MULTIMODAL MAIN CASE STUDY

QUESTIONS

1) After analyzing multimodal typology, please identify here pro and con to develop an intermodal terminal and answer following questions.

2) It will be welcome to develop a matrix model about inland intermodal terminal showing criteria you already weighed through a check list.

3) Create a general matrix dedicated to inland intermodal terminals

This study examines the potential for an intermodal freight terminal in the metropolitan area of Duluth, MN and Superior, WI (Twin Ports). Geographic regions in the US and Canada are assessed for potential intermodal cargo. Operating intermodal terminals in comparable metropolitan areas are examined and key success factors derived. Major shippers in the region are surveyed to determine freight volume, transportation requirements, and destinations of inbound and outbound freight. Intermodal Marketing Companies and other third party providers are surveyed to determine their requirements for an intermodal freight terminal. Freight flow data between sixty-six Business Economic Areas (BEAs) and the Twin Ports was analyzed for freight volume by mode, destinations, lanes and load balance. The establishment of a Roll-On/Roll-Off (RO/RO) marine service with Thunder Bay, Ontario, Canada is examined as a feeder for an intermodal terminal. Operating rail yards in the Twin Ports are cataloged and evaluated as potential intermodal terminals. An overall determination of the Twin Port's suitability as an intermodal terminal is presented along with recommendations for implementation.

This section focused on intermodal freight terminals in communities that had similar attributes to the Twin Ports. The research team looked for intermodal freight facilities in communities with comparable population demographics, industries, products shipped, and geographic proximity to class one rail carriers. The team benchmarked successful terminals and one failed terminal. The successful terminals analyzed were: Neenah, WI; Green Bay, WI; Auburn, ME; and Mobile, AL. Thief River Falls, MN was the terminal that had failed.

1) Small intermodal freight terminals can be successful. Several successful small terminals were identified and their characteristics documented.
2) Successful intermodal freight terminals located in metropolitan areas the size of the Twin Ports are usually responding primarily, but not exclusively, to the requirements of shippers of manufactured goods and raw materials rather than receivers of consumer items.
3) An intermodal freight terminal in a similar metropolitan area is operational with lifts of approximately 40-80 lifts per day five days a week or a threshold of 12,000 to 24,000 lifts per year.
4) The Twin Ports has excellent access to at least one Class 1 railroad intermodal network, which is a critical factor for successful terminal operation.
5) A viable small intermodal freight terminal will require shippers to commit cargo in the start up phase if it is to attract commitments from investors and carriers.

6) Railroads have typically outsourced terminal operations to third party contractors.
7) Low cost operations are essential to success. Many terminals in small to medium communities are co-located with other rail carload operations and often employ equipment or machines retired from other locations in the rail network.
8) In this study, the average terminal varies from six and twelve acres. It also needs to be able to load and stage three days worth of lift activity. Long run terminal viability in a growing market may depend upon additional acreage for expansion.
9) The advantage that a smaller terminal can offer in small to medium metropolitan areas is tailoring their operations and service features to meet the needs of local customers. The more service oriented a terminal can be to the local and regional customers the higher the probability for success.
10) Collaborative business relationships among railroads, drayage carriers, terminal operators, Intermodal Marketing Companies, shippers, and receivers appear to be a catalyst of initial success in intermodal freight terminal operations.
11) The Fort Smith, AK and Port of Montana Terminals are significant to the project because they offer alternatives to the typical intermodal freight terminal.

Cargo data was divided into three Tiers representing the most intermodally compatible (containerizable) cargoes to the least intermodally compatible cargoes. Two caveats should be addressed regarding the survey. First, this survey captured data for calendar year 200x, thus providing a baseline for freight volume but only over one year. The survey did not capture all of the cargo movements in the region.
According to the Intermodal Association of North America (IANA) the Intermodal Marketing Companies (IMCs) account for up to 75% of the intermodal business on most lanes.

Key Findings from the Shippers' Survey
1) Intermodal rail service was used in the Twin Ports in 200x. The shipments enter the intermodal rail network via distant terminals with long highway drayage movements to pick up and deliver the shipments.
2) Approximately 66% of 200x total intermodal shipments were made by the paper and pulp products industry. The Twin Ports based paper and pulp industry is the largest current user of intermodal service, while sub-assemblies, consumer products and agricultural products also use intermodal transportation services.
3) The companies who were surveyed shipped approximately 3,100 forty-foot equivalent (FEU) containers and over 600 48-foot containers during 200x.
4) The survey found that regional agricultural producers were shipping cargo intermodally and studies have indicated that there is an increase in the use of containers by the agricultural and ferrous industries.
5) The total aggregate intermodally compatible cargo (TEUs) that was listed by shippers in the survey was sufficient both inbound and outbound for load balance during 200x.
6) The Shippers' Survey found the commodity groups that expressed the highest interest in using an intermodal service were paper and pulp, wood products, consumer products, sub assemblies and agriculture.
7) The Survey found that a significant volume of wood products, paper and pulp products are shipped into the Twin Ports by vessel and then transloaded into truck and rail cars. These marine transported cargoes would benefit from an intermodal system that would lower their landed cost at the final destination.
8) The survey found that there was more outbound than inbound cargo, which is

reflective of a production area.
9) The survey found that shippers wanted to have an intermodal freight terminal that operates at least Monday thru Friday with gates open 6 a.m. to 7 p.m. for unloading and loading.
10) For both inbound and outbound shippers the average highest rated requirements are, in order of preference, final customer satisfaction, reliability of service, transportation cost, and ease of doing business.
11) The shippers' survey indicated that over 25,000 TEUs of intermodally compatible cargo are shipped overseas through five principal gateways, not including the St. Lawrence Seaway. These gateways in order of rank are: Vancouver, Canada, Mobile, AL, Seattle, WA/Portland, OR,Houston, TX and Norfolk, VA.
12) The majority of the shippers foresee an increase in business along with an increase of inbound and outbound shipments. Paper and pulp shippers are forecasting a decrease in exports to foreign markets.

Key Findings from the Intermodal Marketing Company Survey
1) Intermediaries identified the three most critical factors for a successful service offering as: competitive rates, a steady source of empty equipment, and consistent, reliable service.
2) Intermediaries feel that railroad support is necessary to launch any new intermodal facility.
3) Equipment balance is absolutely necessary to establish and sustain any new service.
4) Intermediaries prefer to sell intermodal services to shippers who are familiar with intermodal services. An intermodal service offered in the Twin Ports area may be received more positively.
5) Intermediaries see much of the potential Twin Ports inbound and outbound freight moving over a Chicago railroad gateway, therefore the rail rate between the Twin Ports and Chicago must be competitive in the short haul portion of the movement.
6) Several respondents suggested a paper ramp as a preliminary effort to test the market.
7) Intermediary sales professionals see more sales opportunities for 40' containers out of the Twin Ports than for 53' containers due to the current rate structure for this type of equipment.
8) Drayage operators favor shorter drayage length of assignments of 60 miles or less.
9) Intermediaries currently have a low market presence in the Twin Ports. They cite: increased rail rates and corporate relocations as the reason for their decline in activity.
10) Steamship companies were concerned if sufficient volume exists to warrant the establishment of a chassis pool to support the local business.

Data Analysis
The data on truck and rail movements for the calendar year 200x was collected and analyzed focusing on three goals. The first goal was to determine the volume of freight that moved in and out of the Twin Ports from 66 select Business Economic Areas (BEAs) in the United States and in Canada.
One of the findings of this study is that virtually all cargoes can and do move intermodally. A common assumption is that commodities such as ore, grain, and coal do not move in intermodal containers. The research team found examples of these three products moving intermodally in Canada, Australia, and the US. In the Shippers' Survey agriculture and ferrous metals groups expressed an above average interest in moving

products intermodally and agriculture was already using intermodal movements. The Reebie data found that all product groups moved in and out of the Twin Ports by truck and could move intermodally.

Key Findings

1) There is a significant amount of freight moving in and out of the Twin Ports area. The aggregate quantity is equivalent to 3.4 TEUs per person annually for the truckload cargo.
2) Over 860,000 TEUs moved in and out of the Twin Ports by truck during 200x.
3) All products listed are turcked in and out of the Twin Ports providing the potential for these products to move intermodally.
4) The Reebie data did not capture all cargo movements in the catchment area.
5) Reebie was unable to provide data on cargo moving inbound to Canadian cities.
6) Based on the aggregate of Tier 1 cargoes moving between all origin and destination points examined, findings indicate that there is sufficient cargo to sustain an intermodal terminal.
7) There are sufficient Tier 1 lifts to establish a short haul intermodal service to the Minneapolis and Saint Paul, MN (Twin Cities) and Chicago.
8) With the exception of a Twin Cities – Twin Ports short haul intermodal link, there is no single origin/destination pair that would sustain an intermodal terminal at an 11% conversion rate of only Tier 1 cargoes. Chicago short haul traffic would be self-sustained as an intermediate point in the network.
9) A route structure that connects the Twin Ports to the Chicago Intermodal hub via Class 1 railroads would create sufficient volume to support a terminal.
10) The Shippers' Survey of the Paper and Pulp industry provides an example of underreporting of Research data. The only absolute method of determining actual volume will be the quantities revealed in confidential commercial freight negotiations.
11) Factors that may increase lifts in a Twin Ports terminal include:
a. Conversion of carload to intermodal
b. Select shippers committing to more than 11% conversion rates
c. Increase in marine break bulk cargoes entering the port
d. Conversion of Tier 2 and 3 cargoes to intermodal

Potential Marine Intermodal Service

The marine service envisioned proposes a vessel that is able to have trailers, chassis, containers, or automobiles rolled on and rolled off (RO/RO). The RO/RO vessel would reestablish a marine link between Thunder Bay, Ontario, Canada and the Twin Ports. A seasonally abbreviated RO/RO service with the *SS Badger* operates on Lake Michigan currently. Previously, the two ports maintained a RO/RO service for two decades with the vessel *M/V Incan Superior.* This vessel carried an average of 26 rail cars per trip or the equivalent of 70-80 truck loads.
Both domestic and foreign vessel selection was assessed considering cost factors as well as service characteristics. Terminals for the RO/RO service will rely in part on accessibility by road, or where available, rail service to the intermodal freight terminal. Potential RO/RO docks were studied and assessed.

Key Findings:

1) There are no physical constraints that would prevent the operation of a RO/RO marine vessel between the Twin Ports and Thunder Bay.

2) While ice may restrict operations for limited periods, research shows that prior operations along this route overcame that issue and comparable service in the Baltic and North Sea are able to deal with similar ice conditions.
3) One of the most important conclusions is the fact that this service may represent the base load volume for this intermodal terminal.
4) This service would provide another alternative route to US Highway 61.
5) Vessel selection will be driven by cost factors as well as service characteristics. There is the potential to consider using a vessel that is registered in a country other than the US or Canada.
6) Employing US or Canadian mariners on a vessel registered in a foreign country would lower pilotage costs.
7) The Harbor Maintenance tax burden on a vessel operating on this bi-national short service needs to be adjusted to reflect the reality of the route structure.
8) Although not examined in depth by this research, passenger traffic also demonstrates significant revenue streams.
9) There are suitable docks available for RO/RO operations located in both Minnesota and Wisconsin.
10) The lack of Reebie data available on inbound cargo flows to Thunder Bay, Ontario, Canada from BEAs limited the research teams' assessment of the volume of freight available for a RO/RO service.

3.6. Twin Ports Intermodal Freight Terminal

One of the base assumptions was that the probable low cargo levels at the start up stage would mean that a low cost terminal would have a higher probability of success.
There are five railroads that serve the Twin Ports market. These include the Burlington Northern Santa Fe (BNSF), Canadian National (CN), Duluth Messabi and Iron Range Railway (DM&IR), Canadian Pacific (CP), and Union Pacific (UP). These railroads collectively operate ten rail yards in the Twin Ports area.

Key Findings

1) In the Twin Ports there are several operating rail yards that, with minor conversion can be used as an intermodal freight terminal.
2) The recommended terminals have all the minimum characteristics required for successful intermodal freight terminals.
3) At least two of the recommended terminals are directly on the route of an existing Class 1 railroad intermodal freight service, (CN's service to and from Winnipeg, Manitoba to Chicago, IL). This train also stops in the Twin Ports for crew changes.
4) A terminal in the Twin Ports could serve customers of any of the four Class 1 railroads that have operations in the Twin Ports.
5) The selected terminals have adjacent space to expand and develop distribution centers or other related services.
6) Railroads view the development of an intermodal terminal as a core function shared jointly by the marketing and operating departments.
7) The top four terminals based on the evaluation criteria and listed in order of preference are as follows.

Rail Yard Owner-Operator

1. Pokegama Yard Canadian National
2. Steelton Yard Duluth Mesabi and Iron Range
3. Proctor Yard Duluth Mesabi and Iron Range
4. 17th and 28th Street Yards Burlington Northern and Santa Fe

MAIN QUESTION

Problem Statement

The metropolitan area composed of Superior, WI, Duluth, MN, and nearby cities and counties has an approximate population base of 245,000. The two major cities, nicknamed the Twin Ports, work closely together and for federal transportation planning purposes have one bi-state metropolitan planning organization, the MIC, that covers a portion of the geographic region of the Duluth/Superior Statistical Metropolitan Area (SMA) (See Map 4.1, Appendix A). The Twin Ports have historically been a transportation hub that started as a marine port in the 1800s and expanded to include rail, highway, pipeline, and air service. At the present time the Twin Ports are served by approximately 35 trucking companies, five railroads, a national airline, general aviation service, major pipelines originating in Canadian oil fields, and are the busiest ports on the Great Lakes. The region has a shipyard, jet maintenance facilities, an airplane manufacturing plant, a number of truck repair facilities, and rail repair shops. Cargo shipped to other major metropolitan areas such as Chicago, IL; Minneapolis and St. Paul, MN; Milwaukee, WI; Winnipeg, Manitoba and Thunder Bay, Ontario are being trucked on increasingly congested highways. The lack of intermodal service limits options for companies located in the area and may place the region at an economic disadvantage when it comes to freight transportation. The Twin Ports appears to have significant cargo moving into and transiting the area because of the community's strategic location on I-35 corridor and the Falls to Falls Corridor on US Highway 53.

The recent Construction and Forecast of Freight Traffic Data for the Wisconsin State Rail Plan 2020 assessed the cargo potential of counties in Northwest Wisconsin without taking into consideration any cargo generated by Minnesota counties such as Lake, Itasca, or Carlton. The study also did not consider Canadian cargo that naturally flowed into the Twin Ports transportation hub. There surfaced a clear need to study these data and shipper needs on a bi-state and bi-national basis with an emphasis on the movement of traffic along lanes that would be conducive to intermodal shipping.

Intermodal (Multimodal) freight operations offer an alternative to single mode carriage. True intermodal operations have a sealed container or truck trailer that is mechanically moved between modes in a seamless fashion (Muller 1999). The information on the shipment is as critical as the cargo and should also move in a seamless manner ahead of the cargo movement. The Twin Ports have some of the world's most efficient bulk intermodal operations for transferring cargo from rail to ship or truck but has no intermodal terminals for the transfer of containers or trailers. An intermodal terminal will need to have equipment suitable for transferring the containers/trailers between modes. The oversight committee requested that this study focus on the potential of establishing a terminal with scheduled service vs. a ramp that may transfer intermodal equipment without offering scheduled service. This study focused on intermodal operations using containers and trailers that are transferred between rail, truck, and marine carriers with scheduled service. Railroads prefer long haul intermodal routes with a minimum of stops in order to minimize the end-to-end transit time. The distance that defines long haul varies with the railroad and its geographic service area. East coast railroads have considered short haul as less than 500 miles while railroads that service the west coast have considered under 700 miles or even 1,000 miles as short haul routes. For the purpose of this project the research team defined short haul as less than 700 miles between terminals. A number of class 1

railroads, railroads with national service, have successful short haul intermodal routes as well as long haul intermodal routes. Length of haul is not an indicator of quality of service. Wisconsin Central Railroad which was acquired by Canadian National Railroad (CN) in 2001, had for many years a highly regarded reputation for excellence in intermodal service and did not have a single intermodal route over 700 miles in length.

The intermodal terminals in the Twin Cities are limited in their growth potential (MIRTS 1996). The drayage distance to the St. Paul terminals for communities to the west, east, and north of the Twin Ports can be a distance of up to 350 miles (See Figure 4.1 in this section). The geographic area that could be served by an intermodal terminal in the Twin Ports is substantial in geographic scope with a number of large production facilities in the region.

Freight that originates in Thunder Bay, Ontario, Canada and moves to Chicago or other regions in the US must travel through the Twin Ports on either a two lane scenic highway or via a rail route that doubles the actual distance between the two cities (See Map 8.1 in Appendix A). Prior studies of this route address the environmental consequences of mode selection but do not address the potential for intermodal operations, (MDOT 1991). This study will examine what appears to be an opportunity to transfer a portion of the cargo that moves along the Hwy 61 and rail route to a marine intermodal system.

Several fundamental studies were undertaken in order to start the process of assessing the viability of establishing an intermodal terminal in the Twin Ports.

1. A determination of the geographic region that cargo for a Twin Ports terminal would originate from.
2. An analysis of existing potential low cost rail intermodal terminal locations was completed and an inventory compiled.
3. An analysis using a Shippers' Survey was completed to help determine the geographical regions that would benefit from establishing an intermodal terminal in the Twin Ports.
4. Data on cargo that is suitable for intermodal transport needs and shipping requirements of companies were collected from the Shippers' and analyzed.
5. An analysis of marine service options to and from Thunder Bay, Ontario and marine facilities that might provide an additional flow of cargo in and out the rail terminal was completed.
6. An assessment of the Twin Ports' rail yards and their potential as intermodal terminals.

The Geographic Region Served by a Twin Ports Intermodal Terminal

Historically the Twin Ports has been a transportation hub for an extensive geographic region. The primary roads in the region are: I-35, US Highways 2 and 53. Additional Wisconsin and Minnesota highways also converge on the region. Rail service is extensive with ten rail yards within a 15-mile radius. The pattern of the principal roads and rail lines flow traffic to the Twin Ports from an area extending out several hundred miles. Consumers and products in those areas are faced with limited options for the transportation of freight. In some cases the only option is trucking on a two-lane highway. The distance that shippers in the region would have to travel to the St. Paul terminal in comparison to a terminal located in the Twin Ports is represented as follows:

Approximate Highway Drayage Distances to Intermodal Terminals

Existing Twin Cities Terminal Potential Twin Ports Terminal

Twin Ports 147 Miles 0-5 Miles

Cloquet, MN 137 Miles 20 Miles

Grand Rapids, MN 175 Miles 81 Miles

Bemidji, MN 221 Miles 150 Miles
Hibbing, MN 189 Miles 76 Miles
International Falls, MN 289 Miles 163 Miles
Ashland, WI 197 Miles 71 Miles
Hayward, WI 139 Miles 76 Miles
Thief River Falls, MN 242 Miles 300 Miles
Ironwood, MI 230 Miles 106 Miles
Thunder Bay, Ontario 354 Miles 200 Miles
Figure 4.1: Approximate Highway Drayage Distances to Intermodal Terminals: Source State and Provincial official highway maps.

Determining Twin Ports' Catchment Areas
One of the most important issues for the establishment of any transportation node is what geographic areas will generate cargo either inbound or outbound for the terminal. The volume and type of cargo generated in this area, referred to as a hinterland or catchment, will be a key element in determining the viability of a transportation node. A catchment area for an intermodal terminal defines its competitive geographic reach given typical rail and motor carrier competition. In other words, it is the area surrounding the terminal where shippers located there would elect to use that intermodal terminal to start or end the intermodal movement of their freight. Assuming a hypothetical terminal in the Twin Ports, catchment areas may be estimated by using the following process:
Step 1: Identify the impact of motor carrier competition. It is difficult for intermodal freight transportation to be competitive if the load must move more than 10-15% of the highway distance in and out of route pattern. Circuitry tests for sample cities, Cloquet, MN, International Falls, MN, and Ashland, WI in the catchment area are found in Graphs 4.2, 4.3, and 4.4 in Appendix A. Each graph presents a comparison of service in Twin Cities terminals, with a proposed Canadian National (CN) Twin Ports Terminal. The graphs indicate which terminal would be competitive when rail or drayage movements are indirect compared to over-the-road truck movements. In the Ashland example, a Twin Ports option could be competitive to Philadelphia, PA and Atlanta, GA but would not be competitive to Los Angeles, CA, Dallas, TX, and Seattle, WA. Terminals in both regions could be competitive to Miami, FL**.** Also, if 15-25% of the total door-to-door miles are drayage miles attributable to that load, the load is typically not going to move intermodally. For instance, in a door-to- door 1,000 mile trip no more than 150-250 miles of the trip could be drayage for the intermodal move to be cost competitive. The rule of thumb implies that an intermodal load moving to a marine terminal in Vancouver, BC, Canada can afford to dray most of the way across Wisconsin to get onto the CN rail line at Superior. Conversely, a load moving to Chicago for interchange will need to be within 50-75 miles of the terminals and if possible, fall in route to be competitive. Drayage tests for sample cities Cloquet, MN, International Falls, MN, and Ashland, WI in the catchment area are found in Graphs 4.5, 4.6, and 4.7 in Appendix A. Each graph presents a comparison of service in Twin Cities' terminals, with a proposed Twin Ports terminal. The graphs indicate which terminal would be competitive when based on comparative drayage distance only. In the Ashland example, a Twin Ports terminal would be competitive with a Twin Cities terminal on all listed routes. Factors that may impact this rule of thumb are repositioning of empty equipment, load balancing, and route geography such as the necessity to move over congested urban highways or water barriers such as the Great Lakes.
Step 2: Identify similar existing intermodal terminals served by the same railroad.
In the case of a CN hypothetical terminal in the Twin Ports, this would include Green Bay,

WI, Neenah, WI, and Winnipeg, Manitoba. From a carrier's perspective, every enroute stop along the way contributes to end-to-end network transit time. Too many stops for incremental freight have a negative impact on the total network transit time. A balance between drayage, market density, and train economics must be established. In rural areas, terminals are typically 250 miles or more apart.

Step 3: Identify existing, potentially competing intermodal terminals. This may include Canadian Pacific (CP) terminals in Milwaukee, WI, Minneapolis, Dryden and Thunder Bay, Ontairo as well as Burlington Northern Santa Fe's (BNSF) terminals in St. Paul and Dilworth, MN. The Iowa Minnesota Rail Link (IMRL) terminal is co-located with CP in Minneapolis and provides potentially competitive services to the west.

Step 4: Identify the hypothetica Twin Ports terminal's geographic scope within the CN system. A CN terminal in the Twin Ports must fit within a CN system. A judgment must be made regarding a Shippers' preference regarding cargo movements among CN terminals.

Step 5: Identify the hypothetical Twin Ports terminal's geographic scope relative to competing intermodal facilities. For example, CN's primary service capability for westbound cargo will be in Vancouver, British Columbia. This is the same geographical area as served by Canadian Pacific (CP). It should be anticipated that primary CP competition for a Twin Ports terminal operated by a competing class I carrier such as CN would come from CP's terminals in Minneapolis and Thunder Bay. The catchment area for the Twin Ports terminal would be small when serving shippers who are moving cargo to and from destinations served by both CN and CP. The Twin Ports catchment area would be larger for shippers going to destinations uniquely served by CN or partner railroads. Numerous other factors might play a decisive part in the actual decision process. Intermodal motor carrier balance concerns are always critical, particularly when drayage distances increase beyond the commercial zone. Other examples might be poor service or high rates by CP in Minneapolis, which could move traffic in marginal areas to CN and vice versa.

The remaining geography after all these deductions are made is the catchment area for the particular origin and destination (O-D) pair and rail terminal. An estimated catchment area for the Twin Ports when servicing a hypothetical CN Intermodal Terminal is geographically represented in Map 4.8, Appendix A.

Freight balance allows for a more efficient drayage component. The more balanced the freight movements are (load/load matches) the longer the drayage portion can be, or the greater percentage of drayage that can be tolerated without impacting profitability. If a market is imbalanced, drayage becomes a more important component of the service. For distant drays over 50 miles, trailer/container pools or drop lots with equipment per diem relief may be helpful in developing the market. In the early months of operation, equipment relief or empty repositioning services may be necessary to launch a successful program.

Comments on Potential Intermodal Movements from Ocean Going Vessels

Most cargo that is moved intermodally is part of a system that transports cargo twelve months a year. The closure of the locks for three months adversely impacts the timeline for intermodal cargo movements by requiring a buffer stock. Buffer stocks incur storage, interest and other inventory costs. The Twin Ports, along with other Great Lakes ports, have experimented with the concept of bringing in containers by ocean vessel but have found that shippers preferred the shorter timeline of rail - truck intermodal movements from the ocean ports for containerized cargo.

A viable intermodal terminal would provide another option for the movement of an

ocean going vessels' cargo to markets greater than 700 miles from the Twin Ports. An intermodal system that lowered total costs could provide an incentive to increase the flow of marine cargo into the Twin Ports. Marine cargos that are break-bulk and neo-bulk should not be discounted and merit further study.

Case Studies of Comparable Intermodal Terminals

Background and Prerequisites

One of the areas of inquiry in this study has been to examine intermodal activity in other metropolitan areas to understand the factors that may lead to a successful intermodal development in Duluth-Superior. This specific analysis assists in understanding the commercial and operational prerequisites for successful intermodal terminal operations.

Commercial Prerequisites for Success: The markets that successfully support intermodal terminal services are those that involve significant movements of containers. These typically include:

- **A Large International Container Port:** These facilities tend to concentrate long distance container flow conducive to intermodal rail services or feeder ships and have a threshold volume over 250,000 TEUs per year.
- **Large metropolitan area:** Almost every metropolitan area with a population over 1 million persons has intermodal rail service. They represent large concentrations of demand for high value consumer goods moving in containers.
- **An area of concentrated production:** Terminals also exist to serve production oriented markets. These facilities can be located in rural areas if the production facility generates sufficient intermodal cargo.

The Twin Ports is not a large metropolitan area. While this is the busiest port on the Great Lakes, it is not a container port. However, the Twin ports is home to a significant number of manufacturers and an intermodal terminal facility will likely be based on regional production activities.

Production driven intermodal terminal key components

Proximity to the Class 1 North American Intermodal Railway Network: In the Twin Ports, CP, BNSF, CN, and Union Pacific (UP), provide carload service. It is important to note here that any intermodal service provided by CP, BNSF, or UP would require an extension of their intermodal service networks while the CN intermodal service network already passes through Duluth-Superior (See Maps 5.2, 5.3, 5.4, & 5.5 in Appendix A). This implies that the volume of intermodal cargo needed to economically justify a new terminal (the threshold volume) will be higher for CP, UP, and BNSF than it will be for CN.

Access to a network is important since network economies and efficiencies are vital prerequisites for the success of intermodal services. For example, the network will generate empty equipment and access to national and global markets for Duluth/Superior raw materials as well as deliver inbound products. In addition network density will drive the frequency of train service and a richer cluster of desirable freight destinations.

Proximity to a source of empty equipment: A key issue for production oriented intermodal facilities geared to shipping outbound production intermodally is the source of empty equipment. Where the predominant intermodal container direction is outbound, identifying a commercially viable source of empty equipment is a mandatory prerequisite for successful development.

Public Support: Often, public support has been obtained for development of these facilities. Public motivation often comes from the goal of making goods produced in the area competitive over a wider territory. Intermodal terminals generate jobs in a variety of

ways. Some jobs are highly paid lift operators, some are clerical in nature, and many are generated by the demand for cartage between the terminal and the actual shippers and consumers of the goods. Clean air and reduced highway traffic are additional public motivators. Opponents to intermodal terminal development often note increased truck trips to and from a specific intermodal terminal and noise.

Prerequisites Associated with key Technical Terminal Features

The following information is provided as an aid for intermodal terminal planning at the preliminary, conceptual stage. The guidelines presented are based on industry norms and are general in nature. The fact that makes this analysis reliable is that intermodal terminals in North America are similar enough that practical guidelines for development of new facilities can be determined by observation of existing operations. Practical exceptions abound, but can generally be understood in terms of unique, case specific factors that should be incorporated in planning when they are identified.

The planning tools have been used and refined over the past decade as The Tioga Group has performed capacity and benchmarking studies for Class 1 railroads and the American Association of Railroads (AAR). The AAR published some of the results in 1993. The Eno Foundation published an additional set of findings in 1999.

Metrics used for Determining Intermodal Terminal Services

Lifts - Production at intermodal terminals is most commonly measured in lifts. A lift is the transfer of a trailer or container from a rail car to the ground or from the ground to rail car.

The daily cycle - Terminals typically strive to match shipper practices. For most facilities this means handling inbound trains in the morning and outbound traffic in the afternoon or evening.

The weekly cycle - Most customers ship five or six days per week. Most intermodal terminals work six or seven days per week because trains move cargo seven days per week. This means that intermodal terminals handle most outbound traffic Monday through Friday, a small minority is handled Saturday, and an even smaller portion of the outbound is handled Sunday. Inbound traffic is very different in that it flows heavily into the terminal all weekend. Generally, it is unloaded throughout the weekend in order to make it available to customers, most of whom want the traffic Monday morning. The weekly cycle strongly influences the cutoff times, rail car, and trailer storage requirements.

Annual cycle - Intermodal service is generally used to replenish inventory. Intermodal monthly and seasonal activities are strongest during the last week of the month, the last month of the quarter, and the last quarter of the year. Demand for intermodal service increases sharply as the supply of over the road trucking capacity gets tighter during the peak produce season and during the end of the year retail ramp up. Intermodal terminal volumes mirror this end of week, end of month, end of quarter, end of year cycle. Relatively small seasonal peaks can occur in March and October and a significant low period can take place in late December and early January.

Intermodal Terminal Planning and Operations Guidelines

Loading Track Length - This is the track that is accessible to sideloaders or cranes. The planning factor that is recommended is 1,500 annual lifts per 100 ft of track. The guideline implies that there will be regular resets of the loading tracks, particularly on busy days. Most facilities do not achieve this level of use and have surplus capacity. Those that exceed this level of use, typically do so at a service penalty.

Rail Car Storage Requirement - The terminal must have enough tracks to handle inbound rail cars that are stored from Saturday, Sunday, and Monday dropoffs less

whatever outbound cars depart over the weekend. The guideline is two times the loading track and is based on the assumption that no cargo departs on Sunday and that Saturday's outbound traffic is half an average weekday's traffic.

Parking Requirement - The range for this guideline is relatively wide: 100-300 annual lifts per trailer parking spot. In making a planning estimate a judgment must be made regarding the operation and character of the traffic. On average, premium traffic is dropped off to make a same day train and is picked up by trucks within 24 hours of train arrival. Non–premium domestic intermodal traffic may dwell up to 48 hours after train arrival; international traffic may dwell as long as 5 days after train arrival. These times vary based on the equipment use fees and the terminal detention fees charged by the owners of the equipment and the terminal. Lower rated traffic tends to use the terminal as a "storage in transit facility". International traffic tends to move much more slowly than domestic.

Operational practices can also have an impact. Traffic moving coast to coast often gets handled in a gateway city (Chicago, St. Louis, Memphis, or New Orleans.) As this traffic can be interchanged on the weekend, terminals in these cities can handle relatively more throughput for a given number of parking spaces. Some terminals, such as Seattle Intermodal Gateway (SIG), can handle a very large throughput with very few parking places because they are very close/adjacent to large marine terminals that perform the container storage requirement.

Lifts Per Acre - The general guideline is 2000 lifts per acre per year. However, terminal operators tend to be very inconsistent in the manner in which they measure and report terminal acreage. 2000 lifts per acre is a relatively conservative guideline and particularly well-operated and designed facilities, serving premium traffic, on regular shaped land parcels can do much better.

Gate Transactions Per Lift - The planning assumption is 1.5 gate transactions per lift. Theoretically this number could be as low as one gate move per lift or as high as four. Exceptions might include terminals that are performing car-to-car transfers and facilities that are also serving as container yards. One move per lift is much more efficient than four and the draymen will be working to produce the most efficient case.

Train Service - Intermodal train service is most successful when implemented in a dedicated intermodal train network. Dedicated intermodal train service is defined as all the cars on the train carrying either containers or trailers, and the train moving between dedicated intermodal terminals where the primary function of the terminal is to facilitate modal transition between rail and highway. In other words, dedicated intermodal trains do not mix rail boxcar loads, which require further switching to access shippers or receiver. Frequency and reliability are important attributes named by nearly every user. In order for intermodal services to be a viable option for companies, many transportationpurchasing managers cite five days a week train service as a minimum service requirement.

Six days a week train starts help offset slower door-to-door transit times by increasing train frequency. Seven days a week train service is often necessary at high volume terminals to keep the ground operation fluid.

Unreliable train service will lead to increased inventories in order to ensure the necessary safety stock levels are maintained. Many shippers have customer contracts, which measure and provide incentives for on-time performance and penalize late deliveries. Just-In-Time inventory management has become the norm for high value shipments in the supply chain and is commonplace in the automotive and retail industries.

Intermodal service by definition includes delivering equipment to a shipper for loading, draying to a terminal, loading the equipment on the train, train line haul, unloading the

equipment and draying the shipment to the final customer. On shorter rail movements these steps can increase the door to door transit time when compared to an all truck movement. Typical on time intermodal performance expectations are 90-95% on time for inventory replenishment movements and 98%-99% on time for customer direct or store direct deliveries.

Gate Services - Intermediaries and logistics companies need interchange information at each modal transition. This is in part due to the equipment liability but also an important customer service function that allows the transportation arranger to set pick up and delivery appointments with reliability. Information about equipment numbers, in gate time, load to train, unload from train, out gate movement time and interchange carrier are important pieces of information in the supply chain.

Many large metropolitan areas offer 24-hour terminal access. This helps keep the terminal fluid and allows drayage companies to pick up and stage equipment for early deliveries or extended travel times to regional customer locations. Gate services that allow the truckers access to the terminal to accommodate early pick-ups and late drop-offs facilitate shipper acceptance of intermodal service.

Support Services - Maintenance and repair services are important complimentary services for any terminal. If the equipment is available at the terminal but cannot be moved on the highways then it cannot leave the terminal. Some terminals may offer on-site minor repair services that can repair flat tires and broken lights. Some terminals have mobile repair vehicles that can be called to provide on-site services.

Specialized Intermodal Rail Service - Specially designed intermodal operations such as Rail Runner, Road Railer or Triple Crown use truck bodies and detachable bogey wheels. All of the systems are created to provide users with the versatility of trucking and reduce the cost of rail cars. This use of specialized equipment is best suited for committed customers who have distribution centers and the probability of backhaul cargo. The service has a limited customer base due to higher equipment costs and the need to track the boogey wheels. Rail Runner provided the research team with a business proposal for two short haul services connecting the Twin Ports to the Twin Cities and Chicago. Their unverified cost savings on the Twin Ports - Chicago route compared to trucking rates were in excess of 30%. A photo of the rail runner system can be found in (Photo 5.4, Appendix C).

Terminal Case Studies Relevant to the Twin Ports

In determining the feasibility of an intermodal service in the Twin Ports, other terminals were visited to catalogue key features and facility design elements. The research examined factors such as: physical terminal size and layout, size of community, commodities shipped, labor, support and services offered, seasonal volumes and railroad ownership. With these factors in mind we focused on five terminals. Neenah, WI and Green Bay, WI were two terminals in the state of Wisconsin, which were formerly owned by Wisconsin Central (WC), but now by CN, and had similar characteristics to the Twin Ports. Both Neenah and Green Bay are communities smaller than the Twin Ports and Green Bay has a port on Lake Michigan. Next we evaluated in Auburn, ME, another terminal that had similar characteristics to the Twin Ports and a unique public funding feature.

Butte, MT is an example of an inland port where multiple freight transload activities all located in one area help justify one another by sharing the cost of administration and overhead. Butte also benefited from public investment to launch the program yet failed. Mobile, AL is another port facility and is a terminal at the end of a train service network with on dock rail offerings. Fort Smith, AR is an “intermodal outreach” terminal, which has no tracks in Fort Smith, but provides a terminal linked by

truck to a high volume, high frequency Dallas Fort Worth, UP terminal. Butte, MT is located in a small to medium size metropolitan area with access to two rail carriers on public property. Thief River Falls is a terminal that is currently closed and that research provided information on the factors that cause terminal closure. (For a location of all terminals visited see Map 5.6, Appendix A). An interview document was designed to capture both physical and operational information about each facility. Operational data collected from the terminals was tabulated and compared (See Figure 5.7, Appendix A). Most of these facilities share the following attributes. Shipping instructions are sent electronically to the rail carrier's central customer service location. At the terminal, equipment condition inspections are still conducted manually with results recorded on paper. Customers can track and trace equipment and commercial information electronically. Discrepancies are generally handled with a centralized customer service representative. The facilities studied are all excellent examples of low cost facilities that have been developed on existing railroad property that were historically used for other purposes. Butte and Fort Smith would be exceptions to this statement since they were new facilities. All terminals studies are located in areas where open access 24 hours per day is available and security has not been an issue. The ease of accessibility facilitates the collection and distribution of freight to and from the terminal. Terminal packers and lift equipment were typically used at another site prior to relocation at the terminal evaluated in the study.

These terminals have been successful predominantly because they have a small, but committed key customer base of shippers, who use the facility year round. These terminals are staffed with flexible labor pools, where key individuals are able to perform many different tasks. In all but one terminal, the labor pool is non-union. These facilities are all located in small to medium sized communities, of population less than 500,000 residents. The size of the terminals ranges from 2 acres to 34 acres with the average terminal size in the 10-15 acre range. Railroad ownership seemed to have little impact on the terminal operation. Terminals with less than 17,000 lifts were often dependent upon another transload or rail carload transportation activities to share operational costs.

Neenah, WI

The Neenah terminal is owned and operated by Canadian National. Two non-union workers perform the train loading and unloading. One is a full time employee while the other works Saturdays and vacations. The 2 to 3 acre gravel terminal is fenced around the perimeter. There is no security gate at the entrances which allows truckers 24 hour terminal access. There are two highway access roads to the terminal. There is one camera in the south end of the yard focused on the drop yard used for intermodal traffic. This camera records all truck movements into and out of the terminal. All other cameras watch the main yard. The primary commodity shipped from this region is paper. In the terminal there is space for 70 wheeled trailers/containers. These spaces are not lined or numbered which allows for greater parking capacity during peak season. In this specific terminal trailers or containers are not stacked on top of one another as this is a wheeled operation (See Photos 5.1 and 5.2, Appendix C). In the last five years only minor maintenance has been required at the facility. Lights were installed recently. The intermodal portion of the yard is adjacent to a carload classification yard. Administrative labor, primarily justified by the carload activities, also provides oversight and exception management for the intermodal operation adjacent to the carload operation. The intermodal operation consists of a single track that holds 21 flat cars. The total track length is approximately 1,500 feet. There is only one lift machine on the site. Roughly 40% of the lifts are trailers and 60% of the activities support container operations. Intermodal truck drivers are responsible for reporting equipment condition when they pick up empty equipment. Railroad

contractors inspect inbound equipment to determine equipment condition and to make sure the empty equipment has been cleaned out and is free of any packing materials or other debris. A mobile maintenance contractor is available to perform minor equipment repairs. Customer service is provided in a central location and is a resource for all terminals. Customers can use the Internet to contact the carrier website to check equipment availability, load status and other commercial information. The same person loads equipment to and from the train and performs hostling services to park incoming equipment from train service in rows available for draymen to pick up. If the space is adequate there is only one lift required per transaction. The business generated by this terminal is 95% local or within a 50 mile radius, with a small portion of some regional traffic to and from the terminal. The other 5% is international traffic. This terminal is dominated by shipments from a single customer with private equipment and the terminal allows special services to accommodate this customer. The primary commodity shipped from this terminal is paper products. Other products shipped include food, foundry castings, and lumber. Seasonal freight volumes peak in September and slow in October through December. Freight volumes pick up again at the end of January.

On a busy day with steady traffic, 60 gate transactions per hour can be accomplished. Currently, operations seem to be growing as they see a greater mix of equipment come into the terminal. They forecast the demand for rail intermodal service increasing, since costs for rail intermodal transportation are typically lower than over-theroad trucking service.

Intermodal train service is offered each way between Chicago, Illinois and Green Bay, Wisconsin and the train stops in Neenah as an intermediate point. The inbound train from Chicago arrives between 4-8 am and the outbound train to Chicago leaves around 7 pm. The intermodal train from Winnipeg, Manitoba and Chicago, Illinois goes straight through and does not stop in Neenah.

The location of this intermodal freight terminal in close proximity (35 miles) to the Green Bay terminal and the low volume of cargo resulted in Canadian National announcing that the terminal would be closed in 200x.

Green Bay, WI

The Green Bay, Wisconsin terminal is owned and operated by Canadian National. The terminal is open 24 hours per day for equipment pick-up and drop-offs. The terminal is staffed Monday through Friday from 6:00 a.m. to 4:30 p.m. and Saturdays from 8:00 a.m. until 12:00 p.m. There are five full time employees. It is situated on 23.89 acres with one highway entrance accessing the terminal. A security camera is located near that entrance to keep track of the traffic coming in and leaving the terminal. There is no physical gate that restricts activity from entering or exiting the terminal. They have enough room for 200 wheeled parking spaces.

Approximately 25% of the activity in the terminal is international and up to 30 parking spaces are devoted to this activity. Because their lot is gravel, not paved, they are not able to stack multiple containers on top of one another. The terminal provides a two day grace period for parking free of charge to accommodate delays in shipping instructions or in securing delivery appointment times. They have a three-day grace period for parking free of charge when waiting for the Shippers' Export Declaration papers.

Several improvements have been made at the Green Bay terminal in the past few years. They have installed a fence around three sides of their property. An old roundhouse was demolished to provide more room for parking and they have upgraded radio communications and yard trucks. The mobile office trailer maybe replaced in the future when the roadbed is upgraded.

The terminal has five side tracks totaling over 7,000 feet in length. Their system works by combining the five separate tracks into one track when the train leaves the terminal. This switching effort is costly due to the number of hours a locomotive needs to spend spotting and pulling the railcars from the tracks. While the design is not optimal, it works and is an example of an alternative track layout if parcel size does not allow for a single-track operation.

Two side lifts packers are used to load and unload the train. There are three yard tractors to spot equipment in parking spaces. This allows terminal operators to complete 10-13 lifts per hour and between 60-70 total lifts per day during peak season. The terminal mainly handles trailers. Currently, they handle only a few domestic containers. On-site maintenance is available for minor repairs. Major repairs are done at a local off site facility. A Canadian National employee based in Fond du Lac, Wisconsin repairs and maintains the railroad lift equipment.

The traffic mix at the Green Bay terminal is 75 percent local and 25 percent international shipping. Their largest customer accounts for 35 percent of their shipments. Their most commonly shipped items include finished paper, liquid smoke, foodstuffs, retail items, and seasonal items.

The current business environment includes 24-hour pick-up and drop-off of trailers and containers, the transport of some hazardous materials, and storage for trailers and containers. They are not designated as a free trade zone. Although this terminal is located in a port city, it does not have a free trade zone designation. No traffic moves between the terminal and the port.

Auburn, Maine

The Auburn terminal is owned by the City of Auburn and leased to the St. Lawrence and Atlantic Railway (SLR). The SLR has contracted the terminal operation to In-Terminal Services. The facility operates as part of the Canadian National's intermodal service network. The terminal hours are Monday through Friday from 5 a.m. until 7 p.m. Weekend hours are subject to the amount of traffic scheduled during that time. The terminal is open for pick-up and drop off 24 hours a day, 7 days a week. The terminal began operations in 1994 on 17 acres of land. The terminal has since expanded to 34 acres to attract new business for the terminal. All of the land at the terminal is used for intermodal transport. There is one gate at the terminal. The terminal has five full time employees who are capable of performing all duties within the terminal, including maintenance.

The Auburn terminal can support between 350 and 500-wheeled trailers, and 180 to 250 stacked containers on its property. Upon notification of the container/trailer arrival, the carrier has that day plus 48 hours to pick up their cargo. Their percentage split is 85 percent container and 15 percent trailer. The terminal handles all size containers including high cubed containers.

There are three tracks at this terminal; two for daily train activities and one for storage. The two primary tracks are each 1,200 feet in length and the storage track is 1,400 feet, for a total of 3,800 feet of track available at the terminal. Auburn uses one Piggy Packer for loading and unloading railcars. They also have two yard hostlers for cargo movement around the terminal. The terminal has a garage where all their maintenance is conducted. They are able to repair their equipment and trailers at this facility.

Gate transactions vary per hour. However, the hours of 5-7 a.m. and 3-5 p.m. are peak hours of traffic. During these times, the terminal can process 35 trailers/containers per hour. The Auburn terminal averages 10 lifts per hour. The terminal averages 10 hostling moves per hour. The terminal averages 10 lifts per machine hour. The terminal

averages 36 lifts per day.
The traffic mix at the Auburn terminal is 85 percent local and 15 percent international. They handle some hazardous materials at this terminal, mainly in the form of empty containers with residue on them. The largest customers at the terminal are the paper industries. The terminal is looking into developing steamship line business at a satellite location to serve the Massachusetts area, because the Boston's port terminal is small and congested.
They do not have a security camera installed at this terminal, although this is being considered. A 12-foot security fence surrounds the entire terminal. They have a security officer at the terminal from 7:00 p.m. until 5:00 a.m. for after hour pick-ups and drop-offs. They also have two employees who inspect and track all trailers/containers leaving the terminal to document equipment condition.
Currently, they are trying to establish customs services at this location. Today cargo must be sent by bonded carrier to Portland to be inspected and then returned to the terminal for further shipment. As a result, there is no free trade zone at this time. Containers leave the terminal, for Montreal, then on to Detroit and Chicago and beyond to other intermodal markets on various Class 1 carriers. The Auburn facility gained some distinction as being the first intermodal facility funded publicly under provisions of Intermodal Surface Transportation Efficiency Act (ISTEA). The City of Auburn obtained the land and the State of Maine provided approximately $2 million for the initial construction. The terminal operators provided a half a million worth of terminal equipment and the railroad provided the investment in the rolling stock. The city's investment is being repaid by the terminal operator in the form of a lease.

Mobile, Alabama

Canadian National operates the Mobile intermodal terminal. Canadian National provided the research team with information. The terminal does not offer 7-day a week service or 24-hour a day operations. The facility is not shared with any other railroad. At the southern tip of Alabama, Mobile is not a gateway or interchange city and does not have extensive railcar transfers. It serves the ocean port but has no on-dock intermodal facility at the port. Mobile's terminal does less than 1/3 of the lifts for motor carrier customers. Two thirds of the business is generated from traditional Intermodal Marketing Companies, (IMC).
Mobile's facility covers 15 acres of land with only one highway access point. The area has about 100-wheeled parking spaces and 30 stacked parking spaces. With all three of the loading tracks, its linear feet of loading track cover 2,400 feet. The equipment used consists of a side-loader and one yard hostler tractor.
Annually Mobile's terminal has 14,000 primary lifts and 1,700 secondary lifts.
Also the terminal has 22,000 gate transactions every year. Assuming 252 working days per year, this terminal performs 56 primary lifts per day and 6.67 secondary lifts. In total this terminal performs on average 86 gate transactions per day.
The facility provides 2,850 man-hours of lifting, 950 hours of yard hostling, and 2,080 hours of clerical work every year. These annual hours can be broken down to B hours of lifting, 3.7 hours of yard hostling, and 8.2 hours of clerical work for each operating day.

Thief River Falls, MN

The terminal was owned by the Canadian Pacific Railroad (CP) and is no longer in operation. The intermodal terminal was closed in November of 2001 due to equipment balance issues the CP had in that region which was further complicated by a couple of bad years for the local agricultural industry. This was a non-union operation. The terminal had three clerical staff members and three yard/truck operators working for the terminal

manager. The yard crew also did the on-site maintenance of the equipment. The clerical staff worked eight-hour days while the yard crew generally worked 8-10 hour days. The hours would vary during different times of the year. This location had a steady flow of goods from May through August and was much busier August through the end of December. The slow season tended to be January through April.

The terminal was situated on 2 acres of land. The property had one main gate and two other points of entry that were often not used. This facility had no security systems in place. The terminal yard consists of two sets of tracks with one track was roughly 700 feet in length. This track was basically used as a side storage track. The second track was about 1,700 feet long and was used as the primary loading track.

The intermodal terminal had roughly 500 parking spaces for trailers and could accommodate up to 1000 containers when double or triple stacked. The terminal served a surrounding market with a radius approximately 120 miles. This would allow for them to transport goods to and from Fargo, North Dakota. Some high volume, priority customers from as far away as Western North Dakota used the terminal.

The principle commodities that were shipped included beans, wheat, sunflowers, other agricultural products, hardwood, occasionally products manufactured locally at Thief River Falls plant and some special loads. The special loads were generally spray planes destined for Europe and antique cars. The major customers using this terminal were agricultural customers and manufacturing customers. The terminal did not give special privileges to any of their customers.

The equipment used at this terminal included one 35-ton packer and a dedicated slave unit. The 35-ton packer is a top pick machine (See Photo 5.3, Appendix C). The dedicated slave unit was used to remove containers from chassis.

About 85 percent of the traffic mix through the Thief River Falls intermodal terminal was international while the remaining 15 percent was local. Approximately 25 percent of the lifts were for trailers and the other 75 percent were dedicated to containers. When the terminal was in operation they would generally handle 12 to 15 lifts per hour. They completed 1-2 transactions per lift. The average number of lifts per day was about 60, but during the busy season they could handle up to 120 lifts per day. The actual intermodal yard is divided into two areas by a local road. The smaller portion housed the dedicated slave unit and was a used as a parking lot for the trailers and containers. The larger of the two lots housed the office, garage, and additional parking for trailers and containers. The two sets of railroad tracks went through both areas of the intermodal yard.

Fort Smith, AR

The Fort Smith, AR terminal is “paper ramp” and serves as an outpost collection facility for the Union Pacific Railroad. The term “paper ramp” refers to the fact that the terminal is listed as an intermodal ramp, which on paper and in directories functions like any other full service terminal on the Union Pacific system. Yet in operation, the terminal has no physical railroad tracks. There are currently seven paper ramps that support the Union Pacific system today, and they are located in Vancouver, BC; San Diego, CA; Calexico, CA; Fresno, CA; Fort Smith, AR; McAllen, TX, and Columbus, OH. This practice of establishing an intermodal ramp on paper was a tactic used in the 1980’s and 1990’s by railroads wishing to either enter or exit a market gradually. Paper ramps are often established to help balance existing terminals by extending the terminal’s market reach. Sometimes these facilities were established in areas where there is interest in intermodal service yet insufficient volumes to establish a terminal. Tactically it was often a first step in evaluating if there was sufficient market support and demand for intermodal transportation service.

A paper ramp is linked to an existing terminal on a given railroad network by a

contract drayage operator who works directly for the railroad. The railroad's drayage contractor moves shipments or empty equipment between the railroad intermodal terminal and the paper ramp or drop lot, which is also referred to as an "outreach terminal". A paper ramp is essentially a drop lot that serves as a central staging facility in a remote location. Because all the movements are under the control of the single contractor, equipment and driver balance is easier to achieve resulting in improved economics and allows for a broader market reach that helps "outreach ramps" to be successful. The "outreach ramps" have published hours of operation; rail cut off times and load availability times, just as full service intermodal terminals do. Rates are published for "outreach ramps" just as they are published for actual full service rail intermodal terminals. The same parking provisions and equipment detention charges apply to both types of terminals.

The key difference between an "outreach ramp" and a full service intermodal terminal is that trailers and containers are loaded directly to and from the trains at an intermodal terminal. Loads moved over the highway by the railroad's subcontractor at an "outreach/paper ramp" directly to an intermodal terminal where typical lifting services are performed. "Outreach ramps" offer a convenience to the local shipping community and in all ways perform and act like intermodal terminals with the single exception that they have no railroad tracks. Empty equipment is made available at "outreach ramps" and loads can be tendered to the railroad at "outreach ramps".

This facility is open Monday through Friday 6:00 a.m. - 6:00 p.m. and Saturdays from 7:00 a.m. until noon. The facility is approximately 3-4 acres in area and has 80 parking spaces for trailers and containers. Local customers in the paper and household appliance business use this facility. Shipments are accepted from Intermodal Marketing Companies and private equipment owners who use this facility. Daily volumes vary between 20 and 60 loads per day depending upon shipping seasons; annual intermodal volume generated at this facility is between 7,000 and 9,000 lifts per year with more inbound than outbound shipments. Domestic, international containers and privately owned trailers are all used at the facility

Transit time from Fort Smith to the Union Pacific ramp in the Dallas, TX area is 5-6 hours. Drivers are domiciled primarily in the Fort Smith area. Some loads are taken to the Union Pacific intermodal ramp in Kansas City. Kansas City is 5-7 hours north of Fort Smith, AR. When loads are dropped at Fort Smith, the terminal operator dispatches the shipment to any one of 117 drivers who move freight between these facilities and also to and from customers in the area. Maintenance and repair functions are available at locations near the terminal. There are no services for maintenance or repair on site at Fort Smith. Equipment is inspected upon arrival and departure from the Fort Smith terminal and also at the rail facilities in Dallas and Kansas City.

Port of Montana

The Port of Montana, located in Silver Bow, Montana was opened in 1988, six miles west of Butte at the intersection of two interstates (I-90 and I-15) and two Class 1 railroads (Burlington Northern and Union Pacific). This port provides intermodal transportation services for Montana's forest products, mining, and agriculture. The port expanded its storage facilities in 1994 to accommodate rail boxcar transload facilities for the forest industry. Because of this expansion, "we've had an additional 300 to 350 rail cars a year," said Bill Fogarty, Traffic Manager at the port, "mostly forest products industry that we couldn't handle due to lack of warehousing and storage space."

The port's creation and later its expansion created 300 jobs directly tied to the facility and transportation services. Better access led to lower shipment rates and increased competitiveness. "One of the lumber companies," Mr. Fogarty said, in describing economic benefits that the port has brought to the area, "saved over $1 million in freight

bills, helping to ensure its survivability and profits."

During a phone interview with Evan Barret, Director of the Butte Local Development Corporation, he said that:

"The port has several major impacts: A number of trucking firms moved in here. The port solidified and increased traffic on the Union Pacific, taking a shaky spur line and giving it greater use. Previously we were controlled by a single carrier. The grain terminal created competition for grain and other products. Burlington Northern Santa Fe changed its tariff schedules once we started shipping. It's reflected in rates across the whole state, saving farmers millions of dollars every year. We have gotten more and more into the container business. We have the most up-to-date intermodal forms of transportation. We are now a staging facility for overseas container companies. It facilitates transportation scheduling which leads to increased traffic."

The Economic Development Administration (EDA) provided $600,000 (9 percent of the total cost) for constructing the new port. Butte/Silver Bow provided 13 percent of the funds; the remaining 77 percent were provided by the state of Montana, using the state's portion of Exxon overcharge funds. EDA also provided 60 percent of the cost for the port's 1994 expansion. Today, the Port of Montana:

a) Serves as an intermodal transportation hub that offers freight forwarding on 10 LTL carriers and 26 full-load carriers.
b) Serves rail-truck combinations.
c) Serves as a staging area for 11 container companies.
d) Is an inland port for international shipping and receiving of cargo.
e) Provides on-site inspection by U.S. Customs Service.
f) Qualifies as a foreign trade zone.

The Port of Montana spans 57 acres of land, with 8,800 feet of railroad track and is served by the BNSF and Union Pacific Railroad. This facility originally cost $6,000,000 and was funded by a combination of public and private investments. $2.3 million was awarded from a competitive bid by the Department of Natural Resources from an energy overcharge settlement, $1 million came from county bonds, and the rest was funded through public, private and non-profit port operations.

This facility was of interest to the researchers because it is a public intermodal freight terminal, which also accommodates the transfer of bulk commodities to and from Class I rail networks to local industry. At this time, intermodal container activities account for only a small portion of the terminal's total activities. Lumber, bulk chemicals and fertilizers and finished vehicles all participate in transload and mulitmodal operations based at this facility. The Butte/Silverbow area has population less than 20% the size of the Twin Ports. Because the Port of Montana is a separate entity from the rail carriers, they have latitude in establishing parking and storage rates which differ from the railroad terminals.

5.7. Key Findings

Small intermodal freight terminals frequently tailor their operations and service features, such as hours of service, to the needs of local customers and this is an advantage that a smaller terminal can offer in a small to medium metropolitan area. The more service-oriented a terminal can be to the local and regional customers, the higher the probability for success.

Collaborative business relationships among railroads, drayage carriers (dray companies), terminal operators, IMCs, shippers, and receivers appear to be a catalyst for the initiation of successful intermodal freight terminal operations.

The Fort Smith and Port of Montana Terminals are significant to the project because they offer alternatives to the typical intermodal freight terminal. Fort

Smith has relevance to the study because it is an example of a successful intermodal terminal serving a small group of shippers generating a smaller volume than is typically required for an intermodal terminal. This outreach facility helps the Union Pacific balance their Dallas intermodal freight operation, which has a heavy inbound flow of loads and not as many outbound loads. The Port of Montana example shows that a variety of products can be introduced in the multimodal mix and the economic benefits to the region are compelling. This location also illustrates how to set up a terminal with two Class 1 carriers. It is also an example of multiple modes justifying a single freight facility, where each benefits by sharing overhead costs over a greater base of activities.

TEU Conversion Factor

The research team converted the freight data collected from the shippers survey to a common denominator of a twenty-foot container (TEU). While certain products, classified as oversize, do not lend themselves to containerization, virtually all commodity groups have been containerized. The conversion criteria used are as follows:

Table 6.1: Freight Conversion Factors

100 Board Feet = 0.236 Cubic Meter
1 Barrel = 42 Gallons = 5.6154 Cubic Feet
1 TEU = 14,905 Kilograms / approx 16.30 Tons*
1 TEU = 140.68 Board Feet / 33.2 Cubic Meter
1 TEU = 1172 Cubic Feet
*Note: ISO weight limits for a 20 standard dry cube container are 21,800 KG or 48,060 lbs

The freight conversion factors offered in Table 6.1 are adjusted for constraints on container capacity. Container capacity is controlled not only by the gross weight limit of the container but also road weight limitations and utilization of space. The Federal bridge formula allows Interstate highways loads of 20,000 pounds on single axles, 34,000 pounds on tandem axles, with 80,000 pounds total gross vehicle weight (GVW) limit. Maximum allowable ISO container weights can exceed the Federal axle or GVW limits for trucks. Overweight permits may be obtained for additional cost if state and federal regulations permit.

A single commodity such as paper that is containerized may have considerable differences in how the products within that group stow in a container. For instance rolls of calendar paper that are quite dense will fill a container by weight without using all that available cubic space. Conversely, toilet paper will use the cubic space before weight limits are reached.

The analysis was completed using industry averages of: cubic utilization of 61%; average weight utilization of 68% on a 20-foot container, (Muller, 1999). Applying Muller's average utilization, a typical loaded TEU would be 68% x 48,060 pounds = 32,680 pounds/2000 pounds = 16.3 short tons or 14,905 kilograms.

Table 6.2: Survey Participants by Freight Movements in TEU for 2001

Inbound Outbound
ID Survey Truck Rail Truck Rail
11006 Wood Products 511.80 56.87 10,129.38 533.13
11031 Wood Products 0.36 0.00 603.71 0.00
11055 Wood Products 0.00 0.00 1,492.40 994.93
11081 Wood Products 1,180.00 0.00 1,777.08 0.00
11091 Wood Products 140.46 0.00 131.22 0.00
11121 Wood Products 90.37 30.12 209.00 0.00
Wood Products Total
1,922.99 86.99 14,342.79 1,528.06

11002 Paper & Pulp Products 8,367.24 170.76 1,572.84 11,534.16
11003 Paper & Pulp Products 5,521.50 12,883.50 18,251.20 1,073.60
11133 Paper & Pulp Products 0.00 0.00 7,290.66 2,056.34
Paper & Pulp Products Total
13,888.74 13,054.26 27,114.70 14,664.10
11017 Sub-Assemblies 14,355.90 4,049.10 23,465.95 1,380.35
11038 Sub-Assemblies 74.00 0.00 74.00 0.00
11072 Sub-Assemblies 30,675.00 0.00 36,810.00 0.00
Sub-Assemblies Total
45,104.90 4,049.10 60,349.95 1,380.35
11025 Consumer Goods 0.00 0.00 307.00 0.00
11119 Agricultural Goods 16,671.74 97,518.26 112.61 4,053.89
11012 Ferrous Products 0.00 0.00 1,477.30 293,982.70
11013 Ferrous Products 9,816.00 2,454.00 0.00 374,294.00
11015 Ferrous Products 0.00 22,086.00 0.00 194,479.00
11016 Ferrous Products 0.00 0.00 0.00 0.00
11113 Ferrous Products 5.94 0.06 5.94 0.06
11126 Ferrous Products 11,280.06 113.94 15,608.95 50,220.10
Ferrous Products Total
21,102.00 24,654.00 17,092.19 912,975.86
11124 Basic Materials **0.00 1,045,023.00 27,714.05 0.00**
11029 Petroleum Products **3,264.55 62,026.45 32,274.35 4,871.60**
11020 Other 700.00 0.00 200.00 0.00
11026 Other 15.50 0.00 16.00 0.00
11122 Other 0.75 0.00 2.00 0.00
11131 Other 0.00 0.00 0.00 184.00
Other Total 716.25 0.00 218.00 184.00

The survey results provided some general observations. Wood products used truckload and rail for outbound and vessel for inbound; paper and pulp products used rail and truckload for outbound and truckload and rail for inbound; sub-assemblies used truckload for inbound and outbound; consumer goods used truckload for inbound and outbound; agricultural goods used vessel for outbound and rail for inbound; ferrous products used rail for outbound and truckload and rail for inbound; basic materials used vessel for outbound and rail for inbound; petroleum products used pipeline and truckload for outbound and pipeline only for inbound; other products used rail for outbound and intermodal and less-than-truckload for inbound.

Intermodal Marketing Companies (IMCs)

Intermodal Marketing Companies have seen a number of consolidations and mergers over the last five years, following a trend started in the 90's by the Class 1 railroads. The IMCs business, once predominantly focused on intermodal freight coordination, has expanded to include truck brokerage and other value added services. The Intermodal Association of North America reports that truck brokerage is one of the fastest growing segments of the service offerings provided by IMCs (See Figure 6.21 in Appendix B). One of the surveyed firms reported truck brokerage activities account for up to 12% of their revenues. In this survey, medium size IMCs typically report 35-60% of their revenues are derived from truck brokerage. A large international logistics provider reports truck brokerage amounts to nearly 50% of their business. The truck brokerage activities seem to increase in areas where rail service is erratic or where there is limited equipment availability. IMCs report that they have a "load the train first" mentality but to meet increasing customer demands are often driven to provide truck brokerage services. In some intermodal markets 53' equipment is in short supply. To meet customer needs in the area a 53' truck brokerage option is a necessity.

Most of the intermodal service is provided on a "drop and hook" basis. This means

empty equipment is dropped one day and the customer is given 24-48 hours to load the equipment. Upon release notification the drayman picks up the load and delivers it to the rail ramp. In this area, intermodal lead times (the time between the customer placing the order with the IMC and the time when the load is released and ready to be picked up for delivery to the rail ramp) are typically 24-48 hours.

The regionally based IMCs typically move less than 10% of their business in specialized equipment such as insulated equipment, refrigerated trailers, flat bed trailers or drop decks. Typically, the specialized equipment is secured through a truck brokerage arrangement.

IMCs allow the customer to select the mode of transportation. This decision is often based on price and service factors. International shipments loaded in international equipment amount to 20% or less of the surveyed IMC business. IMCs surveyed report an increasing trend toward the use of de-consolidators at port locations. This means that inbound international containers are unloaded and mixed with other international freight and reloaded into domestic 48' and 53' equipment, which move to inland domestic destinations. North American international freight (Canada and Mexico) accounts for 5-10% of the Minnesota based IMC activities. IMCs report that intermodal rates are often most favorable in 40' equipment available for domestic backhaul movements to the West Coast.

The IMCs surveyed indicated that the dominant factors that influence mode selection are reliability of service and cost. The IMCs surveyed felt that for the Twin Ports market, five day per week intermodal train service would be sufficient. IMCs would like to see inbound loads available for 6:00 a.m. deliveries and would like to be able to accommodate cargo released by their customers up to 6:00 p.m. The IMCs' outlook is that overall business volumes are increasing, both inbound and outbound in the Upper Midwest market. The economy in the rural areas seems weaker than the Twin Cities as several plant closings and mergers were noted in northern Minnesota and Wisconsin. There is a trend toward increasing truck brokerage in order to meet customer transit needs and lane requirements. Exports in the area are heavily influenced by the support of the steamship liners. The IMCs surveyed felt that the rail carriers must actively support any new intermodal terminal with a commitment to providing equipment, competitive rates and a reliable level of service. Shipment volumes and equipment balance are key concerns for this transportation provider. Several IMCs suggested that a paper ramp as described in section 5.6.6 could be a viable first step in opening a terminal. IMCs are pessimistic that a sufficient supply of empty equipment is available to serve the Twin Ports and there is concern that intermodal rates will not be truck competitive in short haul lanes. They estimate that the Duluth/Superior market has somewhere between a 20-50% chance of success in the 2002 operating environment.

Truckers

There were five nationally recognized carriers who responded to this survey. The trucker group was selective in their responses to the survey due to competitive concerns. In general they focus their efforts on dense intermodal lanes with shorter drays; more than 80% of their business is domestic or North American in origin or destination. Equipment balance and asset velocity are the critical market factors for this group of transportation providers. They are service sensitive and look for intermodal lanes, which can be packaged and sold as "truck plus one day" transit time. Five day a week train departures are mandatory. Evening train departure cut-offs and early morning inbound equipment availability is desirable. This group reported that in order to gain their interest, the bundled intermodal door-to-door transportation must provide a transportation cost savings of $100-$150 per trailer/container to be a viable option. Without exception all truckers described

difficulty in serving high volume customers, with long drayage distances, located in small to medium population areas. While the carriers surveyed in this group were large, they collectively report little intermodal business generated to or from this region. They reported the majority of their business from the Twin Ports region is outbound resulting in load imbalance.

Trucking companies rank equipment capacity, reliable service, and competitive rates as the three most critical features. This group generally felt that a Twin Ports intermodal terminal may be marginally successful. One carrier commented, "Rail carriers need to fix Minneapolis first". One of the five suggested that a paper ramp might be a logical first step in business development. This group had access to all the rail carriers and did not single out a preferred railroad carrier.

Drayage Companies

The drayage companies surveyed did the majority of their business in support of intermodal terminals in the Twin Cities. While several were located outside the Twin Cities metropolitan area, their business activities were more local in scope. Several reported intermodal activities to/from the Twin Ports but the vast majority of their business is within 100 miles of the Twin Cities rail ramp. Drayage firms all held intermodal interchange agreements with rail carriers in the Twin Cities and typically employ 20-40 drivers. In this sample, all of these carriers derive 100% of their revenues from intermodal operations. Duluth/Superior traffic represents a very small share (between 1-10%) of this group's current business base and all that cargo is outbound.

Lead times vary by time of the year. In some cases they are notified the day prior to a work assignment, in most cases work is assigned on a same day basis. 75-80% of the time equipment is spotted and picked up loaded same day. The companies surveyed did not participate in movement of specialized equipment. International container movements represent less than 20% of their business base.

Drayage companies typically do not designate the mode of the shipment. During peak season up to 25% of their dispatches maybe influenced by the supply of empty equipment types they have on hand that day. In general these companies focus on the business in the local area first. They often do not know and often do not track the origins or destinations of the freight beyond the local rail terminal.

This group feels that Monday through Friday train service is a mandatory minimum requirement. Cost, total transit time and scheduled service are the three most important features. Equipment availability is a seasonal issue and there is high demand for 53' equipment. One of the biggest barriers for this group in any location is the lack of loading equipment flexibility, which results in sub-optimization of drivers and equipment movement. Like the trucker group, this group would like midnight inbound train arrivals to accommodate the growing demand for early morning deliveries. A 9:00 p.m. outbound train cut-off time would allow them to bring more same day freight to the rail ramp. A terminal with 24-hour service, seven days per week would be desirable to allow them to stage loads and empties for the next week, although there are few weekend customer pickups or deliveries. Onsite maintenance and repair capabilities are desirable.

Draymen anticipate a flat business outlook in this area. There is concern that there are few new businesses and some companies' business volumes have been down substantially in the Minneapolis area. There is concern about the vitality of the area because so many northern Minnesota based companies have been sold or merged into new operations. According to one firm, "the Duluth intermodal business dried up five to ten years ago, their Duluth activity is less than half of what it was ten years ago." In general they see a move back to truck due to cheap rates and improved communication tools. In assessing responses to question 39 of the IMC survey the consensus is that the IMCs rate

the chance for a successful intermodal terminal in Duluth as marginal. Equipment availability, inbound traffic load balance and price are the three most critical features for this group in considering a Twin Ports intermodal terminal. Some companies commented that they are busy enough in the Twin Cities area that they do not need to run to Northern Minnesota to keep drivers busy.

Steamship Companies

The steamship lines' predominate concern is with generating cargo to or from overseas markets that are served by their vessels and or terminals. Steamship lines have a presence in the domestic intermodal market as it relates to their primary objective. Balance is as important to steamship lines as it is to trucking and railroad companies. Many steamship companies stated that they have a presence in Minneapolis although they consider it a secondary metropolitan area. Steamship companies support establishing new markets which will broaden their scope of shippers and increase their freight participation; yet, tactically there is concern that there has been little (foreign freight) inbound demand to the Twin Ports area and it is unlikely that they can offer a competitive service for the Twin Ports, based out of the Twin Cities market. Companies experience surplus 40' equipment in the spring and summer, yet when the agricultural products begin to run in the fall, this surplus equipment supply dries up. Steamship companies have a heavy inbound flow of international traffic to the Twin Cities and would be willing to "explore" reload/backhaul freight from the Twin Ports to help offset empty repositioning expense. First priority would be given to international loads, yet in practice many companies have plenty of outbound international cargo available at West Coast ports and are simply looking to offset empty repositioning moves with domestic Midwest freight going to West Coast port cities. Nationally, Long Beach and Southern California represents the largest port activities followed by North Jersey and then by Portland/ Seattle. These companies have seen a shift in customer focus recently and relate the following: Service used to be more important followed by price, but today shippers are more price conscious in a softer economy. Preferred terminal hours of operation would be from 7:00 a.m. until 6:00 p.m. and half day on Saturdays. Total transit time seems to be more important than time of load equipment availability. These equipment owners need the market to have easy access for customs clearance (preferably onsite) and good electronic records kept showing the actual location of chassis, boxes and truckers. It is also desirable to have neutral chassis pools, maintenance and repair facilities available in the area.

Extrapolating from current published schedules, typical railroad transit times expected from the Twin Ports to Vancouver BC would be 3-4 days via the CN, Seattle 3-4 days via CN**,** Long Beach/LA 5-6 days via BNSF, and New York would be 4 days via CN & CSX.

Concerns were expressed that before steamship lines would be interested in the Twin Ports market they would have to have an internal sales study done to assess this market's contribution to their overall network value. Winnipeg is already deficit equipment and it is assumed that the Twin Ports region would be similar. An option that was proposed by Maersk and CN during the November 2002 grain intermodal conference at the University of Manitoba in Winnipeg was that grain could be hauled westbound in dry-bulk containers destined for the Far East market. This empty mile reduction for the container in transit would help in the overall freight cost structure. The three largest barriers to the establishment of a Twin Ports intermodal terminal according to these carriers are: the rail linehaul cost, equipment balance and customs clearance services.

One of the surveyed companies raised the issues that they are used to 24/7 customs clearance service with full electronic automation and integration at the intermodal terminal in the Twin Cities. If a terminal in the Twin Ports required customs inspection at a location

other than the intermodal terminal this would be objectionable to the carriers.

To provide a comparable analysis for intermodal movements, the cargo that is moving in and out of the Twin Ports was divided into three tiers. The tiers were oriented from the most likely to the least likely intermodal products. To ascertain the volume of products that are likely to convert to intermodal operations if a terminal were constructed, finished paper, scrap, consumer products and appliances, which are moving between manufacturers and warehouses for further distribution activities, were combined as Tier 1 cargoes. Cargoes of low value, those that require special truck equipment, are difficult to transfer, or have other unique shipping requirements are labeled Tier 2 cargoes. Studies have found that these products tend to join existing intermodal systems as add on cargoes to the first Tier cargo stream. Tier 3 cargoes are those products, such as coal, feed grain, and taconite, that are unlikely to convert to intermodal.

Tier 1 Products
Paper and pulp products
Consumer goods
Wood products
Sub-assemblies
Other

Tier 2 Products
Petroleum Products and Chemicals
Refined Materials

Tier 3 Products
Agricultural Products
Basic Materials (concrete, clay, coal)
Ferrous Products

The Reebie data analyzed was in the form of four digit Standard Transportation Commodity Classification (STCC) codes. Using the STCC codes, the data were reclassified to match the survey classifications provided in the Shippers' Survey instrument. The conversions of the STCC codes to the general categories provided in the survey instrument are shown in Table 7.1. The two-digit STCC codes include all minor categories. For example, STCC 24 would include the subcategory STCC 2411, Primary Forest Materials.

Table 7.1: STCC Conversion To Twin Ports Survey Categories

Survey Categories STCC Description
Wood Products 24
Lumber & wood products
Paper & Pulp Products 26
Pulp, paper & allied products
Sub Assemblies 2211
Cotton Broad-Woven Fabrics
2221 Man-Made Or Glass Woven Fiber
2222 Silk-Woven Fabrics
2231 Wool Broad-Woven Fabrics
2241 Narrow Fabrics
2251 Knit Fabrics
3592 Carburetors, Pistons, Etc.
3599 Misc. Machinery Or Parts
3622 Industrial Controls Or Parts
3624 Carbon Prod For Electric Uses
3674 Solid State Semiconductors

3694 Electrical Equipment For Intern Comb Engine
3713 Motor Bus Or Truck Bodies
3714 Motor Vehicle Parts Or Accessories
3729 Misc. Aircraft Parts
Consumer Goods 23
Apparel & finished textile
25 Furniture & fixtures
27 Printed Matter
30 Rubber & misc. plastic products
31 Leather & leather products
34 Fabricated metal products
35 Machinery excluding electrical
Electrical machinery & equipment (All except 3622, 3624, 3674, and 3694)
37 Transportation equipment (All except 3713, 3714, and 3729)
38 Instruments, photo goods, optical
39 miscellaneous manuf. Products
2844 Cosmetics, Perfumes, Etc.
2893 Printing Ink
3211 Flat Glass
3221 Glass Containers
3229 Misc. Glassware, Blown Or Pressed
3251 Clay Brick Or Tile
3253 Ceramic Floor Or Wall Tile
3255 Refractories
3259 Misc. Structural Clay Products
3261 Vitreous China Plumbing Fixtures
3262 Vitreous China Kitchen Articles
3264 Porcelain Electric Supplies
3269 Misc. Pottery Products

Survey Categories STCC Description
Agriculture Goods 1
Farm Products
Ferrous Products 10
Metallic Ores
3312 Primary Iron Or Steel Products
3313 Electrometallurgical Products
3315 Steel Wire, Nails Or Spikes
3321 Iron Or Steel Castings
3391 Iron Or Steel Forgings
Basic Materials 14
Nonmetallic Ores, Minerals
2812 Potassium Or Sodium Compound
2821 Plastic Mater Or Synthetic Fibers
2841 Soap Or Other Detergents
2843 Surface Active Agents
Refined 3241
Portland Cement
3259 Misc. Structural Clay Products
3271 Concrete Products
3273 Ready-Mix Concrete, Wet
3274 Lime Or Lime Plaster
3281 Cut Stone Or Stone Products
3295 Nonmetal Minerals, Processed

3296 Mineral Wool
3299 Misc. Nonmetallic Minerals
3311 Blast Furnace Or Coke
Petroleum Products 2814
Crude Prod Of Coal, Gas, Petroleum
2815 Cyclic Intermediates Or Dyes
2816 Inorganic Pigments
2818 Misc. Industrial Organic Chemicals
2819 Misc. Indus Inorganic Chemicals
2851 Paints, Lacquers, Etc.
2871 Fertilizers
2879 Misc. Agricultural Chemicals
2891 Adhesives
2899 Chemical Preparations, Nec
2911 Petroleum Refining Products
2912 Liquefied Gases, Coal Or Petroleum
2951 Asphalt Paving Blocks Or Mix
2952 Asphalt Coatings Or Felt
2991 Misc. Coal Or Petroleum Products
3291 Abrasive Products
3292 Asbestos Products
Other 20
Food and Kindred Products
50 Warehouse, distribution, drayage (air & rail)
2271 Woven Carpets, Mats Or Rugs

Survey Categories STCC Description
2272 Tufted Carpets, Rugs Or Mats
2279 Carpets, Mats Or Rugs, Nec
2281 Yarn
2291 Felt Goods
2292 Lace Goods
2293 Paddings, Upholstery Fill, Etc
2294 Textile Waste, Processed
2297 Wool Or Mohair
2298 Cordage Or Twine
2299 Textile Goods, Nec
2813 Industrial Gases
2831 Drugs
2892 Explosives
3275 Gypsum Products
3332 Primary Lead Smelter Products
3333 Primary Zinc Smelter Products
3334 Primary Aluminum Smelter Products
3339 Misc. Prim Nonferrous Smelter Products
3351 Copper Or Alloy Basic Shapes
3352 Aluminum Or Alloy Basic Shapes
3356 Misc. Nonferrous Basic Shapes
3357 Nonferrous Wire
3361 Aluminum Or Alloy Castings
3362 Copper Or Alloy Castings
3369 Misc. Nonferrous Castings
3392 Nonferrous Metal Forgings
3399 Primary Metal Products, Nec

The BEAs were divided into two groups, the regional and the national lanes of freight movements in the Twin Ports (Table 7.2).

Table 7.2: Breakdown of BEAs

Midwest Region	National
Chicago, IL	Albany, NY
Cincinnati, OH	Atlanta, GA
Cleveland, OH	Austin, TX
Columbus, OH	Bangor, ME
Detroit, MI	Birmingham, AL
Fargo, ND	Boston, MA
Fort Wayne, IN	Buffalo, NY
Indianapolis, IN	Charleston, SC
Kansas, City, MO	Charlotte, NC
Louisville, KY	Dallas, TX
Milwaukee, WI	Denver, CO
Minneapolis, MN	El Paso, TX
St. Louis, MO	Flagstaff, AZ
Toledo, OH	Great Falls, MT
Greensboro, NC	Norfolk, VA
Greenville, NC	Omaha, NE
Harrisburg, PA	Orlando, FL
Wilmington, NC	
Houston, TX	Philadelphia, PA
Huntsville, AL	Phoenix, AZ
Jackson, MS	Pittsburgh, PA
Jacksonville, FL	Portland, OR
Las Vegas, NV	Reno, NV
Little Rock, AR	Sacramento, CA
Los Angeles, CA	Salt Lake, City, UT
McAllen, TX	San Antonio, TX
Memphis, TN	San Diego, CA
Miami, FL	San Francisco, CA
Mobile, AL	Savannah, GA
Nashville, TN	Seattle, WA
New Orleans, LA	Shreveport, LA
New York, NY	Staunton, VA
Syracuse, NY	
Tampa, FL	
Washington, DC	

After conversion of the STCC codes, the data were converted into 20-foot equivalent units (TEUs). The data followed the conversions shown in Table 6.1. The conversion to TEUs is the method provided by (Muller 1999). This method includes adjustments for container capacity by the gross weight limit of the container, the road weight limitations, and the utilization of container space. Since, on average, cubic utilization is 61% and average weight utilization is 68% on a 20-foot container (Muller, 1999), using other formulas may be misleading. For example, the Federal bridge formula allows Interstate highways loads of 20,000 pounds on single axles and 34,000 pounds on tandem axles. If we followed the maximum allowable ISO container weight of a 20-foot standard container at 48,060 pounds, the container would not be compatible with U.S. truck weight regulations. A fully loaded 20-foot container, on a truck, can exceed the Federal axle or GVW limits. Overweight permits may be obtained for additional cost if state and federal regulations permit; however, these costs increase the overall costs of freight movement.

7.2.1. Truckload Conversion

Twin Ports Tier 1 products are considered the most likely to move intermodally. These commodities include paper and pulp products, consumer goods, wood products, sub assemblies and the general category of other. This tier effect is supported by the fact that these products are frequently moved as intermodal cargoes and these groups expressed a higher than average interest in intermodal operations in the survey instrument. To assess the tier effect of the Reebie data, we convert the data into potential truckloads. A heuristic commonly used in the intermodal field is that a well-run intermodal operation will capture from 7-15% of the truck market. Applying an average conversion factor of 11% to the Reebie data collected for the Twin Ports in 2001 we find the following:

Conversion of all Truck Movements

Inbound 420,935 Movements x 11% = 46,302 TEUs/2 = **23,151 lifts**

Outbound 443,430 Movements x 11% = 48,777 TEUs/2 = **24,388 lifts**

Next we disaggregated total truck movements into their respective tier components. Using the conversion factor, we find that the Reebie data supports the finding that Tier 1

products, transported by truck, provide 25,149 lifts. Tier 2 products provide 16,805 lifts. The breakdowns by commodity are presented as follows:

Conversion of Truck Movements for the Key (Tier 1) Product Groups – Reebie Data

Commodity	Inbound TEUs	Outbound TEUs	Total Potential Truckloads (TEUs) *
Wood Products	19,952.03	116,627.41	15,024
Paper and Pulp	5,761.12	17,373.50	2,545
Sub Assemblies	1,846.10	695.67	280
Consumer	12,785.88	12,865.59	2,822
Other	161,884.45	107,448.55	29,627
Potential Intermodal Conversions			**50,298**
Lifts (TEUs/2)			**25,149**

* = conversion factor of 11%

Conversion of Truck Movements for the Key (Tier 2) Product Groups – Reebie Data

Commodity	Inbound TEUs	Outbound TEUs	Total Potential Truckloads (TEUs)
Chemicals	65,914.05	140,785.62	22,737
Refined Materials	70,032.77	28,812.88	10,873
Potential Intermodal Conversions			**33,610**
Lifts (TEUs/2)			**16,805**

* = conversion factor of 11%

Table 7.3

7.2.2. Railroad Conversions

The Reebie data indicated that in excess of 20 million tons of product flowed in and out of the Twin Ports by rail. The extensive use of rail indicates considerable asset investment in engines, railcars, yards, maintenance service facilities and personnel to support a rail based intermodal carload system. The conversion of the current rail traffic to intermodal was a two-step process. Products such as coal, grain and Taconite (Tier 3 commodities) are highly unlikely to convert to intermodal and were removed from the conversion analysis. The remaining rail transported cargo totals 47,975 TEUs. The second step is to consider the qualitative role of railroads and shippers. Historically, railroads and shippers are reluctant to convert carload cargo to intermodal freight. Therefore, we adjust the conversion factor to reflect this occurrence.

Railroads are resistant to carload conversion in part because they have considerable capital invested in carload operations. From a logistics perspective, many products are more efficiently moved in large quantities where less handling is required. Some shippers have loading and distribution processes that were designed specifically around carload bulk handling operations. The cost of reconfiguring inbound and outbound logistics operations at some shippers' docks can be cost prohibitive. This modal decision is a complex decision which is influenced by shippers' and receivers' material handling set ups, carrier rate and equipment capacity, and buyer service expectations. These factors combined with expert opinion from industry provided a conversion factor of 5% for changing carload operations to intermodal movements for Tier 1 products. The rail carload conversions for Tier1 commodities are as follows:

Conversion of Rail Car Movements for the Key (Tier 1) Product Groups – Reebie Data

Commodity	Inbound TEUs	Outbound TEUs	Total Potential Carload (TEUs) *
Wood Products	5,941.40	7,155.06	655
Paper and Pulp	31.93	1,065.86	55

Sub Assemblies 0.00 42.68 2
Consumer 0.00 789.30 39
Other 4,565.38 6,591.94 558
Potential Intermodal Conversions 1,309
Lifts (TEUs/2) 655
* = conversion factor of 5%
Table 7.4

7.2.3. Total Conversion Potential:

Given the conversion factors for both truckload and rail carload we estimate that for the calendar year 2001 the following conversions were possible:
Total Reebie TEU Potential in the Twin Ports
(Truck and Carload Conversion) = **51,607 TEUS**
Total Reebie Lift Potential in the Twin Ports
(Truck and Carload Conversion) = TEUs/2 **25,804 Lifts**

These conversion factor findings indicate that a Twin Ports intermodal terminal could be operationally feasible, when considering freight volume only, with the current freight movements inbound and outbound from the Duluth-Superior business economic area.

7.3. Intermodal Lane Movement

Ideally a Twin Ports intermodal terminal would provide one or more Class 1 carriers with a sufficient volume of freight that travels to intermodal terminals on their networks. Cargoes shipped to areas that are not within a reasonable drayage distance of intermodal terminals would move at a price and service disadvantage if converted to intermodal movement. We examined the product flow along several intermodal networks that connect with the Twin Ports (See Map 7.1, Appendix A).

7.3.1. Intermodal Network Case Study

The following cases examine how potential intermodal networks connected to a Twin Ports terminal might be structured. The cargo flow is captured from the 2001 Reebie data and Shippers' Survey. The potential lifts were determined by adding all TEUs for Tier 1 cargoes, then multiplying the TEUs by 11% for market representation, then dividing that number by two to determine lifts. This is represented by the formula: (Tier 1 TEUs x 11%) / 2 = Lifts. These case studies examine cargo captured by the Reebie data that is moving along lanes. The samples do not represent all possible route structures or all BEAs on a route. The cases focus on some of BEAs with the higher cargo density. The intent is to examine terminal activity and potential load balance between terminals. The routes were not examined for operational issues or the potential increase in market share that could occur with the establishment of a Twin Ports intermodal terminal. Where the Chicago gateway is part of the network the totals for that BEA are included.
We have taken a very conservative approach to determining lifts. Other factors may contribute to an increase in lifts. For example, a paper producer who has a distribution center in Chicago may elect to move significantly more than 11% of their product on the intermodal system. A Class 1 railroad that was interviewed estimates that a well-run intermodal system could capture 25% of the over-the-road truck market share and uses this number in their planning process. A 25% conversion metric would more than double the Twin Ports' lifts inbound and outbound. By limiting the marketing potential to only Tier 1 products, other commodity groups that may use the service to some extent are not captured. For instance, the Shippers' survey found that 1,224 TEUs of agricultural products were shipped intermodally in and out of the Twin Ports during 2001 and those intermodal units would not be reflected in these totals. Another example would be a plant that manufactures high value synthetic oil products and ships them to distribution centers would not be

captured because petroleum and chemicals are listed as Tier 2 products. For this study we are examining a potential start-up operation and used a conservative approach. Once a reliable cost-competitive service is started, capture rates may climb to 25% with market penetration into other tiers.

Case 1: This proposal focuses on an intermodal long haul over 700 miles from the Twin Ports that travels on a single Class 1 carrier. Because the network must travel through the Chicago hub that destination is included even though the distance to that terminal is 500 miles from the Twin Ports. The route was taken from Canadian National's published intermodal route structure with a terminal for the Twin Ports added (See Maps 5.5 and 7.2 in Appendix A). These figures include outbound cargo originating in Thunder Bay, Ontario. The Thunder Bay cargo is noted in parentheses.

Total TEUs and Lifts Inbound and Outbound between origin and destination points

Terminal Distance /Time Drayage limit Inbound Outbound

Chicago, IL 500 miles 75 miles 14,467 TEUs 34,600 TEUs
St. Louis, MO 759 miles 113 miles 6,233 TEUs 12,991 TEUs
Memphis, TN 1,041 miles 156 miles 1,262 TEUs 795 TEUs
Jackson, MS 1,248 miles 187 miles 351 TEUs 128 TEUs
New Orleans, LA 1,443 miles 216 miles 332 TEUs 1,290 TEUs
Total TEUS 22,645 TEUs 49,804 TEUs

Total Lifts @ 11% 1,245 Lifts 2,740 Lifts

Table 7.5

Case 2 is a long haul intermodal service to a single destination with load balance. Because the network must travel through the Chicago hub that destination is included even though the distance to that terminal is 500 miles from the Twin Ports. This case study may have operational impediments due to terminal interchanges in Chicago.

Total TEUs Inbound and Outbound between origin and destination points

Terminal Distance Miles Drayage limit Inbound Outbound

Detroit 835 miles 125 miles 22,150 TEUS 18,805 TEUS

Total Lifts @ 11% 1,218 Lifts 1,034 Lifts

Table 7.6

The long haul routes on a single Class 1 railroad are not the only options. Once the Chicago intermodal hub is reached numerous intermodal routes can be accessed from several additional Class 1 carriers. Line haul rates for an equivalent distance on a single Class 1 will normally be lower than rates when using multiple rail carriers, yet no class one serves the entire nation, so network access is important (See Map 7.1, Appendix A).

Case 3: This case focuses on a long haul intermodal route that operates on more than one Class 1 rail carrier for example, the CN and CSX railroads or CN and Norfolk Southern (NS). Because the network must travel through the Chicago hub that destination is included even though the distance to that terminal is 500 miles from the Twin Ports.

Total TEUs Inbound and Outbound between origin and destination points

Terminal Distance Miles Drayage limit Inbound Outbound

Chicago 500 miles 75 miles 14,467 TEUs 34,511 (390) TEUs
Cleveland 820 miles 125 miles 1,325 TEUs 8,850 (208) TEUs
New York 1,342 miles 201 miles 1,333 TEUs 2,706 (913) TEUs

Total Lifts @ 11% 942 Lifts 3,162 Lifts

Table 7.7

One focus of terminal viability is the quantity of cargo that moves to a primary hub that serves numerous destinations. The following table indicates the lifts that would exist from cases 1, 2 and 3 if an intermodal service captured 11% of the 2001 truck market to the

listed destination. The total would increase with the addition of cargo from each BEA on intermodal systems served by the Chicago hub.

Cases 1-3, Total Lifts Inbound and Outbound through the Chicago Intermodal Hub

Terminal Inbound Outbound

Chicago 47,453 TEUs 80,165 TEUs

Total Lifts @ 11% 2,610 Lifts 4,409 Lifts

Table 7.8

Case 4: This represents two short haul (under 700 miles) intermodal routes with a Twin Ports intermodal terminal on the route, (See Map 7.3, Appendix A).

Total TEUs Inbound and Outbound between origin and destination points

Terminal Distance Miles Drayage limit Inbound TEUs Outbound TEUS

Twin Cities 165 miles 25 miles 308,952 TEUs 164,612 (275) TEUs

Chicago 500 miles 75 miles 14,467 TEUs 34,511 TEUs

Table 7.9

Potential Lifts when capturing 11% of Tier 1 cargoes on Short Haul routes

Terminal Distance Miles Drayage limit Inbound TEUs Outbound TEUS

Twin Cities 165 miles 25 miles **8,325 Lifts 5,523 (15) Lifts**

Chicago 500 miles 75 miles **448 Lifts 1,358 Lifts**

Table 7.10

7.4. Comparison of Data to Shippers' Survey and IMC Data

One goal of the data analysis was the inclusion of a comparative analysis of the survey instrument findings and the Reebie data. Although some general conclusions can be addressed with respect to TEUs and commodities, the survey instrument did not provide a comparable sample. Each methodology presents limitations of the cargo moved within any particular market. The limits of the survey are that in the category of "wood products", the team found that less than 10% of the Reebie data movements are captured in the survey. These findings also hold for the category entitled "other." In the categories of "paper and pulp" and "sub-assemblies", the survey results are approximately thirteen times greater than the Reebie data indicates. These results may be a function of two occurrences. The first is that the Reebie data is underestimating paper and pulp and sub-assemblies in the BEAs. Second, the aggregate of STCC codes may differ from the Shippers' Survey respondent's interpretation of the categories.

Particular commodities do present an interesting comparative analysis. We first provide the largest commodity group in the Twin Ports, the Paper and Pulp industry, a frequent user of intermodal service.

Paper and Pulp Industry Inbound
TEUs
Outbound
TEUs
Total
TEUs

Truck Rail Truck Rail

Reebie 5,761 31.9 17,373 1,065.8 24,178 TEUs

Survey 13,887 13,054.0 27,114 14,664.0 68,720 TEUs

Table 7.11

The Shippers' Survey collected data from approximately 90% of the paper and pulp shippers in the area. The total cargo shipped by the survey respondents was 2.8 times greater than Reebie data captured. We were unable, from this statistical sample, to establish a margin of error in comparing the two methods. One of the differences was the fact that pulp is brought in by vessel and shipped out by truck and rail. If we used the

survey data, the potential lifts for paper and pulp products could be 100% greater than indicated in Reebie data. These potential lifts from the survey data are shown below.

Data Source TEUs Inbound TEUs Outbound Total Lifts

Reebie 5,761 17,373 **1,272 Lifts**

Survey 13,888 27,114 **2,255 Lifts**

Table 7.12

The difference in this commodity group is significant and could impact the establishment of an intermodal terminal. The Reebie data also indicated that there was a balance of truck loads inbound to outbound. This data contradicts the comments of truckers in the IMC survey. We believe that individual trucking firms do not have balanced loads but the market as a whole appears to reach a balance.

Roll-On-Roll-Off (RO/RO) Marine Intermodal Link between the Twin Ports and Thunder Bay, Ontario, Canada

RO/RO Marine Service Introduction

A more extensive examination of this segment of the Twin Ports Intermodal study was presented as a paper at the Transportation Research Board's 82nd Annual Meeting in January 2003 and published in the Transportation Research Record (TRR), Journal of the Transportation Research Board. The purpose of this portion of the Twin Ports Intermodal research is to determine the feasibility of establishing Roll on/Roll off (RO/RO) service linking Thunder Bay, Ontario and Superior, Wisconsin. RO/RO service involves a vessel equipped with either shore based or ship mounted ramps that allow vehicles to be rolled on and off the vessel, allowing for relatively rapid vessel turn around times. Research for this study focused on several factors including historical analysis of similar service, examination of appropriate vessel types, and adequacy of shore-side facilities. Cost factors for vessel operation and potential revenue streams were also discussed. All figures assume the availability of suitable cargo. An economically viable RO/RO feeder service may provide a significant component of the baseload volume for a Twin Ports' intermodal freight terminal. Extrapolating from the *M/V Incan Superior* service, it is estimated that as many as 70-80 trailers per day could arrive at the Twin Ports if this service was offered. If 10-15% of the vessel's vehicles were to use the intermodal link, this volume would represent approximately 8-12 trailers per day.

Rationale for the RO-RO portion of the Twin Ports Intermodal Study

Volume is one of the key components of an intermodal terminal, and because of the manufacturing base and transportation restrictions that Thunder Bay faces it appeared there could be an opportunity to bring traffic that is destined for the US market south of Thunder Bay to a Twin Ports intermodal terminal by truck, rail, and marine service. A marine link would provide an option to rail and truck and could, in theory, move significant quantities of freight that would relieve congestion on Scenic Byway US Highway 61, and may potentially lower environmental impacts.

At its core the RO/RO study seeks to determine the viability of an alternate transportation route for goods moving along the northwestern shore of Lake Superior. Goods flowing between the United States and Canada in this region face a challenging situation. US Highway 61 is the only major highway transportation system that offers a direct land route between the two metropolitan areas. Rail traffic between the Twin Ports and Thunder Bay require a lengthy diversion to International Falls, MN and then another rail leg to Canada (see Map 8.1, Appendix A).

Recently US Highway 61 has received national recognition by being designated a National Scenic Byway. Although this designation brings economic benefits, it also limits the possibilities of expanding roadway capacity. During the summer months this

principally two-lane road can be congested with tourists enjoying the natural beauty of the region. The tourist industry is economically beneficial to the region however, increased traffic density can slow down the movement of freight and increase the potential for accidents. A study by the Minnesota Department of Transportation found that road transportation along this route is the least environmentally friendly option for the transportation of freight and people (MNDOT, 1991). Providing a marine transportation option can help ease traffic by giving carriers an alternative to using the highway corridor.

Comparable RO/RO Service Analysis

In order to determine the viability of marine intermodal service, an examination of current and former marine RO/RO services on Lake Superior was conducted including a historic and current operation. Research was also undertaken on RO/RO services on Lake Michigan, the North Sea and Baltic Region. These areas were researched because they have a short route structure and similar weather and ice conditions.

M/V Incan Superior

The *M.V. Incan Superior* began offering RO/RO service in 1974 between the Twin Ports and Thunder Bay, ON (See Photo 8.1, Appendix C). The *Incan Superior* made 162 annual round trip voyages per year. The vessel was 385 feet in length and had a cargo capacity of 2,665 tons and could carry 26 rail cars (Canadian Pacific Railroad, 1990). It had a loaded draft of 17 feet and made round trip voyages in 26 hours. Primarily the *Incan Superior* transported railcars that carried paper products and general freight.

In July 1991 the US Government raised the Harbor Maintenance Tax (HMT) by 212% (Keller and Heckman, 1991). The HMT was imposed on exporters and importers at a rate of 0.125% of the value of the cargo ($1.25 per $1,000) passing through a U.S. port. The funds were to be accumulated in the Harbor Maintenance Tax Trust Fund for disbursement to the Army Corps of Engineers for dredging expenses in qualifying U.S. ports.

The tax was increased under the assumption that the average vessel trading foreign would only clear Customs roughly fifteen times a year. However this fee had an untenable impact on the *Incan Superior*, which was entering the Twin Ports five times each week. It should be noted that as of 1998 the HMT applies only to cargoes imported into the United States and no longer to exported cargo.

Buchanan Tug Barge Service

Buchanan Forest Products of Thunder Bay, Canada imported finished lumber into the Twin Ports by barge during the 2001 shipping season. A total of approximately 120,000 tons was shipped to the Twin Ports with the last tug barge calling in the Twin Ports on January 12, 2002 with about 5.1 million board feet of lumber from Thunder Bay, ("North Star Port", 2002). The barges *Twolan* and *McAllister 132* are owned by A.B.M. Marine and operated by Buchanan Forest Products, both of Thunder Bay, Ontario, (See Photo 8.2, Appendix C).

SS Badger

The *SS Badger* and her sister ship the *SS Spartan* were built in the early 1950's to replace older vessels on a RO/RO rail service that crossed Lake Michigan and linked the rail lines, (See Photo 8.3, Appendix C). The marine service allowed the Chesapeake and Ohio railroad to avoid the congested Chicago rail yards. Other marine RO/RO rail services were found across the lakes on both the US and Canadian side. The advent of the interstate highways and the movement of high value cargo from rail to truck adversely impacted the profitability of many vessels and as they aged the high cost of US shipbuilding made replacement with modern vessels too difficult. In the early 1990s the *SS Badger* was refurbished and resumed service but discontinued hauling railcars. The vessel's principal cargo has been passengers, autos, and trucks. The vessel is focused primarily on the tourist

trade and does not operate in the winter months. The vessel carries cars and buses but also a limited number of trucks. The fact that the service connects very small ports (populations less than 25,000) means that little cargo is generated in the ports and the highways that serve these ports are secondary roads.

North Sea/Baltic Service in Northern Europe

The weather conditions and duration of voyages in the North Sea and Baltic region are very similar to those faced on the Great Lakes. The cargos moved out of Finland by RO/RO vessels such as paper products, lumber, recycled waste products, vehicles, and passengers are identical to those being moved in the Lake Superior region (Tinsley, 1991). The growing highway congestion and limits on truck sizes have encouraged the use of RO/RO vessels as part of Europe's intermodal system. The RO/RO vessels on these routes have been constantly updated and their designs represent the state of the art in northern waters' RO/RO operations. Crowley Maritime has for several years operated a successful tug barge RO/RO operation carrying trailers between Jacksonville, FL and Puerto Rico. This service does not have a problem with ice but does experience severe weather. Crowley Maritime has thirteen ocean-going RO/RO barges as well as vessels.

Routing Schedule

Routing information was generated to determine the number of voyages a vessel could potentially make per year. To perform this analysis a generic 'voyage' linking the Twin Ports and Thunder Bay was broken down into segments. In order to provide for daily service the voyage between the two locations must be done in less than twelve hours. The shipping season was estimated at 30 days in a month for ten months out of the year. The *Incan Superior* frequently exceeded a ten-month season and the proposed schedule is similar to that vessel's timetable. During the 1999-2002 winter months, an ice strengthened RO/RO vessel could have operated on this route 11-12 months per year. Should average winter temperatures continue to remain historically high then there is the potential to increase the shipping season on the Great Lakes.

Loading and unloading the vessel can be estimated to take approximately one hour each, for a total of two hours at each dock. This estimate is based on: vessel size, number of vehicles, passengers, labor efficiency, and other factors that can significantly impact the duration of loading and unloading.

The first leg of the trip is called the harbor passage, with the actual voyage occurring when the vessel clears the breakwater. On both ends of the voyage we assumed a time of one hour by using a time speed determination and speaking with pilots in the area. A suitable and available dock was selected in each port that was approximately 4 statute miles from the breakwater. Speed restrictions, distance of the dock from breakwater, traffic and the complications of maneuvering the vessel in ice or high winds may increase or reduce this average time.

Eight hours of the twelve hour time frame can be spent in lake passage. In this study, a distance of 165 nautical miles was determined between the Twin Ports and Thunder Bay. During this time period some gains can be made for unexpected time delays at the dock or in the harbor. A vessel operating at 22 knots during this segment will require a seven and one half hour transit time with a half hour safety factor. Figure 8.2 in Appendix A provides an example of a typical routing timetable for a RO/RO vessel on the Twin Ports – Thunder Bay Route.

Vessel Selection

A vessel that is suitable for the trade and capable of providing economic returns on the investment that are competitive with other investment opportunities is one of the most critical components of a viable RO/RO service. Vessel selection is typically driven by legal factors, physical constraints and availability of reasonably priced vessels.

Legal Operating Factors

A vessel that carries freight from one Great Lakes U.S. port to another U.S. port without stopping in Canada must fulfill the requirements of the 1920 Jones Act authored by Senator Wesley R. Jones. A vessel that carries passengers must meet the requirements of the U.S. 1896 Passenger Vessel Services Act. Both acts require that the vessel be built in the U.S., that U.S. citizens own a majority of its stock, and that it is crewed by U.S. citizens. In the global marketplace these constraints have placed American flag vessels at a competitive disadvantage. The costs of capital, crews and taxation has resulted in a U.S. shipbuilding base that produces very few large vessels and a merchant marine that carries less than 3% of its imports and exports. The relatively isolated location of the Great Lakes and the principal cargoes carried in interlake/interstate trade has allowed the existence of a relatively robust U.S. flag bulk cargo fleet. However, the Great Lakes shipbuilding industry has not built a new vessel for the Lakes in almost two decades.

Canadian flag operators face similar economic constraints. The Coasting Trade Act of 1992 regulates vessels that operate between two contiguous Canadian ports. The Coasting Trade Act allows only Canadian flag vessels crewed with Canadian citizens to carry freight or passengers between two contiguous Canadian ports. One critical difference from U.S. acts is that the Canadian Coasting Trade Act allows the purchase of vessels built foreign to be flagged as Canadian vessels provided permission is obtained, they meet Canadian safety regulations, and all applicable duties have been paid (Canadian Dept of Justice, 2001). The purchase of a foreign built vessel that is reflagged as a Canadian vessel may be economically feasible depending on the cost incurred in duties and refurbishments.

The unique feature of the proposed intralake route between the Twin Ports and Thunder Bay is that there is the possibility to use a foreign flag vessel on the route, as the vessel would be engaged in international trade. One of the requirements that would be imposed on a foreign flag vessel on this route is that the maritime laws of both nations would require that pilots be employed unless the navigating offices hold US or Canadian pilot endorsements on their licenses for waters transited. A foreign flag vessel on this route could employ licensed officers who are United States or Canadian citizens and have the required pilotage endorsements. American President Lines established the precedent of crewing foreign flag vessel with American officers and unlicensed personnel

The team examined the potential of employing used RO/RO vessels that were built for North Sea and Baltic service. The foreign flag vessels have several inherent advantages in addition to their relatively low, compared to US flag vessels, capital cost. The vessels evaluated are designed to operate in ice and the fresh water operations will extend the life of the vessels so that the capital costs of purchase and refurbishment can be spread over many years.

Physical Limits

A North Sea vessel will have to be able to fit through the Seaway locks including the Welland Canal. The entry in the Great Lakes through the Welland Canal system normally limits a vessel's size to 222.5m x 23.2m x 7.9m, (730'x76'x26') with an air clearance height of 35.6m (117') (Great Lakes Pilot, 2000). Ocean RO/RO vessels that would run the North Sea typically operate at a deeper draft than the controlling depths of 7.9m (26') to 8.2m (28') found at the potential RO/RO docks in the ports under consideration. Winter operation on the Great Lakes is restricted during the height of winter due to ice conditions and closure of the locks. RO/RO vessels that would operate on Lake Superior during this period would need an ice strengthened hull and propeller. Vessel operators also need to consider lake level fluctuations that have recently reduced water level in some lakes by as much as one-half meter (19.5 inches).

In the late fall of 2001 brokers who specialize in selling ferries were contacted to

see if any vessels for sale met the physical requirements. The information in Table 8.3, Appendix A was prepared to show sample vessels that could be suitable (Frank Shipbrokers, 2002).

Cargo Capacity and Revenue Steams

The cargo capacity of a RO/RO vessel varies with the size and configuration of the vessel. Efforts to determine the ideal size vessel based on projected cargo were stymied by the fact the Reebie data for cargo movements between Thunder Bay and Twin Ports had critical information gaps. Reebie was only able to produce outbound data from Thunder Bay to the Twin Ports and no data for cargo moving from the Twin Ports to Thunder Bay. Vessels with a capacity between 50 and 250 TEUs were used in the projections. A Vessel smaller than 50 TEUs capacity was considered inadequate in size. Vessels with greater capacity than 250 TEUs were considered too large for a start up service.

Several potential revenue streams can exist for a RO/RO service between the Twin Ports and Thunder Bay. The freight cargo revenue streams, (See Table 8.4, Appendix A), have been calculated using the supposition that there would be everyday service between these two ports, 30 days a month and for ten months out of the year. The table below assumes one round trip every 24 hours and assumes the availability of suitable cargo. The TEU standard was chosen to generate this stream. Trailer sizes can vary from twenty foot to fifty-three feet, (occasionally oversize cargos could travel on this route) in length.

Price of service was derived from the rate of $350 US charged by a Twin Ports based commercial trucking firm's average rates for moving a 53-foot trailer between the Twin Ports and Thunder Bay. This figure was divided in half ($175 US) to account for the twenty-foot size dimension. The $175 US price is considered optimistic because the following economic factors would force rates down (discounting): rate restructuring by the competing modes, the cost of market penetration, empty repositioning costs and potential imbalance in trade patterns. An operator would likely expect a discounted price closer to $100-$125 US per TEU or $200 per truckload.

Revenue can come from other sources as well. Onsite storage of freight may bring in some revenue; however, it is important to realize that space tied up in storage is space that is lost when planning daily operations. There may be the need for a distribution center providing value-added services (Alderton, 1999).

Dock Evaluation for RO/RO Service

The development of a RO/RO service between Thunder Bay and the Twin Ports is dependent on access to docks that are suitable for RO/RO service. As part of the intermodal study the harbors and docks in the Twin Ports were investigated for their use as RO/RO docks. Research into RO/RO operations (Branch, 1997), (Atkins, 1983), (Alderton, 1999), clearly indicate that RO/RO operations need to have adequate dock space, depth alongside, access to principal highways or intermodal rail service, proper zoning, a large and level parking/marshaling area that ideally is paved, and if possible minimal distance away from the entrance to the harbor to aid in quick turnaround time. RO/RO vessels could have side ramps, stern ramps or a combination of both, and docks need to have the ability to move traffic on and off the ships from these ramps. A sufficient marshaling area needs to be available to hold the traffic that is inbound and outbound along with limited traffic that is dwelling in the terminal. Any RO/RO facility operating on a daily schedule will have activity peaks occurring each time a vessel calls. Choosing systems that facilitate the storage and staging of freight and equipment is essential to maintain efficiency, (Atkins, 1983). The typical types of container and RO/RO systems in common use were analyzed for their adaptability

Terminal Access and Transport System Links

Suitability of a facility to be used for RO/RO operations begins with its ability to physically accept vessels. Dock face length and depth of water at berth are starting factors. Road access is also of importance to a potential site. Of the sites examined all were within a reasonable distance of major road links, primarily I-35 and Highway 2. The RO/RO terminal should have access by road or rail to the intermodal terminal. Long-range planning should consider the option of a Twin Ports intermodal terminal that could be served by road, rail, truck, and marine. Marine links as part of an intermodal systems are currently used in the US and Europe but are not used on the Great Lakes at this time, (Muller, 1999).

Zoning restrictions were checked for candidate sites in Superior, WI and were identified as being zoned W1, for Water Commerce. As such there would be no zoning constraints on a RO/RO system. Restrictions do exist that would prevent structures beyond a height of 60ft, (Superior Planning Office, 2001).

Both the cities of Duluth and Superior are tackling the issue of converting waterfront properties away from maritime or industrial usage. Evidence of the gentrification process in the community is evident along the waterfront just inside the Duluth Ship Canal in the area referred to as Canal Park. Along this area maritime and industrial usage has been replaced with recreational, residential, and light commercial activities.

Foreign Trade Zone (FTZ) designation may be desired for the facility. FTZ designation would offer an additional service for the facility. Either all or a secured portion of the facility may be declared an FTZ. Allowing the shipper to postpone import tax during this storage period can make the facility more attractive to international shippers.

A terminal must provide a security system and procedure to ensure that no container enters or leaves the facility without proper clearance. Providing limited points where the facility can be accessed is one basic way of providing physical security. Security takes the form of not only limiting physical access to the terminal but also building a procedure and information system that is capable of identifying and preventing system theft.

Every trailer or container coming off the RO/RO vessel on this route would be subject to Customs clearance. It is routine for Customs to flag some trailers or containers to be opened and inspected to verify documented freight. In terms of daily operations the terminal must be able to segregate these containers from the rest to comply with the inspection. Similarly other government agencies may request that freight undergo a period of quarantine. An onsite secure storage location will be needed for bonded cargo and other cargo awaiting customs clearance.

Duluth Docks

Three dock areas were available on the Duluth side of the Twin Ports' harbor. The Hallet #7 dock was considered the least viable of the docks because of the relatively long harbor transit from the harbor entrance to the dock (See Photo 8.4, Appendix C). The long transit at slow speeds would significantly increase voyage time, reducing the number of round trips the service could provide. The draft limits of 22 feet could also adversely impact the use of larger vessels.

The C&D docks have the advantages of a short harbor transit, open space, well maintained dock faces, channels and excellent access to rail and interstate (See Photo 8.5, Appendix C). The acreage (28) is limited if the business grows. There may be expansion opportunities in areas that are close but not adjacent. Another potential advantage is the existing Foreign Trade Zone in the immediate area. The Clure Public Marine Terminal is very similar to the C&D docks in terms of capability with the exception of having a number of buildings and operating businesses in the immediate area (See Photo 8.6, Appendix C). The Clure Terminal also has fixed quay cranes that could be used to remove

deck containers from a vessel. Rice's Point rail yard as presently configured has limited potential for an intermodal rail terminal, and traffic generated by the RO/RO vessel would likely have to be drayed. The Duluth Seaway Port Authority owns both the C&D and Clure Marine terminal. The Seaway Port Authority can issue bonds and seek other public financing for development and that adds to the attractiveness of these properties.

Superior Docks

The Superior side of the Twin Ports' harbor has a number of underutilized docks.
The adjacent docks of Hallet #8 and C Reiss Coal have sufficient open acreage, adequate dock walls, channels and access to highways and rail service (See Photos 8.7 and 8.8, Appendix C). The Hallet dock was used by the *Incan Superior* and was recently used to

bring in lumber by barge from Canada. These docks are about a half-mile into the inner harbor adding inner harbor transit time.

The Former Globe Elevator is a long narrow pier that was originally a grain terminal and the old buildings remain on the property. The 6.5 available acres are insufficient for a viable RO/RO parking marshaling area (See Photo 8.9, Appendix C).

Northway Carriers Dock is in an excellent position in the harbor and has marginally adequate parking and operating area. The buildings currently on the property break up traffic patterns (See Photo 8.10, Appendix C). There may be additional room for expansion in land adjacent to the terminal. Road access is excellent and cargo would likely have to be drayed to a rail intermodal link.

The dock area at the former Georgia Pacific (Superior Fiber Products) manufacturing plant has a number of existing buildings that break up the available acreage into small parcels (See Photo 8.11, Appendix C). The dock face is limited in length and has not been used for marine use in several years.

At the south end of the Superior side of the harbor are the former Elevator O dock and the Lakehead pipeline dock, (See Photos 8.12, Appendix C). Both of these docks have not been used for many years. There is adequate space at the O dock and marginal space at the Lakehead dock area. Both docks are a reasonable distance from the Superior entrance and would not adversely impact transit time. The road access is to Highways 53 and 2. Traffic would have to be drayed to and from rail intermodal terminals.

Superior docks could apply for Wisconsin state funding for dock development on projects that are for maritime trade if the proposed project meets the requirements set forth by state.

An evaluation matrix was developed to assist in comparing available dock space (See Figure 8.1 in this section). A map showing the location in the harbor of the recommended RO/RO docks can be found in Map 8.6 of Appendix A. The evaluation process did not take into consideration factors such as the physical condition of the structures and an engineering study would need to be done as the next part of the evaluation process. Ownership of the docks was determined but there was no systematic attempt to assess the willingness of the present owners to use these docks for a RO/RO vessel operation.

Dock	Adjacent Railroads (Rail line Owner)	Road Access/Access Management	Acreage	Zoning	Constraints	Maritime Usage	Length of dock in feet	Depth of water in feet alongside dock
Hallet #7 Duluth, MN	(BNSF)	Approximately 1 mile to I-35	80	M1 no stacking limits	Limited draft, long distance breakwater to dock	Currently in limited use	2,000'	22 feet
Clure Public Marine Terminal Duluth, MN	CP, (BNSF), CN, DMNIR, UP	Approximately 1 mile to I-535	20	W1: limits unknown	Acreage for expansion	Currently use is seasonal	5,762'	27 feet
C&D Docks Duluth, MN	CP, (BNSF)	Hwy 53/High residential	28	W1 Limits unknown	Limited acreage	Current use is occasional	1,200'	27 feet
Former Globe Elevator, Superior, WI	(BNSF)	1 mile to Hwy I-535	6.5	W1 stacking 60 feet high	Buildings on property; very small acreage	Vacant	1,000'	27 feet
C. Reiss Coal Dock, Superior, WI	Dray to BNSF access	Winter Street Truck route to .5 mile –535,	49	W1 stacking 60 feet high	None	Vacant	2,500'	27 feet
Hallet #8 Superior, WI	Dray to (BNSF) CP UP, access	Approximately .5 mile to I-535	46	M1 no stacking limits	None	Currently in limited use	2,500'	27 feet
Northway Carriers, Superior, WI	(CP)	.5 to 1 mile to Hwy 53, 2, & I-535	9.5	WI 60 foot stacking height	buildings on property, small acreage	Limited Maritime use	1,000'	28 feet
Superior Fiber/Georgia Pacific Products, Superior, WI	(CP)	.5-1 mile to Hwy 53, 2 & I-535	40	W1, 60 foot stacking height	Dock face length is marginal. Many Buildings	Not used for marine traffic	560'	27 feet
Former Elevator O, Superior, WI	(BNSF)	.5 miles to Hwy 53 or 2 & 3 miles to I-535	21	WI	Dock face needs repair, narrow pier	Vacant	1,500'	27 feet
Lakehead Pipeline Dock, Superior, WI	(BNSF)	.5 miles to Hwy 53 & 2	10	W1 stacking 60 feet high	Small acreage, access, space	Vacant	1,000'	28 feet

Figure 8.1 Potential RO/RO docks: Docks most suitable are highlighted

Evaluation of Potential Intermodal Rail Terminal Locations In The Twin Ports

Rationale for Terminal Study

A more extensive examination of this segment of the Twin Ports Intermodal study was presented as a paper at the Transportation Research Board's 82nd Annual Meeting in January 2003. This portion of the study is concerned with the physical attributes of a potential rail intermodal terminal and develops methodology for evaluation of terminals for low cost entry and applies that to the Twin Ports rail yards. Metropolitan Planning Organizations (MPOs) have expressed the need for planning tools to help in freight analysis (Heanue, 1998). A key component of successful placement of intermodal terminals in smaller size communities has been MPO involvement along with industry participation. This interrelationship is especially important if public funding is to be used. MPOs have a responsibility to find the most cost-effective use of public funds that will result in a commercially viable intermodal terminal (Harder, 1998). Successful planning

requires methods that can be applied at the start of the planning process. Each public/private partnership in transportation infrastructure investment is unique. Typical surveys on placing intermodal terminals focus on; operating characteristics, budgets and technology of the facilities (Upper Great Plains Institute, 2002). While these surveys and studies are vital, they fail to address the siting of an intermodal terminal in a holistic approach. A holistic approach includes issues such as; zoning restrictions, non-rail infrastructure, options for new modal links and land use. Failure to address these key issues often results in the inability to construct a terminal when construction is economically and technologically feasible. The review of literature provided examples of intermodal terminal expansion in the Twin Cities being thwarted by zoning restrictions that precluded use of a track-straddling toplift crane and land use conflict with suburban sprawl (MIRTS, 1995).

The research team cataloged all the working rail yards in the Twin Ports. The key elements of a small working intermodal terminal derived during the research described in Section 5 along with a review of relevant literature were used to establish criteria that were applied to the cataloged rail yards.

1) Zoning issues for terminal and adjacent land.
2) Highway load limits.
3) Access to interstate highways.
4) Access to docks.
5) Track layout siding length (2,500 feet minimum)
6) Adequate space (25 feet) between tracks to use unloading (side pick) equipment.
7) Vertical clearance for rail and road access, condition of rail bed, track and bridges. (Minimum vertical clearance for double stack operations is 23 feet)
8) To serve multiple customers the site must be a minimum of ten acres.
9) Present yard utilization and expansion potential.
10) Current density of traffic on the tracks.
11) Opportunity for supporting businesses wishing to locate in the vicinity of a facility and residential impact.
12) Access to Class 1 rail lines with a minimum of switching between railroads to get on the intermodal route.

Evaluation Process

There are five railroads running through the Twin-Ports, which include Burlington Northern Santa Fe (BNSF), Canadian National (CN), Duluth Missabe and Iron Range Railway (DM&IR), Canadian Pacific (CP) and Union Pacific (UP). Each of these railroads has one or more yards located within the study area (See Map 9.1 Appendix A). Four of the five railroads that serve the Twin Ports are Class 1 railroads. Only CN and DM&IR have yards that directly access the existing intermodal network lanes and services. While UP, CP and BNSF have rail facilities in the area and offer intermodal services in other parts of their service network, they do not have intermodal services or trains which connect the Twin Ports area to other portions of their network.

Wisconsin and Minnesota have different weight limits for highway traffic that can impact the location of transportation hubs. The bridges that cross the St. Louis River also have different weight limits. A freight corridor with a uniform weight limit connecting the terminal to key cargo generating or receiving areas would address part of the problem. The building of a successful intermodal terminal in this area will require that the relevant government agencies address the weight restrictions.

Twin Ports Railroad Yards

Rail Road Ownership	Yard Name	State
UP	Itasca Yard	WI
	Belknap Yard	WI
BNSF	Mike's Yard and Rice's Point Yard	MN
	Allouez Yard and 17th & 28th Street Yard	WI
DM&IR	Proctor Yard	MN
	Steelton Yard	MN
CN	Pokegama Yard	WI
CP	Stinson Yard	WI

Figure 9.1 Twin Ports Railroad Yards and State Location

Yards Eliminated

Through the use of a criteria matrix, (See Figure 9.2) the team eliminated six yards that did not meet the standards required for an intermodal terminal and highlighted those that were acceptable. The yards eliminated included:

1. Belknap and Mike's yards: were too small for an intermodal terminal and had restrictions on bridge, track spurs. The Belknap yard also bordered a residential and school area.
2. The Allouez yard: was not considered suitable because it is dedicated to shipping taconite iron ore pellets.
3. Itasca yard's bridge clearance on the approach was determined to be inadequate for double stack train and this yard's acreage was also too small.
4. The Stinson yard, though it had the space needed for expansion, is located within a residential area and central to several schools, thereby being unduly influenced by an increase in truck traffic.
5. Rice's Point yard is utilized as a marshalling yard for the grain elevators located on the point and did not have enough space between tracks, nor space to expand.

Yard	Railroad	Road Access/Access Management	Bridge Clearance	Expansion Capabilities	Advantages	Constraints	Usage	Trackage Length (min. 2100'spur)	Trackage Space (25 ft between)
Belknap	Union Pacific/ Chicago and Northwestern **UP**	Hwy 53/ High residential	Restricted	None	NA	Acreage too small	Switching	No	No
Itasca	Union Pacific/ Chicago and Northwestern **UP**	Hwy 53/High residential	Restricted	None	NA	Access, too small	Switching	No	No
Allouez	Burlington Northern & Santa Fe **BNSF**	Hwy 53/High residential	Restricted	None	NA	Specific freight	Taconite storage	OK	No
Stinson	Canadian Pacific/ Soo Line **CP**	Hwy 53/Hwy 35/ Stinson Blvd / High residential	Restricted	None	NA	Access, space	Switching	OK	No
17th & 28th Street	Burlington Northern & Santa Fe **BNSF**	Hwy 35/Medium residential	No	Possible	Central location- near docks	Wetlands, residential , roadways, EPA	Switching yard- coal, grain, bulk	OK	On fringe of yard
Mike's	Burlington Northern & Santa Fe **BNSF**	Central Ave/ Raleigh St/ High residential	No	None	NA	Access, space	Limestone and Taconite	NO	No
Rice's Point	Burlington Northern & Santa Fe **BNSF**	Hwy 535/Garfield Ave/ No residential	No	None	NA	Space	Rail yard for grain and cement	OK	No
Steelton	Duluth Missabe & Iron Range **DM&IR**	Hwy 23/ low residential	No	V. Good	On current intermodal route, space and access	Longer distance from docks	Switching, local	OK	Space to move tracks
Proctor	Duluth Missabe & Iron Range **DM&IR**	Hwy 2/ high residential	No	Possible,	underutilized infrastructure	Off main corridor/ extensive switching & distance from docks	Switching yard	OK	On fringe of yard
Pokegama	Canadian National **CN**	Hwy 105/ No residential	No	V. Good	On current intermodal route, space and access	Longer distance from docks, costs	Switching, local	OK	room to expand

Figure 9.2 Rail Yard Evaluation Matrix: Yard considered suitable are highlighted

Suitable Yards

There are four existing yards in the Twin Ports that have the best potential to be used as intermodal terminals with a minimum of infrastructure improvements. According to the data collected during this phase of the research, the rank order of the four selected yards is listed in figure 9.3. The location of the yards in the metropolitan area can be found on Map 9.2, Appendix A.

Rail Yard Owner-Operator State

1. Pokegama Yard CN WI
2. Steelton Yard DM&IR MN
3. Proctor DM&IR MN
4. 17th & 28th Street Yards BNSF WI

Figure 9.3

17th Street & 28th Street Yards, Superior, WI

These highly active yards are owned by BNSF and used primarily for the shipment of coal, grain and other bulk products. They are located between 17th Street and Hwy 105 alongside Albany Ave. Highway 2 and Highway 35 (Tower Avenue) are among the truck routes through Superior and run adjacent to the yards, thereby allowing easy access. Its site is also within 4 miles of the docks in the ports. With 761 acres combined, these two yards have more than enough space to handle containerized freight (Metropolitan Rail Study, 1996). The trackage in the 17th Street yard, alone, is over 2,500 feet in length. There are places where the centerline distance between the tracks is great enough for movement of unloading equipment, but the majority of tracks are close together and intermodal operations would have to take place on the fringe areas of the yard. Sufficient marshalling space for trucks may be a problem if only grounded chassis are used. Containers may be stacked up to four high without zoning issues. Highway load limits are not an issue but direct access to some of the Superior and Duluth docks require that trucks use congested Winter Street or pass through downtown. Upstream Superior Docks on the St. Louis River can be accessed by less congested routes and most Duluth docks can also be reached by the Bong Bridge and I-35.

Albany Avenue has no road restrictions, but the road is in very poor shape. Access would come from Highway 2 and Highway 35. There would be a residential area to pass through from Highway 105. A manufacturing zoning status is assigned to this property, which will allow for a 60-foot height when stacking containers.

Concerns: Located adjacent to mitigation fields and wetlands, situated along residential and commercial district areas, and commercial traffic is high on Highway 35 along the Tower Avenue corridor.

Proctor Yard, Proctor, MN

The DM&IR owns this extensive yard in downtown Proctor. Its in-yard trackage is well over 4,500 feet (maps from DM&IR), with the centerline-to-centerline distance between the tracks in excess of the 25-foot minimum. Again, this yard is located on Highway 2, which is a major truck route into and out of Duluth. There are no road restrictions and there is room for expansion along the lines. The zoning of this yard falls under manufacturing. Acreage is sufficient for moderate use but expansion would be difficult due to the location in the center of the city of Proctor. Highway load limits are not an issue but direct access to some of the Superior and Duluth docks is nearly ten miles away and requires that trucks move down I-35 and cross the Hammond or Bong bridges.

Concerns: Access to the Class 1 railroads is more difficult from this location than the other optional sites.

Steelton Yard, Gary-West Duluth, MN

This yard is located off Highway 23 in the Gary-New Duluth neighborhood. It is owned by the DM&IR with trackage that runs for 1¼ miles. There are four working tracks and one storage track. There is room between tracks only for a pickup, but there is room on both sides for expansion.

This yard is located within ¼ mile of highway 23, where weight restrictions are not an issue for trucks and the ¼ mile approach road has no restriction. There are up to 30 trains traveling this route each day with the predominant freight moving along this trackage

being iron ore. The zoning in this area is manufacturing, thereby allowing expansion. Discussion with the DM&IR indicates that substantial adjacent acreage could become available for an intermodal terminal development. The mountain grade of the Duluth heights requires large trains to operate at slow speeds. This operational requirement means that at the Steelton yard the CN intermodal train is moving at speeds of 10-20 miles per hour.

Concerns: Would need investment for new access road as the present one is maintained for use by service vehicles only and is in poor condition.

Pokegama Yard, Superior, WI

Pokegama Yard is the most modern of the yards and has been owned by Canadian National (CN) since 1925. With the merging of Wisconsin Central, the Duluth/Winnipeg Yard is now under CN's direct rulings (Gary Carlson, 2002). It is located one mile off Highway 105, a truck route, on Pokegama Road. Eighteen trains travel on this route everyday, regularly. The Canadian National's intermodal trains travel this route daily. The Oliver Street Bridge crossing and curves require that CN intermodal train travel at 10-20 miles per hour when it passes through the Pokegama yard. One intermodal train a day is southbound to Chicago's intermodal facility and one northbound to Winnipeg, Canada. The remaining trains are not involved in intermodal freight. The rail distance to Chicago from the Pokegama yard is approximately 500 miles.

This yard's present tracks would not be able to handle intermodal freight as the yard is already full, but it has great potential as a site location, road access, rail-line through traffic, and is six and a half miles from the Superior Port. Areas for expansion include 350 acres of land owned by CN that lie to the west of the tracks. There is room for another track to round the yard and join up at the DM&IR mainline. Zoning is manufacturing and will allow stacking heights up to 60 feet.

Concerns: This yard will need new trackage to extend around the existing yard, but has space for expansion. A facility located at this yard would have little effect on any residential areas. According the Wisconsin Department of Transportation Representatives, Highway 105 may need improvements (Forbes and King).

General Conclusions:

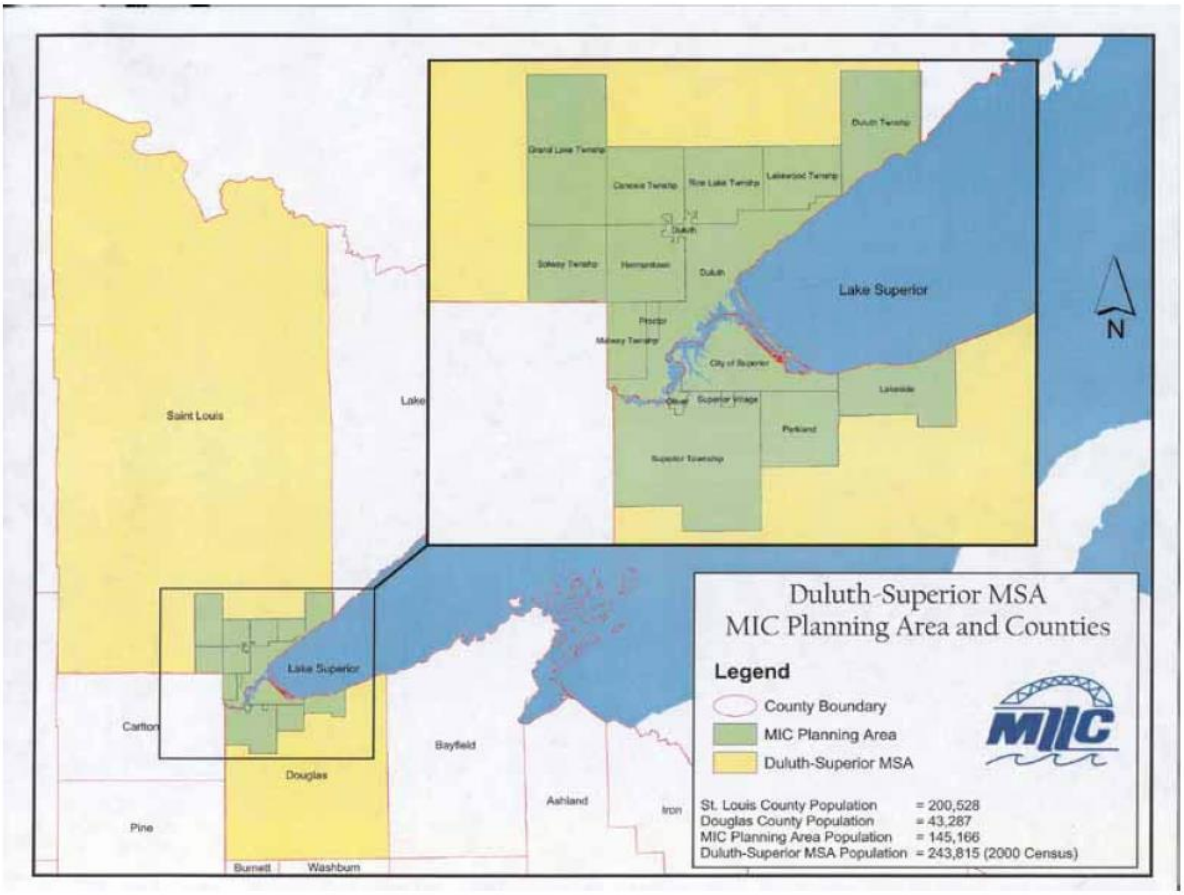
• **Establish a Full Service Terminal:** This would be a terminal operating five to seven days a week with scheduled rail service. The service could be tied to the existing intermodal train operated by CN, or, trains operated by any of the carriers and tied to either the Chicago hub or the Twin Cities terminals would provide the service. Examples of successful full service intermodal terminals are Midway in St Paul, MN and the Port of Montana. The system could have various classes of service available.

• **Specialized Equipment Dedicated Operation:** This would be a terminal operating five to seven days a week with scheduled rail service. The service would be tied to specially designed intermodal operations such as Iron Highway, RailRunner, RoadRailer or Triple Crown. This use of specialized equipment is best suited for committed customers who have distribution centers and the probability of backhaul cargo. The service routes could be to Detroit, the Chicago hub or the Twin Cities. The service has a limited customer base due to higher equipment costs.

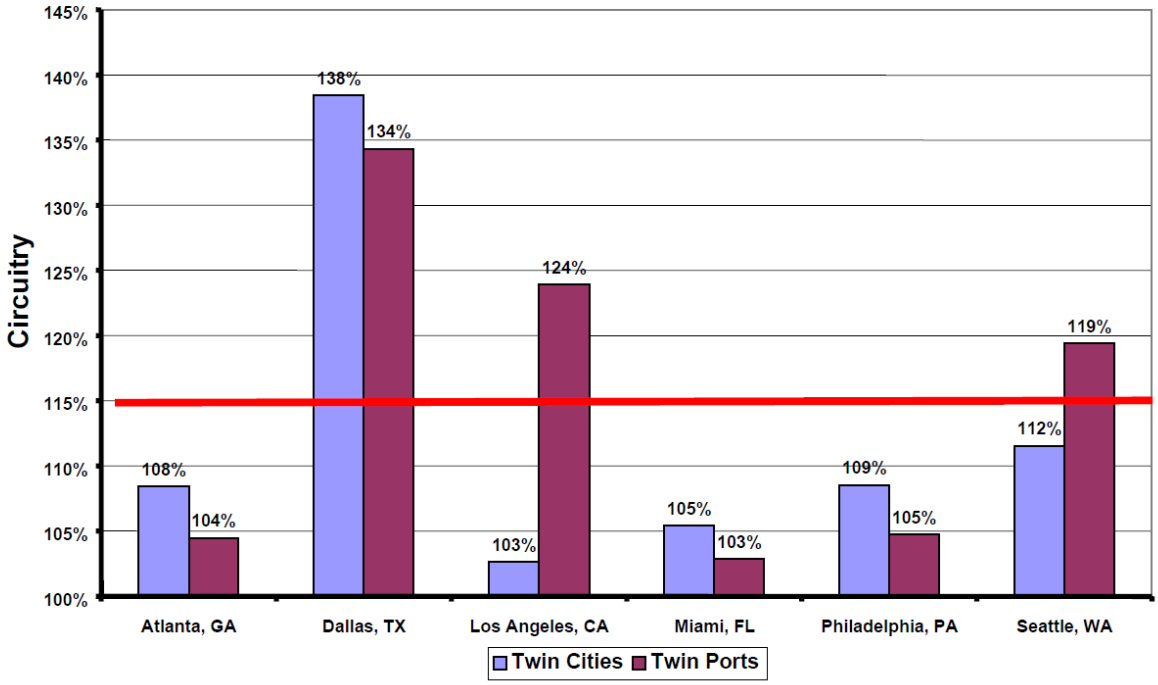
• **Paper Ramp or Outreach Facility**: This would be a terminal operating five to seven days a week with scheduled rail service. The service would be done by bringing the trailers to a drop lot and then be drayed by truck to a rail intermodal terminal in the Twin Cities or Chicago. For a shipper, freight shipments would be available for pick up and drop off locally and the rail carrier arranges for road transportation to an existing intermodal facility. The service would appear to be similar to a rail intermodal service.

There is the potential to reduce drayage costs by this operation through balanced drayage operations and economies of scale. The Paper ramp can be combined with any of the other three services to gain economies of scale and defray operating costs. A portion of the freight would be drayed to the Twin Cities and other cargoes to Chicago or Vancouver. An example of a successful Paper Ramp is in Ft. Smith, Arkansas.
There are a number of unanswered questions that exceed the scope of this study but must be addressed in the process of establishing any intermodal terminal.

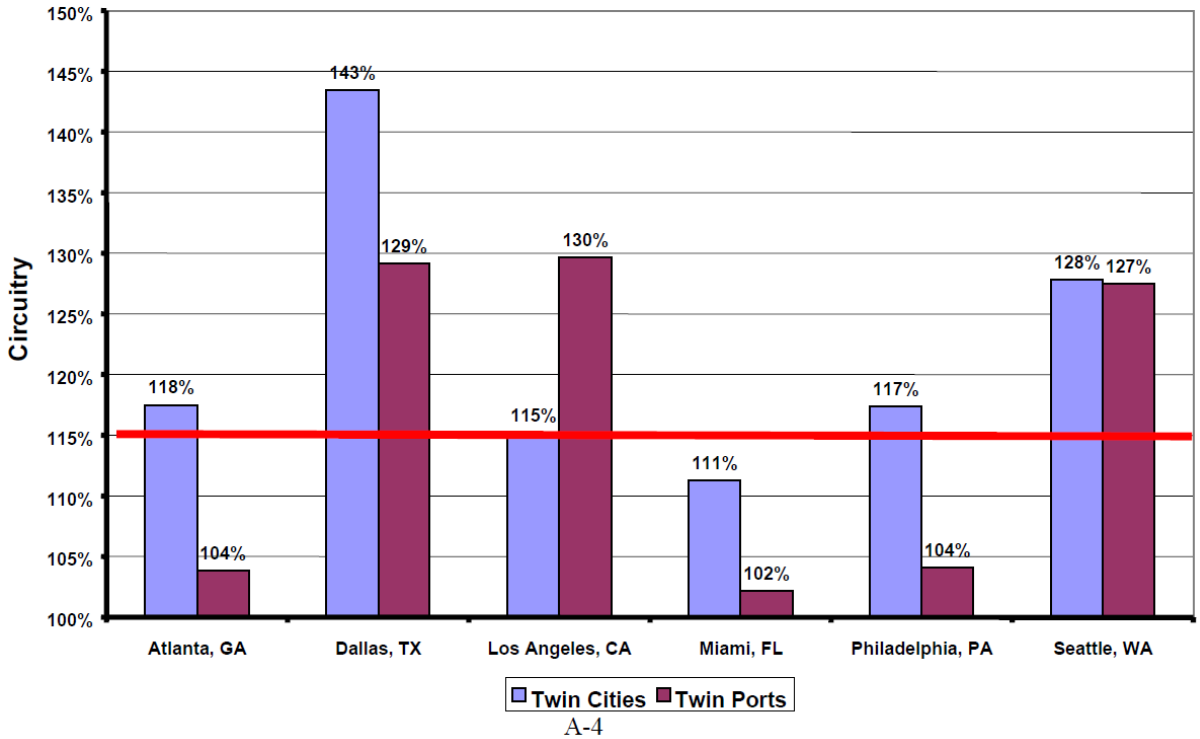
Map 4.1: Duluth-Superior MSA



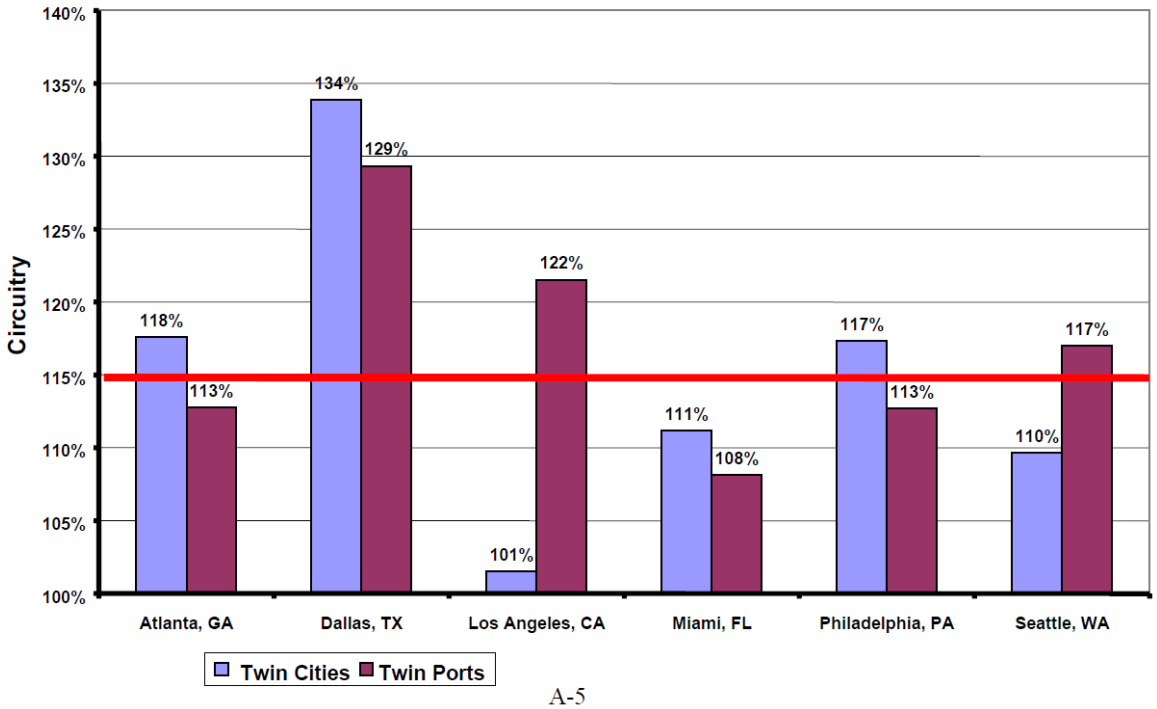
Graph 4.2: Cloquet Circuitry Test



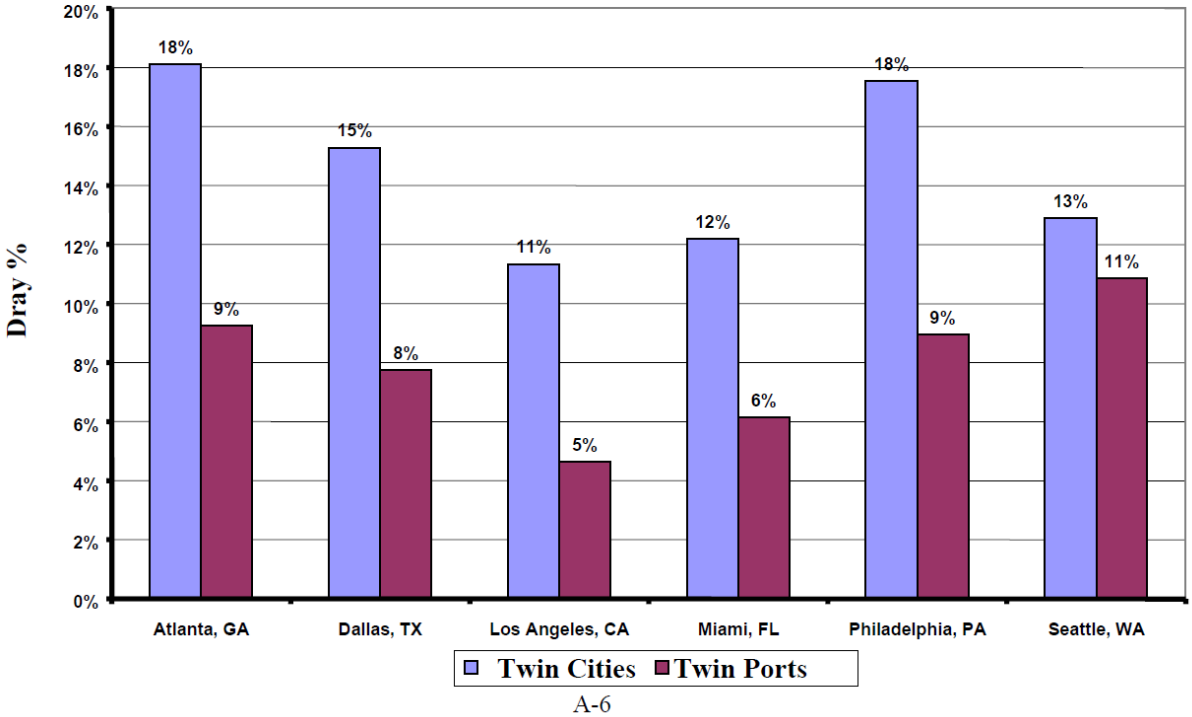
Graph 4.3: International Falls Circuitry Test



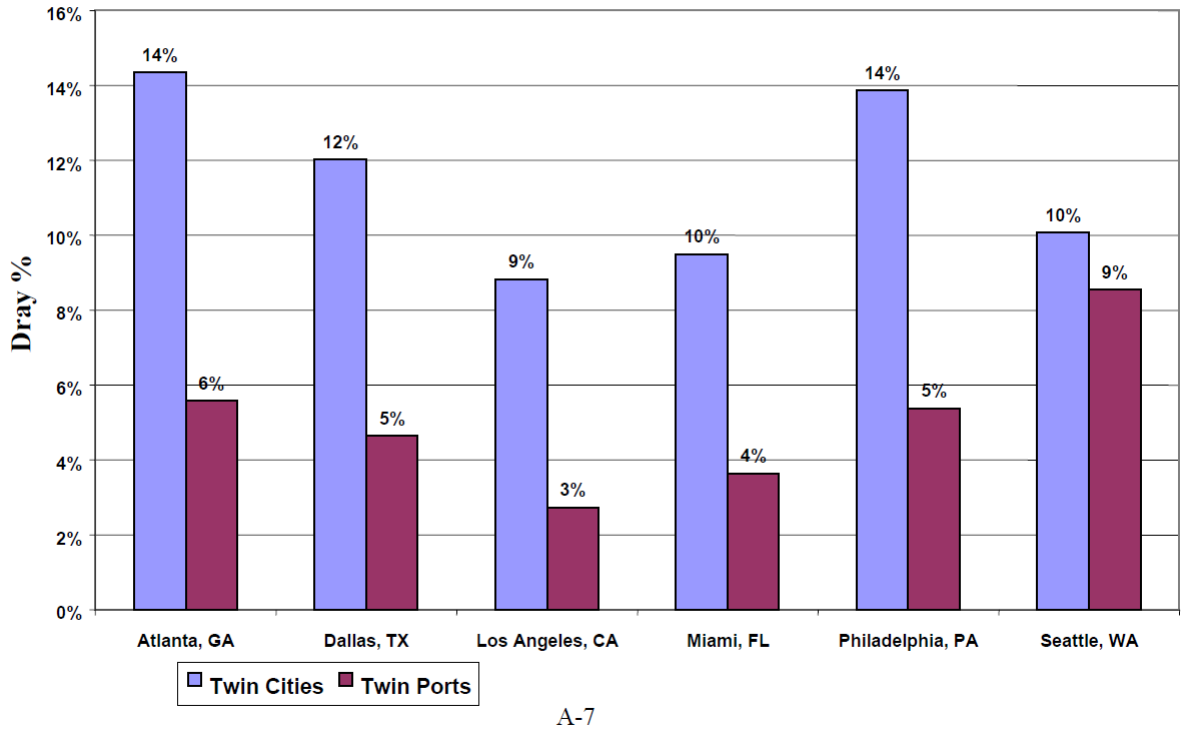
Graph 4.4: Ashland Circuitry Test



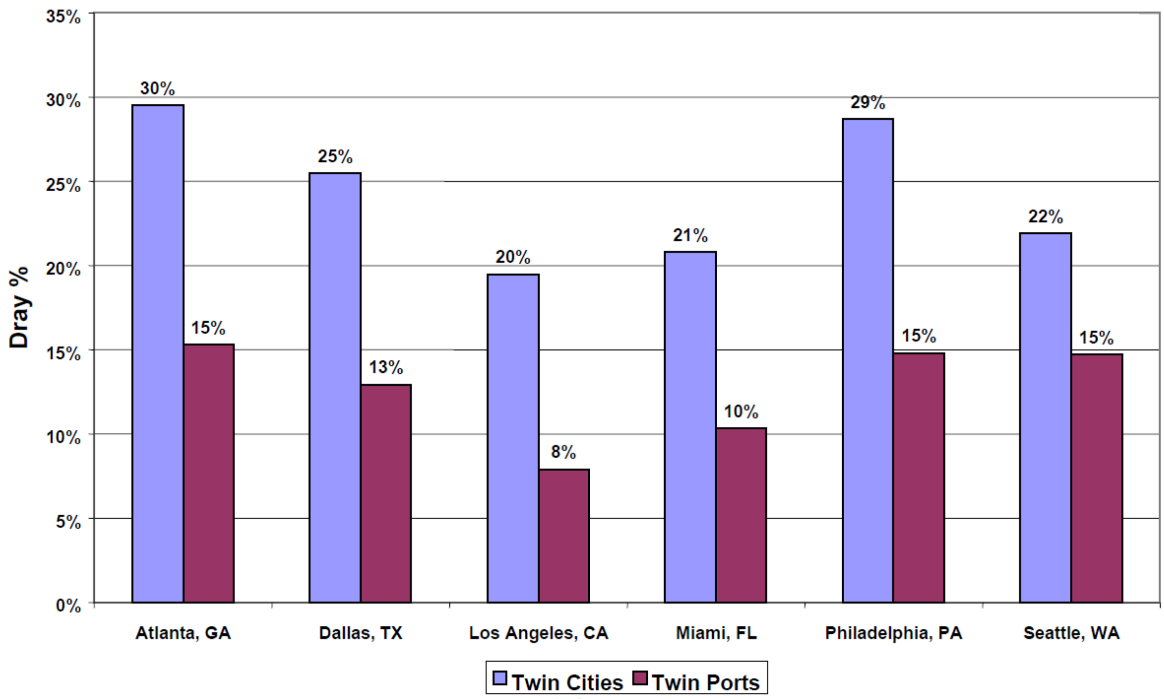
Graph 4.5: Ashland Dray % Test



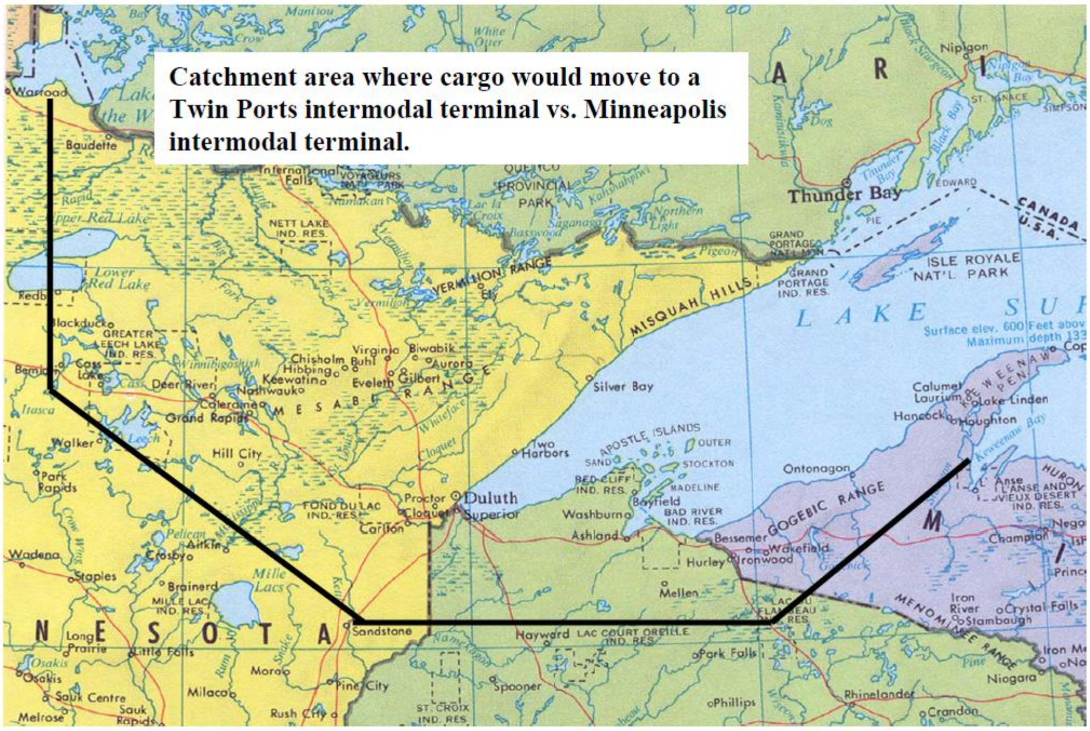
Graph 4.6: Cloquet Dray % Test



Graph 4.7: International Falls Dray % Test

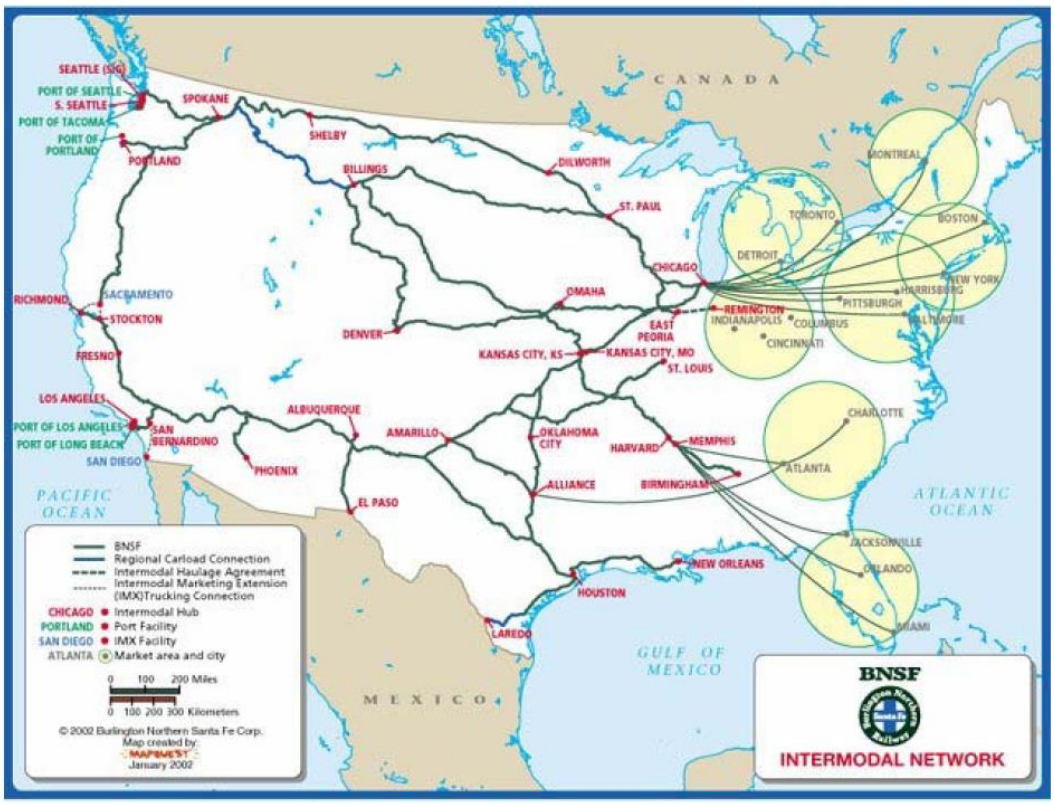


Map 4.8 Twin Ports Catchment Area

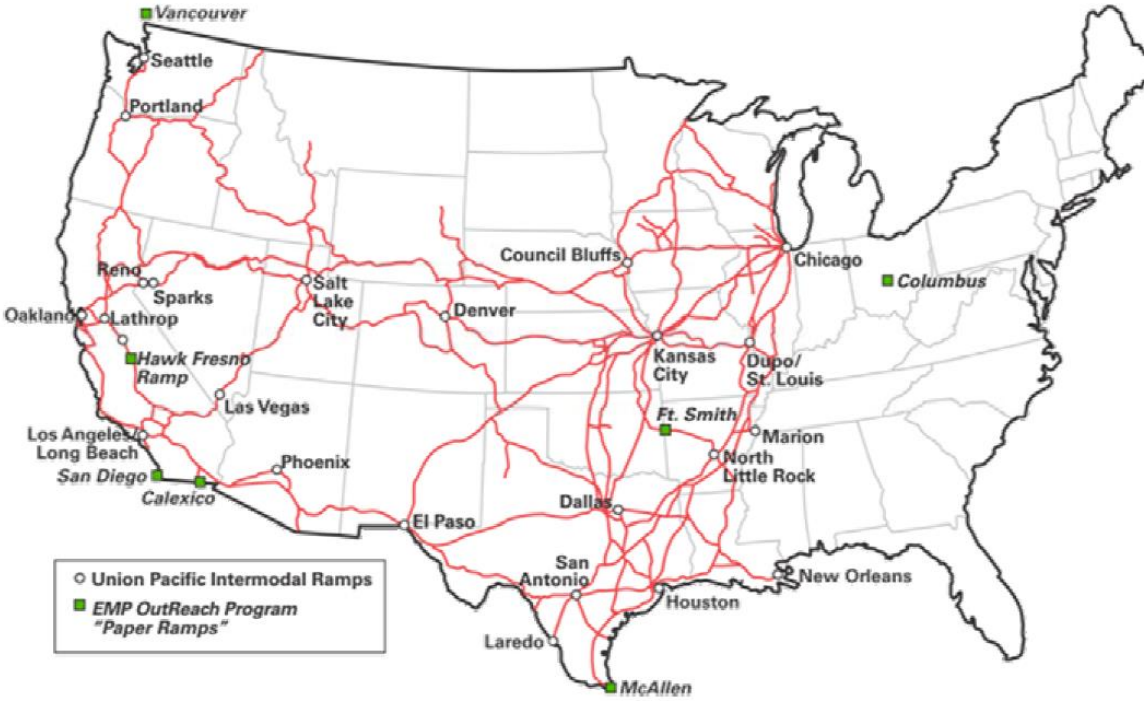


Map 5.2: Canadian Pacific Intermodal Route

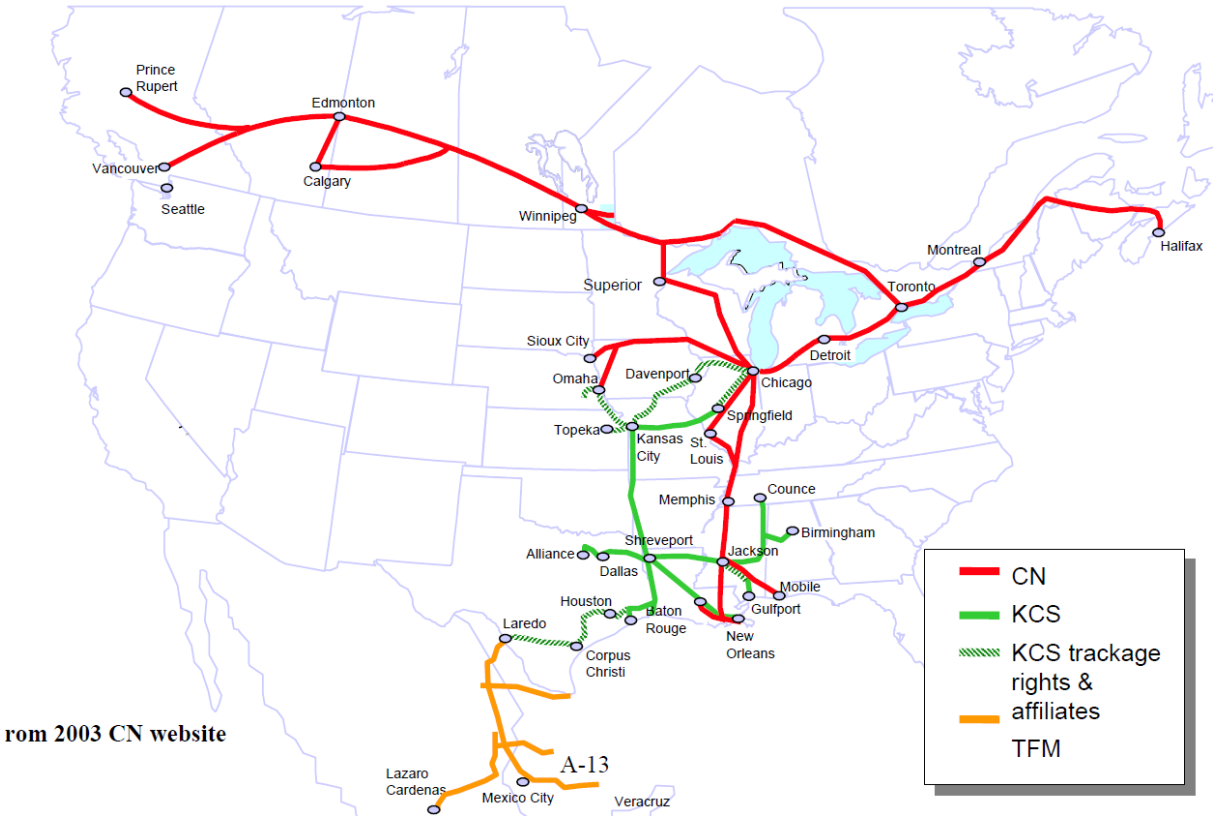
Map 5.3: BNSF Intermodal Routes



Map 5.4: Union Pacific Intermodal



Map 5.5: Canadian National Railroad System



rom 2003 CN website

Map 5.6: Intermodal Terminals Surveyed and Visited

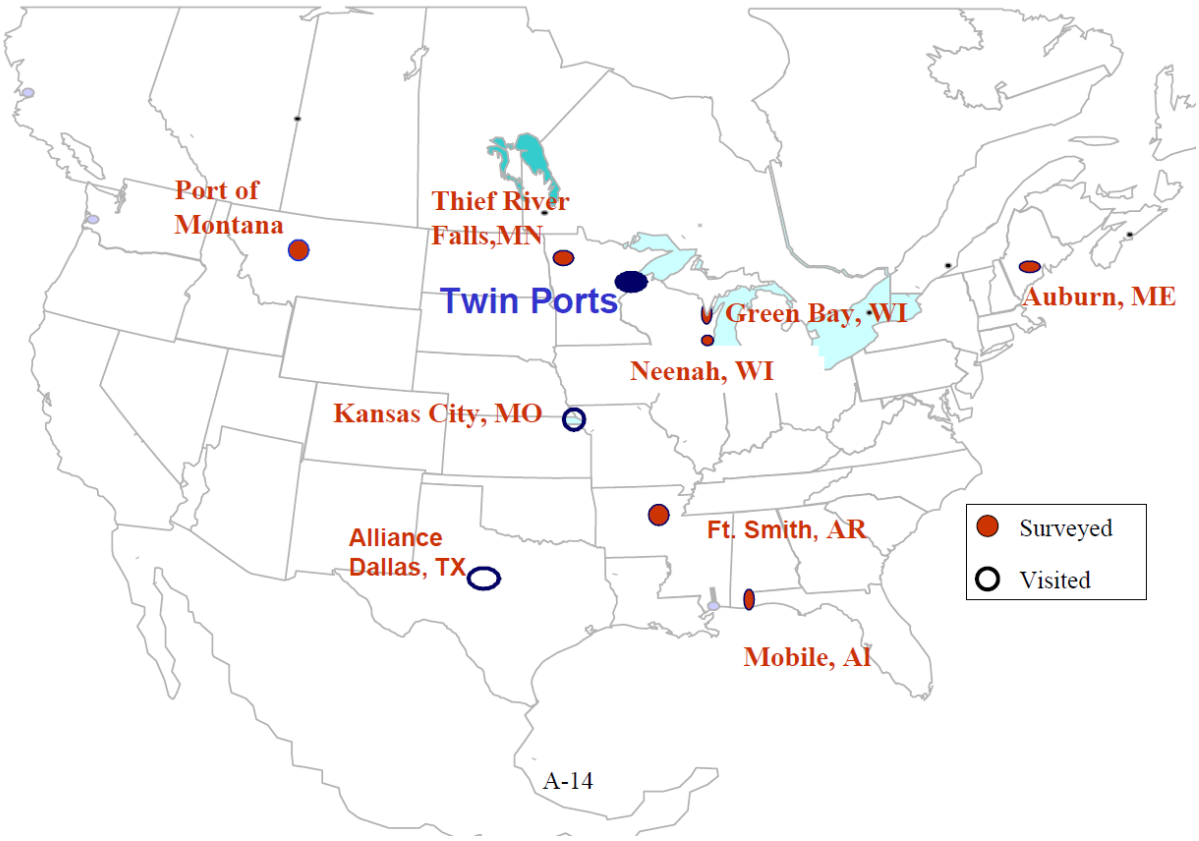
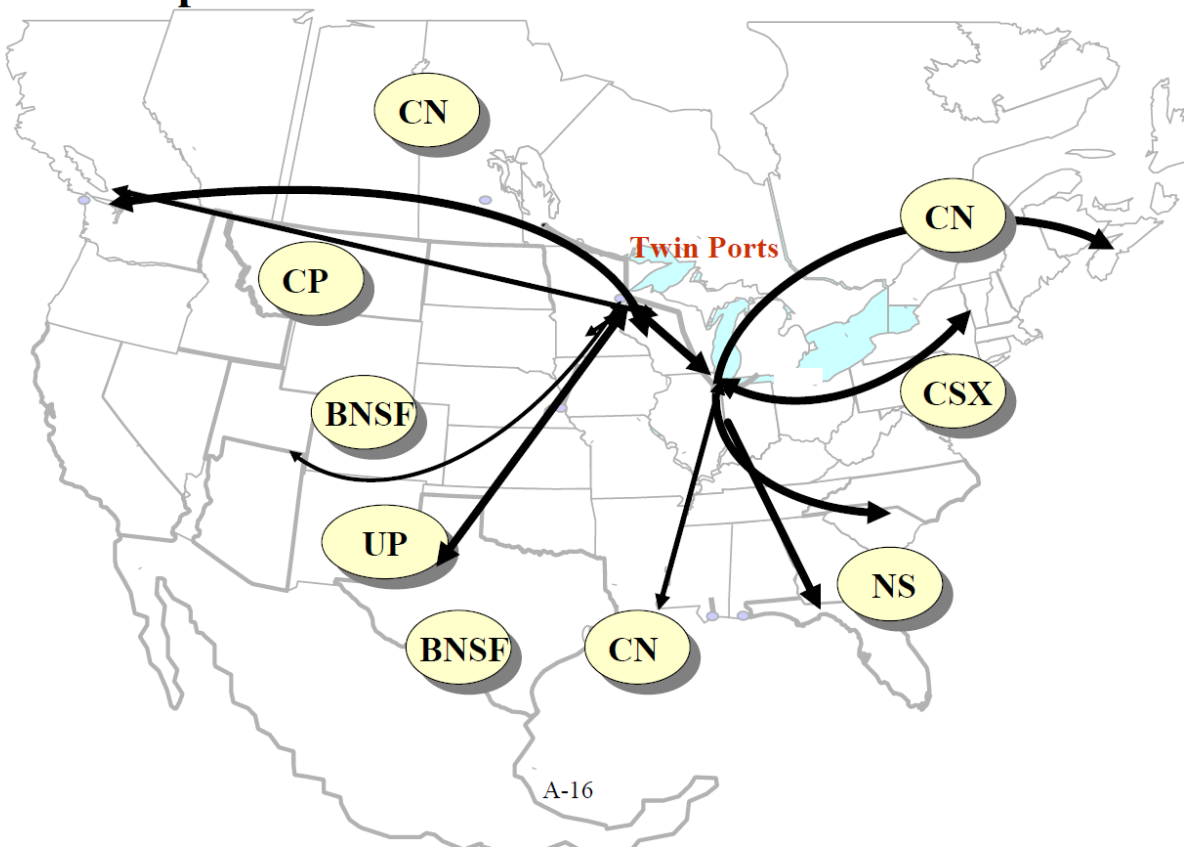


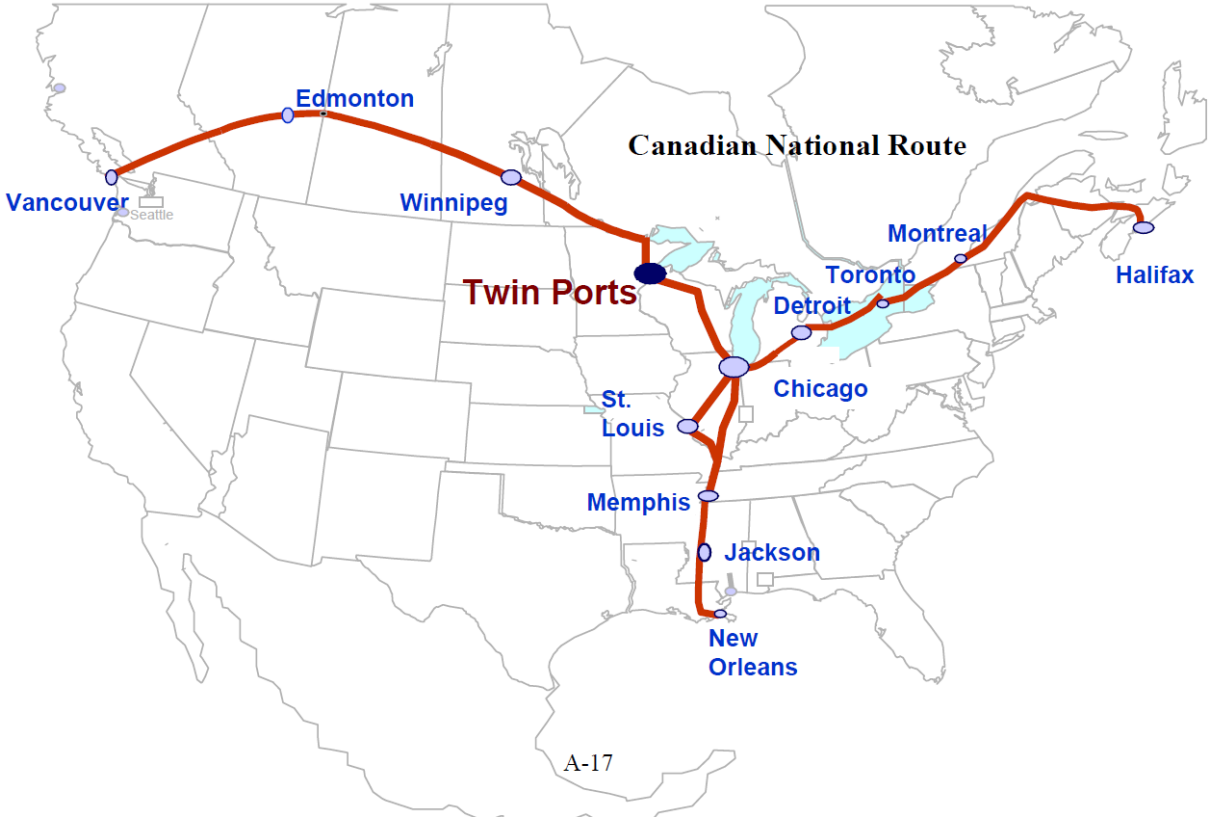
Figure 5.7: Intermodal Terminal Data Sheet

	Railroad Name	***CN***	***CN***	***CN***	***CN***	***CP***	***BNSF/UP***	***UP***
Line	**Input**							
	Terminal Name	Mobile	Neenah,WI	Green Bay, WI	Auburn, ME	Thief River	Butte	Fort Smith
Basic Characteristics								
	7 day a week operation?	6 day	6 day	6 day	yes	yes	5	6
	Shared with another railroad or operator?	no	no	no	no	no	yes	no
	On-dock rail facility at a port?	yes	no	no	no	no	no	no
Volume Activity								
	Annual Lifts - Primary	14,000	8,000	21,840	13,500	LT 5000	1,200	0
	Annual Lifts - Secondary	1,700	n/a	n/a	3,000	0	3600	0
	Annual Number of Gate Transactions	22,000	8,000	22,900	17,000	LT 5000	1,200	8,188
	Does the above include bobtail moves?	no	no	yes	yes	yes	yes	yes
Facility Infrastructure								
	Total Acres	15	2	24	34	2	10	10
	Number of Lanes at Gate (inbound and outbound)	2	2	2	2		1	1
	Number of Parking Spaces - Wheeled	100	70	200	650	250	?	80
	Number of Container Spaces - Stacked	30	0	150	350	500	?	0
	Number of Loading Tracks	3	1	5	3	2	6	0
	Linear Feet of Loading Track	2,400	1,600	7,000	3,600	1,700	8,800	0
Equipment								
	Number of Overhead Cranes	0		0	0	0	0	0
	Number of Packers	1	1	2	1	1	1	0
	Number of Hostler Tractors	1	1	3	2	1	2	0
Labor Activity								
	Name of Lift Employee Labor Union, or Nonunion	Non Union	nonunion	nonunion	nonunion		union	nonunion
	Lift Operator Name	Choctaw	CN	CN	ITS		teamsters	Patriot Logistics
	LT= Less Than							

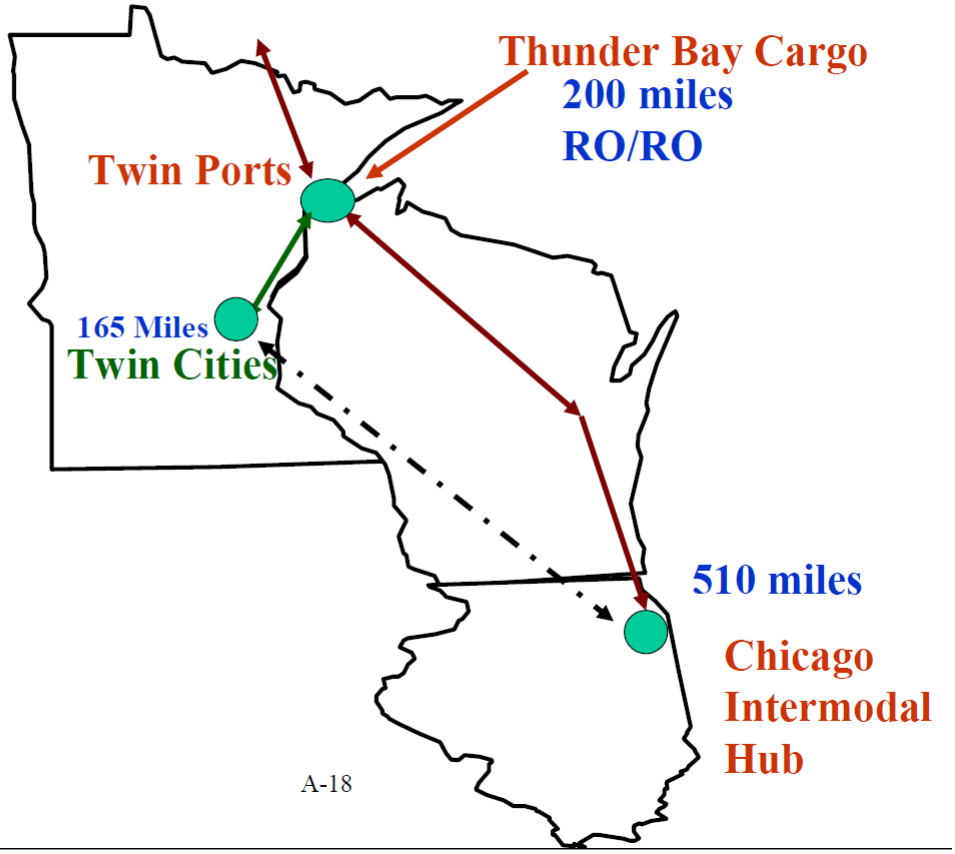
Map 7.1: Class 1 Rail Links to the Twin Ports



Map 7.2: Potential Long Haul Intermodal Routes



Map 7.3: Potential Short Haul Intermodal Routes



Map 8.1: Regional map showing rail lines, highways and proposed RO/RO route

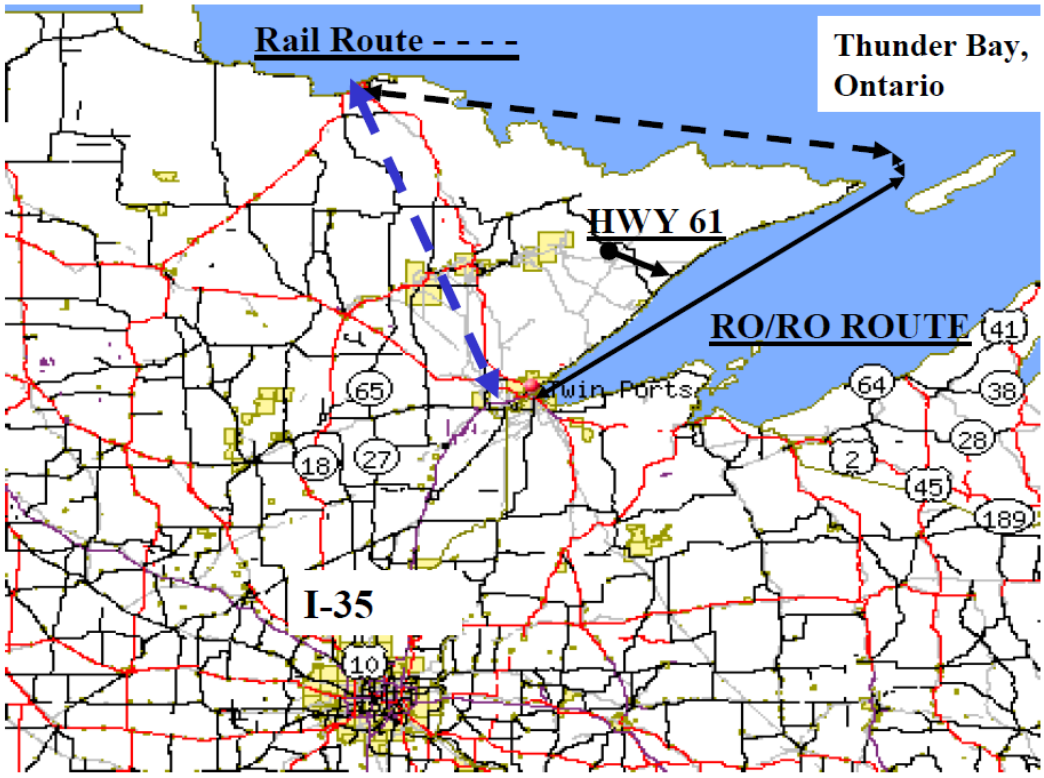


Figure 8.2: RO/RO Vessel Routing Schedule

- **Harbor Transit: 2 Hrs**
  - To and From Breakwater
  - Maneuvering, Speed Limits
  - Not Variable
- **Sea Transit: 7.5 Hrs**
  - 165 Nautical Miles
  - 22 knot Cruising Speed
- **Unload/Load: 2 Hrs**
  - Dependent on Vessel Size and Labor Efficiency
  - Variable

  One Way Voyage = 11.5 Hrs
  Round Trip = 23 Hrs
  - 30 Trips per Month
  - 10 Month per Year
  - 165 Nautical Miles

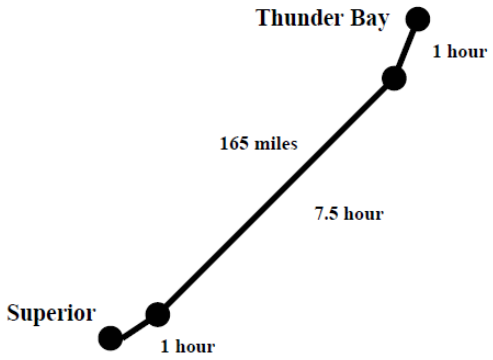


Table 8.3: Potential RO/RO Vessels

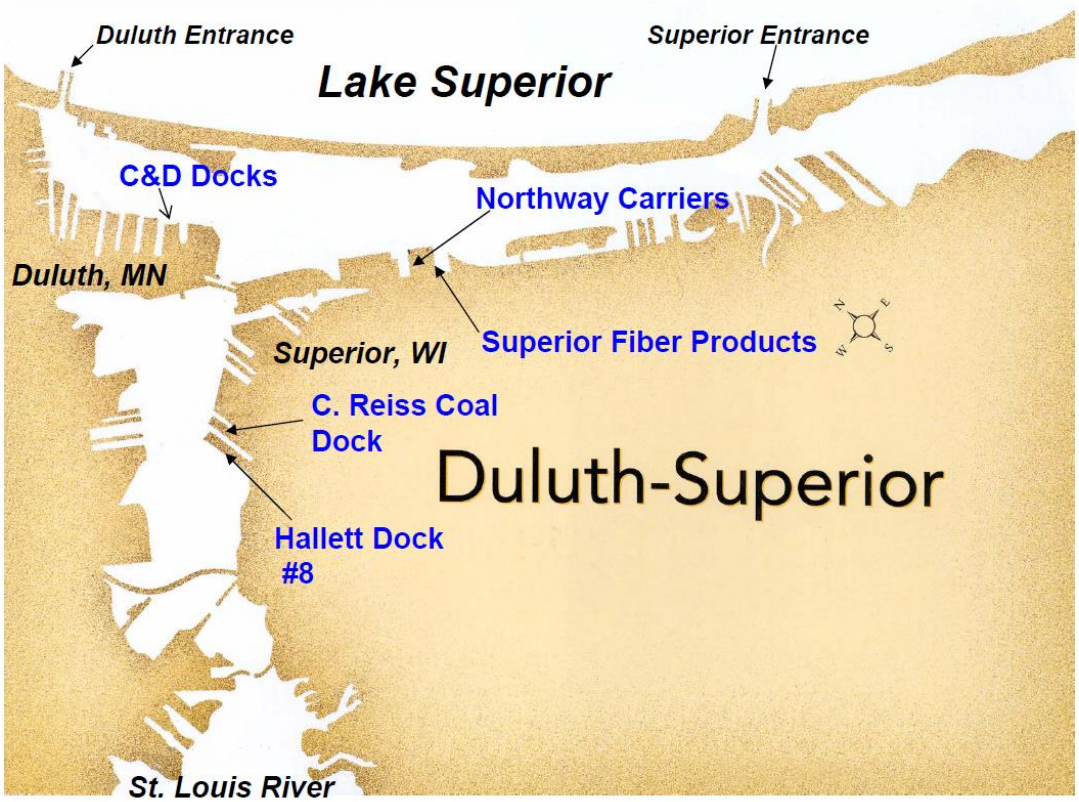
	Napoleon	***Quiberon***	***George OTS***	***PV 1200/80***
Speed	**24 knots (kts)**	**19 kns**	**20 kts**	**17 kts**
Year Built	**1976**	**1975**	**1980**	**1980**
GRT	**14,918**	**8,314**	**12,549**	**12,549**
LOA	**504'**	**419'**	**445'**	**445'**
Beam	**78'**	**70' 5"**	**68' 3"**	**68' 3"**
Draft	**20' 8"**	**16' 2"**	**18' 6"**	**18' 6"**
DPAX	**1844**	**1214**	**1200**	**1200**
NPAX	**1236**	**756**	**488**	**285**
Cars	**435**	**280**	**67**	**107**
Trailers	**44**	**15**	**15**	**?**
Cost	**OFFS**	**OFFS**	**OFFS**	**2.0M**

Table 8.4: Potential RO/RO Vessel Cargo Revenues

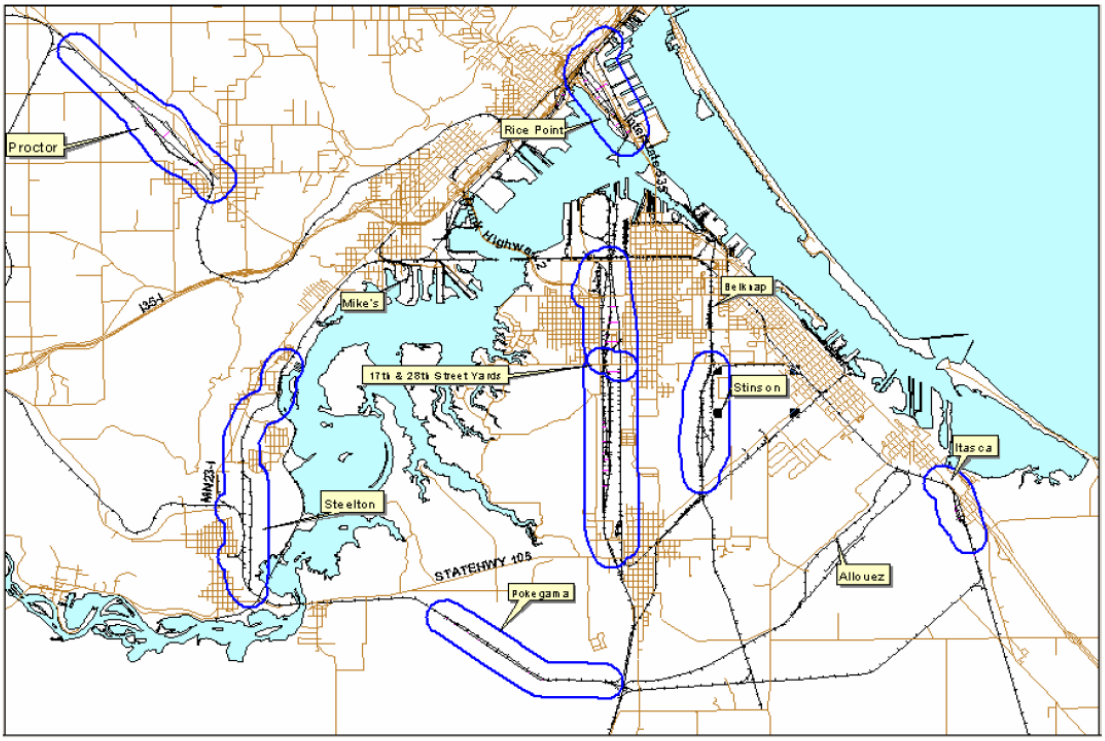
TEU	Price	Revenue	Voyages	Annual Rev
50	$175	$8,750	600	$5,250,000
100	$175	$17,500	600	$10,500,000
150	$175	$26,250	600	$15,750,000
200	$175	$35,000	600	$21,000,000
250	$175	$43,750	600	$26,250,000

- **Price From Local Motor Carrier Firm**
  - **Forty-Foot Trailer One Way $350**
- **Other Revenue Streams**
  - **Storage, 'Flips'**

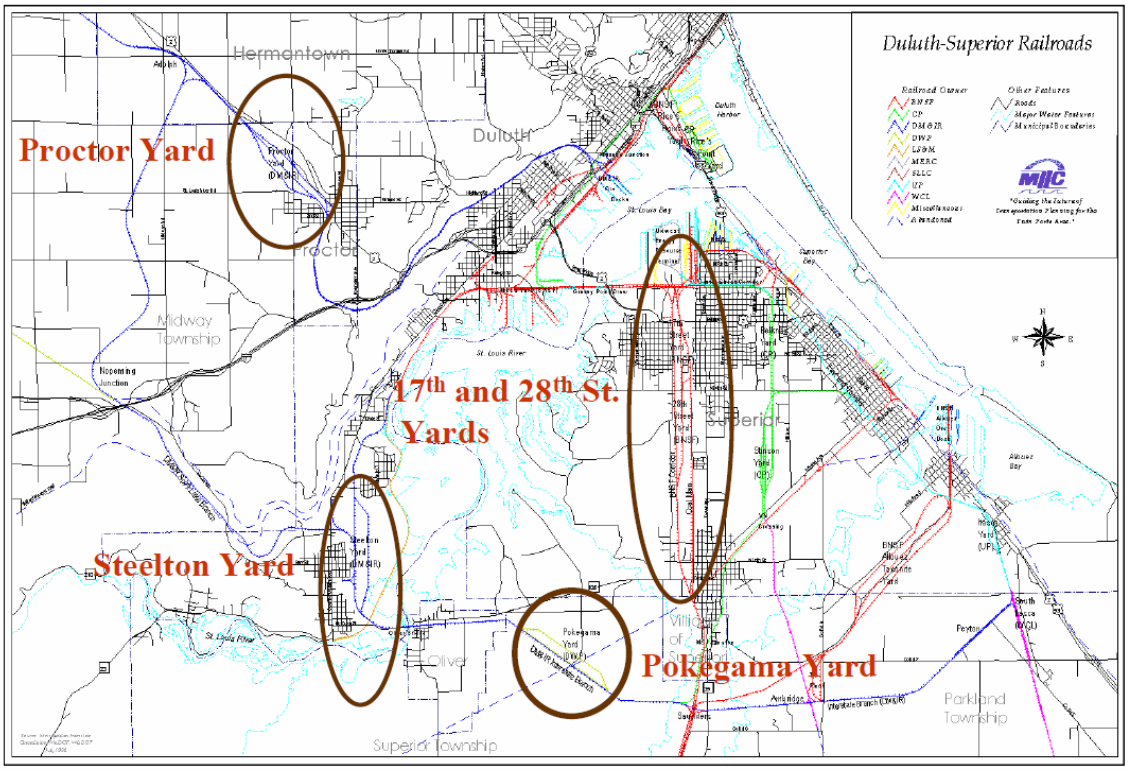
Map 8.6: Recommended RO/RO Docks



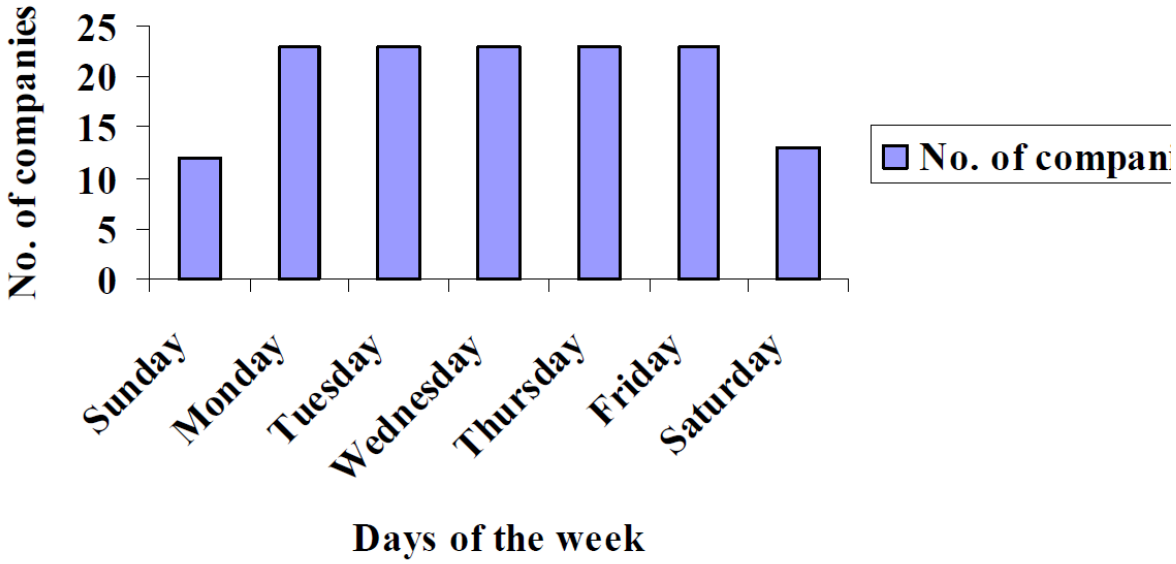
Map 9.1: Twin Ports' Rail Yards



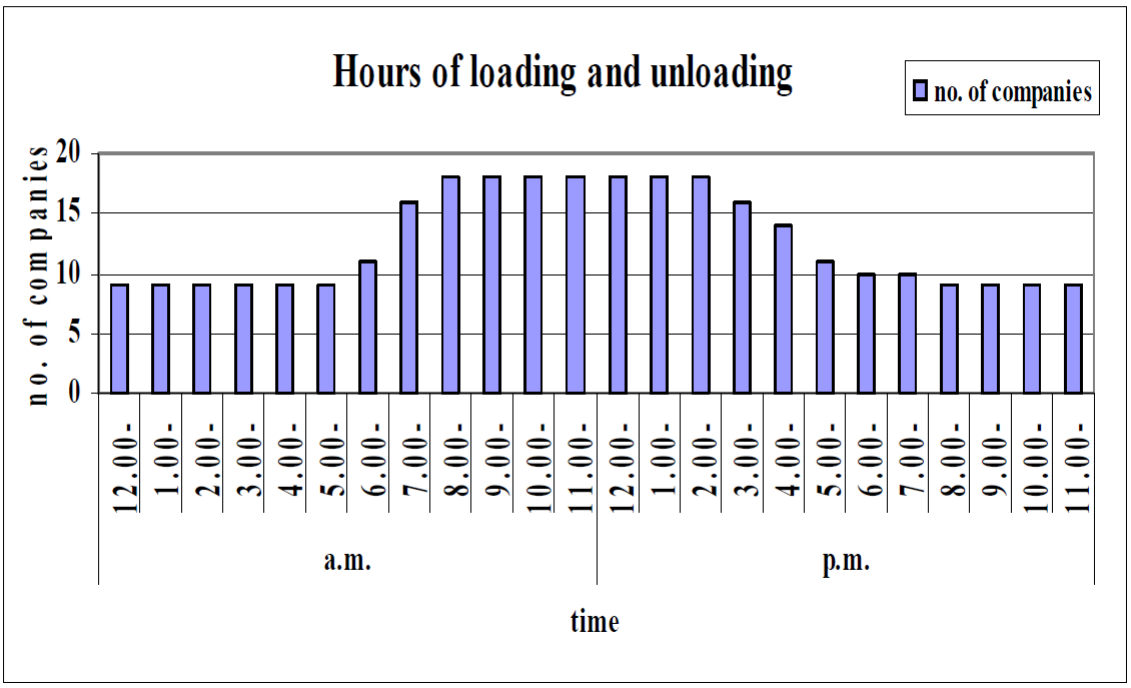
Map 9.2: Selected Intermodal Terminal Sites



Graph 6.3: The Days of Operation for Loading and Unloading Equipment at the Intermodal Terminal



Graph 6.4: The hours of operation for loading and unloading equipment at the facility.



Graph 6.5: Outbound and Inbound Shippers' Requirements: Average For All Groups

	Outbound		Inbound	
1	Final Customer Satisfaction	8.77	Reliability of Service	9.20
2	Reliability of Service	8.52	Transport Cost	9.00
3	Transport Cost	8.27	Final Customer Satisfaction	8.95
4	Ease of Doing Business	8.10	Ease of Doing Business	8.60
5	Claims/ Damage History	7.57	Claims/ Damage History	8.53
6	Total Transit Time	7.57	Total Transit Time	8.50
7	Same Day Pick-Up/Delivery	7.48	Same Day Pick-Up/Delivery	7.90
8	Equipment Availability	7.38	Scheduled Service	7.90
9	Scheduled Service	7.29	Equipment Availability	7.55
10	Choice of Rail carrier	5.29	Choice of Rail carrier	5.37
11	53' Equipment	4.62	53' Equipment	4.05
12	Other*	3.80	Other	0.00

On the scale of 1-10, with 10 being most important and 1 being least important.
*** Tracking Ability, Existing Long Term Sole Source Contacts – Survey Questions 16 & 17**

Figure 6.6: Outbound and Inbound Shippers' Requirements: Paper and Pulp

	Outbound		Inbound	
1	Reliability of Service	9.25	Final customer satisfaction	10
2	Final customer satisfaction	8.75	Reliability of Service	10
3	Equipment availability	8.5	Total Transit time	9.67
4	Total Transit time	8.5	Claims/ Damage History	9
5	Transportation Costs	8.25	Equipment availability	9
6	Other*	8	Ease of Doing Business	8.67
7	Claims/ Damage History	7.75	Choice of Rail Carrier	8.33
8	Choice of Rail Carrier	7.5	Same day pick- Delivery	8.33
9	Scheduled service	7.5	Scheduled service	8.33
10	Ease of Doing Business	7.25	Transportation Costs	8.33
11	Same day pick- Delivery	6.75	53' Equipment	5
12	53' Equipment	5.75		

Figure 6.7: Outbound and Inbound Shippers' Requirements: Consumer Goods

	Outbound		Inbound	
1	Transport Cost	9.5	Transport Cost	10
2	Claims/ Damage History	9	Final Customer Satisfaction	8.5
3	Ease of Doing Business	9	Scheduled Service	8.5
4	Equipment Availability	9	Total Transit Time	8.5
5	Final Customer Satisfaction	9	Claims/ Damage History	8
6	Reliability of Service	9	Choice of Rail Carrier	8
7	Choice of Rail Carrier	8.5	Equipment Availability	8
8	53' Equipment	8.5	Reliability of Service	8
9	Scheduled Service	8.5	Ease of Doing Business	7.5
10	Total Transit Time	8.5	53' Equipment	7.5
11	Same Day Pick-Up/ Delivery	7.5	Same Day Pick-Up/ Delivery	7

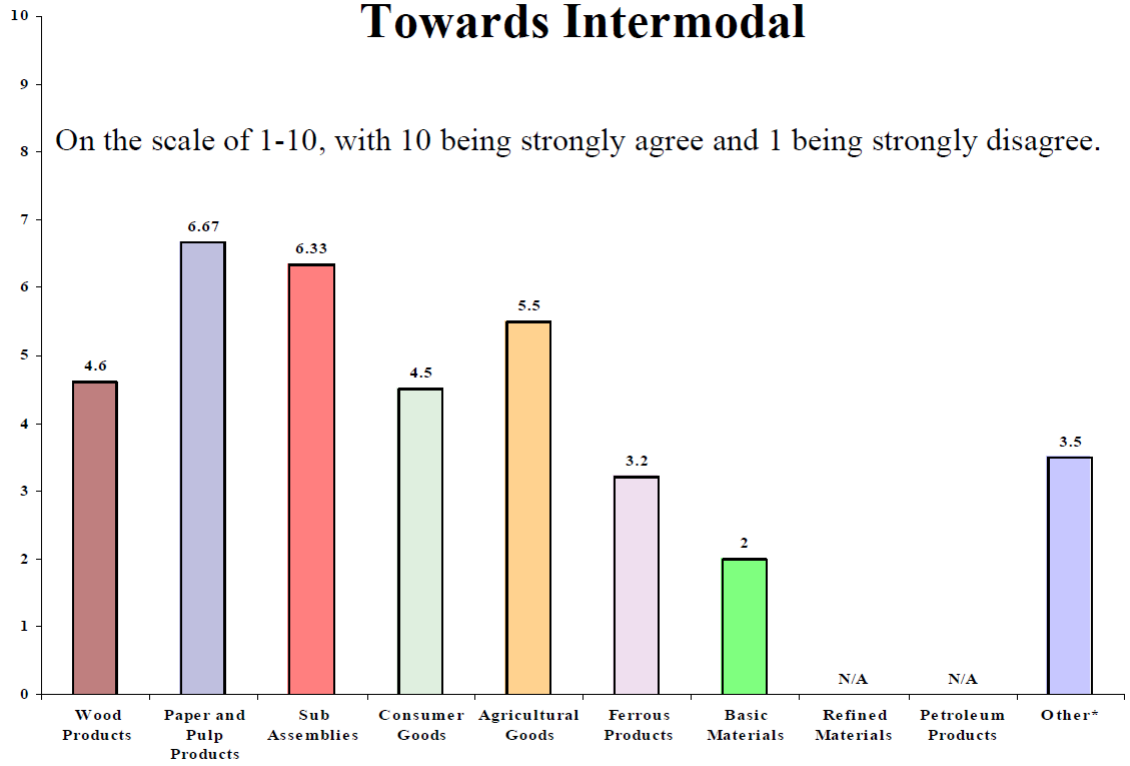
Figure 6.8: Outbound and Inbound Shippers' Requirements: Agricultural Goods

	Outbound		Inbound	
1	Transport Cost	9	Transport Cost	9.5
2	Equipment Availability	8.5	Total Transit Time	8
3	Reliability of Service	8	Choice of Rail carrier	7
4	Ease of Doing Business	7.5	Equipment Availability	7
5	Final Customer Satisfaction	7.5	Reliability of Service	7
6	Choice of Rail carrier	7	Ease of Doing Business	6.5
7	Total Transit Time	7	Final Customer Satisfaction	6.5
8	53' Equipment	6.5	Scheduled Service	6.5
9	Claims/ Damage History	6	Claims/ Damage History	5.5
10	Same Day Pick-Up/Delivery	6	53' Equipment	5.5
11	Scheduled Service	6	Same Day Pick-Up/Delivery	5

Figure 6.9: Outbound and Inbound Shippers' Requirements: Sub-assembly Products

	Outbound		Inbound	
1	Ease of Doing Business	9.33	Final Customer Satisfaction	8.67
2	Final Customer Satisfaction	9	Transport Cost	8.67
3	Same Day Pick-Up/Delivery	7.33	Reliability of Service	8.33
4	Transport Cost	6.67	Claims/ Damage History	8
5	Claims/ Damage History	6.33	Total Transit Time	8
6	Equipment Availability	6	Ease of Doing Business	7.67
7	Reliability of Service	6	Scheduled Service	7.67
8	Scheduled Service	5.67	Equipment Availability	7
9	Total Transit Time	5	Same Day Pick-Up/Delivery	6
10	Choice of Rail carrier	4.33	Choice of Rail carrier	3
11	53' Equipment	3.67	53' Equipment	3

Figure 6.19: Product Category and the Attitude Towards Intermodal



* Electronic Assemblies, Hand Tools, Passenger Cars, Manufacture Steel Products -Survey