investigating the potential to progressively replace the deteriorating, 100+ year old ore car fleet moving between mines and docks. Current cars operate under FRA waiver and are not interchangeable with other railroads. Unfortunately, funding for

replacement is very difficult to justify, so the primary approach is in continuing improvements to extend the life of current fleet.

4.3.4. Expectations for Upper Peninsula Rail Business

While forecasting the future trends in rail transportation is challenging, the railroads are always looking into the potential opportunities and challenges in the future. Overall, none of the railroads expressed any major concerns regarding the future of their operations. Some of the key expectations for the region include:

- Mining remains of high interest to the railroads, especially possible materialization of planned iron and other ore mines. A more detailed discussion of current and potential mining activities is provided under case study section.
- Railroads expect forest product shipments to remain steady, with a possible increase in log transportation. On the other hand, there is a potential concern for additional paper mill closures and shifts in production patterns.
- There are expectations for increases in bulk minerals ranging from limestone to other aggregates and sand. Some of the justification is to keep heavy trucks out of the city centers.
- There is growing interest to potential transloading in the U.P. Railroads are interested in such opportunities and believe that the core traffic for such a facility should come from the bulk commodity business. On the other hand, railroads expressed limited enthusiasm for adding intermodal capabilities in the region, due to high capital costs and the challenges of reaching economically feasible distances for container hauling, and of interchanging containers between railroads.

4.4. Task 4: Shipper Survey

Task 4 consisted of development and implementation of a shipper survey instrument to gather information on commodities shipped (or with potential to ship) by rail, on shipping patterns and modal selections and on the challenges perceived by shippers in utilizing rail services in the study area. As part of the instrument development, the team reviewed two previous shipper surveys from the region, the Northern Wisconsin Rail study survey (2012-2013) and Northern Wisconsin & Upper Peninsula of Michigan Federal Rail survey (2005-2006). The past surveys and related results are briefly summarized in Appendix E.

Businesses in the study region were contacted to complete the survey online, on paper or via phone interview. A total of 127 businesses responded to the survey. Approximately 70 percent of them were from the U.P. as detailed in Figure 25 and the remainder either from Lower Peninsula or from Wisconsin.

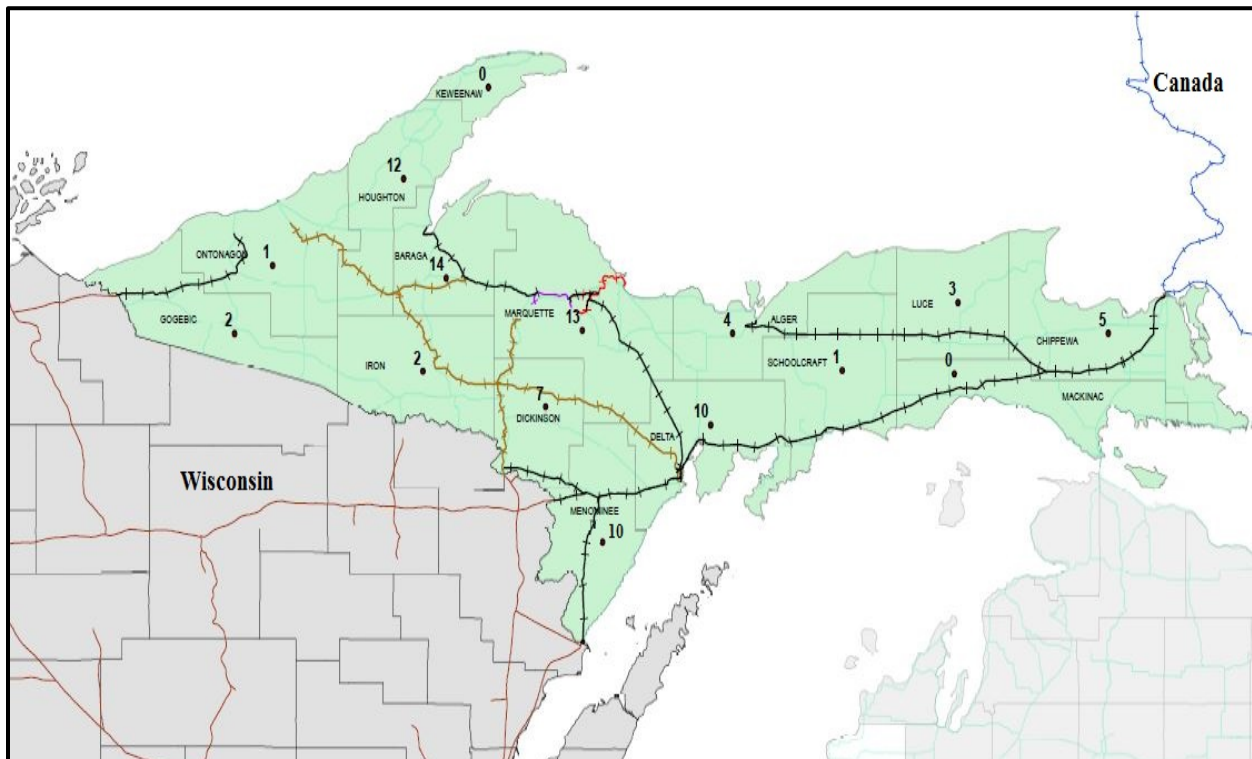


Figure 26: Number of shippers in the Upper Peninsula who filled out the survey

The percentage of returned forms could not be calculated, as the link to survey was distributed via various agencies and entities in the U.P., making it impossible to quantify the total number of surveys circulated. For a point of reference, it is estimated that there are 160 manufacturing companies with more than 15 employees in the U.P., in addition to other company types. A comparison of survey results against 2012 county profiles revealed that only approximately 20

percent of companies listed as “major employers that export” responded to the survey. Even though results from this survey cannot be taken as a comprehensive representation of the region’s shipper community, it provides some useful insights into the shipping patterns and customer satisfaction levels of current rail services.

The following section summarizes the aggregated results of the survey, categorized into five sections. Comprehensive responses for the survey open-ended questions can be found in Appendix J.

4.4.1.1. Demographics

The basic demographic questions included company location, business type and approximate number of employees. The main shipper type was manufactures followed by logging/timber businesses and service providers (Figure 27). On average, manufacturing businesses employed 110 people per businesses while both logging/timber and service providers employed 25 people (Table 9).

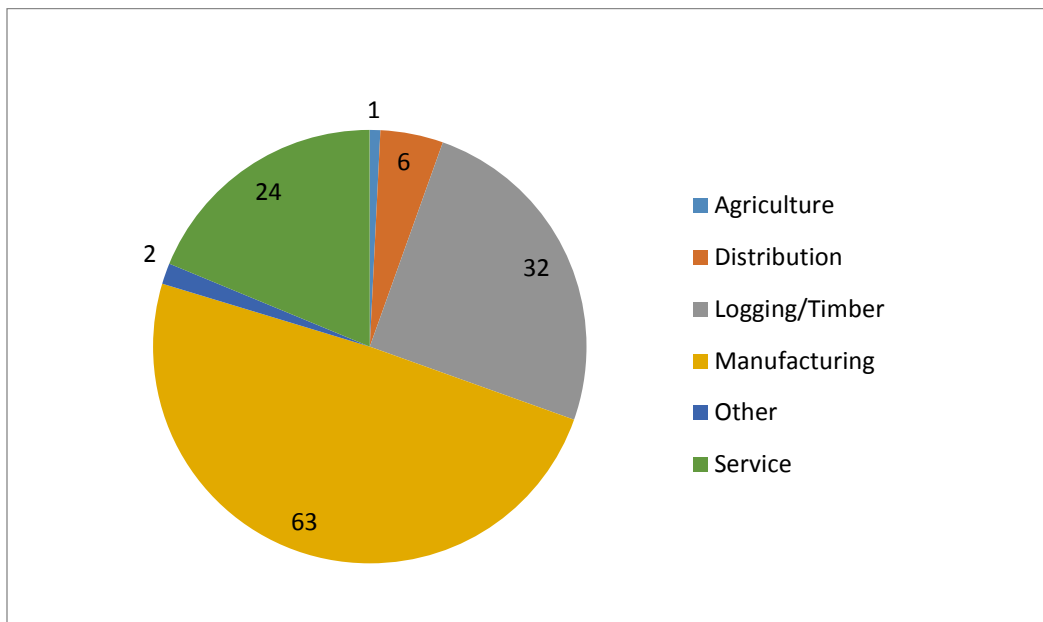


Figure 27: Company type: (Answered: 123)

Table 9: Company type & approximate number of employees (104 responses)

Company Type	N ^o of Companies				
	0-10 Emps.	10-50 Emps.	50-100 Emps.	100+ Emps.	Average N ^o Employees
Agriculture	-	1	-	-	18
Distribution	2	1	1	1	14
Logging/Timber	4	14	4	6	25
Manufacturing	8	26	3	11	110
Other	1	3	-	-	14
Service	5	9	4	2	25
Total	19	52	12	21	

4.4.1.2. Freight Movement Characteristics

Freight data collection focused on information regarding mode selection, inbound and outbound volumes and origin–destination pairs. Truck-only mode was the dominant freight transportation for both rail and non-rail users (Table 10). 63% of survey respondents use truck only for their freight transportation while 28% of businesses use both truck and rail. None of the business surveyed use rail as their single mode of freight transportation. From business type perspective, distribution and logging/timber were the major businesses that use both rail and truck while manufacturers and service businesses predominantly use truck only mode. The majority of businesses from all business categories (67%) use hired carriers for their trucking (Table 11).

Table 10: Shipping mode by company type

Company type	N ^o of Companies				
	Rail & Truck	Rail, Truck & Water	Truck & Water	Truck only	Total
Distribution			1	5	6
Logging/Timber	17			14	31
Manufacturing	10	3	5	41	59
Service	4	2		16	23
Agriculture	1				1
Other	2				2
Total (%)	34 (28%)	5 (4%)	6 (5%)	76 (63%)	121

Table 11: Type of trucks used: (Answered 88)

Transportation Mode Choice	N ^o of Companies			
	Own trucks	Hired carrier	Combination	Total
Rail & Truck	5	18	5	28
Rail, Truck & Water		3	1	4
Truck & Water		5		5
Truck only	6	33	12	51
Total	11	59	18	88

Major inbound products were lumber, wood and logs followed by equipment parts, steel and chemicals. The respondents accounted for a total of just less than 3,000,000 tons in inbound shipments and approximately 70% of the inbound tonnage was carried by trucks (rail handled the remainder). The main origins of freight tonnage have been presented in Figure 28. Almost one third of all tonnage was intrastate movements from Michigan.

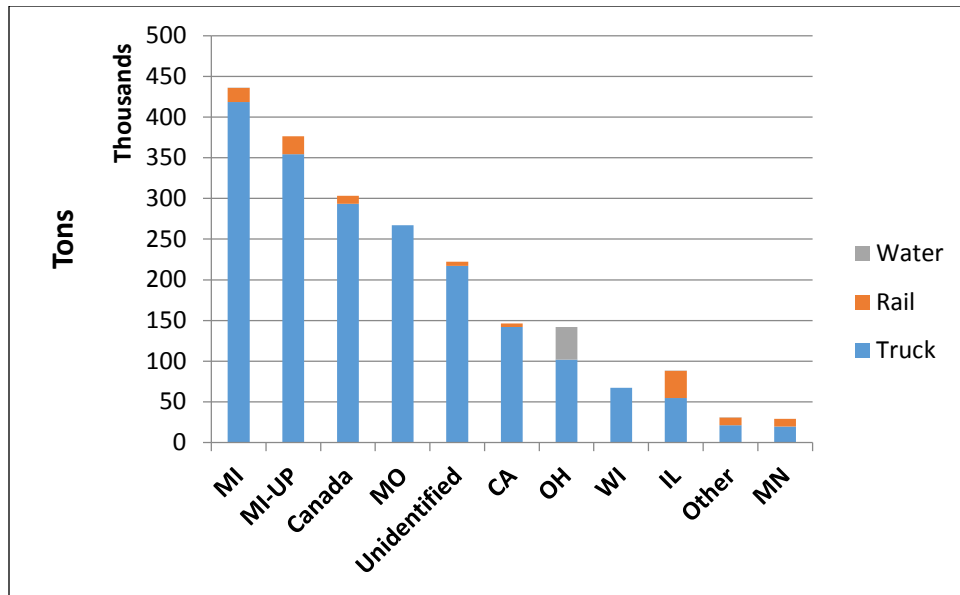


Figure 28 Major freight origins: (Answered: 78)

Major outbound products were lumber, wood and logs followed by finished products and equipment parts. The survey captured approximately 1,700,000 tons in outbound shipments. More than 88% of the outbound tonnage was transported by trucks. Just like for inbound movements, the majority of outbound movements were intrastate movements to Michigan (Figure 29).

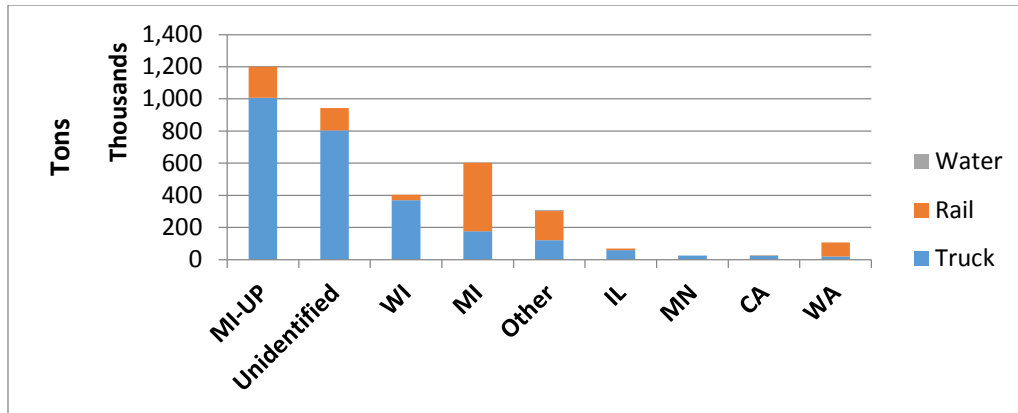


Figure 29: Major freight destinations: (Answered 78)

4.4.1.3. Rail use and related considerations

Shippers were inquired about their rail usage trends and why they use or don't use rail. In the last three years, almost half of respondents' rail usage stayed more or less constant (Figure 30) and 30% saw an increase. Increased business, relative cost savings over truck and changes in customer requirements attributed to the increase. The remaining 25% of businesses had decreased their rail use due to reduced business, increased rail shipping cost, lack of service, and difficulty in getting cars.

More than half of businesses indicated that their rail usage will be more or less constant for the next three years while one-third indicated that they are expecting it to increase. Track constraints, service and cost issues were issues keeping the rail usage at constant levels, while companies projecting increased usage provided increases in trucking and gas price and business growth as the main reasons. Less than 10% predicted a decrease in their rail use, mainly due to future business perspectives, short supply of cars and location of markets that are not profitable for rail use.

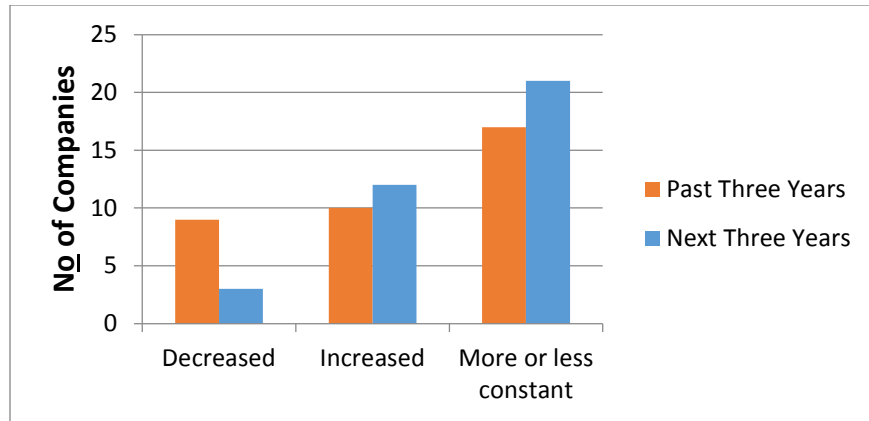


Figure 30: Rail usage: (Answered: 36)

The primary reasons for rail were distance, customer request, high shipping volumes and equipment provided by railroads (Figure 31). Availability of rail lines, Intermodal export and import, and truck weight limit regulations difference between neighboring states also contributed for their rail use. The primary reasons why respondents did not use rail were limited access to rail, low shipping volumes, rail service frequency and quality.

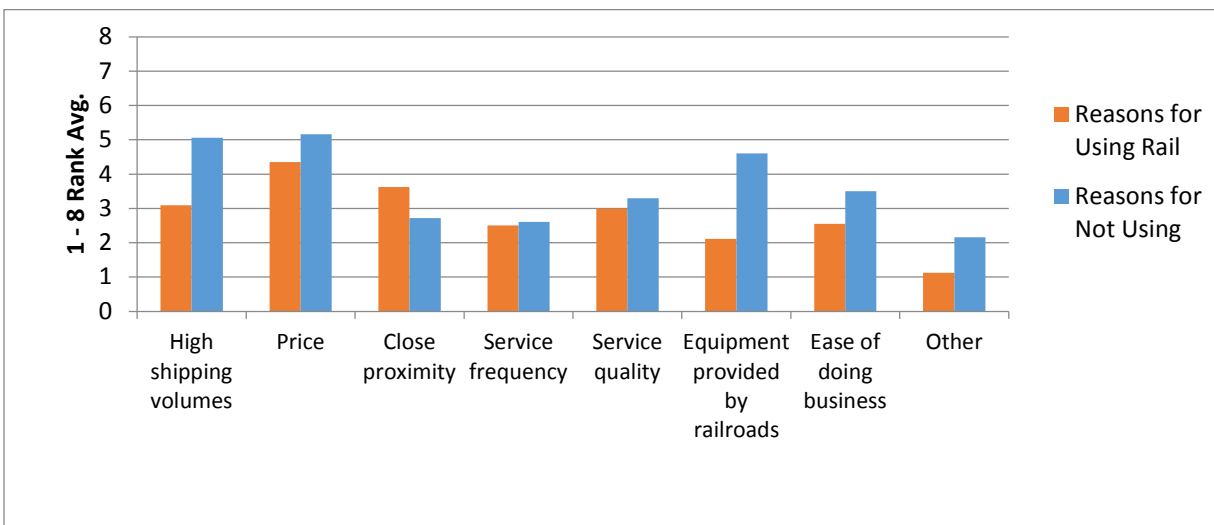


Figure 31: Reasons for using/not using rail (1 = most important, 8 = least important). (Answered: for using rail: 27, for not using rail: 46)

Respondents provided commentary on main issues related to rail transportation and its usage through open ended questions, later categorized as access, cost and service issues (Figure 32). For current rail users, service and access issues were much greater impediment for shipping than cost. Especially long shipping times and poor access to rail were mentioned as main challenges. Difficulty of doing business with railroads and unreliable car service were also contributing factors. For non-rail users, issues were similar, but service related issues were even bigger concern.

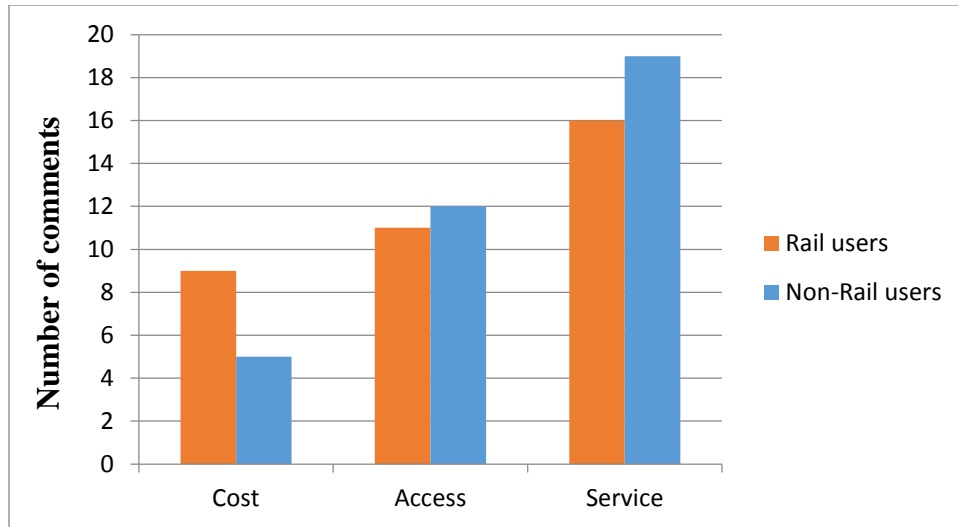


Figure 32: Factors affecting rail use: (Answered 46)

Recommendations for improvements followed similar patterns, including ease of doing business, service frequency, and communication. Improved access to rail, service to new markets and adequately providing reliable cars were also suggested. They would also need to see realistic demurrage period and a reduction in shipping cost in addition to making the pricing system transparent. One of the most common suggestions from non-rail shippers was encouraging railroads to open their business to shippers with smaller volumes and offer opportunities for intermodal transportation. Figure 33 categorizes overall rail issues mentioned throughout the survey. The complete responses for additional suggestions and comments can be found in Appendix J.

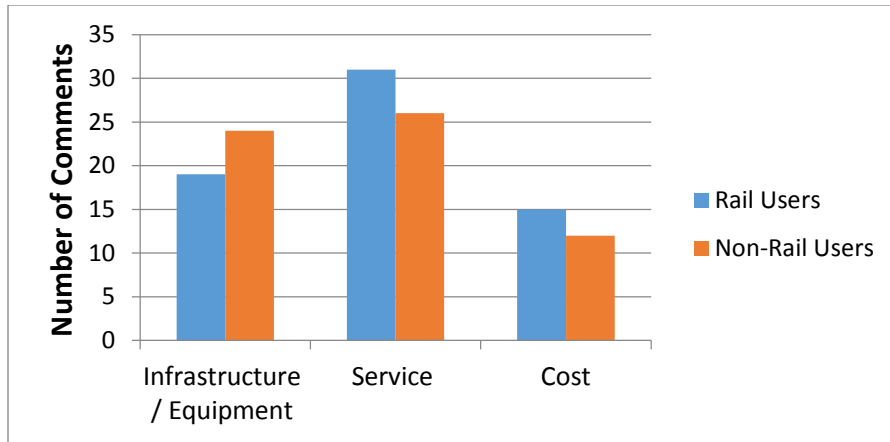


Figure 33: Overall rail issue categories

4.4.1.4. Modal choice and decision making for freight shipments

Over 60% of businesses make their own decision for both inbound and outbound shipments (Figure 34). 30% indicated that their suppliers or customers dictate the freight mode choice selection. 3rd party logistics companies were used by a small minority of companies. There were no slight difference in the decision making between companies that shipped with trucks only versus with truck and rail. Those shipping with truck only were more likely to make their outbound shipping decisions and relying on suppliers for inbound decisions, while for rail/truck shippers that was the opposite (Table 12: Inbound and Outbound freight shipping mode decision (In = inbound, Out = outbound)). Also, 80% of truck/rail shippers made both in- and outbound decisions by themselves.

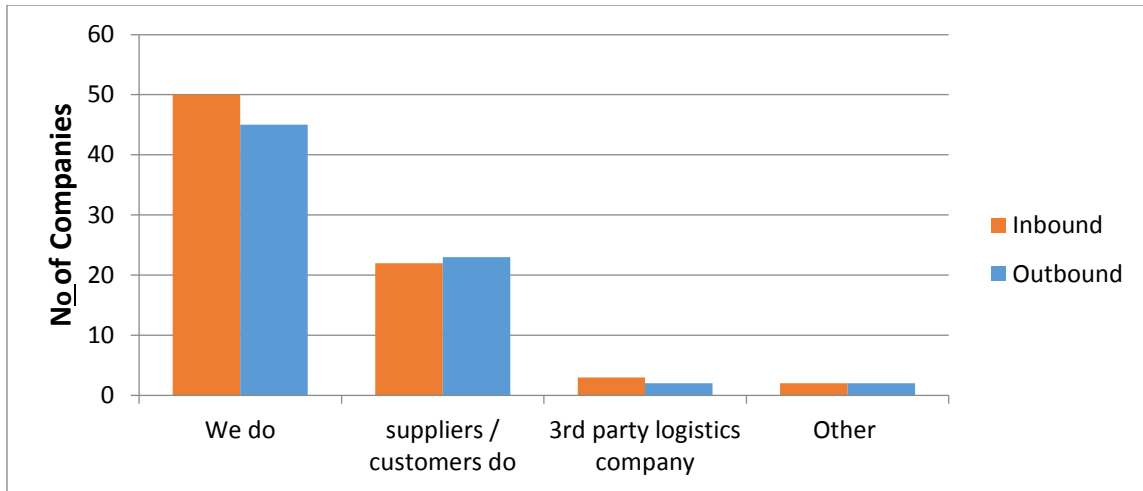


Figure 34: Shipping mode decision: (Answered: inbound: 77, outbound: 72)

Table 12: Inbound and Outbound freight shipping mode decision (In = inbound, Out = outbound)

Company Mode choice	N ^o of Companies									
	3rd Party LC		Our suppliers do		We do		Other		Total	
	In	Out	In	Out	In	Out	In	Out	In	Out
Rail & Truck	-	2	2	7	20	15	1	-	23	24
Rail, Truck & Water	-	-	1	1	1	1	-	-	2	2
Truck & Water	-	-	1	2	4	3	-	-	5	5
Truck only	2	-	19	13	24	26	2	2	47	41
Total	2	2	23	23	49	45	3	2	77	72

Reliability, communication, safety, service frequency, ease of doing business, on-time cargo tracking and billing accuracy were among important performance measures shippers consider when choosing a freight mode (Figure 35). On most of these indicators, truck was considered to outperform rail.

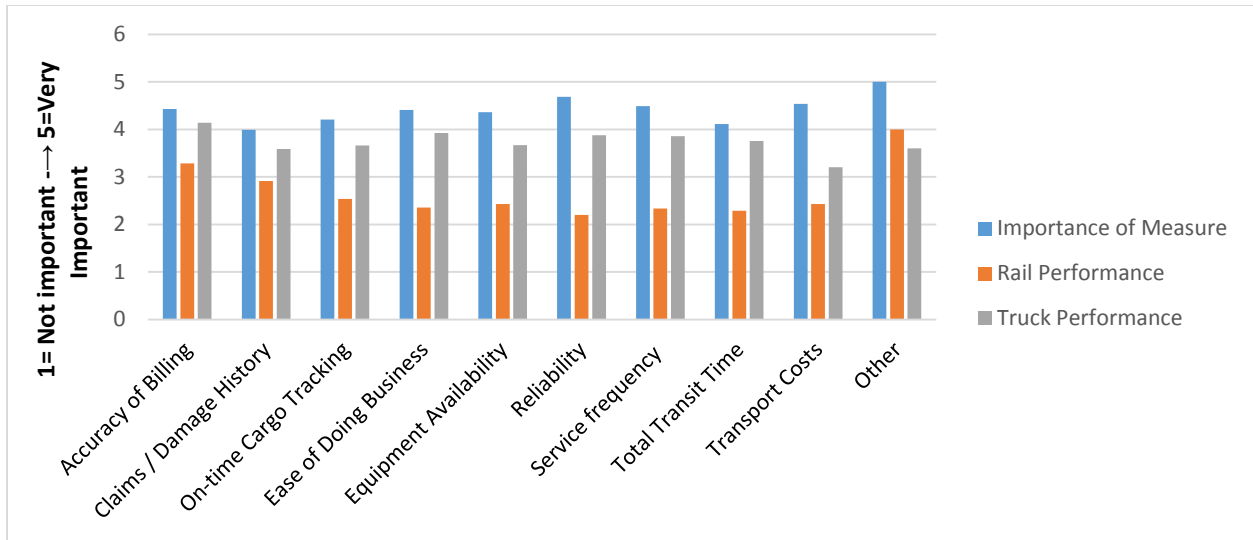


Figure 35: Performance measure: (Answered: importance of measure: 90, rail performance: 15, truck performance: 66)

Familiarity in using rail as freight transportation was limited among non-rail user respondents. More than 80% of respondents stated that they were either very unfamiliar or unfamiliar with rail as a freight mode (Figure 36).

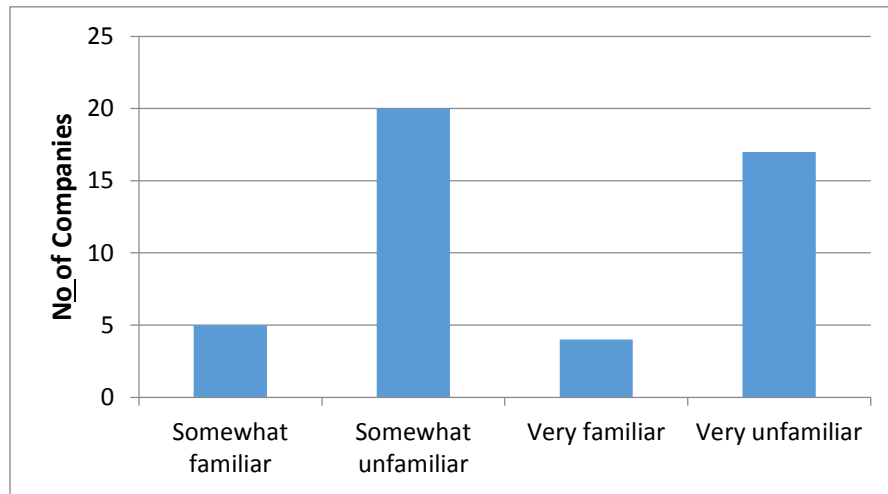


Figure 36: Familiarity in using rail as freight transportation: (Answered: 46)

4.4.1.5. Other questions

The final questions inquired on shipper interest related to the interactive map of the region with rail facility information, developed as part of the project. Slightly over 50% of respondents were interested in the availability of the map (Figure 37).

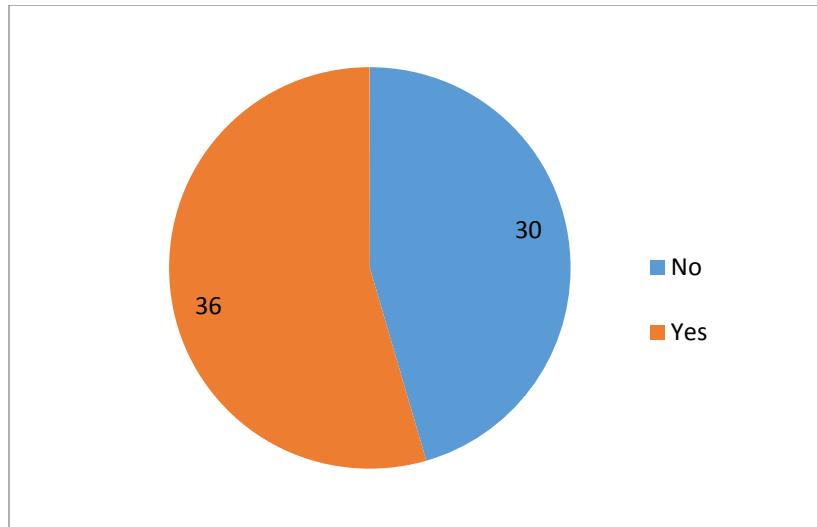


Figure 37: Interest in an interactive map: (Answered: 66)

Interest in a follow up interview and stakeholder meeting was also equally distributed among responders (Figure 38).

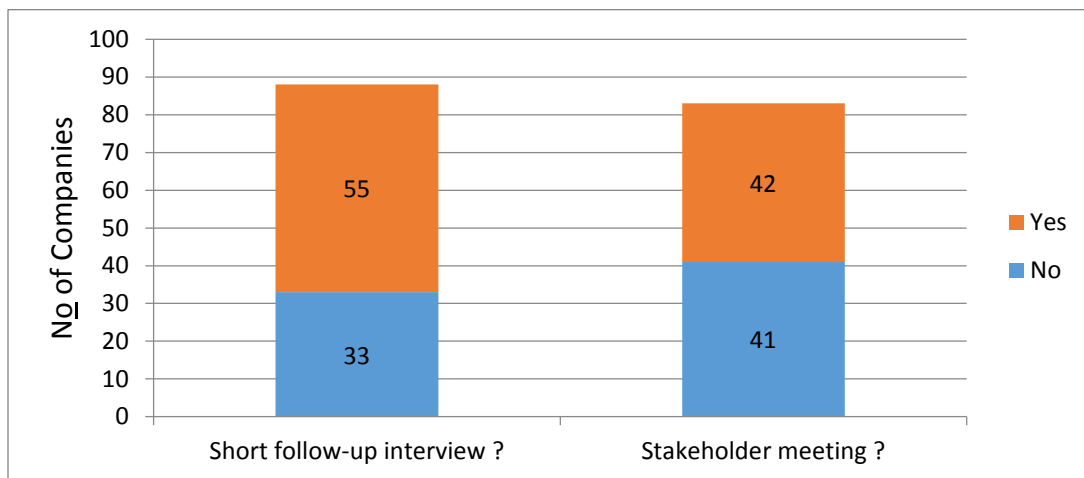


Figure 38: Interest in a follow up interview and stakeholder meeting: (Answered: follow up interview 88, stakeholder meeting: 83)

4.5. Task 5: Analysis of Shipper/Railroad Concerns

One of the objectives for railroad interviews and shipper survey/case study interviews was to allow both sides to voice their concerns of each other's performance and provide recommendations for potential improvements. After reviewing the data, the research team noticed that most of the concerns by shippers and railroads alike circulated around same topics, but from a slightly different angle. Table 13 and the following sections were developed to summarize the concerns in key categories. The summaries are followed by brief comments by the research team.

Table 13: Shipper and railroad concerns

Category	Shippers	Railroads	Research Team Comments
Cars	Provide cars in good shape.	Abusing and damaging cars, not releasing empty cars cleaned out, using them as dumpsters.	Methodology to determine responsibility?
Operations	Reliable and consistent car delivery. Needs to be time competitive and increase frequency.	Not loading and unloading consecutive cars causing excessive switching. Not operating seven days a week and not having access to their facilities 24/7. Poor management of their product pipeline, creating congestion at destination.	Service frequencies in rural areas are challenging. How to develop service efficiency and economies of scale?
Loading /Unloading	Realistic demurrage period.	Holding onto cars for excessively long times when loading and unloading. Loading cars improperly.	Tracking mechanisms
Infrastructure /Utilization	Improved and expanded infrastructure and better utilization of existing tracks.	Not maintaining their side track properly.	How to make best use of expensive infrastructure.
Rates	Reasonable rates.	Shipping before they have a rate or before the rate is published.	Public tariff rates to improve transparency
Quantity	Start accepting relatively small volumes.	Add volume.	Transload/rural intermodal facility
Intermodal /Transloads	Intermodal service within a reasonable distance.	-	Transload/rural intermodal facility
Information	Improved quote times, accurate billing and car tracking.	Lack of proper shipping instructions.	Use of technology for better communications.

Category	Shippers	Railroads	Research Team Comments
Customer Service/Communication	Improve customer service and ease of doing business. Have better communication.	Designate a single “go-to” person for billing and status of cars information.	Collaborative groups (WC group). iAdvise by CN.

Cars: Condition of cars in operation is a concern for all stakeholders, as their proper functioning is required to provide safe transportation. It seems as railroads and shippers and blaming each other for inadequate car condition. There is no current inspection mechanism or policy for car condition, but problems are rather resolved after they’ve been notices.

Comment: Wisconsin Central used to have an inspection method and policy for cars. Today, no standard process exists, leaving each case to be dealt individually. Perhaps a standardized reporting and decision-making process accepted by both shippers and railroads would make it easier to assign responsibility for damages to a specific party and thus provide an incentive for proper treatment of assets.

Operations: Several concerns relate to operations. Shippers are looking for reliable and adequate service frequencies, while railroads are looking for more efficient and flexible operations within the facility and more consistent and balanced shipping volumes.

Comment: It is difficult for railroads to justify frequent service on light-density lines with limited number of carloads. On the other hand, shippers may shy away from railroads due to low service frequency. This can turn into downward spiral. It seems that shippers and railroads don’t always understand the key operational criteria of the other party. Benchmarking and documenting the interactions in the facility would help understand where the inefficiencies of current operations fall short on both sides. Another way to improve the consistency and balance of shipments might be to look into central transload facilities that could consolidate shipments from a specific area to larger units.

Loading/Unloading: There is difference in opinion when it comes to amount of time used for loading/unloading cars. Railroads look to maximize their asset utilization, while shippers try to match loading/unloading with their production cycles. Quality of loading was also questioned by railroads, especially for log/pulp products.

Comment: Quantifying the inefficiencies in loading/unloading processes by proper tracking and documentation, followed by improved planning and communications are probably the most direct way to address the concerns.

Infrastructure/utilization: Railroad infrastructure is expensive to build and maintain, so it’s essential to maximize the use of existing infrastructure. Utilization is closely related to

operational strategies and the change in ownership (typically at property line) can make the issue more complicated.

Comment: It seems that both shippers and railroads believe that infrastructure at facilities could be utilized more effectively, but it was not documented or described in detail where the specific inefficiencies took place.

Rates: Rate concerns are category that will probably remain a concern for eternity. Shippers are looking to minimize their shipping cost, while railroads are trying to maximize their revenues.

Comment: Railroads are making a major effort to move into openly accessible tariff rates, instead of confidential contract rates. While tariff rates will not solve the dispute on reasonable pricing, they at least provide more transparency into the issue. In addition, electronic tools improve access to rate information, but there has to be a methodology to educate shippers (especially small ones) in use of the tools.

Quantity: Another difference in opinion is quantities. Shippers would like to see railroads to consider taking smaller shipments, while railroads are encouraging shippers to increase the volumes.

Comment: There is no question that rail transportation is better suited for larger volumes. However, there is no requirement for the total volume to come from a single shipper. A shared transload/intermodal facility has a potential to function as a point of entry to rail system for numerous businesses whose volume doesn't warrant individual rail service, or who do not have a direct access to rail network.

Intermodal/Transloads: Shippers are looking for opportunities for intermodal and transload activities in the region, but railroads are questioning whether sufficient volumes exist for such activities. In addition, small intermodal terminals are operationally challenging and disruptive, as shipments typically need to be handled or interchanged between railroads.

Comment: Intermodal is one of the fastest growing business sectors for rail industry and the strong manufacturing base in the region tends to be well suited for intermodal transportation. While adding new intermodal terminals is challenging, there is evidence that development of smaller transload terminals in rural areas, often justified by bulk transfers, is gaining traction.

Information: It seems like there is room for improvement in the documentation that relates to shipments. Shippers are looking for more timely information, while railroads are looking for better instructions to handle the shipments.

Comment: In the current state of technology, improvements in information sharing seem eminent, but change in customs takes time. According to interviews with shippers, many of them were unaware of how to use the internet based systems available for information.

Customer Service/Communication: Related to shipping information is the customer service and communication. Both sides are requesting better and more timely communication related to shipments.

Comment: This topic is closely related with previous one. A recent initiative by CN, called iAdvise, is geared toward improved and more timely communication for shippers, especially at times when shipments are delayed. However, communication has also become a concern for shippers who no longer obtain direct communication from train crews making deliveries. Another strategy to improve communication is an innovative Wisconsin Central Group (WCG), where CN and key forestry and manufacturing shippers have formed log and intermodal committees to collaboratively address and work toward improved movements of forest and manufactured products in the region.

4.6. Task 6: Case Studies and Comparative Analysis

In addition to the general shipper survey, several interviews were conducted with selected shippers and industries as more detailed case studies. There were three main topics of interest to the case studies:

- Future of core industry shipments by rail, namely mining and forest products industry
- Perspective of trucking companies to rail competition/collaboration.
- Investigation of a potential transload facility in the region, conducted a complimentary graduate student study.

The following sections summarize each case study topic areas and related outcomes.

4.6.1. Mining Industry

Despite the decline of the mining industry from a century ago, iron ore and other mining products have remained one of the core commodities for rail movements in the U.P. A single mine can generate multiple trains per day and even smaller mines can each function as an anchor customer for a specific rail line. The forecasts by TRANSEARCH suggest significant increases in these product movements by 2030, especially tripling of interstate movements. In addition to existing mines, companies are aggressively exploring new opportunities for aggregate and mineral mining and some sites are already waiting for regulatory approvals to start their operations. On the other hand, it is challenging to evaluate the effects of future mines on freight (rail) transportation, as mining has numerous uncertainties and parameters that can affect the extent, opening date and duration of the operations. The research team used public data and company interviews to develop an inventory of the key existing and potential mining developments in the region with an emphasis on identifying the rail lines that might be affected by the development. Table 14 presents the current and proposed mines in the U.P., including estimates of potential annual shipping volumes. It is expected that rail would be of high importance for the movements, although the final modal split cannot be determined at this point. Table 14 is followed by a map identifying the location of the mines and potential shipment paths (Figure 39). It should be kept in mind that volumes and other data provided are only estimates and if referenced, all values should be validated from the respective companies for accuracy.

Table 14: Active/Proposed mines in the Upper Peninsula

Mines	Parameters		
	Location	Minerals	Estimated Shipping Quantities (Annually)
ACTIVE			
Cliffs, Tilden and Empire Mines	Ishpeming	Iron ore	12 million tons
Carmeuse, Port Inland Limestone Quarry	Port Inland	Limestone and Dolomite	4-5 million tons
Graymont	Port Inland	Lime	250,000 tons
Carmeuse, Cedarville Limestone Quarry	Cedarville	Limestone	3-4 million tons
Eagle Mine	Marquette, Humboldt	Nickel, copper	730,000 tons (ore by trucks), 130,000 and 43,000 tons (Ni and Cu concentrate by rail)
PROPOSED			
Groveland Mine (Michigan Mining LLC)	Dickinson	Iron ore, aggregates and sand	100,000-600,000 tons
Graymont	Rexton	Limestone, Lime	250,000+ tons (per kiln)
Copperwood Project (Highland Copper Inc)	Gogebic	Copper and silver	2.35 million tons ore
Keweenaw Project (Highland Copper Inc)	Keweenaw	Copper and silver	360,000 million tons
White Pine Project (Highland Copper Inc)	Ontonagon	Copper and nickel	235,000 tons (refined copper)
G-Tac Iron Ore (GTAC)	Gogebic	Iron ore	8 million tons Iron Pellets or 7.3 million tons Iron Concentrate
Back Forty (Aquila Resources)	Menominee	Copper, zinc, gold and silver	N/A
Baraga Project (Prime Meridian)	Marquette	Nickel, copper	N/A

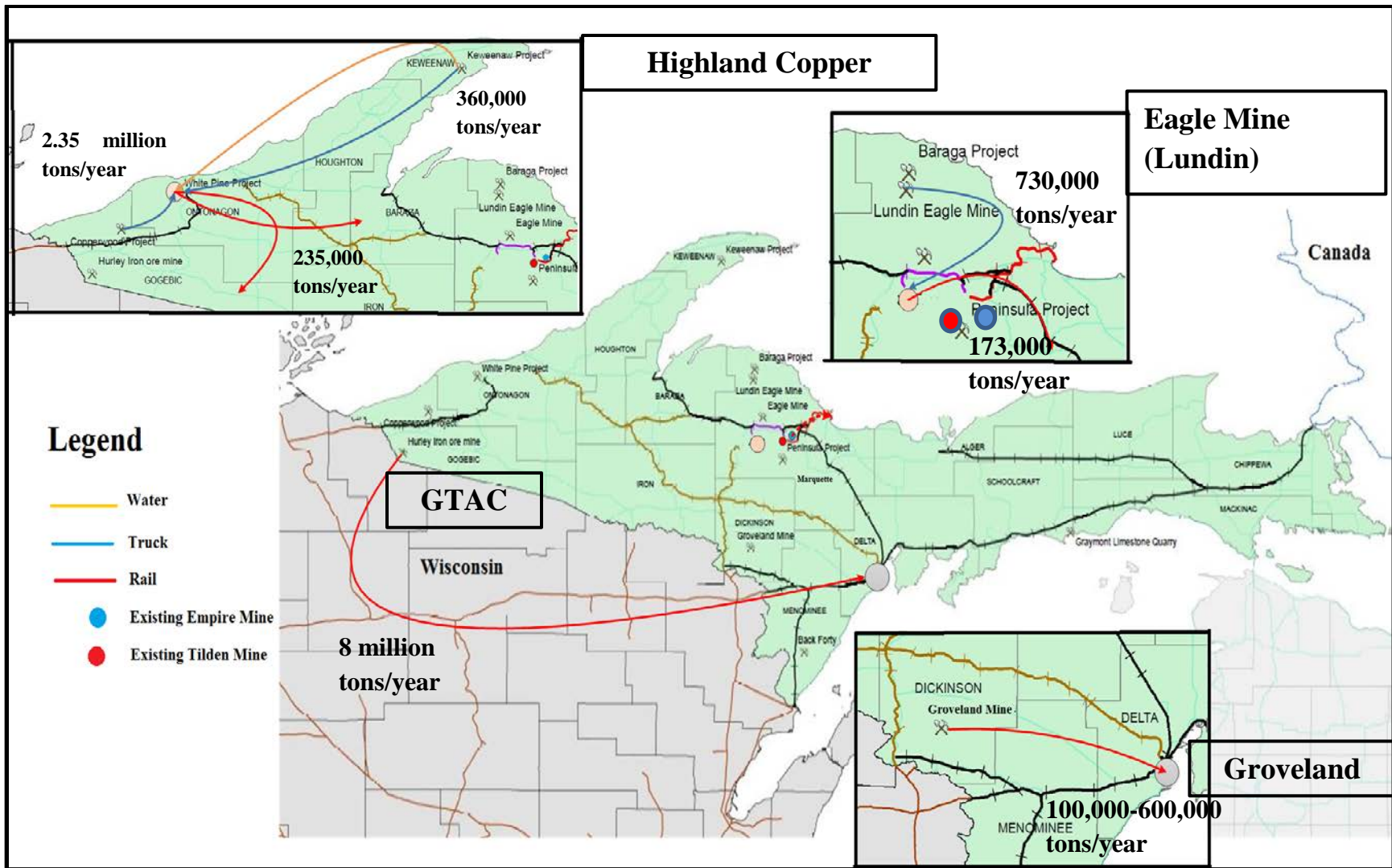


Figure 39: Selected potential rail movements for mining products

Table 14 and Figure 39 reveal the extensive effect that mining has on rail transportation in the U.P. In full implementation, the total potential tonnage from the mines, refineries, kilns, etc. has potential to add another 4-12 million tons to the annual rail traffic in the region, affecting numerous rail segments. The existing mines already form a secure backbone of rail traffic at portions of U.P., but the future developments have potential to expand this effect, both quantitatively and geographically.

4.6.1.1. Existing Mines

Tilden and Empire Mines, Cliffs Natural Resources

Tilden and Empire mines are the largest mining activities in the U.P. and have a century long history in iron ore production. Freight from these two mines represents more than fifty percent of the overall rail tonnage in the U.P., moved by both LS&I and CN.

- **Expected life:** While each mine is approaching the end of their service life, there was recently an extension of Tilden mine contract to 2024 and it has sufficient ore for another 30 years of operation. Current Empire mine contract ends at the end of 2014 (Mining Journal, 2013).
- **Transportation Infrastructure:** The majority of the ore movement is handled by LS&I on its rail lines, yards and dock facilities in Marquette. Movements to Escanaba and Sault Ste. Marie are interchanged with CN. These have been discussed in more detail under Task 3 – LS&I Railroad.
- **Shipments and Volumes:** Majority of the ore goes down to docks in Marquette, but there are significant volumes also going to Escanaba and Sault Ste. Marie. Limestone and reagents are brought by rail to the mine.
 - Marquette dock – approximately 8.5 million tons annually
 - Escanaba – approximately 2.1 million tons
 - Sault Ste. Marie – approximately 1.4 million tons
 - Inbound to mines (limestone, reagents, etc.), - approximately 650,000 tons

Port Inland and Cedarville Aggregate Quarries (and Lime Facility)

Port Inland limestone quarry was originally started in 1920s and is today owned and operated by Carmeuse. The quarry produces both high calcium carbonate limestone and dolomite. Some of the limestone is moved to an adjacent Graymont manufacturing facility that produces High Calcium Pebble Lime from limestone.

- **Expected life:** There are no plans for any slowdowns or closures for the quarry. Graymont facility has potential for 20 percent production increase, but any expansions are based on market conditions (no immediate plans).

- **Transportation Infrastructure:** Carmeuse has an internal railroad at the site, operated by Railinc (Genesee-Wyoming). The railroad moves limestone from quarry to Carmeuse and Graymont plants and further delivers lime cars from Graymont to CN on Carmeuse property (east of Gulliver). Carmeuse has also port facility for great lakes shipping.
- **Shipments and Volumes:** Majority of the 4-5 million annual tons of limestone moves by ships to Graymont plants in Green Bay and Superior, Wisconsin. Indiana steel mills are also receiving shipments. Graymont's rotary kiln produces approximately 250,000 tons of Calcium Oxide (and other limestone materials) annually which are shipped by rail and truck (75 percent by truck), mainly to Sault Ste. Marie, Canada and various locations in Michigan (Figure 40). There is some possibility of inbound fuel shipments for each production facility. Fuel could be coal or coke (likely shipped by rail) or natural gas.



Figure 40: Graymont Lime Loading Facility at Port Inland

Cedarville Limestone Quarry

Cedarville limestone quarry is also owned and operated by Carmeuse. (St. Ignace News, 2013). The quarry was opened in 1955 and completed a \$14 million rebuild project in 2009 on entire facility to introduce new technology and replace aging equipment (St. Ignace News, 2009).

- **Expected life:** There are no plans for any slowdowns or closures for the quarry.

- **Transportation Infrastructure:** Carmeuse has an internally operated railroad at the site that makes a five-mile trip to the mill on 14-car trains, at 100 tons per car, to move the rock to the mill. 99% of the crushed limestone leaves via on-site port facility on Lake Huron for great lakes shipping.
- **Shipments and Volumes:** Mill produces up to 21,000 tons per day (3-4 million tons annually). Most of the stone, 60% to 70%, ends up in the steel industry, the closest buyer being Essar Steel Algoma in Sault Ste. Marie, Ontario. Most of the rest is sold as blended aggregates for products such as concrete and asphalt, much of it making its way to Cleveland.

Eagle Mine (Lundin)

Eagle Mine, a subsidiary of Lundin Mining (previously known as Kennecott mine) is located 35 miles (55 km) northwest of Marquette (Michigamme Township). Total capital cost for the mine which is currently under development, is estimated to be \$780 million. Main commodities are copper and nickel ores which are going to be concentrated in the Humboldt mill, currently under reconstruction.

- **Opening year and expected life:** The Company has received the permits for the mine and is expecting to start operation by the end of 2014 with a mine life of 8 years. The outcomes of additional exploration may extend the service life.
- **Transportation Infrastructure:** There was an earlier plan to improve County Road 550, but current roads through Marquette will be used for transporting ores from mine to Humboldt mill (60+ miles) for concentrating. 1.9 miles of a rail-trail corridor is being converted back to rail use to connect the Humboldt facility with the current line between Ishpeming and L'Anse. Additional eleven mile segment of track is being rehabilitated between Humboldt and Ishpeming.
- **Shipments and Volumes:** Both truck and rail shipments will be done with dedicated fleets. There will be 45 round trips per day from mine to refinery by "Michigan trucks" (164,000 lbs total weight). The concentrated ores would be transported by fleet of 250 rail cars from Humboldt to Ishpeming by Mineral Range Railroad and further through Sault Ste. Marie to smelter or port destinations within Canada. Expected volumes include:
 - 730,000 tons per year from mine to Humboldt mill
 - 130,000 tons of nickel and 40,000 tons of copper concentrates from Humboldt mill annually
 - The concentrated ore is expected to account for eight daily outbound rail car loads. There is also potential for an unknown quantity of inbound flows of chemicals, reagents, grinding media, lime, etc. via truck.

4.6.1.2. Proposed Mines

Groveland Mine

Groveland mine is located in Dickinson County near Iron Mountain eight miles northeast of the Michigan-Wisconsin border. Various types of mining activities are under development, including crushed aggregates for railroad ballast, sand for fracking and potentially iron ore. There is estimated five million tons of potential material for ballast, deposit of 120 million tons of high grade iron ore and 50 million tons of nearly pure silica sand. The entrance to construction/frac sand business would require establishment of a sand plant which would cost approximately \$20 million. The return of iron ore mining to Groveland could cost more than ten times the frac sand investment.

- **Opening year and expected life:** The mine is starting production of rail ballast in summer 2014 with most of the first year production going to the E&LS Wausaukee line rehabilitation project and Humboldt mill line. There is a current grant application to the Michigan Economic Development Corporation to secure a major loan toward building facilities for frac sand production and transportation. At best scenario, construction of sand plant could also start in summer 2014 and have proper inventory by 2016.
- **Transportation Infrastructure:** There is a paved road to the mine from county road 69. The mine will also be served by Escanaba and Lake Superior (E&LS) through a dedicated 4.5 mile rail spur (currently used for storage) that splits from Channing line (Figure 41). The spur will be expanded, if sand production is initiated and additional location on E&LS will be used for car storage.
- **Shipment and Volumes:** The ballast will be trucked from crushing operations to E&LS rail spur within the site. They also had discussion with Seaways coal dock and CN dock in Escanaba for potential customers for longer hauls, potentially to Canada, Texas, Oklahoma and South Dakota.
 - Production in 2014 is expected to be approximately 100,000 tons per year resulting in 20 to 30 rail cars per week. This could eventually be expanded to 300,000 tons per year.
 - Expectations for frac sand production would be around 300,000 tons per year. Destinations are currently unknown.
 - No estimates were provided for potential iron ore volumes.



Figure 41: Current Rail Infrastructure at Groveland Mine Site

Graymont Limestone Quarry

Graymont is a family owned and controlled Canadian corporation, headquartered in Richmond, British Columbia. They operate limestone production facilities in many locations, including the Port Inland facilities covered in previous section. The proposed production facility near Rexton (West of Trout Lake) is located along CN rail lines which are considered a requirement for the project. Initially, limestone from a surface mine near Hendricks and a smaller quarry near Trout Lake would probably be trucked to a dock area near Brevort for maritime shipping. In longer term, the company is considering the possibility of setting up one or more kilns on the site. The produced lime would be shipped by rail (rail access is absolute requirement). If established, production expectations for the Rexton facility would be similar to the current Gulliver location (250,000 tons per year per kiln) and there might be potential for expansion to multiple kilns. Currently, the final product destinations are unknown.

Highland Copper Company Inc.

Highland Copper Company Inc. has several investigations in the U.P., including Copperwood mine in Gogebic county, White Pine refinery in Ontonagon, and 543S/G2 (Keweenaw project) in Keweenaw (Highland Copper Company, n.d.). Copperwood is a feasibility stage project. Main

commodities from Copperwood and Keweenaw project would be copper and silver ores. The company would transport the ores from Copperwood and Keweenaw project to White Pine refinery where it will produce 30- 40 percent concentrated copper. There was no cost estimate for the planned development, but a recent Letter of Intent to Form a Joint Venture with AMCI was announced with \$45 million commitment from AMCI.

- **Opening year and expected life:** The Copperwood mine White Pine refinery is expected to open in 2018 and continue operating for twenty years. No specific year was indicated for the Keweenaw project.
- **Transportation Infrastructure:** 10+ miles of recently improved county road leads to Copperwood mine location. The road connects to main highway in Tomaston. There is also existing (not operated) CN rail line in Tomaston. Both road and rail access (unoperated) is available from Tomaston through Bergland to White Pine (approximately 30 miles). There are major highways from Keweenaw to White Pine and Ontonagon has harbor facilities for potential barge movements (from Keweenaw).
- **Shipments and Volumes:** The Company is looking into two options to haul ores from Copperwood to White Pine. Plan A is to transport ores by truck from Copperwood to the existing CN track in Thomaston. The distance to White Pine on current road network would be 40+ miles. Plan B is to build a 12-mile rail spur to connect the mine with the existing (unoperated) CN line that runs to White Pine facilities. For the Keweenaw project the company is conducting pre-feasibility study on whether it would be feasible to ship ores from Keweenaw to Ontonagon port by barge and then transport it approximately 18 miles by truck to White Pine facility. Outbound movements from White Pine would be by rail, either via existing CN line to south, or via new rail connection to the abandoned E&LS line in Ontonagon (this would require rebuilding of abandoned track). A truck-rail transload to E&LS might also be a possibility. The most potential destinations for the final product from White Pine include Sudbury and Quebec in Canada, and Louisiana or Western States in the U.S. The estimated annual shipment volumes include:
 - Copperwood mine – estimated annual ore volume is 2.35 million tons
 - Keweenaw project - estimated annual ore volume is 0.36 million tons
 - White Pine – After concentrating copper ores from the two projects, outbound shipments could reach approximately 235,000 tons annually.

G-Tac Iron Ore (Hurley)

G-Tac Iron Ore (Hurley) is located in Gogebic County. The \$1.5 billion project is in the planning stage, but according to officials shipments could start as early as 2017 and end by 2052, if the project gets approval. Main commodity would be iron ores. They are expecting to produce eight million tons of iron ore or 7.3 million tons of iron concentrate annually. Ore would be moving by

2-3 daily unit trains to Escanaba docks. The project's future has been questionable, since the State of Wisconsin legislation to streamline permitting was defeated in 2012.

Back Forty Project

The Back Forty project is located in Menominee county 12 miles west of Stephenson township (Back Forty Project, n.d.). The project is in the planning stage with expecting mine life of seven years. Capital cost estimated as \$272.3 million. Main commodities would be copper, zinc, gold, and silver. The production estimates include 3,000 tons of ore daily and production of 77,200 tons of copper concentrate, 323,500 tons of zinc concentrate over the lifetime (a bit less than 60,000 tons annually). The project transport plan and destinations for final products are unknown.

Baraga Project

The Baraga Basin Project by Prime Meridian Resources area is in Baraga and Marquette counties, 40 km northwest of Marquette city (Baraga Basin, n.d.). The project is in planning stage and drilling at the identified seven potential sites is in process. The main commodities would be nickel and copper. The project's land possession is around 4,000 mineral hectares. The drill testing operations near Eagle mine started in August 2010, but were delayed in November 2010. There is no detailed information on progress over the last three years (Prime Meridian Resources Corp., 2010)

4.6.2. Forest Products Industry

The forests in Michigan, and particularly in the U.P., are a resource for the world and the basis of a substantial part of the economic activity in the area. The forests are a sustainable wood fiber resource that supports paper making, tissue products, consumer goods, fencing, flooring, veneer, biofuels, and manufactured wood products, such as furniture. The significance of forests in Michigan can be found in the publication "Michigan's Forests 2004" prepared by the Northern Research Station, USFS. This publication notes the following forest statistics:

- Among the 50 states, Michigan ranks 22nd in land area but 10th in forest land area.
- Forest land accounts for 19.3 million acres or 53 percent of land in Michigan; 97 percent of it, or 18.7 million acres is timberland.
- Total growing stock on timberland has increased significantly since 1955. From 1955 to 1966 the increase was nearly four percent per year. Since 1980 the increase has been just under two percent per year.
- The ratio of net growth to removals from 1993 to 2004 was 2.7 indicating that volume of net growth to removals has remained almost constant.

- The economic benefits of Michigan’s forests are enormous as more than \$12 billion and 150,000 jobs contribute to Michigan’s economy annually through forest-based industries, recreation, and tourism (Michigan Department of Natural Resources).

The importance of U.P. in the forest products industry can be seen in Figure 42 that presents the forest acreage, employment and trucking tonnage. U.P. accounts for almost 50 percent of Michigan forests (Tree Basics/Descriptors, n.d.). Annual forests timber removals equal only 60-68% of the allowable “sale quantity” (limited due to state and federal budget constraints) and only 40-50% of the “allowable cut” (determined by sustainable forestry practice standards). The combination of increased growing stock and limited harvests indicate that the forests in the U.P. will continue to be a resource for the future and current or greater production levels should be expected. This also means that the future transportation requirements for truck and rail forest product production should closely follow previous years or increase.

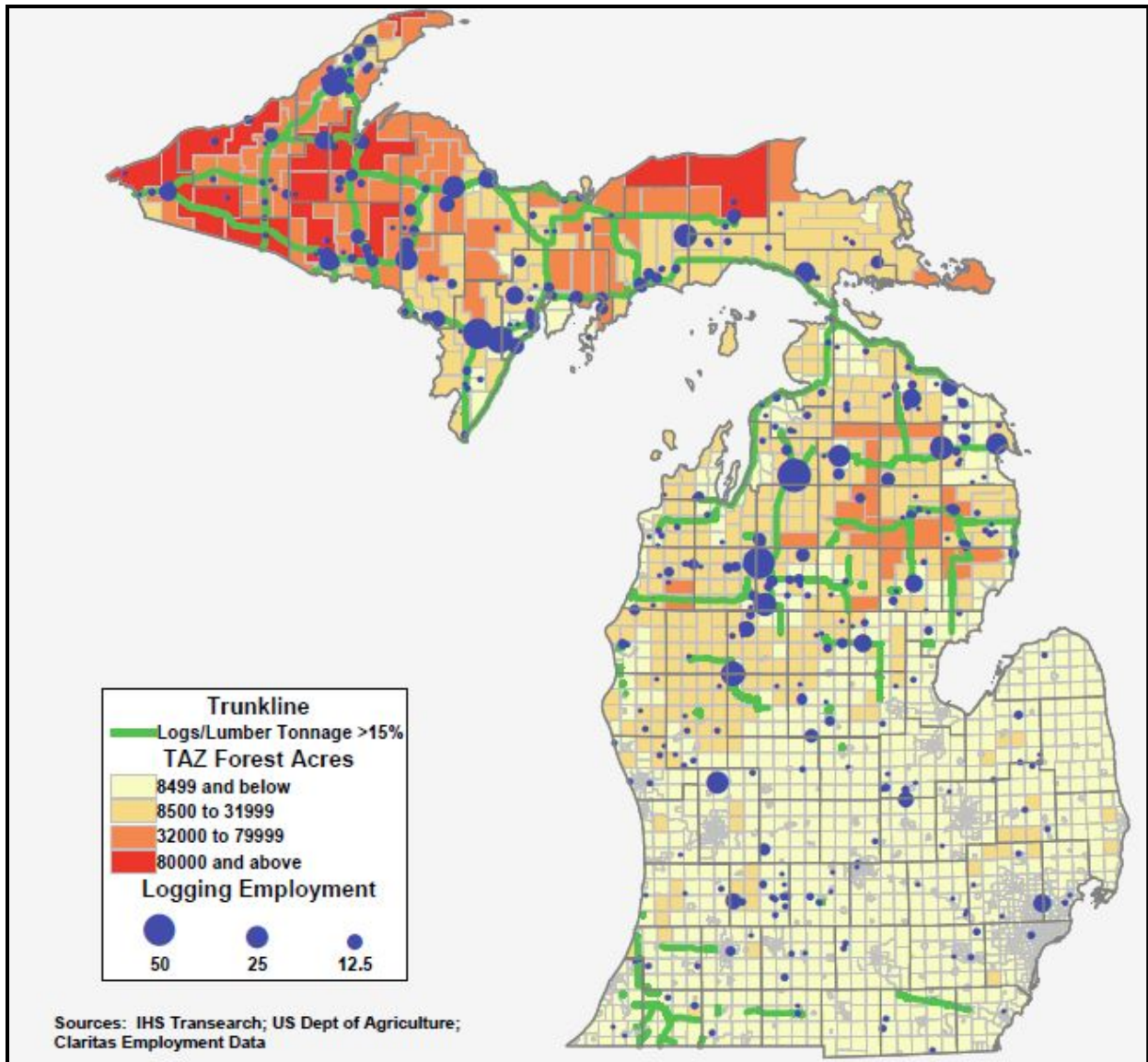


Figure 42: Michigan logging locations

The forest base in the U.P. is versatile. Large private landowners are supplemented by two National Forests managed by the United States Forest Service and three state forests managed by the Michigan DNR in the U.P. The Ottawa National Forest covers 993,010 acres and Hiawatha National Forest covers 894,836 acres. The Ottawa National Forest has tentative harvest program for Fiscal Year 2014 is approximately 89,280 CCF (hundred cubic feet) (approximately 55 million board feet – MMBF). In addition to National Forests, the 3.9 million acre state forest system provides more than 800,000 cords per year of certified wood. Based on combined volumes by TRANSEARCH, all private and public resources together provide approximately six million tons of wood to be transported (80 percent by truck), or approximately 100,000 truckloads, highlighting the large scale of log shipments in the region.

It is hard to envision the disappearance of the forest products industry from the U.P. TRANSEARCH forecasts significant volume increases by 2030 (50 percent for logs and lumber, 20 percent for paper and pulp), but the question is the form and shape of those movements. The traditional paper industry has been in decline and in constant “change”, as most lately demonstrated by the proposed \$1.4 billion merger between Verso and NewPage (Proposed Verso, NewPage merger in jeopardy, 2014). At the same time new applications, such as biofuel, energy and pellet production from woody feedstock are on the rise, as demonstrated by a recent plan to convert Escanaba power plant from coal to biomass (Upper Peninsula man buying Escanaba power plant, 2016) and the transformation of Sappi’s Cloquet, Minnesota mill from a producer of pulp for paper into one that makes “cellulose pulp,” which is used in textiles (Twin Cities Business, 2013).

The fact above demonstrates the scale of forest products industry and its effects on the overall transportation in the region, including the challenges. In 2013, Michigan’s Governor hosted a Forest Products Summit that identified the top 27 barriers to growth in forest products industries (Governor's 2013 Forest Products Summit, 2013). Three of the top ten barriers were transportation related and provide a good blueprint for future priorities when it comes to development of transportation from forest products perspective:

- Barrier #5, high energy costs;
- Barrier #8, poor road system; and
- Barrier #9, railroad system and the ability to move logs.

4.6.2.1. Wisconsin Central Group

The challenges with rail transportation of forest products relate to both operational and equipment capabilities. The vast and shifting geography of forest products movements, together with seasonal changes and necessity of multiple access points to rail network, are not ideal for productive rail movements and asset utilization. In addition, the equipment is aging and stakeholders are reluctant to invest their limited capital to new ones due to low value of logs as a commodity.

Recently, an innovative approach was established to address the issue through the development of Wisconsin Central Group/CN Railroad collaboration (Wisconsin Central Group, n.d.). Under the initiative, CN has established the "CN Advisory Board - Great Lakes Region" and, thus far with the support of WC Group, two working committees, CN/WCGroup Log and Intermodal Committees. The most tangible outcome to date is agreement on a plan for establishing a publicly-own rail log car fleet. Phase one is reflected in a \$14 million federal TIGER grant application, together with a \$4 million contribution by CN, to purchase 150 new-built log cars to be the foundation for the "Great Lakes Forests Region Log Car Fleet" which they hope to grow to 300-450 log cars by 2017.. (Wisconsin Central Group - Northwoods Rail, n.d.).

4.6.3. Trucking Company Perspectives

The research team recognized that understanding the relationship between trucking and rail transportation within the study region and adjacent areas was necessary. Collaborative (multimodal or intermodal) opportunities with trucks and modal shift to rail are the most promising sources for new rail traffic. The study team contacted five trucking firms in the U.P. region to determine their attitudes toward railroads as a competitor and/or collaborator. The team also assessed the amount of existing interaction between trucking firms and railroads, whether it was through direct or indirect interaction via a freight forwarder or third party logistics firm (3PL).

Three companies were willing to participate were asked a list of sample questions (provided below) to create discussion and provide insight into the relationship between the trucking firms and railroad companies:

- Within the U.P., does your company view railroads as a competitors or collaborators?
- If a competitor, how would your firm view the development of a transload facility to act as a regional multimodal hub?
- How is the rate model constructed and are loading and unloading costs included in the trucking rate?

All three companies considered rail a competitor, but when approached from transload terminal perspective, they indicated strong support for intermodal service with transload capability to supplement their needs as carriers. The companies considered intermodal/transload freight to be necessary/good idea to support shipping in the U.P. and that success would be dependent on strong collaboration with the railroad companies. One firm stated that carriers would prefer multiple short distance hauls to local destinations including intermodal facilities. The other comments related to intermodal/transload operations included:

- With a transload facility, a collaborative and cost saving service can be established. Until such a time, railroads and trucking firms will remain highly competitive.
- Local trucking firms only interaction with railroad tends to be through freight forwarders and 3PLs at terminals in Chicago and Minneapolis/St. Paul. Large nationwide truckload carriers often have more interaction with railroad via intermodal (TOFC and COFC).
- Trucking firms want access to expedient, fast and reliable access points to the intermodal network other than Chicago and trucking firms would actually like to see TOFC or COFC options for shippers.
- It is known that the freight transported by trucking firms is often on rail for part of its journey but the firms have no knowledge of the specific details, as the freight that trucking firms pick up or deliver to and from terminals in Chicago, Twin Cities, etc.

comes from freight forwarders. Truckers are often hired by the 3PL or shipper themselves to simply pick up the freight from the freight forwarder's warehouse for the final delivery.

According to companies, the rates are most commonly per mile (for a truckload) and typically prepaid by the shipper or collected by the consignee. Truckers are rarely concerned of loading/unloading costs, as those activities are typically the responsibility of the shipper and most shipments (LTL and full truckloads) originate and terminate at warehouses that have docks and loading equipment, eliminating the need for trucker participation in the activity.

4.6.4. Modal Choice and Transload/Intermodal Facilities in the Upper Peninsula

There are two different alternatives to increase rail traffic in the region, either by alternating modal choices, or by providing multimodal (truck/rail) opportunities. There are several factors that affect modal choices, such as modal and commodity characteristics, access to modes, various types of logistics costs and additional factors, such as length of haul and length of shipment.

In some cases, combination of modes offers a better alternative to a pure modal shift. Early research revealed a great shipper interest toward establishing a transload/intermodal facility in the region and as a result, a complimentary study was completed by the Michigan Tech graduate student to investigate the potential (Rasul, 2014). Truck/rail multimodal transportation typically includes truck drayage in one or both ends of the movement with rail and one of the most common justifications for using multimodal alternatives is anticipated cost savings. However, other aspects also affect shipper decisions on modal choices, such as Figure 43 presents an example of the effects of different unit costs and handling costs to the cost efficiency of multi modal transportation chain. In the figure, the cost of multi modal (truck/rail) transportation is compared to a single mode truck transportation from origin (O) to final destination (F), using the length of rail haul as a variable. The product is transloaded to rail after truck drayage in point 1 and either taken to final destination by rail, or transloaded back to truck for final drayage at point 2, 3 or 4. The Figure reveals that even through the unit cost of rail segment (per mile) is significantly lower, the added handling causes higher total cost for multi modal option, if rail segment covers insufficient portion of the total trip distance (transfer back to truck at points 2 or 3).

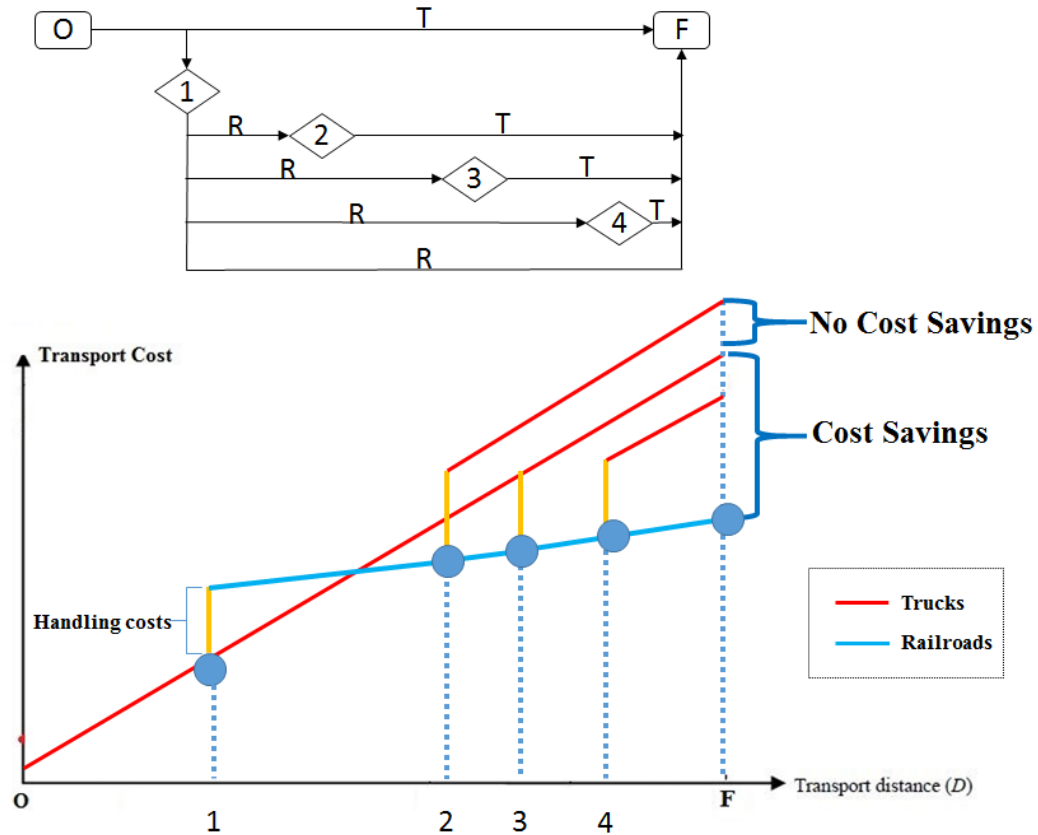


Figure 43. Multi modal chain cost efficiency

4.6.4.1. Current Facilities

Currently there are no intermodal facilities capable of handling containers in the U.P. E&LS Railroad offered a successful Trailer on Flat Car (TOFC) intermodal service from Ontonagon to Green Bay for Smurfit Stone on 90' long flat cars, but that was discontinued after the mill closed. Today, the nearest terminal for U.P. shippers is located 200-450 miles away (depending on origin within U.P.) in Chippewa Falls, serviced by CN and operated by a private contractor (

Figure 44). Since Chippewa Falls handles only outbound traffic for international markets, most intermodal freight to/from the U.P. travels first either to terminals in Chicago, or Minneapolis. The long initial/final drayage is considered a major competitive hindrance by the U.P. companies.

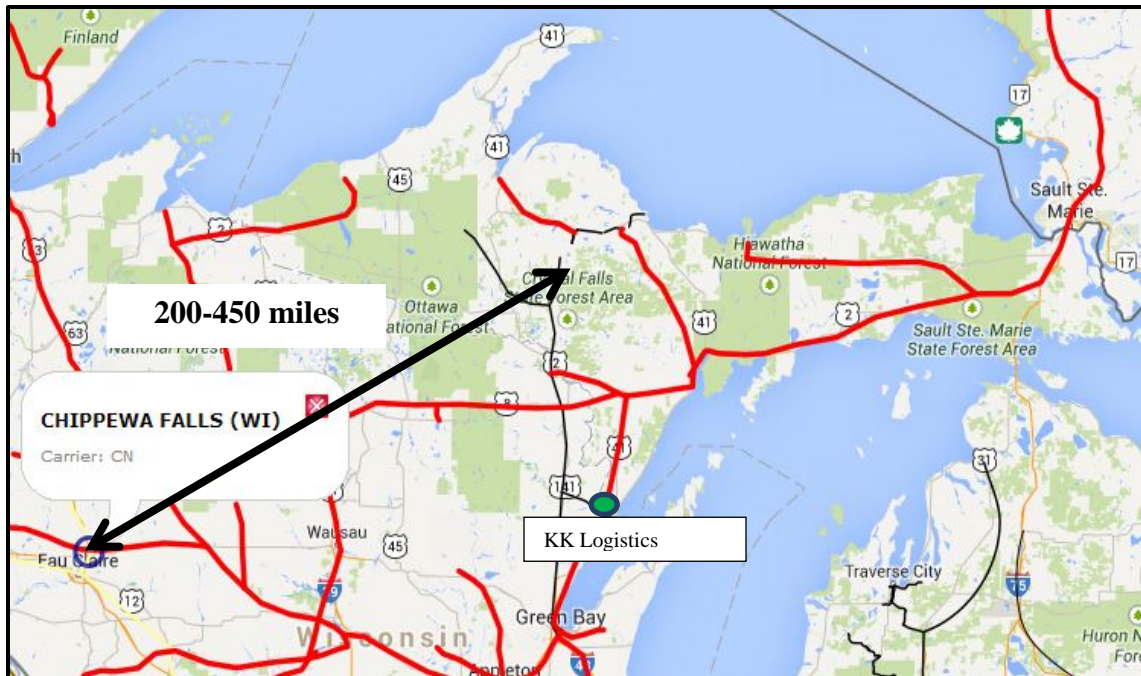


Figure 44: CN Chippewa Falls Terminal

Excluding private sidings and loading docks within specific companies, there are limited capabilities for transloading in the U.P. Established in 1984, KK Integrated Logistics (KKIL) owns and operates a transload facility and adjacent warehouse in Menominee which is served by both CN and E&LS Railroad (K K Logistics, n.d.). KKIL functions as a full-service logistics and transportation company, providing access for shippers to a fully integrated network of transportation and logistics with warehousing, trucking, stevedoring (loading/unloading), and transloading. KKIL owns over 2.5 million square feet of warehousing space in Menominee and Marinette, Peshtigo, Manitowoc and Green Bay, Wisconsin, for short- and/or long-term storage. The company was initially set up to serve the paper industry, but over the time, the cargo has expanded to various types of bulk-break, bulk, and specialty project cargo services. Rail transloads are a small portion of the business, recently approximately 100 box and flat cars per month. Expansion potential of transload services is dependent on expected profitability and warehouse space availability.

Escanaba and Lake Superior Railroad (E&LS) also has past experience in transloading. In the late 1980's, E&LS purchased a 13,500 sq. ft. former lumber distribution center and warehouse in Kingsford, MI, and renovated it to serve as strategic truck/rail transload center for industry in the central U.P. (Figure 45). The center's rail dock has room for three 50' box cars inside the building. The center was operated successfully by E&LS from 1989 through 1993, serving paper mills located in Quinnesec, MI and Niagara, WI, and other forest products related companies. The principal commodities included woodpulp, paper, OSB, cut stock lumber, scrap paper, and machine parts. E&LS offered a single rate with trucking and transfer to rail. Another rate was

offered for storage. A single E&LS employee operated the facility with forklift. While the center has only been used sporadically over the last 15 years, it could be re-opened for operations.



Figure 45: E&LS transload facility in Kingsford, Iron Mountain (closed for operations)

4.6.4.2. Potential Transload Locations

The study included three potential transload facility locations identified by stakeholders; Nestoria (or vicinity), Ishpeming, and Amasa (Figure 46) and analyzed the potential shipping benefits from cost and emission perspective. Nestoria and Ishpeming are located on CN line. Ishpeming already has a rail yard and Nestoria has a siding to serve J.M. Longyear’s Peshekee Yard. Amasa is on E&LS line which is located in Iron County and has the potential to attract the business in the surrounding area. Amasa is also connected to Channing rail yard, owned and operated by E&LS, which has large capacity of storing cars.

The study concentrated purely on evaluating potential savings in shipping costs (with and without consideration for emissions). No engineering design was conducted, neither analysis of capital costs for facility development, or availability of other required resources to the facility (such as power). Based on limited discussions, it is expected that each one of the general locations would have technical capability to host a transload facility. During the analysis, additional facility locations were also suggested by stakeholders, such as Sidnaw, vicinity of

Groveland mine, and the old power plant site in Niagara, Wisconsin. While all of the locations offer potential for transloading, they were not included in the analysis.

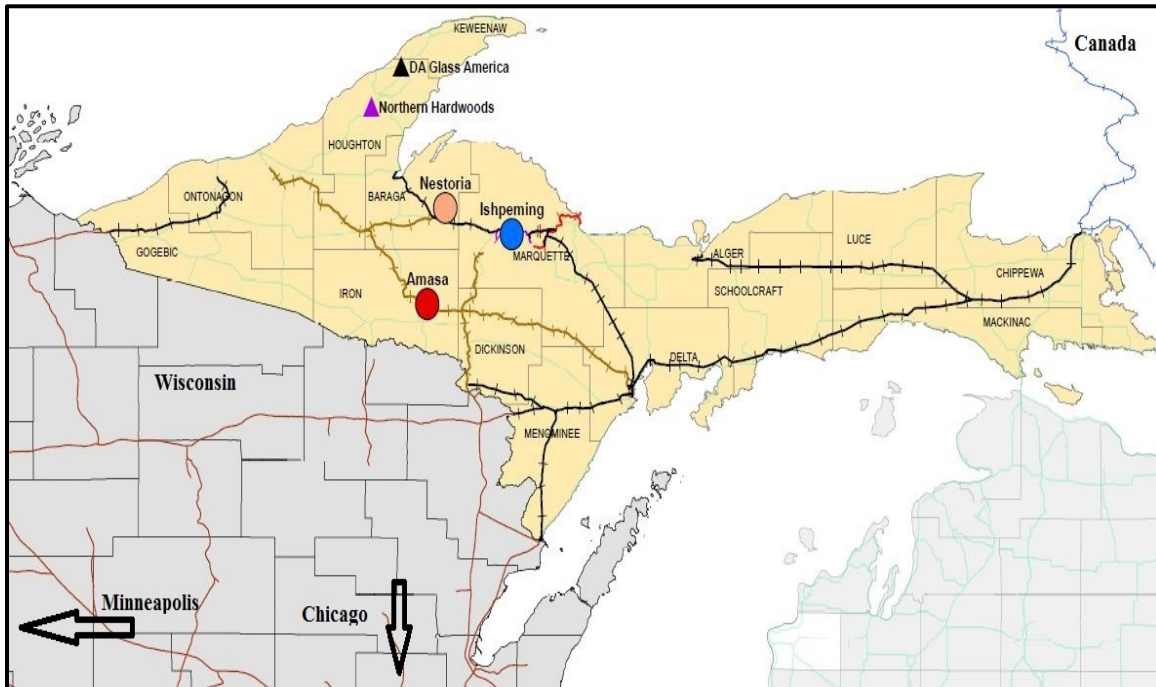


Figure 46: Case study companies and locations of transload facilities

4.6.4.3. Potential Shipments using Transload Facilities

The initial objective was to use information collected as part of the Task 4 – Shipper Survey to identify companies and quantities for potential multimodal options. As it became clear that responses were not sufficient for such analysis, two alternative approaches were used instead. The first approach used TRANSEARCH data to identify potential shipments. However, it was realized that conducting cost analysis could not be done with reasonable accuracy, due to limited level of detail included in TRANSEARCH. The county level accuracy for origin/destination data within the U.P. reduced accuracy, but even greater challenge was the out-of-state origin/destination data that was only provided at state level. The second approach relied on specific case studies, namely two different companies with specific shipment needs.

The two companies selected for case studies included DA Glass America and Northern Hardwoods. Each company is located within 100 miles of each alternative location and had expressed their interest in using multimodal option, if a transload facility is made available in the U.P. DA Glass America has recently established a business location next to the Hancock (CMX) airport. The company will process glass shipped to the facility with an anti-reflective coating and ship it for Greenhouse construction to various locations in the U.S., including Wisconsin,

southwestern US, and California. The most logical way to move the glass (inbound and outbound) is in containers that are loaded at DA Glass facility.

The second company was Northern Hardwoods which is located in South Range, MI. They manufacture lumber products. The company is currently shipping nearly 70 percent of their volume to Wisconsin and the rest to Minneapolis and beyond using flatbed trucks (commonly used for lumber transport). They are also interested in export opportunities to Asia, but lack of multimodal opportunities has been impeding the development of global business.

4.6.4.4. Methodology of Analysis

The objective was to compare the two companies' truck only option over potential multimodal transport. A spreadsheet methodology was developed to calculate shipping and emission costs for truck only and multimodal alternative (using transload). Figure 47 illustrates the concept diagram for the methodology. The input parameters included in the calculations were the movements (origins and destinations), available infrastructure and various unit costs. Movements and infrastructure parameters were used to generate shipments and possible routes for both truck and multimodal options and unit costs parameters were used to formulate cost equations and to calculate transport and emission costs.

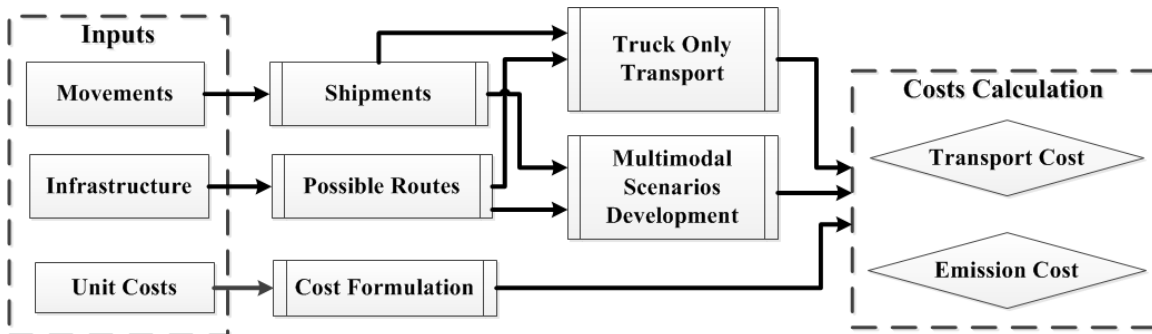


Figure 47: Conceptual transport calculation diagram

The parameters for each input category are illustrated in Table 15. A combination of shipping, fuel surcharge and loading costs (multimodal only) were used to develop the total freight costs (rates) for comparison.

Table 15: Input parameters for transport calculations

Input Category	Movements	Infrastructure	Unit Costs
Input Parameters	Origin and Destination	Road network	Shipping costs
	Volume of Commodities	Rail network	Emission costs
		Potential transload locations	Fuel Surcharges
			Transloading costs

4.6.4.5. Parameters

Parameters used for the model are presented in Table 16. It was necessary to develop separate formulas for DA Glass and Northern Hardwoods, as DA Glass movements were considered to be containers (from beginning to end), while for Northern Hardwoods, lumber would first use “Michigan trucks” with higher total truck weight limit to access the facility and either boxcars or center beam cars for the rail segment. Based on industry guidance the cost formulas were developed separately for intermodal (container) and car load traffic. Unit cost estimates for trucks were obtained directly from the companies. Rail rate for containers was provided by the industry and car load rates by CN were developed based on CN tariff rates. Although E&LS uses different cost structure and would require interchange with CN, same CN tariff rates were applied to Amasa location, as no detailed information on actual rates was available. Transloading cost was also developed based on industry input while emission rates and costs were developed based on literature. It should be recognized that these unit costs are not actual rate quotes and such, should only be considered adequate for preliminary analysis.

Table 16: Input parameters for calculating shipping and emission cost

Parameters		DA Glass	Northern Hardwoods
Shipments		Containers	Carloads
Unit Cost (Truck)	Truck only shipping cost (\$ per ton-mile)	0.XXX*	
	Truck drayage to transload (\$ per ton-mile)	0.XXX*	50% of 0.XXX*
	Fuel Surcharge (\$ per ton-mile)	mileage based (included in price)	
	Emission cost (\$ per ton of CO2)	30.50	
Unit Cost (Rail)	shipping cost (\$ per ton-mile)	Containers (85% of trucking rate)	Carloads equation
	Fuel Surcharge (\$ per ton-mile)	percentage based (CN tariff)	Mileage based (CN tariff)
	Transloading (\$ per ton)	6.00	
	Emission cost (\$ per ton of CO2)	30.50	

* Actual value not revealed to maintain confidentiality. Fuel surcharge included in the value.

In addition to calculating shipping and emission costs, the research also conducted sensitivity analysis on the effect of different On-Highway Diesel Fuel (HDF) prices (\$4, \$5, and \$6 per gallon) on shipping costs. The analysis were conducted with and without consideration for emission costs, but based on the emission rates and costs used in the analysis, adding emission costs into the analysis would have only small effect on the overall cost, increasing the savings from multimodal options by 1-2 percent.

4.6.4.6. DA Glass

For both case studies, the analysis were limited to destinations that could be reached within the CN system, which meant that the only final destinations available for DA Glass were in Wisconsin. While it would be expected that the longer overall shipments to the Western U.S. had higher potential for multimodal savings, they were not analyzed for two reasons. First, a combined rate that included the interchange with second railroad could not be obtained by the research team and second, containers are less likely to be interchanged from one railroad to another, especially, if one of the legs is significantly shorter. CN advised that the short initial distance to Chicago (when compared to overall trip length) would not offer sufficient financial incentives for them to consider container movements from the region to the Western states.

Figure 48 summarizes multimodal cost savings over the truck option for DA Glass, with and without emission costs for three different fuel price levels. The analyses were done with and without direct rail access (25 miles) in the final destination. The analysis found that without direct access by rail at final destination, no benefits could be gained for Wisconsin movements, mainly due to short overall distances. From Figure 48, it can be noted that Amasa would be the preferred transload location, but any cost benefits would be difficult to obtain, even with higher fuel prices of \$5 and \$6 per gallon (negative savings mean increase in total price). Even if cost savings could theoretically be obtained, this would require capability to handle containers in both ends, a very unlikely scenario for a limited volume of containerized movements. While the potential for cost savings to East/West U.S. destinations are much higher, they would most likely continue to require the lengthy trucking drayage to Minneapolis or Chicago.

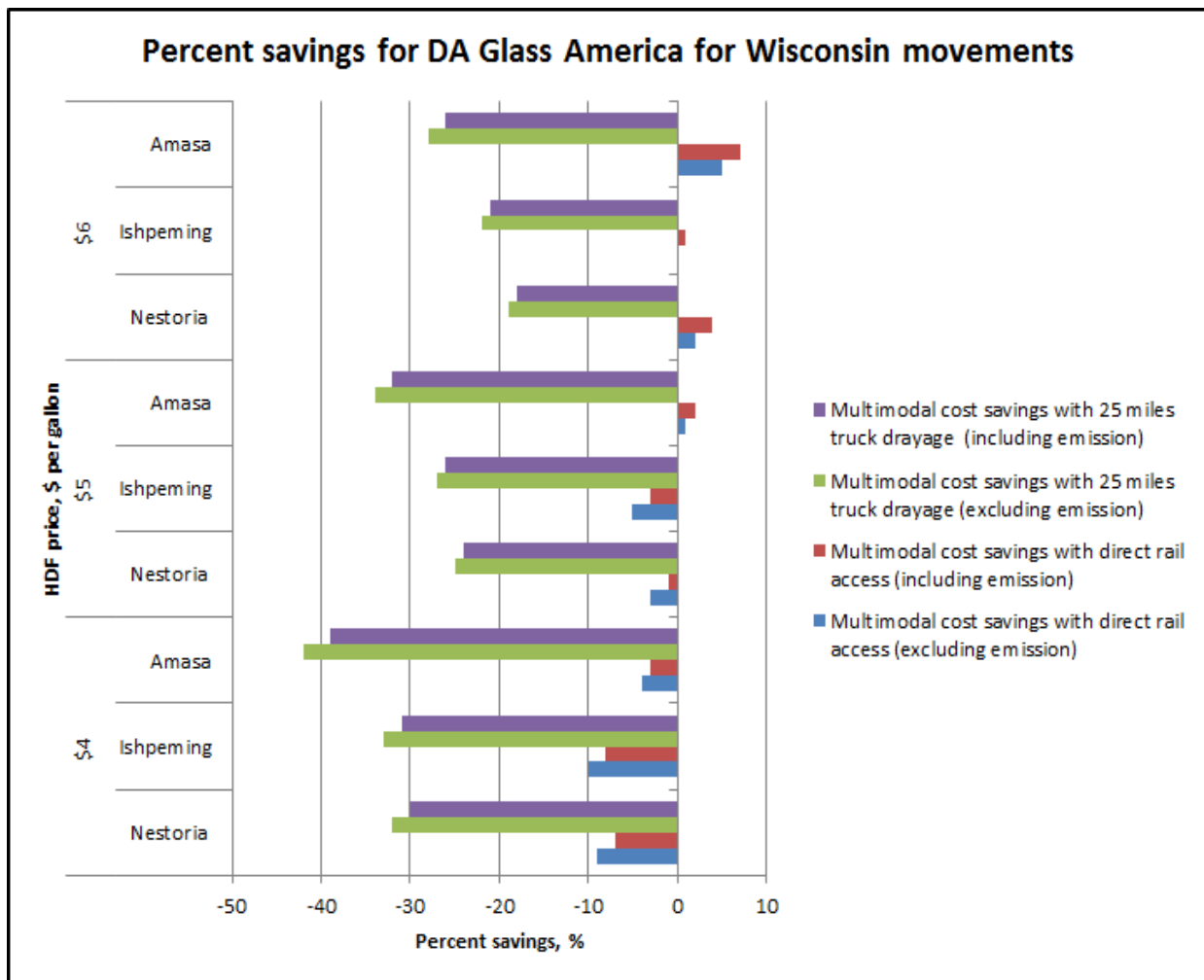


Figure 48: Multimodal cost savings for DA Glass (Wisconsin movements) using transload facility

4.6.4.7. Northern Hardwoods

Northern Hardwoods has several different movement scenarios, including several destinations in Wisconsin and Minneapolis/St. Cloud in Minnesota. Some of the Minneapolis movements are containerized and loaded to trains to reach their final destinations. Since getting a container facility to U.P. is a challenge, the analysis concentrated on two specific movements; Minneapolis/St. Cloud (non-containerized) and selected Wisconsin movements (with highest total mileage). These movements would use “Michigan Trucks” (164,000 lbs total weight) to the initial drayage to the transload facility and either centerbeam or box cars for the rail movement. 80,000 lbs trucks were used for interstate movements, or final drayage in Wisconsin and Minnesota.

Figure 49 summarizes multimodal price change between truck only and multimodal alternatives for a movement to Theresa, WI for Northern Hardwoods, with and without emission costs. The total distance to Theresa is over 300 miles, making it more likely for multimodal alternatives. The analyses were done with and without direct rail access (25 miles) in the final destination. The analysis found that there multimodal alternative might would provide cost savings, as long as there was rail access to the final destination. However, no savings could be obtained, if truck drayage to final destination was required.

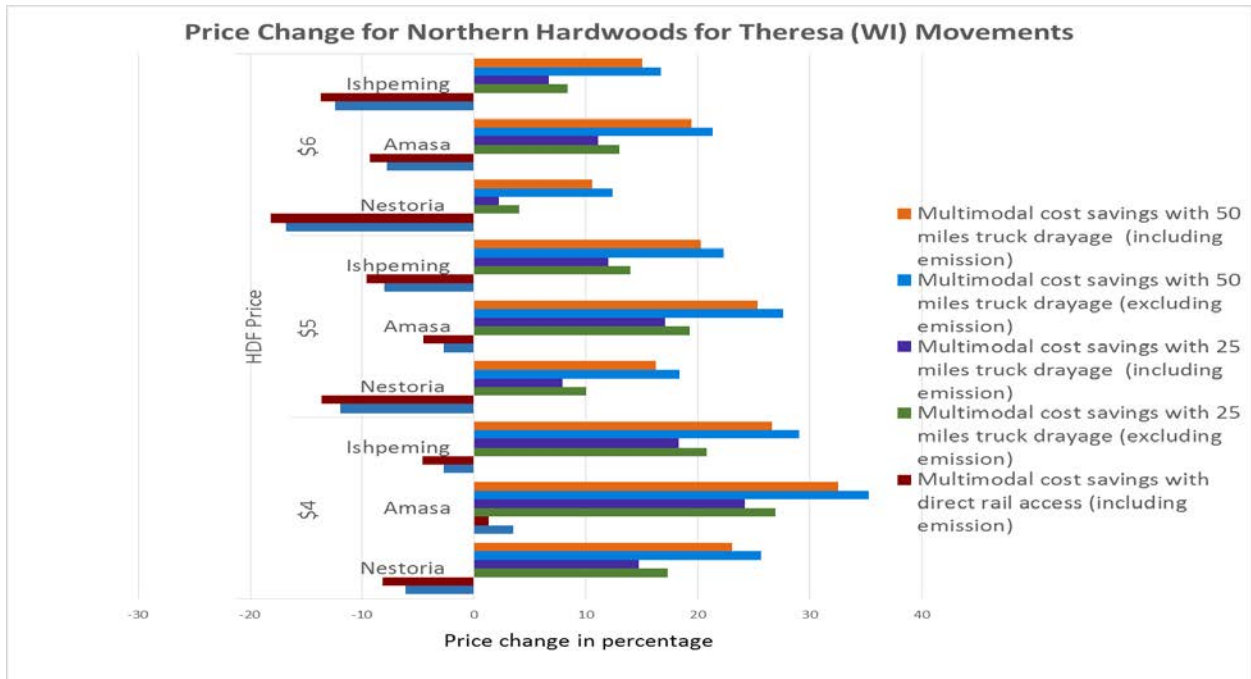


Figure 49: Northern Hardwoods multimodal price change (Theresa, WI movements) using transload facility

Figure 50 presents the same analysis for Minneapolis movements. All transload locations would provide benefits for current and higher HDF prices, with Amasa offering the greatest reductions. With higher fuel prices, the movements to Minneapolis have the potential to gain benefits, even if 25 or 50 miles drayage were required to reach the final destination.

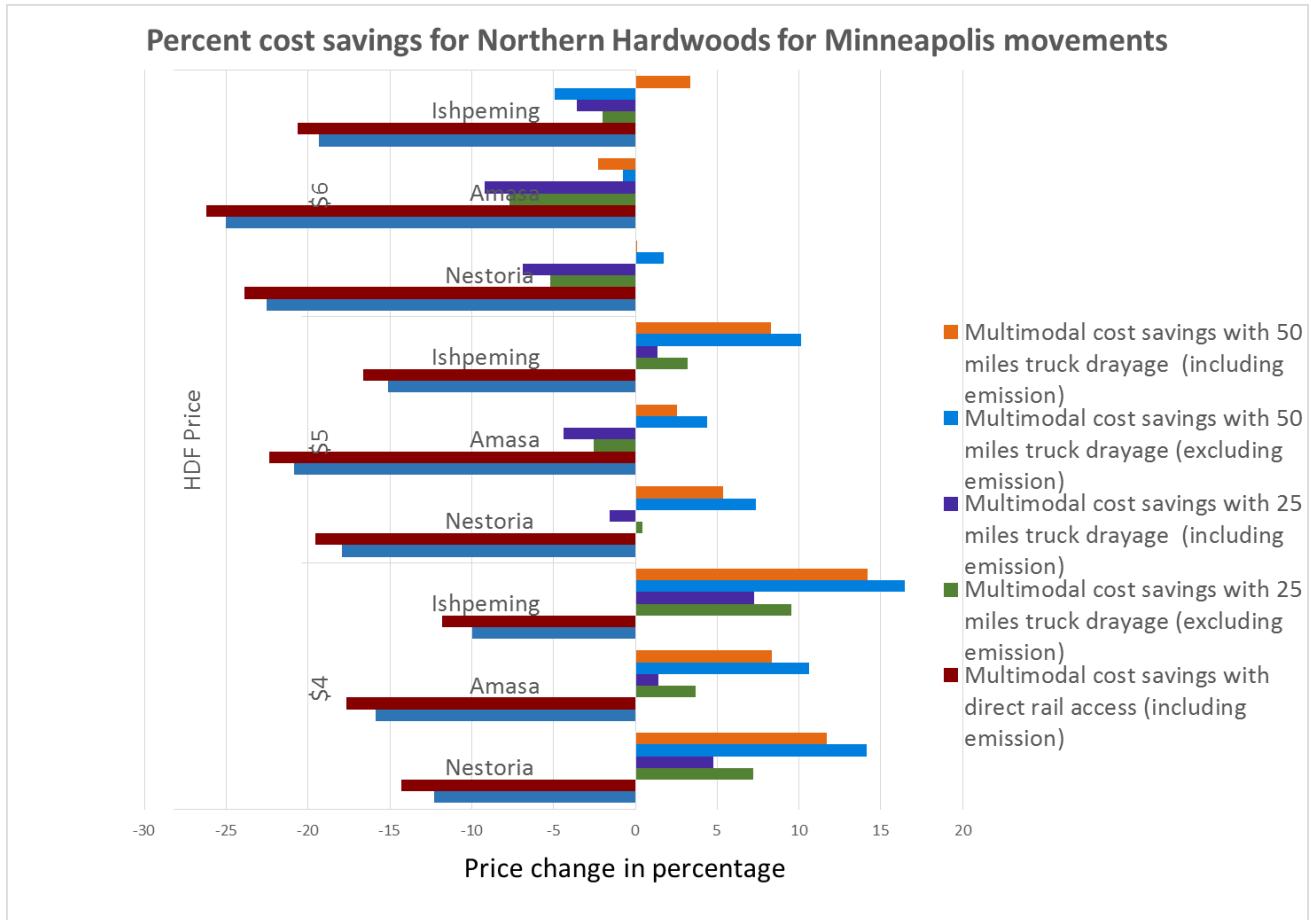


Figure 50: Multimodal cost savings for Northern Hardwoods (Minneapolis movements) using transload facility

4.6.4.8. Other Business Potential

While DA Glass and Northern Hardwood have potential to ship significant volumes annually, it is recognized that without container handling capability, additional volume might be needed to sustain a transload facility. According to earlier studies, 3,000 car loads per year can be considered a sustainable volume for such a facility, although the variability of commodities, storage requirements, etc. all are part in the equation. (Thomson, 2012) (HDR Engineering Inc, 2007) This would be also a significant increase in car loads to the L’Anse – Ishpeming line.

Based on the shipper survey data and interviews, the team attempted to identify the potential carload levels from the area. Several potential sources were identified, although more detailed analysis would need to be conducted to make an accurate determination of potential conversion to multimodal option. Examples of potential traffic (in addition to Northern Hardwoods and DA Glass) include:

- Osmose, located in Lake Linden, MI, is shipping Copper carbonate Powder packaged in supersacks to various locations. Memphis is one of the primary locations and it is believed that the final destination has direct rail access. Osmose has also started to export limited volumes to overseas destinations and this business is expected to have high growth potential.
- Sand production from Keweenaw has potential to function as major anchor business for the transload facility. While specific quantities for the production are currently not publicly available, it is expected to be substantive and the developers have identified truck/rail transload around L'Anse area as the preferred transportation option.
- Forest products industry. The Log Committee of Wisconsin Central Group has been working on a parallel project to look into the potential increases in shipments, especially along L'Anse line and have identified additional log transportation potential, if sufficient service and equipment can be made available.
- L'Anse/Baraga area manufacturers. See following section for a more detailed discussion.

Even though detailed breakdown of potential conversion to multimodal was not developed, the aggregated inbound and outbound volumes identified by the research team from the above industries accounted for approximately 200,000 tons (2,000 carloads) and 1,200 containers per year. Potential sand quantities from Keweenaw development and increases in log transportation were not included.

4.6.4.9. L'anse/Baraga Area Manufacturers

The L'anse/Baraga area has a number of relatively small manufacturing operations, with a couple of medium sized operations mixed in. The medium sized operations, Peninsula Powder Coating (PPC) and Pettibone, LLC are the focal point of most operations. The smaller manufacturers do some contracting with other clients, especially in the local area, but the bulk of the work in the area funnels through these two firms. In many cases PPC receives pre-cut steel parts from outside sources (much of it from China), and distributes it to local manufacturers for assembly. The assembled components come back to PPC for coating, then on to Pettibone (or Barko, an affiliated company in Superior, WI) for assembly into a final product. The area also has a healthy forest products business, with three local sawmills. However, much of the sawn lumber is cut green, and must be sent on to other locations for further processing almost immediately to avoid sticker stain and mold issues. There is also one large manufacturing operation, a CertainTeed plant producing ceiling tiles. The plant has an on-site rail spur.

Current Transportation

The shippers in this area do not currently view rail as a viable option. Service to the area is limited, and is not viewed as shipper friendly. The CertainTeed plant receives about eight rail cars each week, but sends them back empty. There are pulp wood shipments from a log yard in L’anse. Almost all of manufacturers’ shipping in and out of the area is by truck. Much of the pre-fabricated material received by PPC comes by trucks in containers. Table 17 shows current shipping movements by truck and rail and Table 18 presents the most optimistic view for potential movements by rail (all movements would be converted to multimodal). The values in Table 18 are derived by dividing inbound and outbound trucks by three, and combining with current rail volumes. Origins and destinations are not listed, because they are scattered. However, much of the steel used in manufacturing comes from sources in Wisconsin, or from Chicago. The forest products are not included in the potential rail volumes due to their time sensitive nature and the circuitous route required by the existing rail lines. These products seem to be better served by trucks.

Table 17: Current weekly traffic for interviewed L’anse/Baraga Manufacturers and Forest Products

Category	Inbound Rail Car	Inbound Container by Truck	Inbound Truck	Outbound Truck	Local Truck
Manufacturing	8	8	47	22	25
Forest Products	X	X	30	30	X

Table 18: Future potential weekly rail traffic of interviewed L’anse/Baraga manufacturers and forest products

Inbound Car/Container	Outbound Car/Container
32	8

Rail service challenges and potential transloads

There is a lot of interest toward increase in industrial park development that would include a transload facility in the L’Anse/Baraga area. Both existing industrial parks are filled to the capacity and the county is looking to improve the infrastructure of a third, 30 acre park, including a potential development of a multi-modal freight facility (Figure 51).

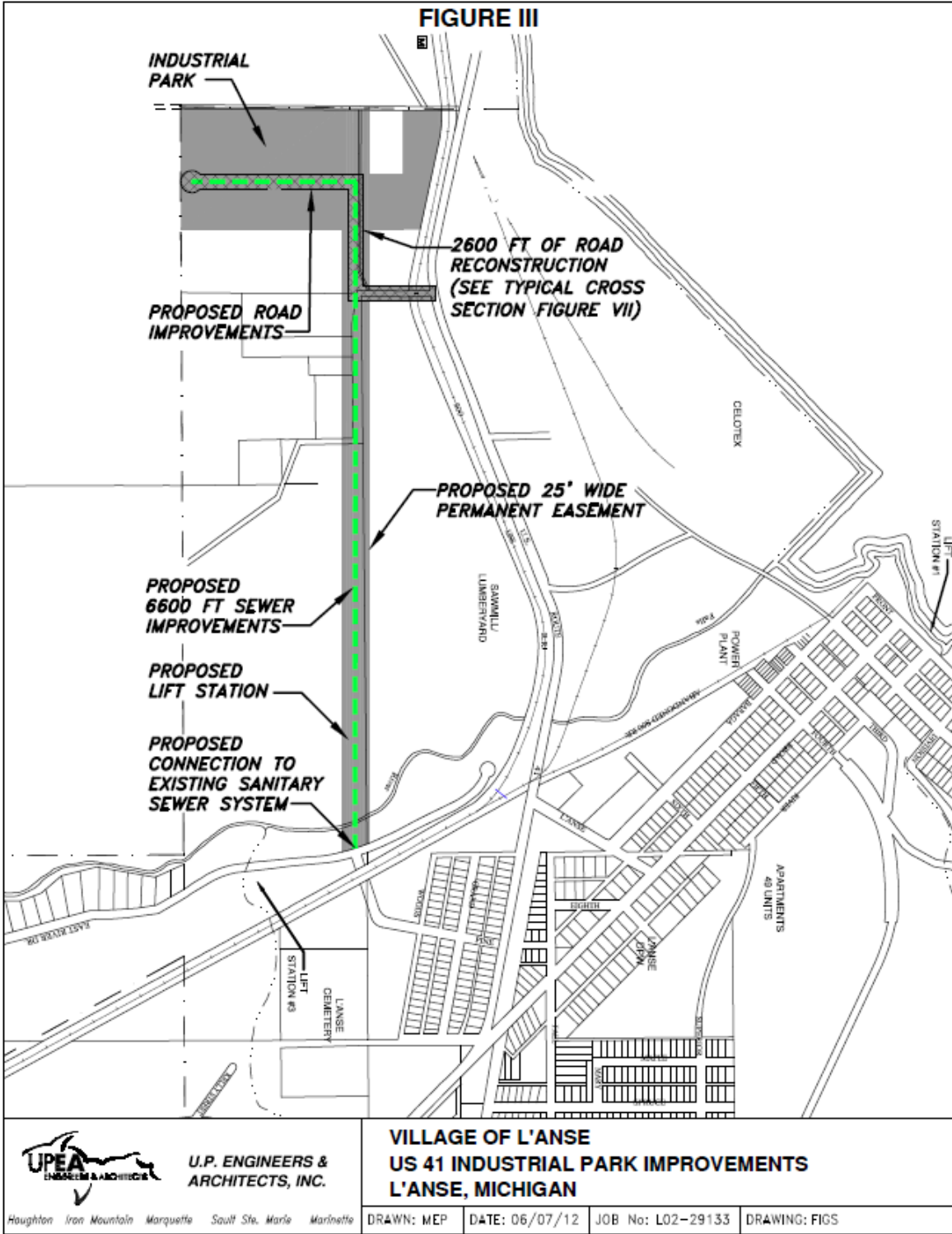


Figure 51: Village of L’Anse, US 41 Industrial Park Improvements
(source: (U.P. Engineers & Architects, Inc., 2012))

While multimodal facility that is immediately adjacent to industrial park would be preferred for shippers, it also needs to be operational by rail. According to CN, the L'Anse/Baraga region is a challenging service area for a railroad due to the grades encountered to the south of L'Anse. The elevation climbs from around 600 feet in L'Anse to over 1,700 feet near Herman, a distance of only 8 miles. The resulting average grade is over 2.5 percent which is well above commonly accepted values. This requires use of two high horsepower locomotives on the line and even then, only limited number of cars can be pulled from the L'Anse/Baraga bowl. Once the train has cleared the hill, two locomotives are actually oversized for the train size, so additional cars could be accommodated from operational perspective.

Since the industrial facilities in the area exist in several geographical locations, no single location exists where all companies could have their products loaded/unloaded directly from their facility, without truck drayage. Therefore, it should be investigated, if the operational difficulties by rail at the immediate vicinity of L'Anse/Baraga would warrant locating the transfer facility further along the line with more suitable geography for rail service. One potential location was Nestoria used in this study, but other locations might be even more suitable. From trucking cost perspective, it's unlikely that extending the drayage by 10-20 miles would negate the cost savings gained from multimodal transportation alternative.

Chapter 5 –Discussion and SWOT Analysis

The following combines the findings from each study task and additional information from other sources into a discussion in several key categories. In addition, it presents an analysis of Strengths, Weaknesses, Opportunities and Threats (SWOT) to the region’s rail system.

5.1. Upper Peninsula Rail System

The Upper Peninsula has long benefited from a robust transportation system consisting of three main components: rail, water, and later highways. As early as 1899, there were 14 docks serving the ore mines in the Upper Peninsula while railroads provided essential freight and passenger transportation thorough the Upper Peninsula. While the overall system, including rail system, has changed over time, railroads still maintains some characteristics that separate it from the rest of the Michigan. First, all rail lines in the U.P. are rural systems with completely private ownership and operations. Second, there is no land connection with the rest of the Michigan. The only land connections are either to Canada or Wisconsin. Third, the majority of track mileage is operated by a Class 1 railroad, separating it from the rural rail lines in the Lower Peninsula.

The mainlines in U.P. are in satisfactory condition, although most of them cannot accommodate the industry standard 286,000 lbs rail cars. Excluding the two long spur lines (Ishpeming - L’Anse and Trout Lake – Munising) with limited traffic and poor infrastructure, most lines have sufficient shipment levels. On the other hand, if private facilities for larger shipper are excluded, the U.P. has limited number of facilities for loading and unloading rail cars and even more limited number of them has sufficient equipment available.

Partially due to the fact that railroads in the U.P. are privately owned and operated, the State investment on U.P. lines has been limited. Even though the U.P. contains 20 percent of Michigan’s trackage, it has received only nine percent of the total funding through Michigan Freight Economic Development program and two percent of the Michigan Rail Loan Assistance Program between 1995 and 2010 (Table 19). The recent grant to Mineral Range Railroad and the potential grant for facilities at Groveland mine represent a significant increase in the state funding commitments for U.P. projects. Figures for these projects are not included in Table 19.

Table 19: State Funding on Upper Peninsula rail lines (1995-2010)

Freight Economic Development Project History (1995-2010) in Michigan		
Recipient	Loan Amount	% of Loan amount in Michigan
Upper Peninsula	1,793,455	9
Lower Peninsula	18,056,045	91
Total	19,849,500	100

From an operational perspective, the U.P. depends heavily on individual carload business. Excluding iron ore and limestone movements, there are currently no unit trains. However, there are several key carload shippers that form the backbone of the overall system, such as the forest products industry. Moving carloads complicates the operational patterns and together with low operational speeds extend the overall shipment time. As an example, Figure 52 presents the steps for a carload moving from Detroit to L’Anse. As demonstrated in the figure, the trip requires eight different movements (pairs of terminal departure (TD) and terminal arrival (TA)) and takes ten days. The issue is further exacerbated, when the trip plan requires an interchange between one of the shortlines and CN.

EVENT	TRAIN	STATION	DAY	TIME
RL		DETROIT	1	1200
TD	R95061	DETROIT	2	1445
TA	R95061	PONTIAC	2	2100
TD	M39161	PONTIAC	3	2305
TA	M39161	KIRK YARD	4	1145
TD	A44791	KIRK YARD	5	1000
TA	A44791	FOND DU LAC	5	2105
TD	A44981	FOND DU LAC	7	0300
TA	A44981	GREEN BAY	7	0725
TD	L55181	GREEN BAY	8	0230
TA	L55181	GLADSTONE	8	0920
TD	L54981	GLADSTONE	9	0330
TA	L54981	PARTRIDGE	9	0910
TD	L54081	PARTRIDGE	9	1615
TA	L54081	ISHPEMING	9	1715
TD	L53981	ISHPEMING	10	0900
TA	L53981	LANSE	10	1340
AP	L53981	LANSE	10	1400

Figure 52: Example carload trip plan, Detroit-L’Anse (courtesy of CN)

Overall, the strong presence of a Class 1 railroad can be considered an advantage, as it provides access from the U.P. to the national network without an interchange. However, CN network in the U.S. is somewhat limited to North-South movements (Figure 53), so most shipments to East or West require an interchange with another major carrier. There are also questions whether the common Class 1 business models that increasingly concentrate on hook-and-haul strategies (picking up and dropping off large blocks of railcars while leaving the assembly and disassembly of blocks to industries and shortlines) can provide the service and rates desired by the local

customers and whether the situation would be significantly different with a regional/shortline carriers.



Figure 53: CN Network Map (Source: (CN Network Map, n.d.))

Despite the challenges, the outlook for railroads in the region is mainly positive. The region has just welcomed a new railroad (Mineral Range), two miles of new track at Humboldt, railroads expect their business to remain stable, or increase, and are planning for increasing investments to maintain the lines. The companies are also aggressively looking for new businesses with potential needs for rail transportation.

5.2. Freight flows

The research team believes that the main source of freight flows (TRANSEARCH 2009 database) does not provide a complete picture of freight movements. Some movements are simply excluded, such as shortline movements within the U.P. and the accuracy of other movements, such as intermodal movements, is questionable. The attempt to generate freight volume data from local data sources had limited success as well. Shippers were reluctant to discuss their business and despite close collaboration with economic development agencies, the researchers could not identify an inventory of key businesses/shippers, or gain direct access to

decision makers. Based on this project, it could be stated that neither shipping volumes, nor shippers themselves are properly documented in the area, making analysis unreliable.

The fact that quantities collected directly from shippers as part of the shipper survey exceeded TRANSEARCH volumes at several areas suggests that there may be more freight moving in the U.P. than is currently documented. It should be also noted that while there seems to be a general perception of unbalance between inbound and outbound movements (outbound exceeding inbound), the TRANSEARCH data suggest the volumes to be fairly equal.

Despite the fact that a significant portion of the commodities shipped in the region are bulky and of somewhat limited value, trucking has a stronghold on most shipments (excluding iron ore). The importance of trucks can be understood for the majority of intrastate movements that are less than 100 miles, but one would expect higher percentage of rail for longer and interstate moves. There are several possible reasons for high trucking numbers. Michigan allows 164,000 lbs. total truck weight, which is more than double the federal standards and greatly reduces the comparative capacity advantage typically offered by rail. In addition, the extended period of contentious relationships between shippers and railroads has reduced shipper enthusiasm for rail use. This was evident from the shipper survey responses and has also been documented in previous studies from the region. Finally, the shipper survey also revealed that shippers possess limited understanding of the U.P. rail system and operations, making them unlikely to aggressively pursue rail opportunities.

There are multiple ways to address the challenges mentioned above, but above all, there should be better understanding of businesses and related freight flows (independent of the mode). With competitive disadvantages placed by the physical location, there should be an emphasis on mode-balanced transportation system that utilizes trucks, rail, water and air to their maximum. There are several projects / initiatives in the region that include transportation component, such as

- The Statewide blueprint development for logistics assets in Michigan,
- Western Upper Peninsula Regional Prosperity Initiative, and
- The establishment of a sixth Next Michigan Development Corporation (NMDC) for the Upper Peninsula of Michigan.

As these initiatives move forward, a strong and balanced participation from all transportation modes should be a high priority.

5.3. Terminals and Transload/Intermodal Facilities

It's no surprise that there is a great interest toward intermodal transportation in the study region. A recent white paper by an industry analyst, Anthony Hatch stated that "*the intermodal industry*

has become an accepted shipper choice for both expansion potential for both current and new shippers international and domestic goods movement due to vastly improved operations, improving modal competitive scenarios and public policy implications. And yet, in terms of market share and growth potential (volumes and contribution), we are still at an “early innings stage”. The minimum distance where intermodal becomes competitive continues to come down and the share of domestic intermodal volume has recently surpassed that of international. Considering the geographical location of the U.P., almost all interstate movements are becoming candidates for intermodal movements (Figure 54). Even though railroads are today more interested in serving smaller intermodal terminals, as evidenced by the CN facilities in Chippewa Falls, WI, and Indianapolis, IN, it is doubtful that an intermodal terminal could be developed in the U.P. without extensive collaboration between shippers and railroads, as individual volumes are fairly low. In addition, individual intermodal containers are rarely interchanged between railroads, as there are no intermodal classification yards to support such operation, and CN's portion of the total trip miles would make any intermodal traffic that did not originate or terminate on CN highly unlikely to provide sufficient economic return. However, the negative outlook may change in the future, if the concept of “remote intermodal” materializes. Such service would provide intermodal container car loading/unloading by railroad or third-party at locations beyond railroad's intermodal network. These containers would move on specific freight lane(s), 3- or 5-pack minimum per lane, on a consistent schedule, using manifest train service to/from efficient, non-disruptive connections with CN's intermodal network.

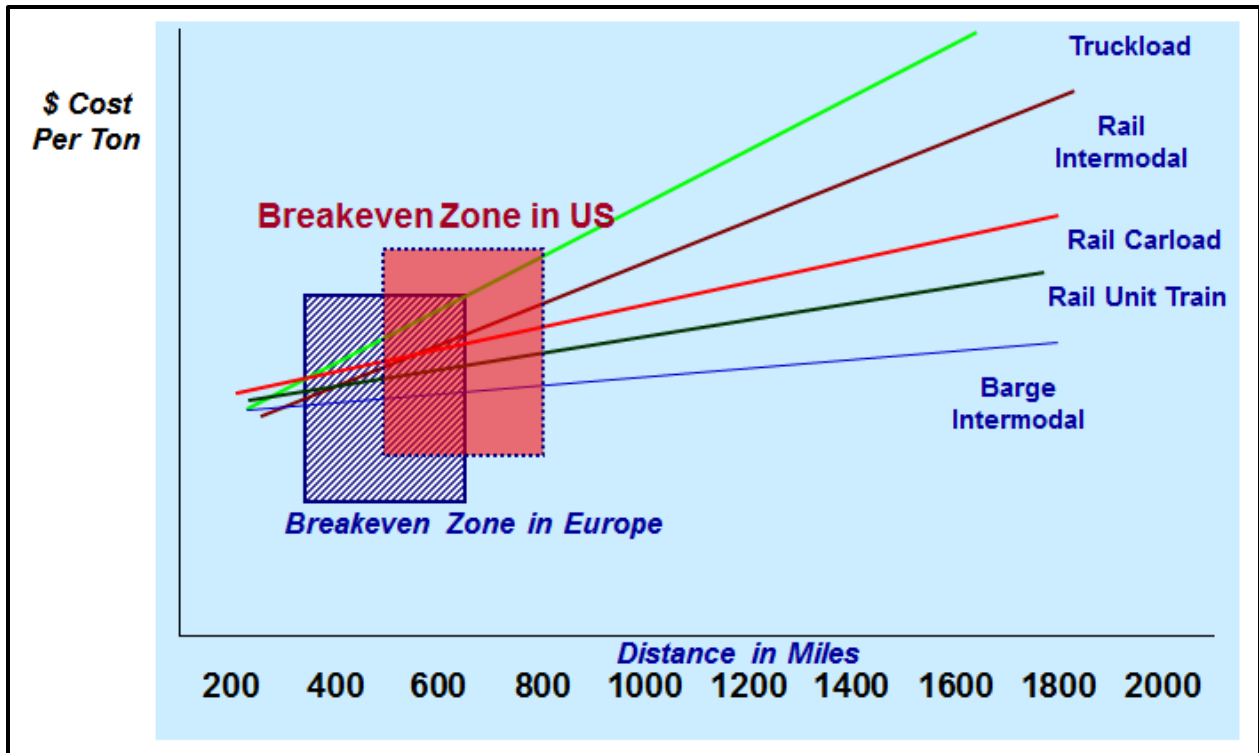


Figure 54: The breakeven distance between truck, rail, intermodal and barge transportation (Source: Adapted by Richard Stewart from (The Tioga Group, 2003))

Transload facilities should not be neglected. The study revealed potential savings from fairly short movements, there are significant volumes of bulk commodities and several areas with high warehouse and trucking employment (Figure 55), and there is great interest toward such facility development, trucking companies included. However, if such a facility is really needed, it should be questioned why the facility by KK Integrated Logistics is not used more for transloading, or why the facility by E&LS has been left to deteriorate for so long.

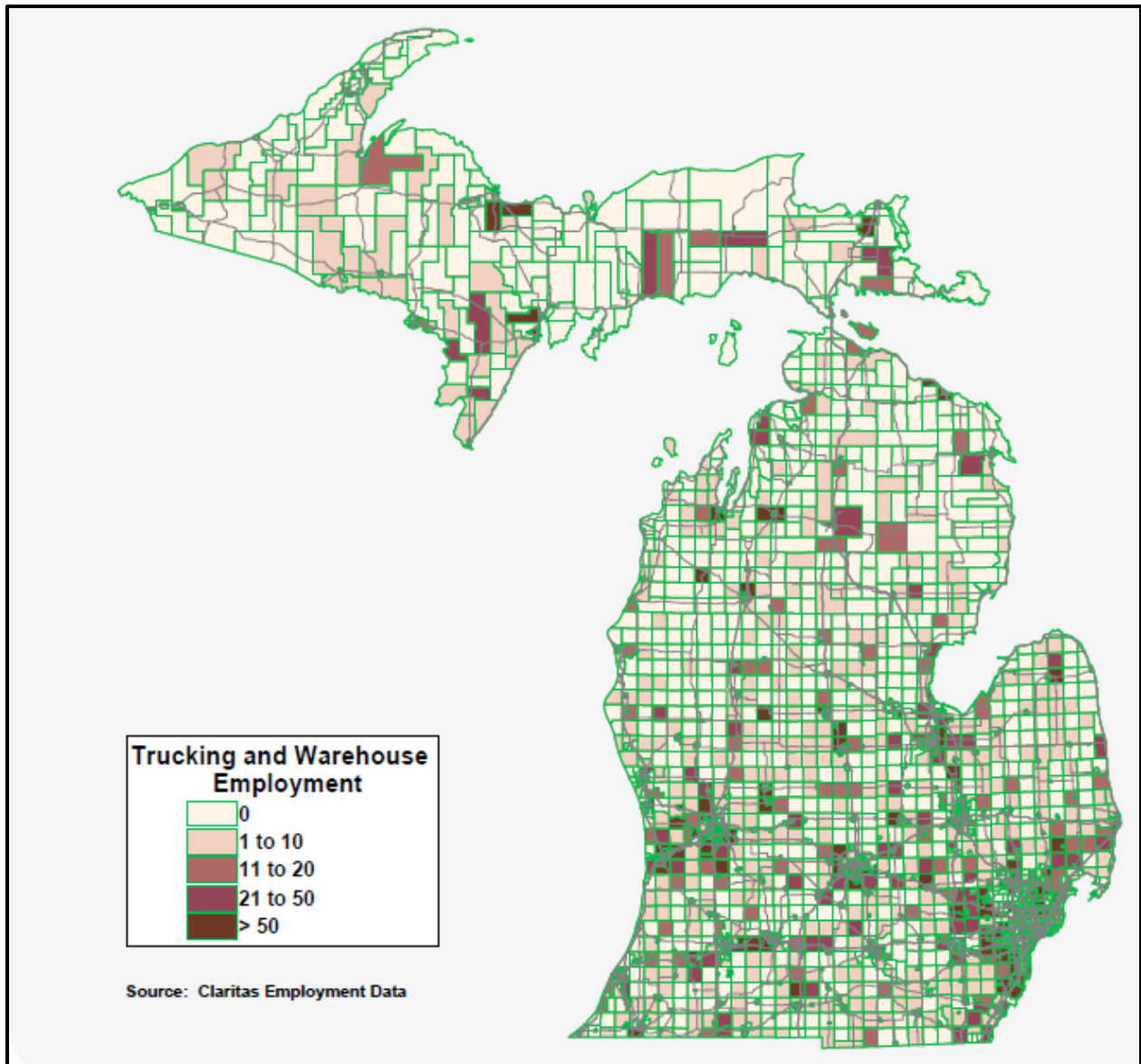


Figure 55: Warehouse and trucking employment

Source: (Michigan Freight Plan, 2013)

An additional potential for a transload facility would be to use them for intermodal movements with alternative intermodal equipment, such as *RailRunners* (Figure 56). These alternative technologies reduce the need for capital and equipment investments, but there have also been challenges in such implementations, such as defects on technology, required recertification after repairs and limitations to certain types of containers (Wu & Markham, 2008). Another technology that might assist in the use of intermodal by local manufacturers is On Deck technology that improves the transportation of heavy commodities in containers by providing a “rolling floor” that can be loaded and secured outside and then pushed into the corridor with trucks (Figure 57).

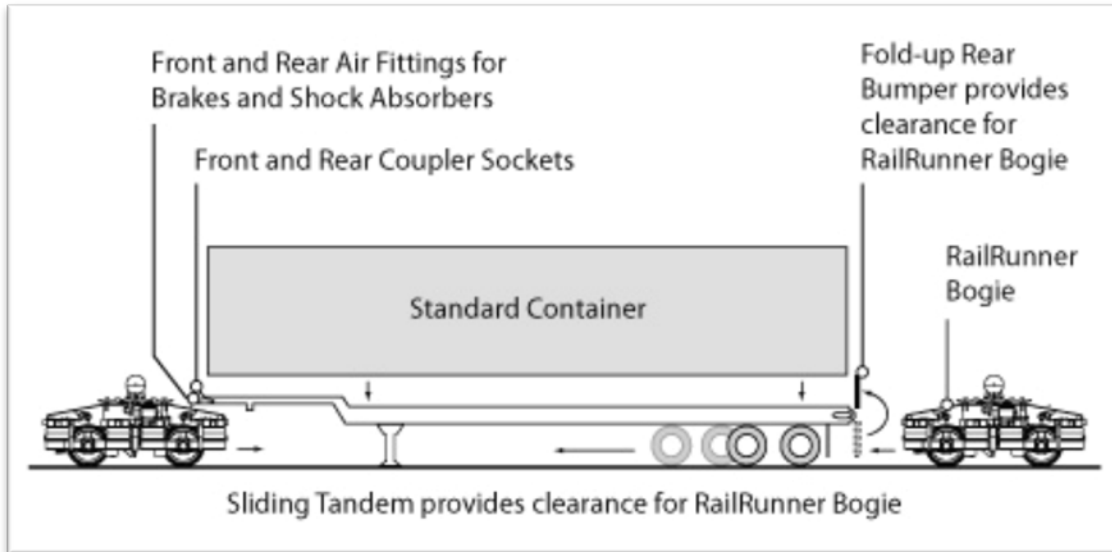


Figure 56: RailRunner Technology

Source: (RailRunner Web site, n.d.)



Figure 57: On Deck technology for loading domestic containers

Source: (Canadian National Web Site, n.d.)

5.4. Shipper/Railroad Relationship

The previous studies have identified the relationship between railroads and shippers in the region to be sometimes a tumultuous one. The shipper survey had a similar trend, showing overwhelming interest from the shipper community to grow rail shipments, but also lots of

skepticism and frustrations. Since over half of the companies in the region make their shipping decisions internally, railroads need to reach the local decision-makers to be successful in expanding their business, but shippers need to also be able to recognize the necessary changes in their supply chain, if rail is used instead of trucks.

The findings of Task 5 (presented in Section 4.5) provided an outline of main complaints by each group, categorized into eight different topics areas. The similarity of complaints from both parties was a surprise to the research team. While this research did not have sufficient resources to investigate each individual challenge, it was clear that understanding the background for each party's position/complaint need to be clarified, before any improvements, or common ground can be identified. The formation of Wisconsin Central Group seems like an initiative toward such actions and it should be monitored closely to see if such a collaborative approach brings tangible results in the future.

5.5. Stakeholder meeting outcomes

As another method to entice discussion on the rail issues, a stakeholder meeting was held at Northern Michigan University in the University Center on April 16, 2014. Thirty three people representing a wide range of interests including state and local governments, the mining and forest products industries, the railroad industry, and logistics interests attended the meeting. The meeting was also broadcast live throughout the U.P. and recording of the meeting can be viewed at <http://mediasite.nmu.edu/NMUMediasite/Play/d5b2aa25c6314a6dbd0315112dcfb2e11d>

The meeting included a brief overview of the U.P. Freight Study, including some of the challenges and opportunities to rail operations. It also discussed lessons learned during the study. The following discussion focused on data and the problems the research team found in collecting it. Attendees noted that regional development and transportation are linked, but good data is needed to understand both, and to relate the two. Participants noted that benefit cost analysis for transload facility, or any other rail investment is not possible until the freight movements in the area are understood more fully and there were suggestions for a comprehensive U.P. freight study that would include truck, rail and marine modes.

Dr. Lautala also introduced Michigan's new Commission for Logistics and Supply Chain Collaboration. Much of the following discussion focused on the need to think regionally, and to consider Governor Snyder's Regional Prosperity Initiative, which encourages cooperation and collaboration between regional stakeholders, rather than competition (Regional initiative to coordinate service delivery, grow economy through local collaboration, 2013). A more integrated transportation program is needed, with a system basis, focused on the transportation of goods, rather than a modal basis.

There was also an interactive discussion around the theme, “Private Industry Participation in Economic Development Issues”, led by Bob Eislinger. In general, the small businesses participate extensively in local economic development efforts, but resources are limited and fragmented initiatives make it difficult for businesses to select the most important ones.

5.6. SWOT (Strengths, Weaknesses, Opportunities and Threats) Analysis

Based on the study findings and discussions above, the research team has identified the following as key strengths, weaknesses, opportunities and threats for the U.P.’s rail system (Figure 58). In general, strengths and weaknesses tend to be considered as internal to the system, while opportunities and threats are considered external. In this case, it is believed that some of the classic categorizations become blurred due to complexity of the system and related interrelationships.

<p>STRENGTHS</p> <ul style="list-style-type: none"> • Long-term anchor industries • Location • Rail-trails • Class 1 railroad 	<p>WEAKNESSES</p> <ul style="list-style-type: none"> • Class 1 railroad • Geographic extent • Long spur lines with light density • No metropolitan areas • Lack of access points / facilities • Lack of data on freight flows / industries • Size of individual companies • “Low value” commodities
<p>OPPORTUNITIES</p> <ul style="list-style-type: none"> • 164,000 lbs trucks • Lack of interstates • Mining developments • Great lakes shipping • Level of interest and Collaborative approaches (WCG) 	<p>THREATS</p> <ul style="list-style-type: none"> • 164,000 lbs trucks • Great lakes shipping • Industry uncertainty

Figure 58: SWOT Analysis of Upper Peninsula rail system

5.6.1. Strengths

The volumes and types of commodities shipped in the U.P. speak for the strengths of the system. While the location of U.P. may be considered a weakness for industries, it is probably a strength for the rail system, as distances for freight shipments regularly exceed the “rail” threshold. When

this is combined with the presence of core long-term industries, such as mining and forest products that depend on the natural resources available in the region, the long-term health of the core rail system should be secured. The region has also numerous rail-trail sections that may offer unexpected opportunities for potential expansion of rail system, as demonstrated by the two-mile conversion near Humboldt.

As mentioned earlier, strong presence of Class 1 railroad can be considered a major strength, or a weakness, depending on who is asked. While the suitability of the business model may be questioned, the Class 1 railroad certainly provides an institutional stability to the lines in the region. It also improves the connectivity from the region to the national and Canadian network, although CN's network is fairly limited when it comes to Eastern and Western U.S. destinations.

5.6.2. Weaknesses

The extensive presence of Class 1 railroad can also be considered a weakness, as the U.P. represents a small portion of the overall tonnage within CN network. It can also be speculated whether Class 1 company structure and business model are a good fit for such a vast geographic area with significant portion of light-density, rural lines, or whether a smaller company would be able to provide more attention to business development. The lack of metropolitan areas is a major weakness, when it comes to intermodal transportation, because without such locations within or in the vicinity, it is very difficult to generate sufficient volumes for intermodal terminals. It potentially also hinders the development of other types of equipped facilities to access the rail system.

The absence of intermodal/transload terminals in the region is considered a major weakness by some, jeopardizing the transportation efficiencies of local companies, and thus their economic well-being. It seems that the industry and transportation systems have evolved to a point of mutual accommodation, but haven't figured out yet, how to take full advantage of both modes. The best potential for facility development would be in "collaborative shipping" where several companies utilize a single location, but lack of data and understanding of freight flows and industries must be first resolved to confirm sufficient volumes, and to establish a data-based decision making. Finally, the combination of numerous, fairly small size companies presents a weakness to the area, as it is more difficult to generate sufficient freight for efficient rail from a fragmented group of small, individual companies, especially when many of them ship fairly low value commodities, such as logs.

5.6.3. Opportunities

The fact that 164,000 lbs. trucks are allowed on Michigan highways is considered a threat to the rail system by many, but it can also be an opportunity, to determine the potential benefits of a transload facility as demonstrated by the shipping cost analysis. In intermodal/transloading

operations, trucking and rail both become integral components of the supply chain. If a properly located transload facility within the U.P. were available, companies, such as Northern Hardwoods, could take advantage of the lower unit costs for 164,000 lbs. trucks, as shippers could make the initial and/or final drayage with the heavier trucks. This seems to be of interest both to shippers and truckers, as shippers are looking to reduce their costs and truck drivers are ever more reluctant to stay on the road over the night. Another potential opportunity for rail transportation relates to current transportation infrastructure. The U.P. has only two lane highways running east-west (no east-west interstates) which lowers truck speeds and forces them to be intermixed with local and non-motorized traffic as they go through cities, villages and residential areas. With fairly well maintained east-west rail lines through the U.P. with ample capacity, an interesting question is whether the rail system could be developed to serve as the “steel interstate” of the U.P.

Perhaps the most interesting long-term opportunities come from the potential mining developments. If 2030 freight projections by TRANSEARCH are accurate, rail may be essential to move the newly found volumes, especially those related to mining and the possible impact of each of the larger mines to rail transportation could also be extensive. While there are lots of uncertainties for mining development, the potential payback is also high for both trucking and rail. This growth is in many cases also contingent of the robustness of Great Lakes Shipping, as a solid collaboration between rail and marine transportation seems to be required for our region to succeed in global natural resource industry competition. The access to marine transportation may also extend beyond mining to the intermodal opportunities. While there has not been intermodal transportation in the lakes, Port of Cleveland unveiled started a regularly scheduled express freight shipping service between the Cleveland Harbor and Europe in April, 2014 and is already considering an addition of second ship to the lane (After splashy debut, the Cleveland-Europe Express may add another ship, 2014).

Finally, the high level of interest toward rail transportation and transloading, as expressed by shippers in the survey and interviews offer a promising start for increased usage. However, the fragmentation, large geographic area, and small typical size of companies may require a collaborative approach for improvements, as no individual companies are large enough to justify significant improvements in rail infrastructure or service. The form and shape of collaborative approach could follow shipper/railroad consortium, such as Wisconsin Central Group, but should probably lean more on economic development professionals, if a new facility is under consideration.

5.6.4. Threats

If looked from competitive point of view, both 164,000 lbs. trucks and marine transportation options on Great Lakes can be considered as threats to railroad operations, as they offer

alternative modes for rail transportation, both outweighing the benefits of rail in certain decision categories. In addition, the region has witnessed numerous changes to its industry over the past several decades, either in the form of merging or closing the facilities, making investments in the rail system more difficult to justify, as they require a long-term stable prospects for payback. In effect, industry in the U.P. has evolved using the transportation infrastructure that has been in place. The industry that is based on suppliers and manufacturers is more prone to volatility due to “bullwhip” effect, where safety stocks kept by downstream players to diminish the demand uncertainty actually amplify the volatility in upstream supply chain (Figure 59). In addition, new products, such as pellets, chips and residues in the forest industry, may not be as suitable to rail transportation as the traditional log business, especially, if it requires investment on new, specialized equipment.



Figure 59. Bullwhip effect (Source: Courtesy of Kim D, 2008)

Chapter 6 - Conclusions and Recommendations for Future Development

Affordable freight transportation is a requirement for survival for rural industries, and in many cases this is challenging to accomplish without the presence of freight rail systems. Even though transportation by itself is not a sufficient condition for economic development, the availability of transportation infrastructure is regarded as one of the essential factors. This study investigated the transportation system in the Upper Peninsula of Michigan (U.P.), concentrating on identifying challenges faced by rural freight rail service providers and shippers along light-density lines and on identifying tools and methods that facilitate the current and future rail and multimodal transportation alternatives in the study area. The study consisted of six separate, but interrelated tasks, ranging from development of interactive rail system map to commodity flow analysis, rail operational interviews, a shipper survey and transload facility studies. The following are the study conclusions:

1. **Rail transportation has an important role in the U.P.** The surrounding lakes isolate the region and limit the interconnectivity with adjacent regions and states, but it also makes rail access in and out of the region more comparable to trucks. Absence of an east-west interstate highway in the U.P. offers an interesting possibility for increased competition by rail, but the lack of rail connection with the Lower Peninsula practically eliminates any rail intrastate rail traffic between the peninsulas.
2. **The mainline rail infrastructure in the U.P. is in satisfactory condition** and traffic levels justify maintaining them in the current track levels. However, the majority of U.P. lines cannot accommodate the 286,000 lbs. rail cars (current industry standard) and there are no plans to increase the carrying capacity, partially due to high investment cost to upgrade the bridges in the Sault Ste. Marie.
3. **Lengthy spur lines may be in jeopardy.** Especially lines between Ishpeming – Baraga and Trout Lake – Munising are in poor condition and have insufficient traffic levels (minimum 75-100 rail cars per mile per year) to meet the industry investment criteria. Public funding is one potential avenue of assistance, as demonstrated by the funding provided to Mineral Range Railroad for track rehabilitation by the State of Michigan.
4. **The strong presence of a Class 1 railroad (CN)** can be considered an advantage, as it provides direct rail access from the U.P. to the national network without a rail to rail interchange. On the other hand, CN network structure provides limited coverage to Eastern and Western U.S. and there are questions whether the Class 1 business model can meet the service and rate expectations of region's shippers.
5. **General business outlook is positive, but growth is challenging.** The U.P. system relies heavily on mining and forest products as backbone commodities and this dominance is expected to continue, likely providing sufficient future traffic levels for

most mainline segments. However, excluding iron ore movements, the freight moves in mixed trains with carloads from various businesses and numerous origins/destinations, complicating the operational patterns and in many cases increasing the overall shipment time. Increasing the rail market share is challenging due to the small size and geographical fragmentation of individual businesses.

6. **Data on businesses and freight flows is insufficient.** Neither the main source of freight flow data used in the analysis (TRANSEARCH), nor the attempt to collect the data directly from shippers proved sufficient for analyzing freight movements in the region with confidence. The lack of a single, accurate source for information on region's businesses and related numerous economic development agencies makes data collection and analysis even more challenging.
7. **Trucking has a stronghold on most shipments (excluding iron ore).** Considering the geographical location of the U.P. and the main commodities shipped to/from the region, one would expect most interstate movements to be candidates for rail, or intermodal/multimodal movements, but this is not the case. While it is often speculated that 164,000 lbs. total truck weights offer competitive edge to trucks, this applies only to limited interstate movements. Instead, the current situation is most probably due to a combination of already mentioned fragmented business structure, inadequate access to rail and intermodal/multimodal facilities, tumultuous long-term relationship between rail providers and shippers, and the limited understanding of the U.P. rail system and rail operations.
8. **Limited understanding of rail business/operations by decision makers.** Most businesses make their shipping decisions internally, but despite clear evidence toward increased interest in rail transportation in shipper survey responses, shippers also acknowledged limited understanding of rail as a shipping mode. Economic development agencies recognize the importance of rail to the region as well, but they share the lack of understanding and tools to address the requirements and limitations caused by rail for economic development.
9. **Shippers and railroads share common concerns.** The analysis of shipper and railroad complaints/concerns revealed common topics of interest related to car conditions, operations, communication, etc., but viewed them from different perspectives. There is limited documented evidence on these issues, but they provide a promising foundation for potential improvements, if compromise solutions are sought collaboratively.
10. **Poor access to transload/intermodal facilities** is considered a competitive disadvantage to the region, especially by manufacturing companies. There is a great interest toward intermodal facilities, but feasibility of an intermodal terminal would be questionable due to fairly low overall container volumes and lack of direct access to Eastern/Western U.S. rail networks (rail to rail interchanges happen more rarely for intermodal shipments). There is an equal interest toward development of transload facilities, but the existing KK

Integrated Logistics facility in Menominee witnesses only limited truck/rail transloading activities. A parallel study attempted to evaluate the benefits of a multi-shipper transload facility, but lack of data of freight flows limited the study to individual company case studies.

Based on the study outcomes, the following recommendations are made for future development and research related to the U.P. freight (rail) transportation

1. **All freight rail recommendations provided in the Michigan Rail and Freight Plans are well aligned and compatible with needs by the U.P. system.** Even though the recommendations are not specifically developed for the region, preservation of rail corridors, rail accessibility and railcar shortage are all topics of importance to the U.P. system. The strategies identified in the plans provide potential solutions, but will only have value, if there is sufficient funding to implementation. Alternatively, incremental approaches should also be considered.
2. **Public funding to support rail development.** Current and past State funding levels to dedicated rail/freight related programs are fairly low, as demonstrated by the total amount invested in the two main rail programs in Michigan between 1995 and 2010 (approximately \$35 million total, with two million applied to the U.P. during this period). The recent funding to the Mineral Range Railroad and potentially to Michigan Mining, LLC (currently under review) show promise toward increased rail development in the U.P. with State support. However, it should also be investigated, whether more aggressive rural and light density rail funding programs by other states, such as the State of Wisconsin, have provided expected benefits to those states.
3. **Secure future operations on lines under threat.** As mentioned, the greatest challenges in sustaining the current U.P. rail system include the two light density line segments (Ishpeming – Baraga and Trout Lake – Munising). It should be carefully evaluated whether these lines have potential to succeed as they exist today and what alternatives, such as development of a transload facility at a strategic location along the line to consolidate the flows (with potential abandonment of lines beyond the facility), transfer of lines to a regional/local operator, or public funding to improve the lines/facilities, could be considered to secure future operations. Local economic development agencies should also be included in initiatives to identify new business along the lines.
4. **Improving the understanding of industries and freight flows.** Comprehensive understanding of the industries and related freight patterns in the region is of great importance when considering the future of the U.P. freight transportation system including rail, truck, Great Lakes maritime shipping, and even air freight. Developing this understanding should extend beyond transportation to include the complete supply chains and economic development demands. This should be done collaboratively by transportation and economic development experts. It should also be investigated, if data

available from the Michigan Treasury or other state or federal (even commercial) sources could offer better insight into the industries, employees, and related freight flows in the region.

5. **Field study of truck movements.** Absent a comprehensive study (see previous recommendation), a comprehensive field study on truck movements with concentration on the main U.P. entry exit points could be used to increase understanding of freight movements and reasons for truck dominance in the region. While TRANSEARCH and shipper survey fell short on providing a solid understanding of the freight flows, they could be used with the field data in statistical analysis to validate the field survey data. The newer 2012 TRANSEARCH database could add an improved set of data for analysis, as it aggregates origin/destination data based on zip codes (the 2009 database used counties).
6. **More robust stakeholder communication/dialog and collaboration.** Railroads, shippers and external stakeholders would benefit from a better understanding of each other's supply chains, logistics, business models and operations. Shippers have interest to rail, but with limited understanding of rail as transportation mode may not recognize that use of rail transportation requires changes to the overall supply chain, while railroads need to be able to understand the restrictions placed by the business environment on their customers. The majority of the companies in the region make their shipping decisions internally, so access to the local businesses is a key to identify expansion opportunities. Economic development agencies could play an important role in "consolidating" the individual interest to larger units with more appealing business case for a rail solution, but a concentrated educational/communication effort, coordinated by a single entity, should be developed to improve the understanding and collaborative interest between stakeholders. This could also be advanced by integrating rail business development to some of the existing initiatives, such as the Wisconsin Central Group (WCG), Northwoods Rail Transit Commission, the Western Upper Peninsula Regional Prosperity Initiative, and/or The establishment of a sixth Next Michigan Development Corporation (NMDC) in the U.P.
7. **Expanding the proof-of-concept interactive map** is one approach to improve the understanding of the U.P. rail system and its opportunities. The map should be extended to include the northern Wisconsin/Minnesota (WI/MN) area. This was supported by the Wisconsin Central Group (WCG) and Northwoods Rail Transit Commission and will reflect the regional nature and interconnectedness of the U.P. and Northern WI/MN rail systems. Pending collaboration from rail service providers, this could be done with minimal effort.
8. **Attacking the "low-hanging" fruit.** The common topics of interest identified as part of analysis of shipper and railroad complaints offer some of the greatest potential for immediate improvements in shipper/railroad interactions. The research team believes that

a proper documentation of issues, such as challenges with rail car conditions, would allow development of low-cost solutions that not only could save in costs, but also provide a common ground for improved relationships. The team provided some initial comments on the topics, but a more in-depth analysis of the concerns should be conducted either by researchers, or by shippers/railroads as the next step in the search for potential solutions.

9. **Transload/intermodal opportunities** warrant additional investigations from a regional perspective. If a more accurate freight and business data can be secured through increased collaboration (as proposed earlier in the recommendations), the true potential for benefits from one or more multi-user facilities should be investigated in more detail.

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Abbreviations and Acronyms

3PL	Third Party Logistics
AADT	Annual Average Daily Traffic
CAZ	Commodity Analysis Zone
CCF	Hundred Cubic Feet
CN	CN Railway (corporate parent is “CN Railway Company”)
COFC	Container on Flat Car
E&LS	Escanaba and Lake Superior
FRA	Federal Railroad Administration
GIS	Geographic Information Systems
HDF	On-Highway Diesel Fuel
LLC	Limited Liability Company
LS&I	Lake Superior and Ishpeming Railroad
LTL	Less than Truck Load
MDNR	Michigan Department of Natural Resources
MDOT	Michigan Department of Transportation
MEDC	Michigan Economic Development Corporation
MMBF	Million Board Feet
MOREV	Mineral Occurrence and Revenue Estimation and Visualization Tool
MRI	Mineral Range Railroad
NRTC	Northwoods Rail Transit Commission
OGV	Ocean Going Vehicles
OSB	Oriented Strand Board

PPC	Peninsula Powder Coating
STCC4	4 digit Standard Transportation Commodity Code
TA	Terminal Arrival
TD	Terminal Departure
TIGER	Transportation Investment Generating Economic Revenue Program by US Dept. of Transportation
TOFC	Trailer on Flat Car
UPEDA	Upper Peninsula Economic Development Alliance
WCG	Wisconsin Central Group
WCR	Wisconsin Central Railroad
WI/MN	Wisconsin/Minnesota
WisDOT	Wisconsin Department of Transportation

Appendices

Appendix A – Relationship between Mine/Mill Closures and Rail Abandonments

Appendix B – Past Studies on Upper Peninsula Freight/Rail

Appendix C – Railroad Interview Questions

Appendix D – Shipper Survey

Appendix E – Previous Shipper Surveys in the Region

Appendix F – Mining Questionnaire

Appendix G – Examples of interactive map

Appendix H – Interactive Map Implementation and Updates

Appendix I – Railroad Forms – Rail Line and Siding Parameters

Appendix J – Responses for open ended questions

Appendix A – Relationship Between Mine/Mill Closures and Rail Abandonments

Table A-1: Upper Peninsula mining/mill and railroad closures

Year	Mine/Mill Name and Closing year	Lines closed
1960-1965	Data not available	Raco Jct. to Sault Ste. Marie - 1961 Marenisco to Ethelwood - 1962 Marenisco to Ethelwood - 1962 Mowhawk to Gay - 1964 Lake Linden to Calumet - 1964
1965-1970	Calumet & Hecla-1966 Vulcan Corp. -1966 Peterson Mine -1967 Champion Mine +Mill -1967 Cliff's Shaft -1967 Kingston Mine Shaft - (strike) - 1968 Osceola Mine -1968 Bristol Mine-1969	Hartho to Sunrise Landing - 1965 Quincy Mine to Mason - 1967 Buckroe to Big Bay - 1967 Franklin Jct. to Quincy Mine - 1968 Manistique to Shingleton - 1968 Iron River to Chicagon Chicagon to Kelso Jct. - 1969
1970-1975	Quincy Mine -1970 Tracy Mine -1971 Caledonia Mine -1972 Quincy Smelter -1972 Raco Army Airfield -1972	Hazel to Gibbs City - 1970 Escanaba to Antoine Narenta to Metropolitan - 1970 Stillman to Shingleton - 1970 South Range to Freda - 1971 Mass City to Lake Linden - 1973 Little Lake to Princeton - 1973 Wakefield to Past Connorville - 1974
1975-1980	Sherwood Mine- 1978 Mather Mine B -1979 Groveland Mine-1980	Republic to Champion - 1976 Soo Jct. to Raco Jct. - 1977 Hancock to Mowhawk - 1978 Little Lake to Munising Jct. - 1979 Rapid River to Edben Jct. - 1979 Marquette to Lawson - 1979 Ishpeming to Martins Landing Republic to Clowry - 1980

Year	Mine/Mill Name and Closing year	Lines closed
1980-1985	Humboldt Mine+Mill -1980 Republic Mine, Suspended - 1981 Eagle Mills Pellet Plant, Suspended -1981 SS Chief Wawatam Railcar Ferry stops service -1984	Bergland to Sidnaw - 1982 Antoine to Marenisco - 1982 Stager to Crystal Falls - 1982 Mastodon to Alpha - 1982 Marenisco to Ironwood - 1982 Groveland Jct. to Groveland Mine - 1985 Kingsford to South of Quinnesec - 1985
1985-1990	Inland Lime & Stone Company -1989	Trout Lake to St. Ignace - 1986 Presque Isle to Buckroe - 1987
1990-1995	Ropes Mine-1991 White Pine Mine (Inmet)-1995	Arnheim to Lake Linden - 1995
1995-1999	Data not available	Hermansville to Escanaba - 1999 Marquette to Munising Junction - 1999

Sources: (Berry 2005)

Table A-2: Correlation between end of operations and line abandonment

End of Operation	Year	Rail Line Abandonment Approved	Year	Time Difference
Kearsage Mine	1956	Lake Linden to Calumet	1964	8
Mohawk Mine to Mohawk Mill	1957	Mohawk to Gay	1964	7
Torch Lake Reclamation (Quincy Mine 1945)	1967	Quincy to Mason	1967	0
Gibbs City Lumber Mill	1966	Hazel to Gibbs City	1970	4
Champion Mine + Mill	1967	South range to Freda	1971	4
Vulcan Corporation (1973 Copper range abandons all Operations)	1966	Mass City to Lake Linden	1973	7
Calumet & Hecla (Centennial Mine + Ahmeek Mine) and Kingston Mine Shaft	1968	Hancock to Mohawk	1978	10
Bristol Mines	1969	Stager to Crystal Falls	1982	13
Peterson Mine	1967	Mastadon to Alpha	1982	15
Sherwood Mine, in Iron River	1978	Antoine to Marenisco	1982	4
Smurfit Stone Paper Mill, Ontonagon	2009	Rockland to Ontonagon	2010	1

Appendix B – Past Studies on Upper Peninsula Freight/Rail

A comparison of Alternative Rail Routes in Northern Michigan and Wisconsin

A study was done by Wilbur Smith Associates in 1990 for the county of Gogebic, MI to select viable alternative rail routes for a new connection track between Wisconsin Central Ltd.'s (WCL) White Pine Subdivision and Bessemer Subdivision which run from northern Wisconsin into Michigan's Upper Peninsula. (Wilbur Smith Associates 1990). The study provided alternative connection routes and found an estimated initial rehabilitation cost of \$2,940,385 for the White Pine Subdivision and \$2,609,597 for the Bessemer Subdivision.

The study also identified current and potential rail traffic demand by interviewing mining, forest products rail users and WCL marketing personnel. By considering the base case traffic scenario which consisted of moving all current and projected traffic, the study estimated an annual traffic of 6,725 carloads (671,000 tons) from mining business and 5,230 carloads (340,850 tons) from wood products. The study concluded that the resumption of the proposed rail line was viable and would have positive public, economic and environmental impacts on both states. It stated that without rail service availability, it was unlikely that mining and pulpwood consuming industries would flourish. However, the project didn't move forward and the white Pine subdivision was closed in 1995. The Bessemer line was abandoned later same year. (Glischinski 2007)

Evaluation of Shipper Requirements and Rail Service for Northern Wisconsin and the Upper Peninsula of Michigan

Completed in 2006 as a joint project between the University of Wisconsin-Superior's Transportation and Logistics Research Center and Michigan Technological University, the rail shipper study analyzed ways to improve rail service in the study region through the use of surveys, stakeholder meetings and interviews. In addition to the shipper survey, one key outcome of the study was a rail user toolkit that would aid current and prospective shippers in organizing and evaluating rail service.

A GIS (geographic information system) was explored as a tool for use in development of rail sites for growing or prospective rail shippers. The study concluded that a detailed GIS database would have advantages in fostering the use of rail services and promoting economic development at available sites adjacent to a rail line. However cost was identified as an issue because of the low initial freight volume and few initial potential users. In addition the challenges in obtaining input from railroad operators to make the database thoroughly detailed and useful were also issues.

The shipper survey provided useful insight in the shipping patterns and rail customer satisfaction levels. The study concluded that the majority of rail shipments in the region consist of heavy bulk raw materials, such as wood, paper, and pulp (low value, high volume products) and less than 50% of the above commodities are shipped by rail, instead mainly by trucks. A more detailed summary of shipper survey results is provided in Appendix E – Previous Shipper Surveys in the Region of this report.

The study concluded that lower volume density areas are challenging for railroad operations, as securing profit is not easy in such service environments. The study also noted that while state DOTs recognize the importance of rail and often have specific departments and funding programs for the railroads within the state, the local economic development agencies are not knowledgeable on railroad practices such as rail usage, business models, and shippers needs for rail and they do not have adequate contact with the railroad companies.

Specific recommendations from the study included methods to improve communication, such as stakeholder meetings with all interested parties, and short term and long term goal planning. The study also speculated on the need for rail carriers to expand their outreach for seeking customer input and to establish a single point of contact for governments and railroad users in a region to ease of communication. Additional speculation involved researching the potential of selling line segments to short lines railroads to improve local operations.

Rail to Truck Modal Shift: Impact of Increased Freight Traffic on Pavement Maintenance Costs

The study, completed in 2008 by the University of Wisconsin-Superior under sponsorship by the Midwest Regional University Transportation Center, analyzed the effect of the loss of railroad infrastructure and rail service on the modal shifts of rail to truck freight transport. It was hypothesized that rail freight converted to truck may have significant impact on pavement maintenance costs and activities. One of the three railroads investigated for closure was the Escanaba & Lake Superior (E&LS) Railroad.

The case study used for the E&LS was the Channing, MI/Ontonagon, MI to Green Bay, WI section. The study found that a modal shift from rail to highway would occur, unless the shipper preferred shifting to truck rather than moving it on a Class I railroad because the cost of direct access to a Class I railroad is lower than the cost of a joint line move. The study found that, for the E&LS branch line, 18 out of the 48 pavement sections analyzed (37.5%) would experience a shorter lifespan due to increased truck traffic, if E&LS ceased its operations.

All Michigan routes cited in the study had a 164,000 lbs. weight limit with eleven-axle trucks (axle loading is lower in comparison to the US average) while Wisconsin allows generally 80,000 lbs. with overloads up to 96,000 lbs. allowed for certain commodities and routes. Even though Michigan weight limits are allowed to certain Wisconsin destinations, most trucking

would require a transload center for breaking up the load between two trucks, or to be loaded onto a railcar. It was also noted that if E&LS service was lost, the lumber and scrap traffic would nearly double current traffic volumes on certain northern highways. This increase was estimated to be approximately 25,678 trucks on the three highway routes listed. However, the MDOT maintenance staff stated that additional truck traffic would be so small (approximately two percent) that it would not affect the maintenance budget.

U.S. Department of Transportation Truck Size and Weight Study

There have been many studies of truck size and weight but there seems to be no definitive set of commonly accepted conclusions as to the impact on highway and bridge maintenance costs if truck traffic were to shift to rail.

Section 32801 of the 2012 surface transportation authorization statute, Moving Ahead for Progress in the 21st Century (MAP-21), calls for the U.S. Department of Transportation (USDOT) to conduct a comprehensive truck size and weight limits (CTSW) study. The law requires the study to examine the effects of operation of large trucks in terms of impacts on bridges, pavements, safety, fuel efficiency, the environment, enforcement of truck regulations, and shares of freight traffic carried by trucks and other freight modes. USDOT asked the Transportation Research Board (TRB) to provide a peer review of the CTSW study.

To conduct the review, TRB convened a committee that includes members with expertise in highway safety, vehicle dynamics, freight modal shift, bridge and structural analysis, pavement design, and highway safety enforcement. The committee is to deliver its review in two reports. The first report will conduct literature reviews prepared by USDOT in each of the technical areas of the CTSW study with respect to their thoroughness in covering the literature, analysis of models and data for conducting the comprehensive study, and overall synthesis of the preceding body of work as it applies to the study that is to follow. Once USDOT has completed the technical analysis for the study in spring 2014, the committee will prepare its second report, which will comment on the extent to which the technical analysis and findings address the issues identified by Congress. The study report is to be delivered to Congress by November 2014.

Study of Greenhouse Gas Savings Associated with Congestion Reduction Using Multi-Modal Optimization of Timber Shipments in the North Central United States

Completed in 2010 by the Transportation and Logistics Research Center at the University of Wisconsin-Superior, the study examined multimodal (rail and truck) models for the optimization of timber shipments in the North Central United States (northern third of Wisconsin, Minnesota, and the Upper Peninsula of Michigan). The research team also reviewed plans to establish a rail served super yard in the region to consolidate logs with the objective of reducing empty truck miles and increasing rail ton-miles.

The study found that a multimodal rail-truck haulage of forest products from the harvesting site to the mills or biofuel plants was highly economical, but in multimodal movement wood products have to be handled more when rail service is used, thus reducing the savings. The greatest potential was for moves that terminated at facilities with rail access, but rail service closures have reduced the number of rail siding locations where forest products can be transferred from truck to rail. This often increases the distance trucks have to travel in order to reach a rail siding or spur.

At the time of the study being prepared (2010), the cost of transportation for the movement of logs from harvesting site to the mill was estimated to be close to 50% of the overall delivered cost. Results from the multimodal transportation model for log transport showed that 22% of the actual ton-miles that moved by truck in 2007 could have traveled more economically via rail/truck multimodal movements (with 2007 fuel prices). Additionally, an increase of one dollar in fuel price warranted an additional seven percent of the movements to shift to rail/truck bimodal transportation.

Michigan Economic Development - Forestry Biofuel Statewide Collaboration Center: Task B1 – Evaluation of Michigan Biomass Transportation Systems

Completed in 2012, the biomass transportation study was developed to find ways to minimize transportation cost for the forest product industry. This is difficult considering these products are typically high in volume and low in value. The main objective of the transportation system evaluation was to identify and evaluate the capabilities of the Michigan transportation system to deliver woody biomass in general to nine proposed biomass plants, all of which would be located on the northern most sections of track of Lower Peninsula short line railroads. Another parallel study was investigating similar delivery scenarios to a cellulosic ethanol production plant, proposed to be built at Kinross in the Upper Peninsula.

The study identified the fact that rail and marine transport are the most viable for long distance movements. Typically, rail is most viable over 300 miles while marine/ship is most viable over 900 miles. Upon examination of the roads between the Upper Peninsula and the Lower Peninsula, road and bridge weight restrictions do not cause major limitations for truck movements, excluding the Mackinac Bridge, which has a weight limit of 72 tons (144,000 lbs.). This was vital to research since shipments of logs and biomass would have to travel from harvesting regions in the Upper Peninsula or northern Wisconsin via land transport (rail or road) or marine transport (Great Lakes).

Issues with rail service between the harvesting region and the proposed refineries located on northern Lower Peninsula are numerous. Though the distance to the proposed refineries would be cost effective for rail service, multiple interchanges between railroads via Chicago would increase transportation costs. Additionally, railcar ferry service via the Strait of Mackinac, which has historically been a primary route for forest product shipment, has been deactivated since

1986. Railcar availability is also an issue, partly because of equipment return time to the harvesting region.

Though many rail sidings (both public and private) exist, most railroads, such as CN, do not allow storage of logs or biomass near the siding or right of way due to liability. Railroad cooperation for quick service times can only be obtained if sufficient and continuous volumes are shipped. According to the given rates of trucks and rail operators, and CN rates in the U.P., multimodal truck-rail operations for biomass transport can be more cost effective than trucking alone when the total operating length is over 120 miles. From prior practice and shippers/railroad experience with forest product transport, it is not feasible to have a rail spur near every harvesting site. Typical distances between harvesting sites to rail stations/sidings range from 20-30 miles.

Improving Log Transportation with Data Based Monitoring and Analysis in Northern Wisconsin and Upper Peninsula of Michigan

Completed in 2012 by the Transportation and Logistics Research Center at the University of Wisconsin-Superior, in collaboration with the Michigan Tech, the log transportation study focused on the reduction of transportation costs associated with the movement high volume, low value raw forest products from the harvesting sites to the mills.

The research used portable global positioning systems (GPS) to track and record log truck movements that were later used to map the routes used by the trucks, together with supplemental data (activity logs) prepared by the truck drivers to create a more complete understanding of operations and time usage of truck transport of logs and raw forest products.

The team discovered that the loading and unloading of the log and chip trucks averages 40-50% of the daily operations, placing a significant burden to efficient revenue movements. One recommendation provided was to apply the use of modern cranes and machines for loading and unloading operations at harvesting sites, mills, power plants, refineries, and rail sidings. For chips specifically, unloading time at mills can be reduced though the use of trailer or railcar tippers.

Summary of Evaluating Export Container Pooling Options in MN, WI, and MI's Upper Peninsula

Completed in 2013 by the Transportation and Logistics Research Center at the University of Wisconsin-Superior and associated researchers from other organizations, the study was an investigation into the issues that impact the expansion of containerized cargo in Wisconsin, Minnesota and the Upper Peninsula of Michigan. The topics included best practices in container pooling, load matching, inland port connectivity, and electronic tracking of shipments.

The study found that containers are in high demand and priority for container leasing is given to shippers who have high shipping volumes and ship on a consistent, regularly scheduled basis. Lower volume shippers (most businesses in the region) had issues acquiring leased containers because of low, inconsistent shipping volumes and associated empty back haul movements increasing cost.

Class I railroads do not consider “less than trainload” quantities of containers or railcars ideal operationally, which may further limit the use of container shipping in the study region. Dedicated rail container feeder routes do not exist in the region, but containers are drayed by trucks from intermodal terminals around Chicago.

The study concluded that the ideal intermodal rail system in the study region would carry freight in both directions to reduce operating/back haul costs. Connections to intermodal facilities or intermodal rail service providers would be necessary to allow for an efficient short line railroad or truck feeder system. Potential regional intermodal container pooling initiatives could use the Chippewa Falls intermodal facility as a model for development of small intermodal facilities. New or expected intermodal terminals would preferably have the following attributes: rail service by one or more Class I railroads, logistics and service provider base, access to inland ports, interstates and highways, space for expansion and storage of containers, and cooperation among stakeholders and government entities.

Appendix C – Railroad Interview Questions

The information collected in this interview is **confidential**. Part of your information will be added in the Interactive map to provide Shipper an overview of rail lines in the Upper Peninsula of course with your permission.

Why are we conducting this interview?

- Identifying challenges faced by rural rail service providers and shippers along light-density lines.
- Developing tools and methods that facilitate the use of rail and multimodal transportation alternatives in the Upper Peninsula of Michigan.
- Collaborative effort with Michigan Department of Transportation (MDOT), Tioga Group, and shipper/railroad stakeholders.

Company Name: _____

Address: _____

City _____ State _____ Zip Code _____

Email: _____

Website _____

Respondent name and Position _____

Infrastructure Questions

1. What is the total track mileage you are currently operating in the Upper Peninsula?
2. Can you provide us your system/ Network map for the Upper Peninsula?
3. Can you provide a list and map of track classes and weight limits?
4. Do you have any trackage rights on other railroads in the U.P.?
5. How many sidings do you have in the Upper Peninsula? Can you provide us a list and a map? We have a map which was made by MDOT but not sure about the current condition of our information. Attached is our map.
6. How many stations have transloading equipment? Can you provide us a list?
7. What type of transloading equipment do you use?
8. What is the weekly frequency that you operate in the U.P.? Does this vary by segment of your railroad?
9. What type of commodities do you handle in each siding?

10. How many log cars do you have as there is a high demand of shipping logs in the U.P.?
11. How many of rail sidings in the U.P. have storage service for commodities?
12. How do you classify commodities? STCC or SIC code?
13. Do you have any major infrastructure improvement plan in the U.P. in near future?

Service

1. Can you provide any idea of shipping cost and handling cost of commodities?
2. What is the total capacity of your train in the U.P.?
3. If shippers want to use their private rail cars do you charge extra?
4. What type of service do you provide to the shippers who have privately owned cars?
5. Do you think privately owned cars instead of using your cars can improve service and capacity?
6. If shippers like to get his own car will you provide any subsidy to them?
7. What is your overweight limit and penalty for that in the U.P.?
8. Do you have any plan to expand your network in the U.P.?
9. Do you think improving your service in the U.P. will help in increasing revenue?
10. What type of issues do you face with the shippers?
11. What are the extra services you think shippers get from trucks?
12. What are your thoughts for improving your service?
13. What do you expect from shipper that can help you to provide better service?
14. As a part of our project, we are building an interactive map where railroads in the Upper Peninsula will be shown. What are the things do you like to see in the map?
15. Do you think this map will help you attracting more shippers in the U.P.?
16. The map will be updated by MDOT. You would have to provide update in writing to MDOT so that they can make necessary changes. Do you prefer to provide updates by yourself instead of MDOT

Appendix D – Shipper Survey



Northern Michigan Rail and Truck Freight Shipper Survey

1. Company information

Company Name: _____

Address: _____

Address 2: _____

City/Town: _____

State: _____

ZIP: _____

2. Respondent (s) name: _____

3. Approximate Number of employees currently employed by your firm in the region? _____

4. Please check the company type that most describes your business.

- | | |
|---|--|
| <input type="checkbox"/> Manufacturing | <input type="checkbox"/> Agriculture |
| <input type="checkbox"/> Distribution | <input type="checkbox"/> Other (please specify): _____ |
| <input type="checkbox"/> Service | _____ |
| <input type="checkbox"/> Logging/Timber | _____ |

5. If known, what is your Standard Industrial Classification (SIC)? _____

6. Which modes do you use for your shipment?

- Rail
- Truck
- Water
- Other (please specify) : _____

7. If you don't use rail service for all your shipment requirements, please let us know why. (Rail users only) _____

8. Please check the type of trucks you use.

Hired carrier

Combination

Own trucks

% of own trucks: _____

9. Please give rank (1 up to 8) to main reasons for using/not using rail. If not applicable, write N/A

Rank

- High shipping volumes: _____
- Price: _____
- Close proximity: _____
- Service frequency: _____
- Service quality: _____
- Equipment provided by railroads: _____
- Ease of doing business: _____
- Other: _____

(Please specify): _____

10. For your INBOUND freight, who has the overall say on which shipping mode to use?

We do

Our suppliers do

3rd party logistics company

Other (please specify) : _____

11. In the table below, please fill out the information regarding your INBOUND movements for the most recent year to the study area. Fields are provided for five different product types and if your product has multiple origins, you can fill up to three origins under each product type.

You may insert either Standard Transportation Commodity Code- STCC or write a description about the product when asked “**STCC Product Code or Product Description**” for each product.

Important: Please indicate whether the volume information you will be providing in the table below is weekly, monthly or yearly.

- Weekly
- Monthly
- Yearly

12. For your OUTBOUND freight, who has the overall say on which shipping mode to use?

- We do
- Our suppliers do
- 3rd party logistics company
- Other (please specify)

13. In the table below, please fill out the information regarding your OUTBOUND movements for the most recent year from the study area. Fields are provided for five different product types and if your product has multiple origins, you can fill up to three origins under each product type.

You may insert either Standard Transportation Commodity Code- STCC or write a description about the product when asked “**STCC Product Code or Product Description**” for each product.

Important: Please indicate whether the volume information you will be providing in the table below is weekly, monthly or yearly.

- Weekly
- Monthly
- Yearly

14. Please check the box that best describes how important the following performance measures are to your business. These metrics are listed alphabetically and not by a rank value.

Transportation performance measures	N/A	Not Important	Minor	Neutral	Major	Very Important
Accuracy of Billing						
Claims/Damage History						
On-time Cargo Tracking						
Ease of Doing Business						
Equipment Availability						
Reliability (Consistency) of Service						
Service frequency and Adherence to Schedule						
Total Transit Time						
Transport Costs						
Other (please specify): _____ _____ _____						

15. How would you rate Rail performances using these performance measures?

Rail Performance	N/A	Poor	Meets minimum requirements	Satisfactory	Good	Excellent
Accuracy of Billing						
Claims/Damage History						
On-time Cargo Tracking						
Ease of Doing Business						
Equipment Availability						
Reliability (Consistency) of Service						
Service frequency and Adherence to Schedule						
Total Transit Time						
Transport Costs						
Other (please specify): _____ _____ _____						

16. How would you rate **Truck** performances using these performance measures?

Truck Performance	N/A	Poor	Meets minimum requirements	Satisfactory	Good	Excellent
Accuracy of Billing						
Claims/Damage History						
On-time Cargo Tracking						
Ease of Doing Business						
Equipment Availability						
Reliability (Consistency) of Service						
Service frequency and Adherence to Schedule						
Total Transit Time						
Transport Costs						
Other (please specify): _____ _____ _____						

17. Have you increased or decreased your rail usage in the past three years?

- Increased
- Decreased
- More or less constant

Please explain why: _____

18. Do you expect to increase or decrease your rail usage in the next three years?

- Increase
- Decrease
- More or less constant

Please explain why: _____

19. What improvements would encourage your company to ship more by rail? (Rail users only)

20. If these improvements were to happen, by how many percent would you estimate your annual rail volume increase from current? _____

21. How familiar is your business with using rail as a freight transportation mode?

- Very unfamiliar
- Somewhat unfamiliar
- Somewhat familiar
- Very familiar

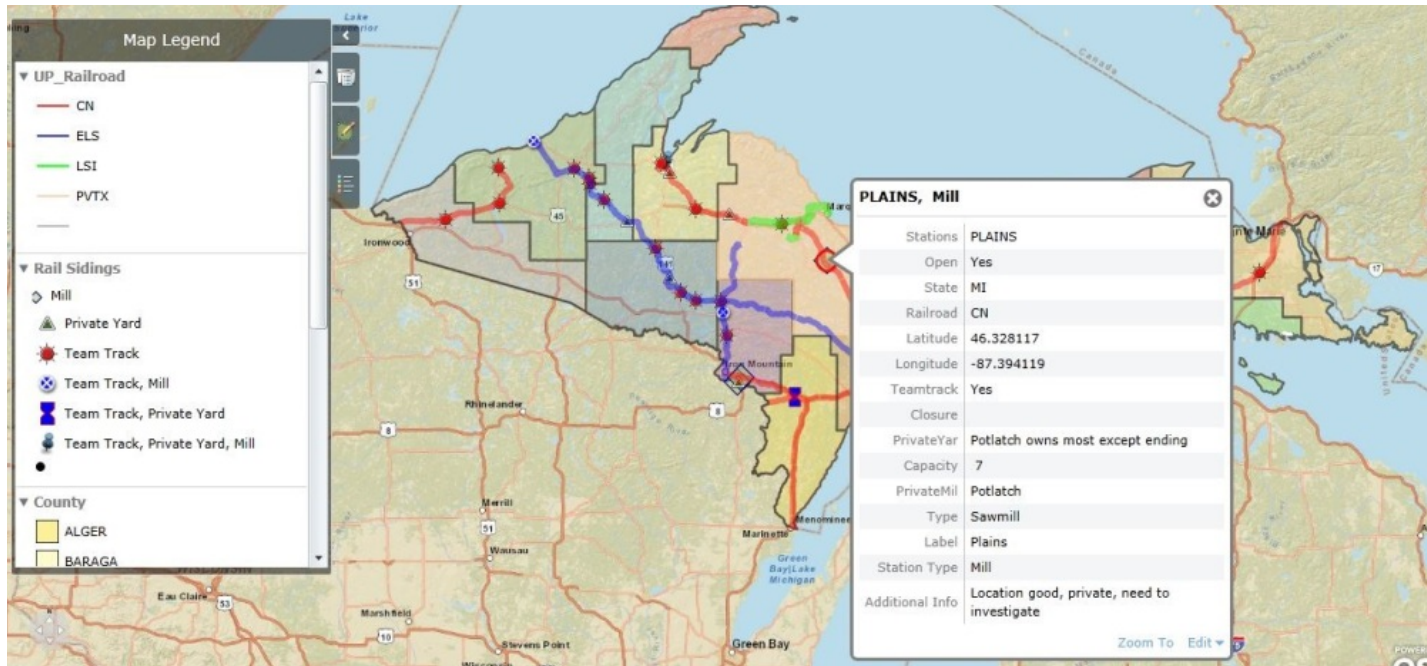
22. What would have to happen in order for your company to start shipping by rail? (Non- Rail users only) _____

23. When considering shipping by rail, would an internet-based interactive map of your region with rail facility information (example shown below) be beneficial? To explore the interactive map more, you may go to

<http://www.arcgis.com/explorer/?open=9cee7d2a3070409ea0c74b03819b202d&extent=-10080848.0972853,5582962.99690244,-9564024.45873864,5838548.43690247> . Please note

that you may be prompted to install ArcGIS Explorer Online before exploring this interactive map if it is not already installed in your system. The installation is free, but may take a moment depending on your internet connection speed.

- Yes
- No



24. If you believe there might be benefits to such a map, please check all information parameters that you would like to see on the map.

Operational information like:

- Railroad Operator (s)
- Location and Contact info
- Track length
- Weekly service Frequency
- Track Class
- Allowable speed
- Weight limits
- Interchange locations
- Industrial development around rail lines
- Special Information(s)

Other (please specify):

Facility information like:

- Commodities handled
- Storage availability
- Storage Capacity
- Trans loading support
- Equipment availability
- Site Security
- Other (please specify):

25. Do you have any specific suggestions for rail service improvements?

26. Please include any other comments or information you believe could assist in improving the rail utilization in your region.

27. If we contacted you would you be willing to participate in a short follow-up interview to discuss your transportation?

Yes No

28. Do you want to be informed of a stakeholder meeting to discuss the study and its outcomes?

Yes No

29. If you answered **Yes** to either question 24 or 25, please provide your contact information.

Name: _____

Email Address: _____

Phone Number: _____

This is the end of the survey. Thank you for taking the time to participate.

Shipper Survey Instrument and Evolution

Table D-1: Question categories asked in each format of the survey

N ^o	Question Categories	Online & Paper format distributed to shippers	Survey developed for phone interviews	Basic short version survey
1	Demographics	✓	✓	✓
2	Company type	✓	✓	✓
3	Shipping mode	✓	✓	✓
4	Rank reasons for using or not using rail	✓	✓	x
5	Reasons for not using rail for all shipment requirements (<i>Rail users only</i>)	✓	x	x
6	Type of trucks used	✓	✓	x
7	Who decides on Inbound and outbound shipping mode	✓	✓	x
8	Inbound and outbound commodity, volume, and origin-destination	✓	✓	✓
9	Important transportation performance measures	✓	✓	x
10	Rail usage in the past and next three years (<i>Rail users only</i>)	✓	x	x
11	Familiarity in using rail service as a freight transportation mode (<i>Non-rail users only</i>)	✓	x	x
12	Improvements to encourage your company to ship more or start shipping by rail	✓	✓	x
13	Expected % increase if these	✓	x	x

Nº	Question Categories	Online & Paper format distributed to shippers	Survey developed for phone interviews	Basic short version survey
	improvements are met			
14	Interest in an internet-based interactive map and information you would like to have in such a map	✓	✗	✗
15	Any other comments and specific suggestions for rail service improvements?	✓	✓	✗
16	Interest in Follow up interview & stakeholder meeting	✓	✓	✓

Appendix E – Previous Shipper Surveys in the Region

Wisconsin Northwoods Freight Rail Market Study - September 2013

In 2012 – 2013, Wisconsin Department of Transportation (WisDOT), in collaboration with Northwoods Rail Transit Commission (NRTC), carried out a freight market study in northern Wisconsin. Part of the study included conducting a survey of businesses in the region to understand current levels of freight rail use and potential future outlooks if the rail network regained its connectivity. The primary focus of the survey was on 10 Wisconsin counties located along the rail corridor that roughly parallels US 8, but nearby locations including the four counties in Michigan’s Upper Peninsula that border Wisconsin (Gogebic, Iron, Dickinson, and Menominee) were also included. The survey had two versions – one for rail users and another for non-rail users. A total of 190 surveys (17%) were returned to WisDOT of 1,094 surveys distributed to businesses considered potential rail users, regardless of whether they currently had access to rail. Table E-1 summarizes the survey results.

Table E-1: Summary of Northern Wisconsin rail study survey

Item	Rail Users	Non Rail Users
Responses	<i>39 businesses - (20% of total)</i>	<i>151 businesses - (80% of total)</i>
Major commodity types	For both inbound and outbound; lumber/wood products & pulp/paper products are the major commodity types	Inbound: lumber/wood products, followed by primary metal products and machinery. Outbound: lumber/wood products, machinery and transportation equipment.
Shipping modes	Inbound: More than half receive at least 90 % by truck. Outbound: More than three-fourths ship at least 90 percent of their outbound freight by truck	More than 80% move inbound & outbound freight entirely by truck.
Origins & destinations	WI, MI, MN, IL. Ontario and Quebec are the most trading partners.	WI, MN, MI, IL. Ontario, British Columbia and Quebec are the most common trading partners.

Item	Rail Users	Non Rail Users
Reasons for Using/ NOT using rail	Cost, efficiency and convenience	No rail service, freight not shipped by rail, less convenient than truck and difficulty to ship low volumes.
Potential use of out-of-service rail lines	More than 40% are interested and the remaining were unsure. Main improvements requested was on availability of sidings/spurs	About 30% are interested in shipping by rail if sidings are improved.
Potential increases in rail shipments with improved service	More than 40% would ship or receive additional volume with improvements of access, timing, reliability, and availability of rail cars.	There is a potential for additional 2,300 carloads to be shipped in by rail, and another 4,800 carloads could be shipped out of the study area each year.
Interest in a transload or intermodal facility	About 36% would like a transload facility while about 30% were interested in an intermodal facility. Locations suggested include Wausau, Superior, Milwaukee & Chicago. From MI, Bark River, Bruce and Delta County were also suggested.	About 25% indicated an interest in a transload facility while about 21% preferred an intermodal facility. Suggested locations varied throughout Northern WI. Rice Lake & Crandon in the U.P. were also among the suggested locations.
Unfavorable impressions about freight rail.	<ul style="list-style-type: none"> • Rail cost continues to increase. • Difficult service and communication; it is non customer friendly. • Takes too long to get cars, too short time to load; pushing for unnecessary demurrage charges. • CN has become hard to work with. • Carriers have gotten too large to care about small volumes. 	

Evaluation of Shipper Requirements and Rail Service for Northern Wisconsin and the Upper Peninsula of Michigan - 2006

In 2005 – 2006, a study was conducted by the University of Wisconsin-Superior’s Transportation & Logistics Research Center and Michigan Technological University on evaluating and improving rail service in Northern Wisconsin and the Upper Peninsula of Michigan. As part of the study, a shipper’s survey was conducted to understand rail shipper characteristics in the region, perceived problems and potential solutions. An estimated 900 businesses in the region were contacted about the survey either by direct mail, email, public meetings or through associations. However, only a total of 43 survey responses were collected. Sixty-five percent of these respondents were current rail users, while the rest were using other transportation modes, mainly trucks. Table E-2 summarizes the survey results.

Table E-2: Northern Wisconsin & Upper Peninsula of Michigan Federal Rail survey (2005)

Item	Summary
Company Type and Size	Manufacturing companies formed 75% of the responding businesses. The company size varied from less than 50 employees to more than 500 employees
Product types	50% of the companies shipped wood, paper, and pulp. 70% of rail users shipped these products. The other 50% was divided fairly between other categories.
Shipping Quantities	The survey captured over 11 million tons annually. Out of which, 70% was moved by truck. Rail & water accounted 27% & 3% respectively. Rail users shipped significantly larger quantities than non-rail users, however they used trucks for more than 50% of their shipments
Control and Payment for Shipments	For inbound shipments, shippers & consignee had major say. For outbound, shippers had the majority control. The respondents were also responsible for paying for approximately 80% of shipments.
Rail Service Frequency and Rail Shipment Trends	The most common switching services provided by the operating railroad were 5 or 7 days per week. 11 rail shippers indicated decrease in rail shipments due to either poor car availability and/or higher prices. Most rail shippers reported a potential to increase rail shipments if rates and service were improved
Rail Car Ownership	65% of the rail users showed interest in owning, leasing, or pooling (sharing) of privately owned rail cars in the future

Item	Summary
Shipment Origins and Destinations	For rail and non-rail users, most of the inbound truck freight (85%) originations were in the States of Michigan, Wisconsin, Minnesota, Illinois, and Ohio. However, for rail shipments, 40% of the locations were outside the Midwest. For outbound traffic, truck destinations were geographically more dispersed, but rail still had more destinations outside the Midwest
Rail Performance Metrics	Reliability, consistency of service and equipment availability are important factors for shippers. They evaluated Railroads mostly as a fail in this categories.
Information they would like to receive from the railroads	Most shippers were interested in equipment availability, pricing, and customer service
Improvements suggested by shippers	<ul style="list-style-type: none"> • Car quality & quantity • Interest to work with small volumes • Revise demurrage period • Improve communication and customer service.

Appendix F – Mining Questionnaire

Upper Peninsula Mining and Transportation

The Upper Peninsula of Michigan has a long mining history and recently there has been increasing interest toward future development of mines. Figure F-1 presents some of the potential locations that we have been able to identify for current and planned mining activities.

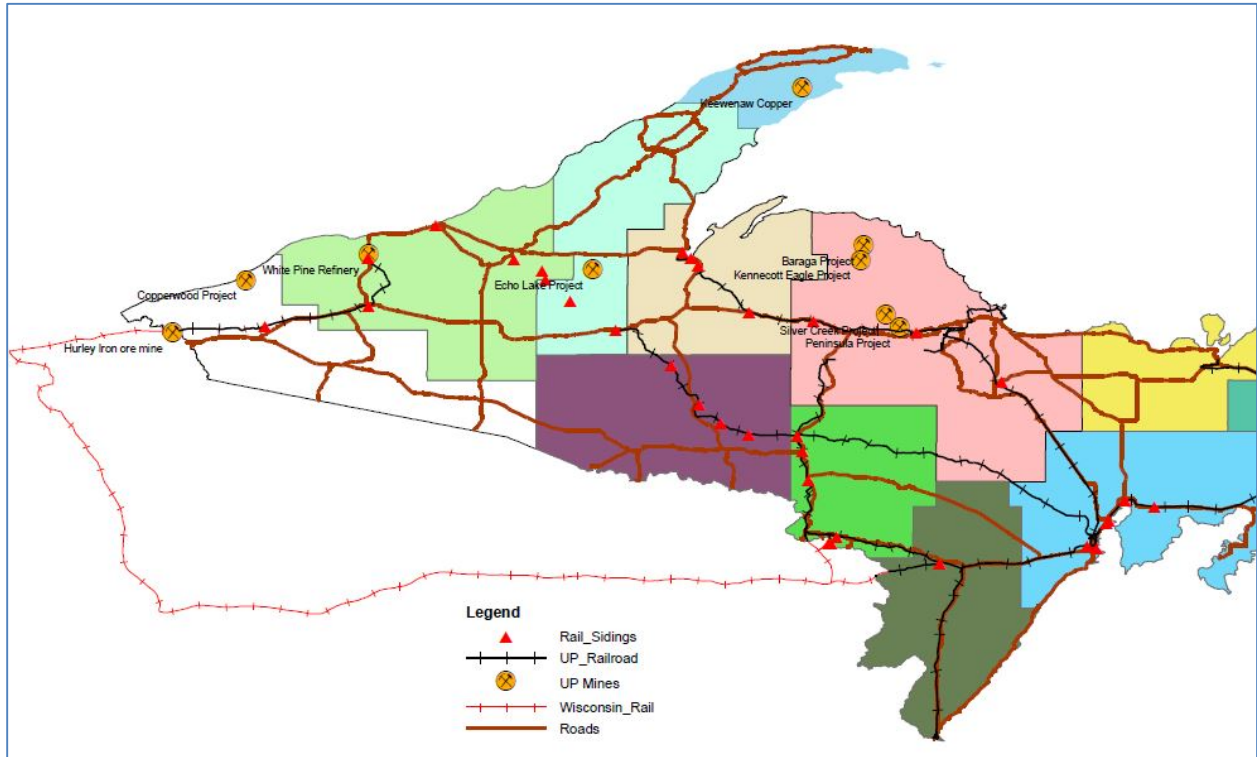


Figure F-1: Potential Proposed/Developed mines in the Upper Peninsula

In Table F-1, we have summarized the production information of proposed mines in the U.P. which have been acquired through discussions with stakeholders and searches on relevant web sites, but we are very uncertain when it comes to the accuracy of our data, or current project stakeholders. We would appreciate any corrections/validation of the data.

Table F-1: Summary of New/Proposed/Planned Mining Activities in the Upper Peninsula

Mines	Baraga Project (Prime Meridean)	Copperwood Project (Orvana)	Echo Lake Project	Peninsula Project	Silver Creek Project (Back Forty)	White Pine Refinery
Location	Marquette	Gogebic	Houghton	Marquette	Marquette	Ontonagon
Operation	Exploration	Proposed	Exploration	Exploration	Exploration	Active
Minerals	nickel, copper	copper	nickel, copper	gold, Silver, Copper, Lead and Zinc	gold	copper
Volume (Estimated)		850 million pounds of Cu and 3.46 million oz of Ag			987,236 ounces of gold, 11.91 million ounces of silver, 1.02 billion pounds of zinc, 74.3 million pounds of lead and 110.4 million pounds of copper	
Annual Production (Estimated 10 years mine life)		42,500 tons of Cu and 10.8 tons of Ag			5,520 tons of Cu	

Our special interest is the effect of potential mining activities to the rail system and transportation in the U.P. We have prepared a few questions below that would assist in developing the inventory of “future mining transportation” in the region. We do recognize that there is lots of uncertainty in quantifying/identifying many of the items, but nevertheless, it would be better starting point than “no data”.

Mine Product Transportation

1. Mine/Facility Name and Location: _____
2. What are your anticipated years of mining operation? _____
3. Please fill up the appropriate cells in the table below to describe the anticipated movements from your mine. If no movement is anticipated, leave the cell empty.

Movement	Commodity	Estimated Annual Volume	Anticipated Destination (Origin)	Anticipated Mode/Type of Equipment	Transportation cost per ton-mile (if estimate available)
Freight Flows to Mine					
Mine to Refinery Within U.P.					
Refinery (in U.P.) to final destination (Outside U.P.)					
Mine to refinery (or other destination) outside U.P.					

4. Would you have any interest for using rail to move your products out of U.P., if a location was identified within U.P. to transload mining products to larger train consists?
 - a. Yes ___ b. No ___ Why not? _____
5. Would it be acceptable for us to contact you by phone for any further clarifications?
 - a. Yes ___ b. No ___ Phone number _____

Appendix G - Examples of Interactive Map

The literature review of interactive rail maps resulted in several examples, as described below. The U.P. map could be considered an expansion of a map by CN showing rail stations, terminals and distribution centers (Figure G-1). If a shipper wants to ship something from Baraga, he can find rail options by typing his location in the search tab to locate a station close to him. The output presents the specific station location and the rail segment leading to the station, but any additional information must be obtained directly from CN. CN offers additional information in their distribution centers through a separate interactive map (Figure G-2).

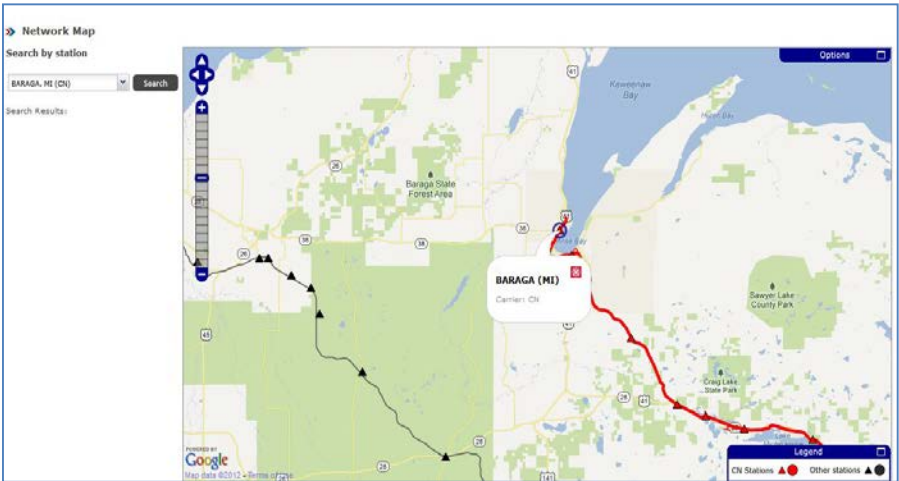


Figure G-1: CN network interactive map (CN Network Map n.d.)

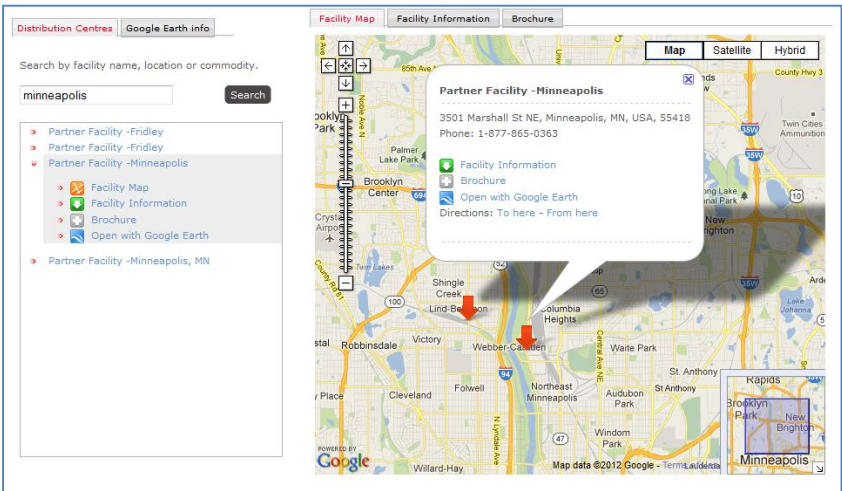


Figure G-2: CN distribution center interactive map (CN Distribution Centres n.d.)

Canadian Pacific (CP) offers a similar map to locate various facilities (Figure G-3). The map is developed in Bing (Microsoft platform) and users can enter either address or city or commodity to find out a specific facility.

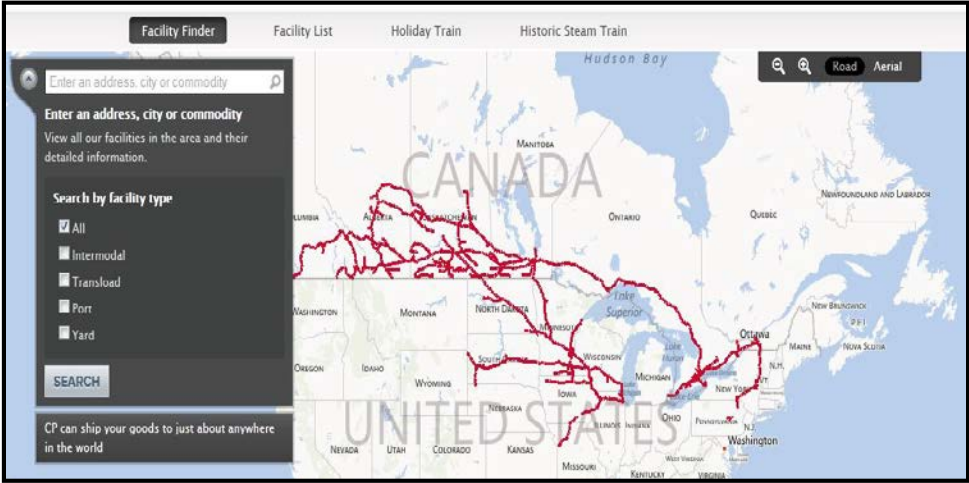


Figure G-3: CP interactive map (Facility Finder: Canadian Pacific n.d.)

Selecting a specific facility will allow the user to see the contact information for the facility and hours of business (Figure G-4)

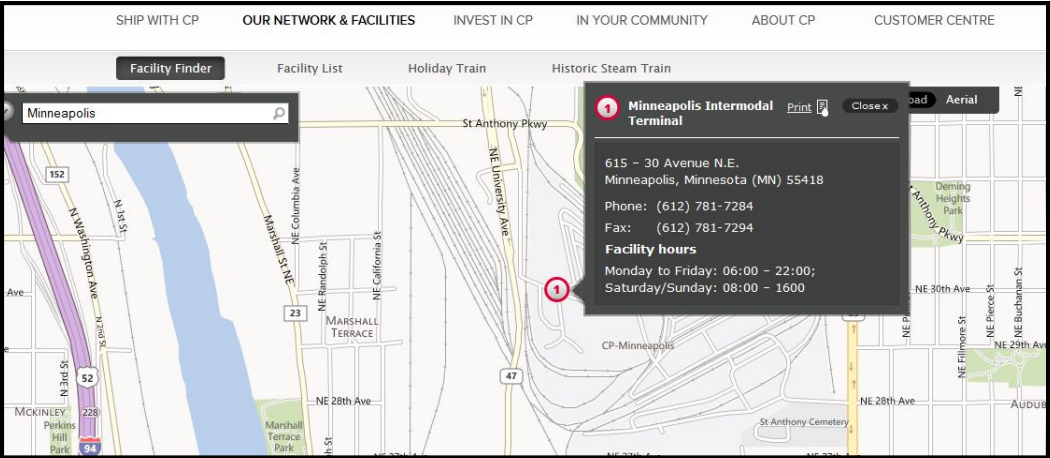


Figure G-4: CP Intermodal facility information in interactive map (Facility Finder: Canadian Pacific n.d.)

Norfolk Southern (NS) has intermodal map where all origins are shown and the size of the terminal according to their capacity are shown by the size of the yellow dots. (Figure G-5)

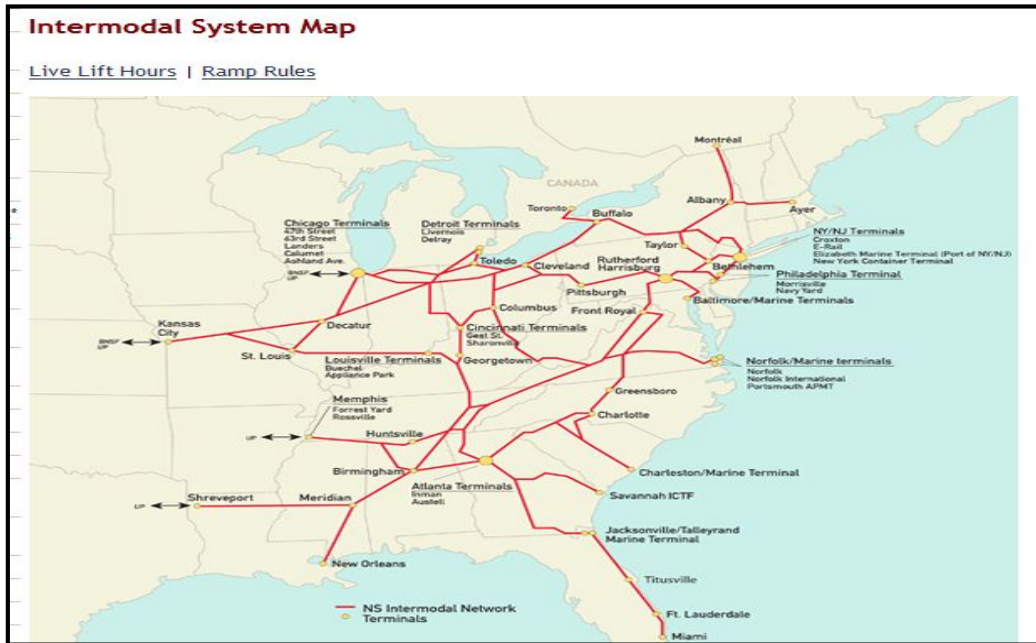


Figure G-5: Norfolk Southern Intermodal Interactive Map (Terminals & Schedules: Norfolk Southern n.d.)

If shipper click on the origin state another window will pop up and it will give the contact information, capacities, frequency and direction of the terminal. This is a simple map which we can use in our U.P. Freight Rail as it will easy to modify if the railroads change anything in their service. For major modification they need to provide the administration the changes that they wanted to make.

The study also looked into the interactive map of Highway Construction by MDOT which provides the road condition, weather, bridge or road closures and live video streaming of the Highways which is very sophisticated and informative to the highway vehicles. It also gives wind speed, visibility, bridge weight class which depends on capacity of a bridge in terms of A, B, C and D. Drivers can obtain information before long drive which roads or bridges are safe or closed currently or when any construction work is scheduled for any road or bridge in Michigan. (Figure G-6)

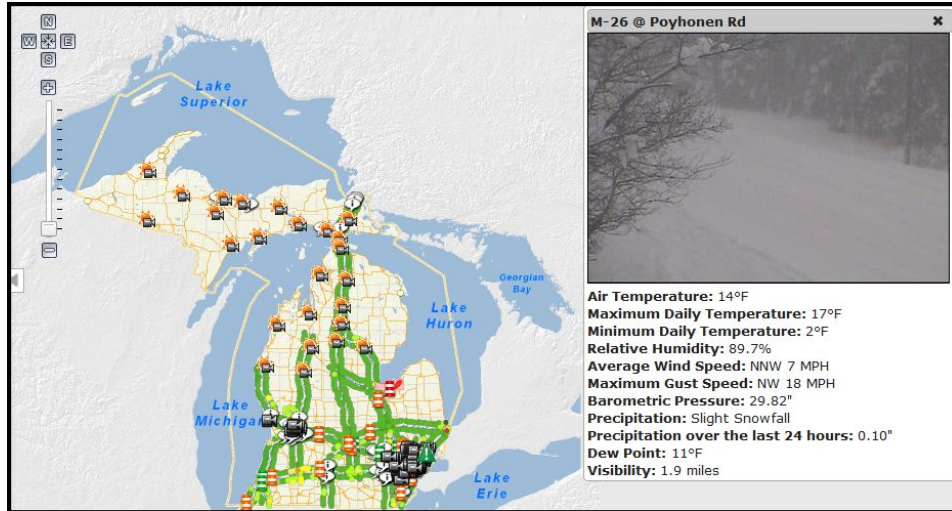


Figure G-6: MDOT Highway Construction Interactive Map (Mi Drive: Michigan Department of Transportation n.d.)

This map will be a good example for our Interactive map as MDOT will be maintaining the interactive map and they already have such map in their database. Vermont area has implemented an interactive map showing their railroad crossings, culverts, bridges and mile posts. Figure G-7, the snapshot of the map is presented.

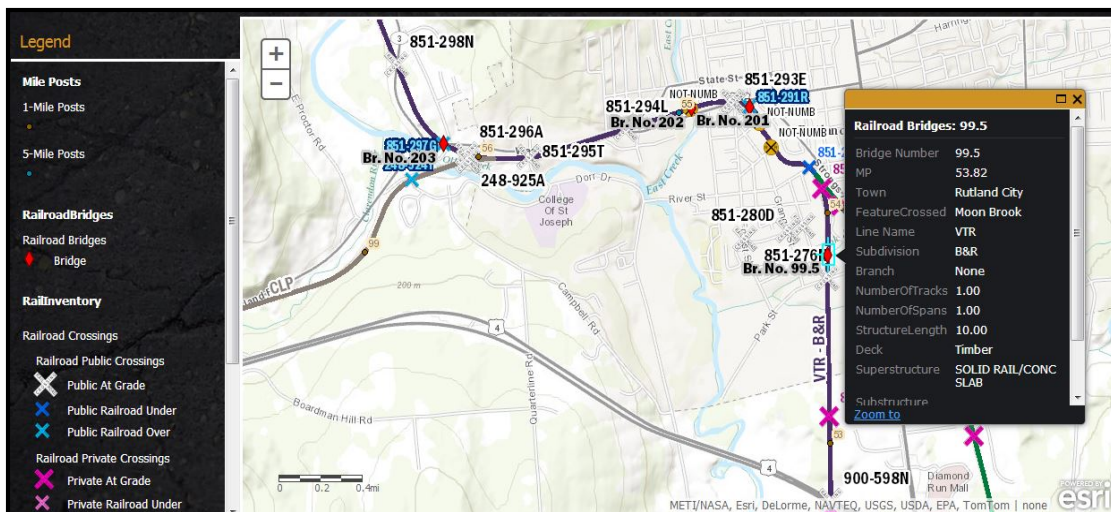


Figure G-7: Vermont Rail Inventory Interactive Map (Rail Asset Inventory: Vermont Agency of Transportation n.d.)

Though the infrastructure systems information such as bridges and culverts were not in the scope of the project but it definitely opens for future research and addition in the interactive map of the current project.

Appendix H – Interactive Map Implementation and Updates

The necessary shape files for uploading the interactive in an official ArcGIS account by MDOT have been provided in a separate package by the research team. This also includes instructions for signing up ArcGIS account.

It is recommended that the map gets updated on annual basis in collaboration by MDOT and freight railroads. The recommended process is presented in Figure H-1. Data can be provided by the railroads either in GIS format, or in excel spreadsheet developed by the Michigan Tech research team (Table H-1 and Table H-2).

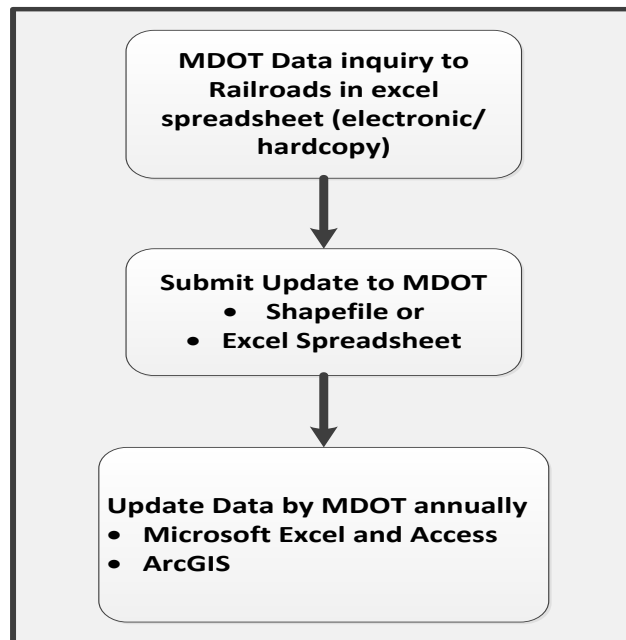
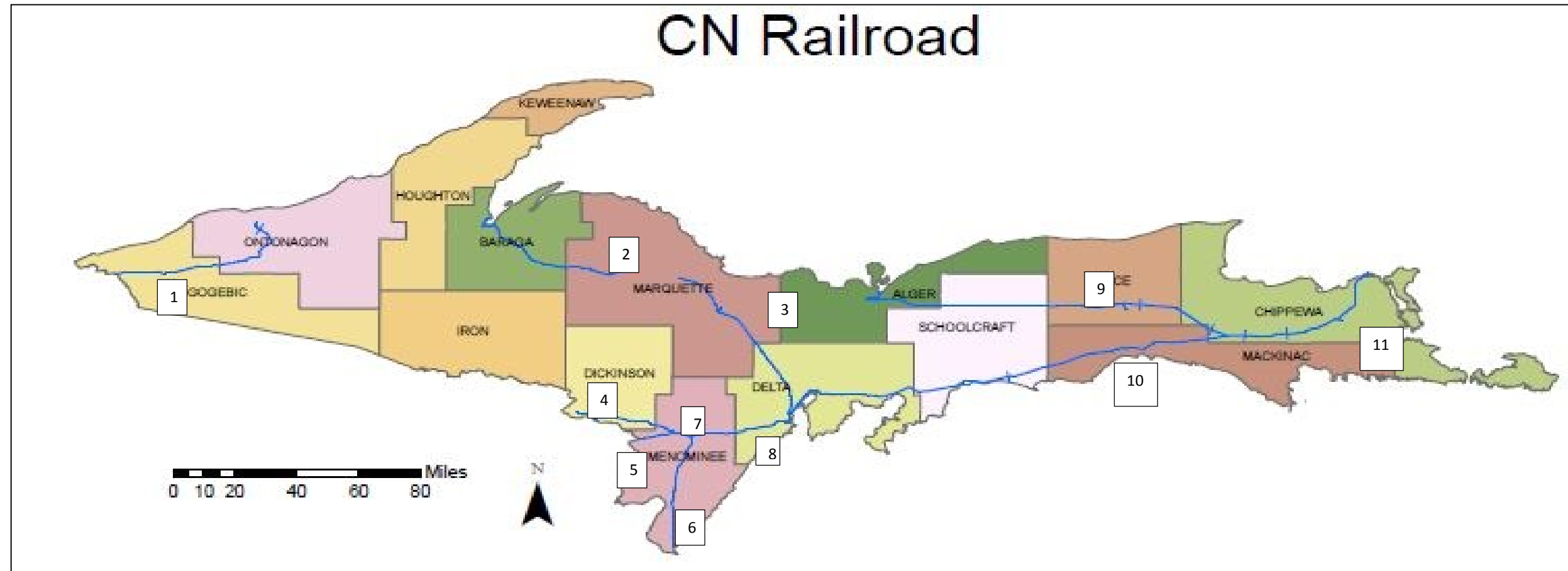


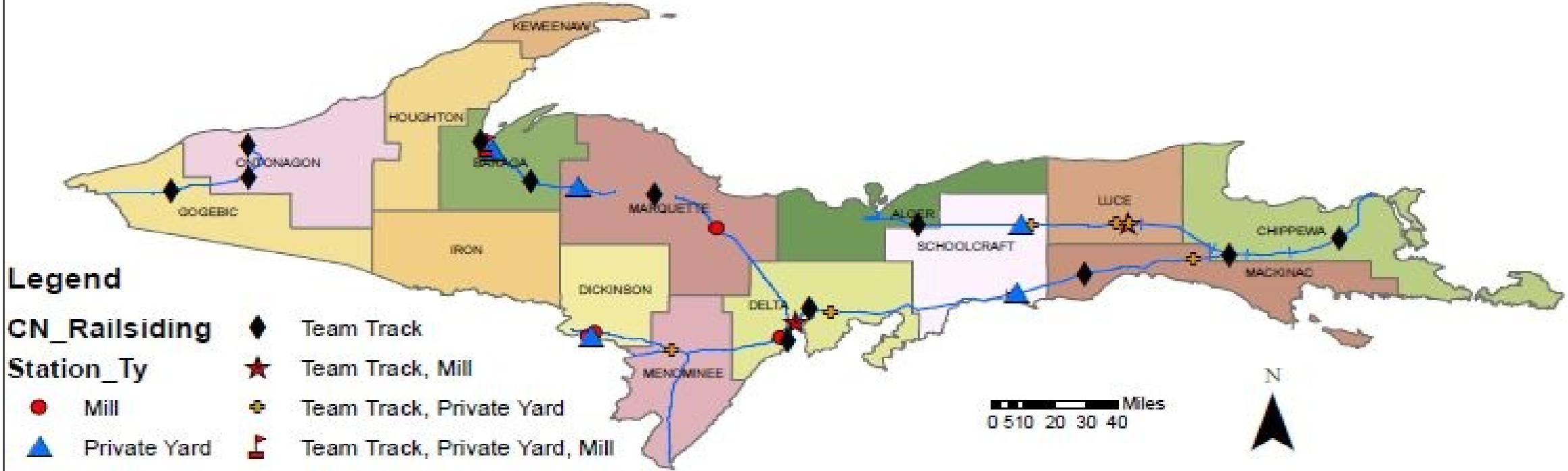
Figure H-1: Interactive map updating procedure

Appendix I - Railroad Forms – Rail Line and Siding Parameters



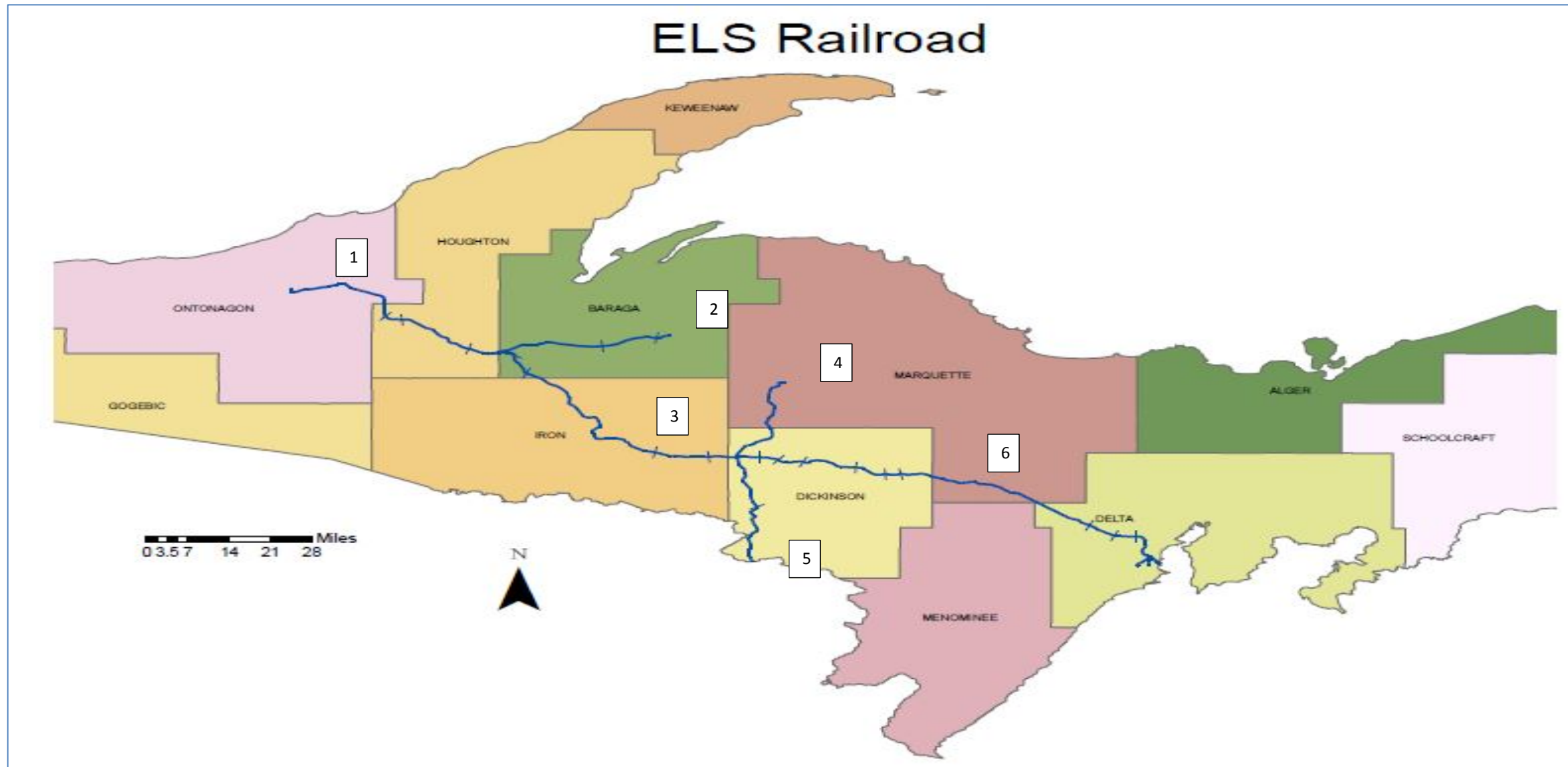
Segment	Length (miles)	Track Class	Speed Limit	Rail Weight	Weight Limit (lbs.)	Revision
1	48	Inactive	Inactive	80	263,000	
2	43	FRA 1	10	80-85-90	268,000	
3	61	FRA 3	40	112-115	268,000	
4	26	FRA 2	25	90		
5	9	FRA 1 and 2	10 & 35	112-115	286,000	
6	39	FRA 3	40 & 50	110-112-115	286,000	
7	3	FRA 2	25	90	286,000	
8	25	FRA 1	40	110-112-115	286,000	
9	93	FRA 1 and 2	10 & 35	80-85-90	268,000	
10	110	FRA 2 and 3	25 & 40	90-100	263,000	
11	47	FRA 2 and 3	25 & 40	90-100	263,000	
Total	505					

CN Railsidings



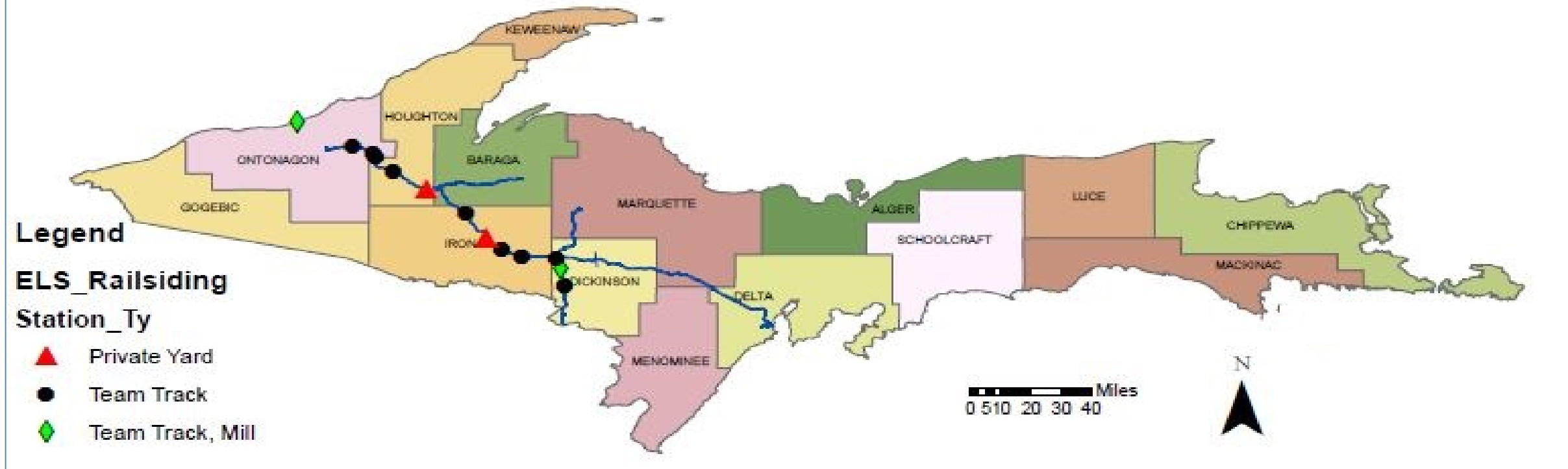
County	Stations	Open	Railroad	Team track	Closure	Capacity	Station Type	Comments	Operation (open/close)	Commodities Handled	Revision
ALGER	SHINGLETON	No	CN	Yes	Closed	5	Team Track	Closed now, but possible storage and reopening			
BARAGA	NESTORIA	Yes	CN	Yes			Team Track				
BARAGA	SPUR D 15	Yes	CN	No			Private Yard				
BARAGA	LANSE	Yes	CN	Yes			Team Track, Private Yard, Mill				
CHIPPEWA	TROUT LAKE	Yes	CN	Yes			Team Track	Proximity to FRR, Verso owns storage yard			
CHIPPEWA	KINROSS	Yes	CN	Yes			Team Track	Proximity to FRR			
DELTA	ESCANABA B	Yes	CN	No			Mill				
DELTA	GLADSTONE C	Yes	CN	Yes		3	Team Track, Mill	6 Car capacity, in CN's Gladstone yard			
DELTA	ENSIGN	Yes	CN	Yes		4	Team Track, Private Yard	No storage, Verso hot-loads on their half			
DELTA	RAPID RIVER	Yes	CN	Yes	Closed	10	Team Track	12-car hot load potential, near logyard,			

County	Stations	Open	Railroad	Team track	Closure	Capacity	Station Type	Comments	Operation (open/close)	Commodities Handled	Revision
DELTA	Gladstone B	Yes		No		Unsure	Private Yard	Storage potential w/Besse lease, main CN svc area			
DELTA	Escanaba D	Yes	CN	Yes		5	Team Track				
DICKINSON	NIAGARA	No	CN	No	Closed	6	Mill	1/2 on WI side, but good storage capacity			
DICKINSON	QUINNESEC A	Yes	CN	No		5	Mill	Verso use			
DICKINSON	Quinnesec C	Yes	CN	No		20-30 in main spur	Private Yard	State border, 20 car capacity, multiple spurs			
GOGEBIC	THOMASTON	Yes	CN	Yes			Team Track				
LUCE	NEWBERRY A	Yes	CN	Yes		5	Team Track, Mill	Proximity to FRR,			
LUCE	DOLLARVILLE	Yes	CN	Yes	Seasonal	10	Team Track, Private Yard	Seasonal use now, storage potential			
LUCE	BARAGA	Yes	CN	Yes			Team Track				
LUCE	Newberry C	Yes	CN	No		10	Team Track, Private Yard	Proximity to FRR, access to main line			
MACKINAC	GOULD CITY	Yes	CN	Yes		8	Team Track	Small storage, open siding for hot loading			
MACKINAC	CAFFEY	Yes	CN	Yes			Team Track, Private Yard	Proximity to FRR			
MARQUETTE	PLAINS	Yes	CN	Yes		7	Mill	Location good, private, need to investigate			
MARQUETTE	ISHPEMING B	Yes	CN	Yes		6	Team Track	Possible large hot load, unsure storage			
MARQUETTE	CHAMPION	Yes	CN	No			Private Yard				
MENOMINEE	HERMANSVILLE	Yes	CN	Yes		4	Team Track, Private Yard	Closed mill, private spur could buy storage			
ONTONAGON	BERGLAND	Yes	CN	Yes			Team Track				
ONTONAGON	WHITE PINE	Yes	CN	Yes			Team Track				
SCHOOLCRAFT	GULLIVER A	Yes	CN	Yes		4	Team Track, Private Yard	Gas company			
SCHOOLCRAFT	SENEY A	No	CN	Yes	Closed	10	Team Track, Private Yard	Closed now but CN would open			
SCHOOLCRAFT	Seney B	Yes	CN	No		6	Private Yard	Private track, Northern Hardwoods uses often			
SCHOOLCRAFT	Gulliver B	Yes	CN	No		18	Private Yard	Lots of storage, have to compete with others			



Segment	Length (miles)	Track Class	Speed Limit	Rail Weight	Weight Limit	Revision
1	40	FRA 2	25 mph	112#	286,000	
2	20	FRA 1	10 mph	80-90#	263,000	
3	44	FRA 2	25 mph	112#	286,000	
4	22	FRA 1	10 mph	80-90#	263,000	
5	26	FRA 2	25 mph	90#	263,000	
6	67	FRA 1	10 mph	65-100#	263,000	
Total	219					

ELS Railsidings



County	Stations	Open	Railroad	Team track	Closure	Capacity	Station Type	Operation (Open/Close)	Commodities Handled	Revisions
DICKINSON	Randville	Yes	ELS	Yes	.	(12)8	(NewPage)Team Track	Open	Pulpwood	
DICKINSON	Sagola	Yes	ELS	Yes		6	Team Track	Open	Pulpwood	
DICKINSON	Channing	Yes	ELS	Yes		(yard)1816	Team Track	Open	Pulpwood	
HOUGHTON	Sidnaw	Yes	ELS	Yes/No		(21)14	(Team Track) & Private Yard	Open	Pulpwood, raw ore	
HOUGHTON	Frost	Yes	ELS	Yes		20	Team Track	Open	Pulpwood	
IRON	Kelso	Yes	ELS	Yes		4	Team Track	Open	Pulpwood	
IRON	Mitchell Spur	Yes	ELS	Yes		(6)4	Team Track	Open	Pulpwood	
IRON	Triangle Spur	Yes	ELS	No		(23)12	Private Yard	Open	Pulpwood, lumber	
IRON	Park Siding	Yes	ELS	Yes		9	Team Track	Open	Pulpwood	
ONTONAGON	Pori	Yes	ELS	Yes		20	Team Track	Open	Pulpwood	
ONTONAGON	Rousseau	Yes	ELS	Yes		(10)8	Team Track	Open	Pulpwood	
ONTONAGON	Mass	Yes	ELS	Yes		(14)13	Team Track	Open	Pulpwood	
ONTONAGON	Ontonagon	Yes	ELS	Yes	removed	5	Team Track, Mill	Closed		

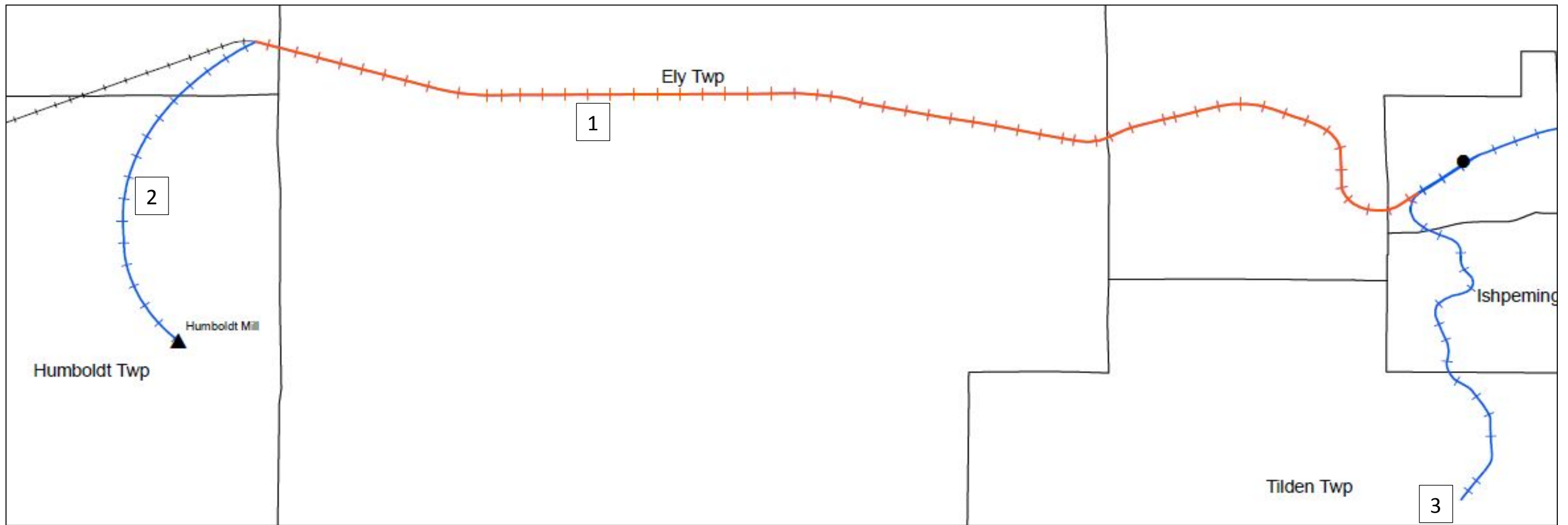


Figure 3: Mineral Range Railroad

Segment	Ownership Status	Length (miles)	Track Class	Speed Limit	Rail Weight	Weight Limit	Revision
1	Rail Line owned by LS&I RR to Mineral Range	12	FRA 1	10 mph	80# to 90#	263,000	
2	Rail Line to be restored by Mineral Range	2	FRA 1	10 mph	112#	263,000	
3	Pluto Sub to PVT industry owned	2.5	FRA 1	10 mph	112#	263,000	Pluto Sub PVT industry owned (From Winthrop Jct)

Appendix J – Responses for open ended questions

1. Other reasons for using/for not using rail.

For Using Rail

- Intermodal export shipments represent 50% of volume
- This is how we get our import containers from the west coast
- Long distance from customer 150 miles plus
- Most of our rail business is with Wisconsin Mills. The truck regulation difference between the two states is too great for profitability.
- We utilize rail for shipping petroleum
- Customer Request
- CN
- Customer Request

For Not Using Rail

- Customer driven
- Convenience
- Closed rail
- No contact from rail
- Low shipping volumes, Small Company, not enough volume to make rail feasible. Shipping time critical
- Too small- Less than truck load shipments
- Immediate delivery critical
- Portal to portal shipping
- Not near Depot, Low volume, not door-to-door
- No Rail Close enough
- No Option
- Opportunity, No contact
- No Rail
- Not Available
- Oversize Loads/Load Security
- We use UPS and LTL
- business model built around a very short cycle time from order to delivery to many states beyond MI
- Outgoing shipments are specified by customer
- No rail connection
- No local rail pickup service

- Not required, cost effective, or reasonable for our shipping needs.
- Not an option

2. If you don't use rail service for all your shipment requirements, please let us know why?

- We have no rail service in Ironwood.
- Transit times of boxcar shipments out of the U.P. and the path around Lake Michigan through Chicago is not efficient.
- No close loading sites.
- Unreliable car availability. Rarely do they arrive when promised. Rarely do you get the number you requested.
- Not all of our customers can unload intermodal equipment.
- Because by rail is expensive, distance plays a part. But most of all, we would never get enough cars to meet our demand. We can't get the amount we order now.
- Many of our shipments are "just in time" delivery with scheduled unloading times that rail cannot provide. The rail line is not very easy to work with compared to truck.
- Poor Equipment. Difficult to work with, Price, Just in time deliveries
- In closer distances to the customer once you put it on a truck to get it out of the woods we take it direct to eliminate the cost of double handling. Most of the wood we move on rail is pulpwood.
- Does not serve all markets. Less expensive to customer to use trucks. High valued logs spoil before rail could deliver to mill.
- Not available
- Speed of shipment, distance of shipment, price, and lack of appropriate infrastructure on receiving end.
- Lack of Sidings, equipment and lack of "I want your business" attitude
- I would like to use rail even more, if rail would go north or west out of Alpena.

3. Have you increased or decreased your rail usage in the past three years?

Decreased

- Lack of rail offered.
- Availability of Equipment
- Trouble getting rail cars
- No service on CN lines anymore (service discontinuation)
- Cost due to our location
- Less business with WI mills
- UPS/LTL used

Increased

- We had a logistics goal and an opportunity to use rail for one of our customers.
- Plant in Meridian, MS closed.
- Price of gas has drove truck prices up
- Change in customer base and customer requests.
- Business Growth
- Price
- Additional managed timber acreage
- Cost savings over truck freight

More or less constant

- Not available in our area, or if available not of use for the quantities we handle.
- We average 800 rail cars per year consistently over the past years

4. What improvements would encourage you to ship more by rail?

- Ease of doing business.
- Improved service to Munising, lower cost.
- Reliability, consistency as far as cars showing up when promised. More car availability.
- Access to rail; improved demurrage.
- The awful service from Canadian National needs to be fixed. CN keeps charging us for railcar THEY lost in transit.
- More direct service/increased frequency
- Already using rail
- Cost, equipment and service.
- More cost efficient than truck
- Minimize costs of Institutional barriers, (Multiple line hauls), long term Pricing contracts with reasonable increases and more certainty.
- Transparent pricing, actual delivery of cars requested and promised by railroad, consistency of service delivering cars, realistic demurrage period
- Access to new markets
- Car availability - Better service, shorter transit times
- Competitive rates and reliable service
- Improved quote times, improved infrastructure.
- Cheaper and car availability would help
- Write a contract and have it be a highest bidder.
- Rail service is ok except for the out-of-control rates charged primarily by the CN.
- Service and frequency needs to be better. Communication Turnover on crews

- More road projects and more cities accessible by rail.
- Dealing with the railroad is difficult. CN is not helpful. If a Boxcar is delivered damaged, CN says either use damaged car or wait two weeks. CN is the only game in town and therefore can be arrogant. Car delivered is given 24 hours to load, then demurrage. Tough luck if car delivered late to mill.
- Given the profit margin, rail can be viable. Mother Nature makes life interesting in the woods though; the distant mill has to really compete hard to make the difficulty of rail transportation being viable. Bottom line is; if the distant mill pays enough, rigid rail schedules can be tolerated.
- Increase capacity, Operational issues between ELS and CN.
- Not a practical option give our clients business model
- Basically something similar to the old Railway Express Agency
- More rail cars for pulp. If was cheaper than trucking.
- Rail freight would not be an option for our products
- If we had more information on logistics, cost, etc.
- Local pickup.
- Having it as an actual option
- Duplication or improvement of current process. Just don't know % of increase.
- Would have to arrive from east coast vendors within two days consistently. No damage allowed. Rail spur would need to be adjacent to our property. Many issues to resolve....
- Rail is not a feasible option, as our shipments deliver primarily to job sites around the country. Our product is very delicate and we would not want our freight transferred on and off of rail cars en route to the final destination.
- Cost savings
- Wood utilization facilities that are currently being serviced. Rail loading facilities that have been shut down that have the potential to restart
- We would like to see improvements and additions to our rail in northern Michigan
- Would like the railroad to be fair. Deliver cars as scheduled. Deliver cars on Saturday when not working. Advance notice for car order: 10 days Tuesday of week before. Non delivery of cars not always. Some of the cars get in bad shape. Straighten doors to open. Wrap cargo in plastic to protect it from elements. 1 of every 50 cars is in bad shape. Problem usually in doors

5. What would have to happen in order for your company to start shipping by rail?

- I would need to learn how to do it, what it entails, what are benefits verse LTL and current FTL shipment
- New tracks to facility/area.
- Not worth time and effort; low volumes and shipments; \$\$\$
- Not possible, need immediate pick up
- Need to be larger and more far reaching business. Mostly local area now.
- Gap between locations to shipping point. Make it as faster as truck and cost. Outbound less than truck load
- How do you use rail when most remote CN lines are out of service (White pine, Wakefield, Bergland, Goodman to Rhinelander, WI
- Get bigger shipments or make working with rail road for less than car load practical
- Ease of loading boxcar, Close to our facility & must be cost effective
- Need service
- Use of a track mobile, currently have issues using containers since the product doesn't fit in "box", could prefer to use piggyback (TOFC). There are issues with CN service; too long between visits and they are protective of crews. CN doesn't communicate well. Issues with backhaul movements.
- More service/cost comparable
- Wouldn't. Traveled from trainload
- Product size, cost competitive, timely
- Ease of Trucking, Small shipper headache. Maybe if easier and competitive.
- It is not appropriate for the hospital
- Inbound Frt. Only
- No rail currently
- Intermodal service
- Customers dictate
- Talk to rail company, check costs, equipment avail, logistics
- More convenient cost Time to deliver sometimes
- More cars on a regular basis.
- More volume; we are a small operation.
- Rail yards close to mill availability from job sites to loading yard
- We are no longer set up for rail service. Though we did have rail service years ago, the rails have been removed and it is no longer a possibility.
- Better communication
- cost effectiveness

- We want to have a rail spur to our facility.
- Costs, If on rail spur, we could use rail
- Rail sidings closer to job site
- Rail is not available all the time. Need more contracts
- This business is inconsistent in material used and parts produced. Yet our niche is quickly satisfying our customer's needs, sometimes in less than 24 hours. We also have a plant near by which manufactured Biodiesel. Biodiesel and rail would have been a good fit. This location could be used for fuel blending and distribution, if there is interest.
- The price must be right. We have taken some measurements to check container shipment but have not yet followed through.
- Easy access to cars
- We have no rail

6. Do you expect to increase or decrease your rail usage in the next three years?

Decrease

- Cars appear to be in short supply and service is a constant issue.
- Plant in Meridian, MS re-opening
- Location for markets is not advantageous for rail

Increase

- Price of gas has drove truck prices up
- Business Growth
- We will be installing another center beam siding due to increased mill productions
- Personal preference - less overall impact
- Looking to load 60' boxcars with finished goods to ship to the east coast
- Hope to expand the area we procure wood products from, using rail as a tool. If rates are acceptable.
- Cost savings over truck freight

More or less constant

- Without change in service quality, no reason to change
- Does not meet our needs
- Track constants - equipment availability would prevent this. We do not have enough track space.
- Don't have opportunity to use.
- Service issues and rates have been a problem
- If WI mills make an offer for our wood that is more profitable, we will increase rail business.

7. Specific suggestions for rail service

Rail users

- I don't deal directly with the rail; however I have heard the stories from customers and co-workers about how difficult and frustrating it can be.
- Demurrage is a problem when railcars are dropped off on the weekend.
- WE DO NOT SHIP BY RAIL OUT OF L'ANSE BECAUSE THE CN SERVICE IS SO AWFUL. Better service is needed Customer cannot talk to train master. We need to talk locally. Communication is awful
- Equipment available.
- Pricing Improvements, Reasonable Lease rates for siding usage, communicate with shippers well in advance for closures and abandonments.
- Actually ask the customer how they can help improve their service, better communications, publish real time delivery schedules so a person can plan shipments. Stop diverting cars once they are promised to customer. Extend demurrage period beyond current midnight to midnight (24 hours) to include at least 2 full business days to load and release cars, OR have Railroad give FIRM arrival time for spotting cars at least 24 hours in advance.
- Increase frequency and reach - easier processes for doing business
- Not at this time
- Reliable car order information consistency
- Respond to potential customers needs
- More cars. Quicker delivery
- Future RR development
- More reasonable rates.
- More accurate billing and car tracking
- on site CN staff helpful, problem is with CN booking agent located in Wisconsin

Non-rail users

- Improve the total rail system in the Upper Michigan Region. Current conditions of rail system do not allow for all types of cargo.
- Having rail options in our part of the Upper Michigan could very well help this company stay in business much longer. Our freight cost puts us out of reach for a lot of companies using the product we produce simply because once we add our freight cost we are no longer competitive
- The ease of doing business as indicated by performance measures. Pick up and receiving at door
- Better customer service arranging delivery times to avoid demurrage charges

8. Comments or information that could assist in improving the rail utilization in your region.

Rail users

- Getting trucks is sometimes troublesome; finding flatbed difficult in this area
- A sufficient number of rail cars for service provided

Non-rail users

- It would be cool to see them coming through, but no need at this time
- Needs to be time competitive with truck. Might work on In-bound
- CN needs to relocate their lines in WI and U.P. to provide better service and accessibility. Without rail service these areas are not going to improve in shipping commodities. Intermodal service should be closer to us. A deep water port in Escanaba would be a huge boost to the current business environment.
- Match Truck Frequency
- We as a corporation would utilize rail as main option if service was comparable and cost competitiveness.
- Cost comparison of rail Vs struck shipping time comparisons
- Better service, door to door or at least pickup
- Faster, more dependable service needed - time critical because of wood mold and rot between cutting and staining
- More utilization Convenient Access
- The main problem is location of loading site.
- We don't know about rail service so they need to be advertised more
- Move rail trainload closer to Baraga; it might open up new markets.
- Rail facility in L'Anse?
- Side tracks
- We need rail for this area bad, seen the condition of our roads