

5 THE CHALLENGE OF THE FUTURE

5.1 INTRODUCTION

In the late 20th Century, the Midwest and Central Canada began to face new challenges. The domestic costs of labor in Japan, Korea, China, and India began to reduce the region's international and national competitiveness initially in basic products like iron and steel, but more recently in light manufacturing and even automobiles. This challenge has resulted in the Midwest region needing to adapt to the future and to move up the manufacturing chain into new products of the "New Economy." To meet this need, the Great Lakes and St. Lawrence Region needs to maintain its transportation nexus to meet the needs of "Just In Time" (JIT) manufacturing and to develop new express services using air, rail, highway and water modes.

- The GLSLS region has already developed extensive express air services and major freight hubs exist in such locations as Montreal, Hamilton/Toronto, Rockford/Chicago, Toledo/Detroit, and Rochester/Twin Cities. A large share of the traffic moved by air is related to the computer and medical industries and reflects the need of "new economy" industries for fast "overnight" delivery.
- With respect to rail, significant improvements were implemented to increase speeds and improve the infrastructure for intermodal trains. CN for example developed a new tunnel between Sarnia and Port Huron to provide more effective intermodal service from the Port of Halifax to the Chicago market. A similar project is planned by CP between Windsor and Detroit. Both NS and CSX have improved yard and mainline operations and the Port of Norfolk has developed new inland port facility on the Ohio West Virginia border to increase container through put. However, despite these efforts rail capacity is being reached and significant pressure is being put on the system.
- In terms of trucking operations, significant road improvements such as on the Pennsylvania Turnpike and the 407 in Toronto (the world's longest electronic highway), increasing truck size, weights, and new operating regulations are all helping to improve container and truckload movement times. However, the growth of passenger car volumes on many of the key interstate highways is limiting or threatening to limit the movement of trucks and containers in the increasingly urbanized environment generated by the interstate/expressway system. The 1989 Toronto Urban Goods Movement Study showed how the commuter flows generated by urbanization, reduced manufacturing plant access, and increased manufacturing costs. It developed the case for building the 407 Expressway to provide a new location for industry that offered reduced transportation accessibility costs.
- Capacity limitations are also being felt in the Atlantic and Pacific Ports where increases in oceanic shipping capacity associated with post-Panamax vessels is making ports less efficient in handling ocean traffic. Furthermore, the rapid growth in world trade is threatening the ability of ports to support the efficient movement of container traffic through the port. Some ports such as the Port of Norfolk in Virginia and California's Los Angeles / Long Beach (LA/LB) port complex are taking steps to build more effective distribution systems from the port by improving rail connections and building inland ports¹.

¹ In the case of the Port of Norfolk at front of Front Royal, VA and on the West Virginia and Ohio border on the Ohio River and in the case of San Pedro the Alameda Corridor across Los Angeles to the rail facilities east of the city.

- One resource that is not yet at capacity however is the Great Lakes and St. Lawrence Seaway. This facility is heavily used for bulk traffic but has significant spare capacity to support container traffic from the Atlantic Ports to the Central Canada and Midwest heartland. If efficient transport systems can be developed it could well support the trade and traffic flows needed to maintain and grow the emerging New Economy of the GLSLS region. Recognizing this, the St. Lawrence Seaway Management Corporation created the Highway H₂O brand to give a unified identity to the GLSLS cargo services.

5.2 THE CAPACITY QUESTION

Rapid changes in the U.S. and Canadian economies in the 1990's reflected the growth of the 'New Economy' with its Just-In-Time (JIT) delivery requirements and the relative decline of traditional heavy industrial and manufacturing sectors across the whole GLSLS region. The impact of this change is increasing volumes of truck traffic as the distribution sector grew to accommodate increasing trade volumes, along with growth in intermodal rail transportation for long distance container movement. This growth in truck traffic has put pressure on the existing highway infrastructure, which has also needed to accommodate the strong growth in automobile Vehicle Miles Traveled (VMT). Automobile growth has been extremely strong particularly in corridors used by commuters who are making longer and longer trips as exurbia continues to expand along interstate highways. As a result of this growth, capacity limitations have emerged across segments of the whole network, but particularly around urban areas for the highway system and at major intermodal yards and ports for rail freight. See Exhibits 5-1 and 5-2.

Exhibit 5-1: Major Highway Congestion Areas by 2020

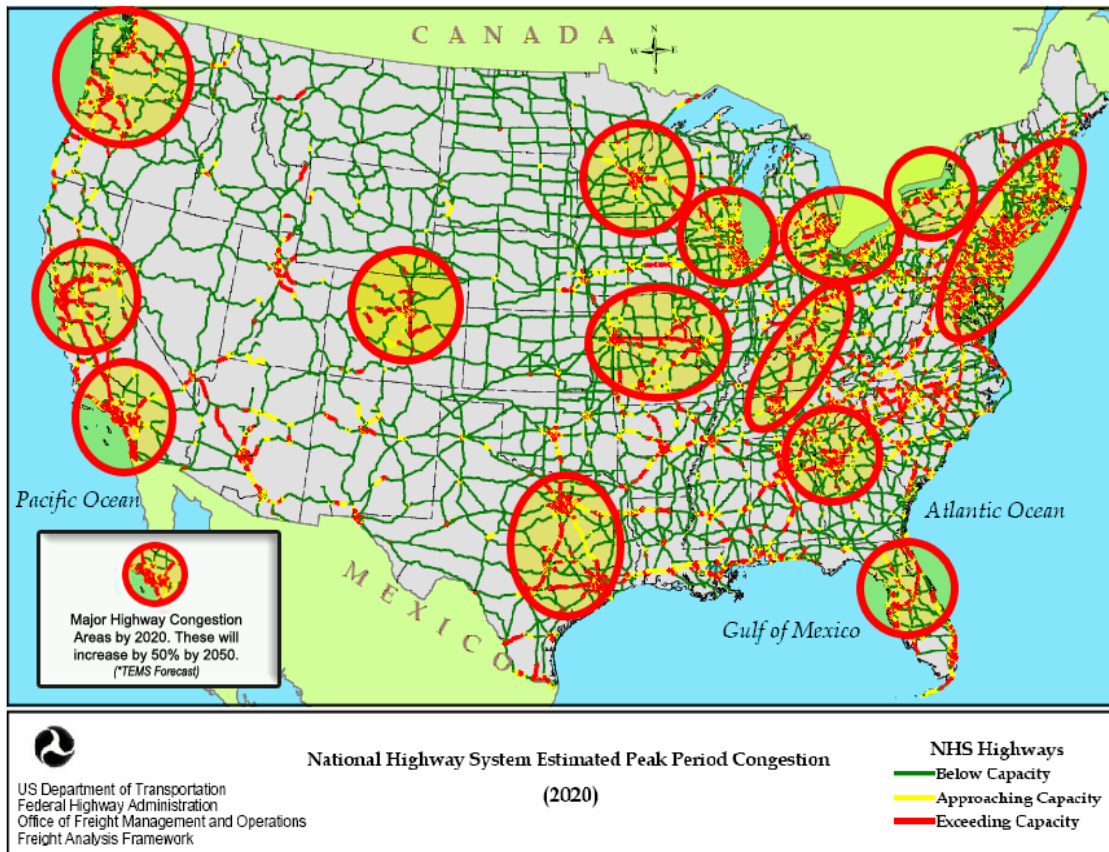
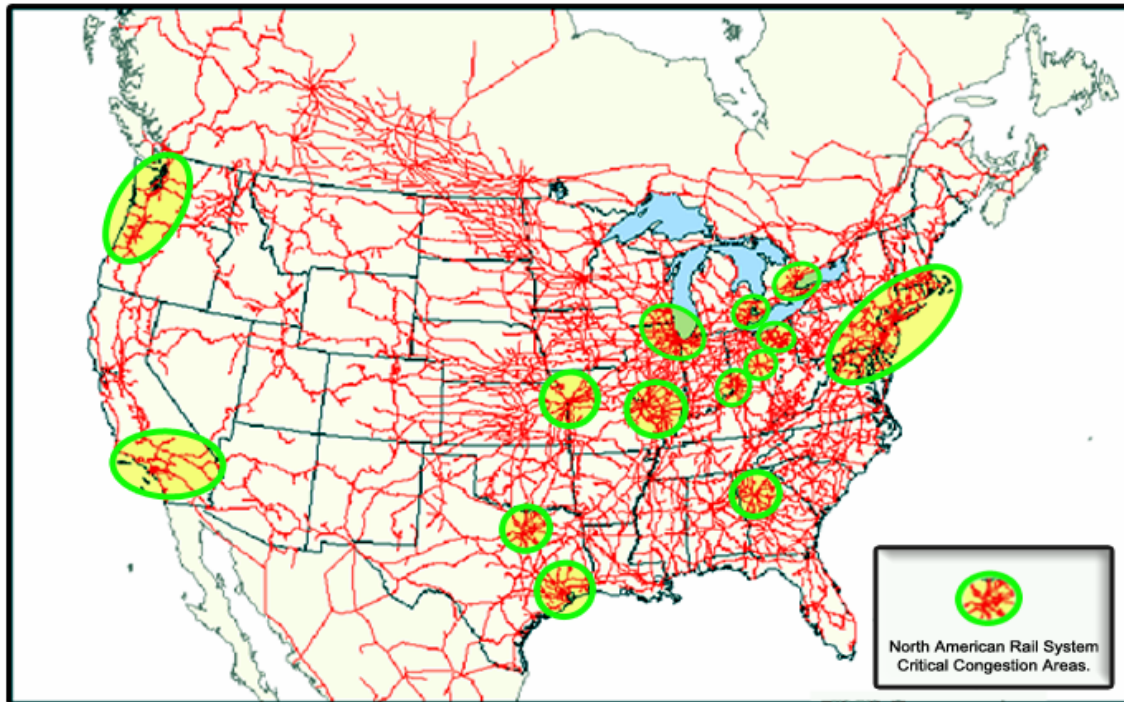


Exhibit 5-2: North American Rail Network – Bottlenecks and Congestion Areas



Looking to the future and recognizing the continued growth of the 'New Economy' businesses with its associated traffic, concerns increase about the ability of the U.S. and Canadian transportation system to absorb the forecasted levels of traffic increase.

However, any forecast of future traffic congestion must consider not just existing capacity, but also planned capacity that is likely to be built as traffic grows. While levels of demand will likely be consistent with demographic projections, future capacity is harder to predict. This is because it depends on the behavior and decisions of private and public entities who make infrastructure investments and decide route choices. No single official source specifies what levels of future congestion should be assumed in planning studies². However, the U.S. Transportation Research Board³ (TRB) took a restrained view of the likelihood of severe congestion, saying that –

“. . . to obtain a balanced view, it must be recognized that certain developments, although they do not diminish the legitimacy of concerns about capacity, have positive implications. Demographic trends, in particular the slowing of the rate of labor force growth compared with the 1970s and 1980s, will moderate highway traffic growth. Moreover, the evidence is mixed on how much average highway trip times are actually increasing; apparently highway users' behavior changes are partially offsetting the effect of increased traffic density. Part of the trend toward greater traffic density in all modes reflects productivity improvement, a positive rather than harmful development.”

² Therefore, multiple data sources were reviewed to support the synthesis of a probable scenario. These included AASHTO Rail and Highway Bottom-Line reports, port development plans, US DOT and Transport Canada data and reports and other publicly-available information. However, some data such as railroad intermodal volumes and throughput at specific terminals is private and confidential. This makes it difficult to verify very recent trends, for example, the question of whether the increase of all-water routing from Asia is starting to displace mini-landbridge traffic arriving into the New York SMSA.

³ Freight Capacity for the 21st Century, Special Report 271, Transportation Research Board, 2003. See: <http://onlinepubs.trb.org/onlinepubs/sr/sr271.pdf>

TRB noted that highway capacity is being added; overall highway capital stock is being added faster than it is wearing out; and ports and railroads report ambitious spending plans. Dire forecasts based on a “no-action” scenario⁴ are only hypothetical since current rail, port and highway initiatives will add significant capacity to the system. However, in some places such as West Coast ports, it seems that new infrastructure cannot come quickly enough to keep pace with rising demand.

What is clear however, is that many congestion problems now and in the future, will occur in urban areas due to local commuting. In such areas, costs are high and land needed for expansion may simply not be available. Therefore, development of new and innovative solutions may be needed to cope with the upcoming capacity crunch. The U.S. Department of Transportation⁵ has noted that –

“ . . . At its most fundamental level, highway congestion is caused by the lack of a mechanism to efficiently manage use of existing capacity. While congestion in our aviation and rail systems also deserves national attention, the ability to formally assign rights to various users through air traffic control and dispatch systems helps prevent the type of gridlock we see on our highway system. Economists have long advocated that pricing the costs of congestion directly is the most viable means to address this problem and reduce overall congestion costs. The price of highway travel (gas taxes, registration fees, etc.) currently bears little or no relationship to the cost of congestion, however. Put differently, the average rush hour driver pays out of pocket costs that do not reflect the true costs of the travel. As a result, the network gets swamped, vehicle throughput collapses, and the cost of congestion to all users grows rapidly.”

Therefore, it is expected that rather than continuing to add physical capacity, future solutions to the congestion problem may include the introduction of congestion pricing mechanisms for highway and freight rail users to improve the allocation and utilization of existing assets.

5.3 HIGHWAY CAPACITY OUTLOOK

The highway capacity outlook reflects the likelihood of higher trucking costs in the future. The massive highway investments of the past 50-years have resulted in nothing less than a complete transformation of the industrial structure of production, as higher-cost truck transportation has substituted for other inputs such as warehouse labor and inventory. The movement towards JIT manufacturing and demand-responsive “pull” rather than “push” supply chains has shifted an increasing share of freight onto the highway system.

For truck freight, the problem is not so much a lack of capacity as it is the saturation of highway capacity by automobile traffic. The most serious freight bottlenecks on highways occur at urban interchanges⁶ even when major highway expansion projects are undertaken there is a tendency for increased automobile traffic to rapidly fill up the new capacity. Any gains are short-lived. In the current environment, these experiences have contributed to a growing sense of futility of the ability of highway investment to keep pace with the growth of automobile traffic.

⁴ Upper Midwest Freight Corridor Study, Executive Summary, page ES-2, March 31, 2005. See: <http://www.uppermidwestfreight.org/files/execsummary.pdf>

⁵ National Strategy to Reduce Congestion on America’s Transportation Network, USDOT, May 2006. See: <http://isdde.dot.gov/OLPFiles/OST/012988.pdf>

⁶ An Initial Assessment of Freight Bottlenecks on Highways, Cambridge Systematics White Paper in association with Battelle, October 2005, page ES-2 See: <http://wwwcf.fhwa.dot.gov/policy/otps/bottlenecks/bottlenecks.pdf>

Mass transit investments have been tried as an alternative to increased highway investment. However, in the current environment where travel time is being used as the only mechanism for rationing highway capacity, it is practically guaranteed that transit investment cannot be effective for keeping highway systems fluid. In competition with freeways, transit carries some of the load but has not been able to divert enough auto riders to keep the highway systems free-flowing. Indeed, if a transit system ever were successful in attracting enough auto riders to restore fluid highway traffic flow, it could be safely assumed that transit riders would start diverting back to their cars until the highways were congested again.

A fundamental problem is that auto travelers are not required to pay for highway use, so motorists treat highway capacity as a free good. However, highway tolling has proven its ability to change behavior and reduce traffic congestion⁷. Tolling promises to influence auto travel and land use patterns towards a more rational allocation of highway capacity, as well as to encourage more carpooling and transit use. Whether highway congestion is paid for through tolls or through congestion delays, either way, it is apparent that trucking costs are likely to rise in the future.

The problem is most severe in urban areas where congestion greatly affects the costs for local pickups and deliveries. However, to put this in perspective, while the trucking company Pyle, Inc reported that their New York City metro area drivers only averaged about 7-mph⁸ the impact on trucking costs is quite modest. This is because congestion delays are likely to impose only a moderate increase on the cost of long-distance trucking, since congested areas are mostly limited to urban areas that comprise only a small percentage of the mileage of a typical intercity truck trip. Also, even under level of service "F" conditions, freeway speeds are typically closer to 25-mph than to the 7-mph reported by Pyle. Consider, for example, the impact of congestion on the cost of a typical 50-mile urban truck trip –

- At "normal" highway speeds, a truck at \$1.50 per mile would cost \$75 to go 50 miles in one hour.
- If the highway level of service drops to "F" at 25-mph, the truck would take two hours to cover the same distance.
- Previous studies have shown that a typical value of time for truckers is in the vicinity of \$30 per hour⁹. The cost of the 50-mile trip would rise to \$105, an approximate 40% increase in cost.

Furthermore, to the degree that congestion does occur in rural areas, it is reasonable to assume that in the future the highway can be widened to eliminate the delays. This is because the cost for widening rural highways is very small compared to the costs for urban projects.¹⁰ Also, the potential exists for using alternative routes (e.g., I-68) as an alternative to certain congested segments, such as the Pennsylvania Turnpike. If 80% of the trip consists of rural segments, then covering 20% of the distance at level of service "F" would increase the cost of a long distance intercity trip only by about 8%. A cost increase of this magnitude would not reduce intercity truck market share by very much.

⁷ No More Just Throwing Money out the Window: Using Toll Roads to Cut Congestion Protect the Environment and Boost Access for All, Environmental Defense, 2006, Page 16. See: http://www.environmentaldefense.org/documents/5257_TollingReport0506.pdf

⁸ A Look into Trucking's Future, Fleet Owner magazine, October 22, 2004. See: <http://fleetowner.com/news/topstory/102204/index.html>

⁹ Border Delays Cost Auto Industry CDN\$ 1 Million Per Day, Logistics Today magazine, Sept. 16, 2004. This reference cites a cost of \$40 Canadian, which is in the same range as the \$30 US that TEMS has obtained from prior Stated Preference studies. See: <http://www.logisticstoday.com/sNO/6520/LT/displayStory.asp>

¹⁰ Poole, Robert W., Surface Transportation Innovations, Reason Public Policy Institute, Issue No. 11, September 2003. Urban costs per lane mile are typically 10-12 times higher than those for widening rural interstates. See: <http://www.rppi.org/surfacetransportation11.html>

For developing the long-term highway outlook however, it is important to remember that even modest increases in volume can result in large increases in travel time through congested highway “bottleneck” areas. Of considerable concern are the expanding and integrating metropolitan cities of the East Coast (Boston to Richmond), the “golden horseshoe” area between Toronto and Buffalo, the congested Chicago, Northern Indiana to Southeast Wisconsin areas and from Cleveland to Detroit. In these locations, the size of the merging urban regions, the volume, and length of highway commuter flows and the difficulty of developing new roads for environmental and other reasons are creating major blockages to long distance truck traffic. This issue is as much a reliability problem as congestion problem since congestion produces considerable variability in travel times and generates uncertainty in delivery schedules when trying to support an increasing JIT production environment.

Urban highway congestion does present some opportunities for increasing rail intermodal market share, but the way intermodal services are currently structured, the need to still pick up and deliver containers by truck in congested urban areas eliminates much of the advantage that could potentially be provided by expanding rail service¹¹. Other factors, such as fuel and labor cost, have a larger and more immediate impact on trucking costs. For example, recent changes to the trucking hours of service regulation in the United States reduced capacity by 12% and increased costs proportionately.¹²

Structural changes in the way intermodal service is provided are needed to make it more effective for reducing highway congestion. For example, one way of avoiding congestion is by the increased use of on-dock rail loading of import/export containers. Another is the “freight village” concept that encourages industrial development in the immediate vicinity of a port or intermodal facility. Typically, freight villages are located on the urban fringe rather than downtown to avoid high real estate prices and traffic congestion. It may even be possible to combine the “freight village” concept with “on dock loading” to produce a short-haul intermodal solution that could work even within the same urbanized area.¹³

5.4 FREIGHT RAIL CAPACITY OUTLOOK

Privately owned freight railroads are assumed to act on a rational basis with regard to making investments that yield a sufficient rate of return for them. Not only do freight railroads provide their own trains, but also their own tracks and terminal facilities. They evaluate their economics according to investors’ requirements that they must fully recover capital costs along with a return, which is typically in the range of 15% per annum.

A significant benefit of private ownership is that when a commercial justification for investment can be developed, railways can quickly move to satisfy market demand. Nonetheless, this is not universally true, since some railroads suffer cash-flow constraints that limit their ability to undertake even profitable investments. As well, major rail projects such as the Dakota, Minnesota and Eastern (DM&E) Railroad’s efforts to extend its reach into the Powder River coal basin¹⁴, can be delayed for years by government regulation including environmental reviews, construction permitting processes, difficulties obtaining financing and by opposition from community groups and other railroads.

It can be assumed that private railroads will add capacity where it is commercially profitable for them to do so, but some important rail facilities are completely hemmed in by

¹¹ Typically, the intermodal line haul would replace only the rural portion of the trip -- while the truck pickup and delivery in the congested urban area still remains.

¹² Allen, Benjamin J. and Burke, Neil, Future Freight Capacity Needs, presentation April 7, 2006. See: http://www.ctre.iastate.edu/educweb/2006seminar/allen_apr7.pdf

¹³ Erickson, Thomas F. Jr., “Urban Freight Economics: A New Rail Paradigm for Large Lots”, Transportation Journal, Vol. 40 #3, page 99, Spring 2001. See: [http://www4.trb.org/trb/crp.nsf/reference/boilerplate/Attachments/\\$file/8-42IR_4-04_v1.pdf](http://www4.trb.org/trb/crp.nsf/reference/boilerplate/Attachments/$file/8-42IR_4-04_v1.pdf)

¹⁴ Dakota, Minnesota and Eastern (DM&E) Railroad’s announce \$1.2 Billion Plan to Expand Into Powder River Basin and Rebuild Existing Track: Project Provides Significant Benefits to Communities, June 9, 1997 press release. See: <http://www.visi.com/~mfrahm/dme/news/prb.html>

mountains, rivers or surrounding development. It may not be easy to expand capacity without relocating facilities. Sometimes these relocations take facilities completely out of the urban areas they serve. For example, Norfolk Southern is trucking from its Bethlehem, PA terminal all the way into the New York market¹⁵. This lack of sufficient terminal capacity has already reduced the competitiveness of rail intermodal service to New York. If it is not possible to expand when capacity is reached, a railroad will start shedding its least profitable traffic, typically short-haul business to free capacity for more profitable long hauls.

A specific example of this is ConRail's 1994 "demarketing" of short-haul intermodal lanes such as New Jersey to Pittsburgh¹⁶ in favor of allocating its limited New Jersey terminal capacity to longer-haul traffic. It is important to remember that railroad intermodal terminal capacity is privately developed and owned and must return a profit like any other investment. More recently, Federal funding has been obtained for a new intermodal facility at Rickenbacker airport¹⁷ in Columbus, Ohio. But until the new Rickenbacker facility can be built, the railroad continues to turn away business from its current Discovery Park ramp¹⁸.

Without increased capital investment in railroads, a gradual decline in rail market share and an increase in the average length of haul can be expected. It can be assumed that railroads will only be able to invest for long-haul traffic that contributes the most profit. By shedding some existing short haul and loose carload business, the railroads can reallocate existing capacity to longer haul traffic and to their most profitable commodities, such as coal unit trains. Reallocating capacity will help railroads improve their investment returns, which are still below their cost of capital. Until the industry at least recovers its cost of capital, it will not be able to finance massive new investments for expanding capacity.

Just as for highways, the most serious railroads bottlenecks are located in the urban and terminal areas within and around the major cities. In the last twenty years, the amalgamation of freight railroads and the consolidation of rail traffic on fewer lines resulted in a sharp focus of traffic at major hubs such as Chicago, St. Louis, Kansas City, Toronto, as well as east and west coast seaports. Major rail congestion issues have started to arise at all these points.

A number of specific projects are being considered or built. The Alameda Corridor serving the Los Angeles port was successfully developed as a public private partnership. However, Chicago's Regional Environment and Transportation Efficiency (CREATE) project is for all intensive purposes stalled having lost the participation of one major railroad¹⁹ and little public support has been offered for addressing any of the other capacity needs that were identified in the American Association of State Highway and Transportation Officials (AASHTO) Rail Bottom-line report. In the I-81 corridor, Virginia DOT decided to negotiate with the STAR consortium on development of a truck toll road rather than to continue pursuing the rail option²⁰. Some improvements are being made in the I-95 corridor from Washington, D.C. to Richmond, Va., but this funding is linked to passenger rail expansion²¹.

¹⁵ Investing in Mobility: Freight Transport in the Hudson Region, Environmental Defense and the East of Hudson Rail Freight Operations Task Force, 2004. See: http://www.environmentaldefense.org/documents/3601_InvestingMobility_Hudson.pdf, page 55.

¹⁶ Conrail Ends Short Haul Intermodal to/from New Jersey, web posting by Daniel Convissor, September 30, 1994. See: <http://www.panix.com/~danielc/region/crshort.htm>

¹⁷ More than \$30 Million in Federal Funds Allocated for Rickenbacker Intermodal Facility, Columbus Regional Airport Authority, News Release July 29, 2005. See: <http://www.rickenbacker.org/news/press/release.asp?PID=167>

¹⁸ Central Ohio Freight Fact Book, Mid-Ohio Regional Planning Commission, August 2004, page 4. See: http://transportation.morpc.org/freight/factbook/Rail_Freight.pdf, page 4

¹⁹ CN pulls out of Chicago's CREATE program, Progressive Railroading, January 18, 2006. See: <http://www.progressiverailroading.com/freightnews/article.asp?id=8189>

²⁰ RAIL Solutions pushes for railroad alternative, Rockbridge Report, See: <http://journalism.wlu.edu/rrarchive/10-28-2004/I-81/I-81/Rail.htm>

²¹ Washington DC/Richmond Corridor, Virginia Department of Rail and Public Transportation, 2006. See: <http://www.drpt.virginia.gov/projects/washingtoncorridor.aspx>

If these trends continue, then railroad demarketing of short distance intermodal lanes and loose carload traffic can certainly be expected to continue.

It should be noted that the Midwest region of the U.S. that is served by the Seaway is very poorly served by intermodal rail today. Since private freight railroads regard 700 to 1,000 miles as a minimum economic length of haul, the eastern railroads have primarily focused on developing long-haul lanes from the east coast to Chicago. Given their capital constraints and limited terminal capacity on the east coast and in Chicago, railroads have not been very interested in developing markets at the intermediate points. Therefore, the midwestern U.S. relies very heavily on trucking to reach east coast ports or western railroad service at Chicago. The relative weakness of intermodal rail in the Midwest creates conditions that are favorable to introduction of container shipping on the Great Lakes and St. Lawrence Seaway.

5.5 PORT CAPACITY OUTLOOK

In recent years, ports have been aggressively expanding their infrastructure; yet given the high rate of traffic growth, even these investments have not been enough to eliminate congestion at the major west coast ports. Port projects are seen as strongly contributing to regional job growth, but ports add traffic to already congested urban highway and rail networks that leads to concern over local environmental impacts.

Port authorities do seem to recognize the substantial environmental problems associated with transporting large container volumes through urbanized areas. Although impacts of rail are considered less than those of trucking, the community impacts of rail particularly at grade crossings can still be substantial. For development of hub ports in urban areas, the best way to minimize the environmental impact of transshipped containers is to send them back out by water again rather than by utilizing surface modes.

Some port development projects can fully recover their capital costs through user fees, nonetheless, port authorities are often able to obtain supplementary forms of funding such as direct Federal and State grants to cover at least a portion of the costs. Ports are not uniformly capable of funding expansion projects. Some ports such as those in southern California are in a strong market position and can afford to finance much of their own expansion costs from port revenues.²² Other ports such as New York's have other revenue sources, such as airports, highways, toll bridges and tunnels and seem willing to cross-subsidize the cost of port development in order to gain employment benefits and economic stimulus provided by the port.

Port authorities have also proven their ability to spearhead major rail investments such as the development of the Alameda Corridor²³ in Los Angeles and the FAST corridor²⁴ in the Pacific Northwest. The Virginia Ports are strongly sponsoring development of the Heartland rail corridor that will connect Norfolk to the Midwest on a direct rail routing.²⁵ New York has invested heavily in development of Expressrail²⁶ on-dock loading and improved its rail links to the ports. These rail projects have improved the efficiency of port operations and reduced the adverse impact of port traffic on surrounding neighborhoods. These port-sponsored initiatives have been a welcome bright spot in the overall generally discouraging outlook for freight rail funding.

²² Leachman, Rob, SCAG's Port and Modal Elasticity Study: Port and Modal Elasticity Study: Stakeholders Stakeholders' Briefing, August 28, 2005. See: http://www.scag.ca.gov/goodsmove/pdf/gmtf111605_ElasticityPresentation.pdf

²³ Alameda Corridor Transportation Authority website. See: <http://www.acta.org/>

²⁴ FAST Corridor website. See: <http://www.wsdot.wa.gov/mobility/fast/>

²⁵ Heartland Corridor Project Presents Growth Opportunities for Port and State, Virginia Port Authority press release, August 2, 2005. See: http://www.vaports.com/Media_Room/2005/heartland.pdf

²⁶ Rail service page, Port Authority of New York/New Jersey website. See: http://www.panynj.gov/DoingBusinessWith/seaport/html/rail_service.html

The synergy between a vibrant port and regional economic development is well understood. For example, the attraction of distribution warehousing has been a key part of the Virginia Ports strategy²⁷ to develop into a major container port and is also being aggressively pursued in New York. It is an economic reality however, that because of improvements in port productivity, the docks themselves are no longer the prime mover of employment opportunity. The lion's share of port related employment growth comes from firms that locate or expand within a region because of access to container facilities. The establishment of a strong local customer base is also a major inducement to attracting steamship lines to serve the port.

At the Virginia ports, for example, employment in distribution warehousing and light manufacturing rose from about 3,300 in 1979 to just over 18,600 in 2000, roughly a six-fold increase over the period. Meanwhile, port employment related to cargo handling grew by only about 20% while cargo volume quadrupled. If the Port is a growth engine, then industrial development is the major source of that growth.²⁸

A primary concern of most port authorities is to keep their port attractive and competitive in support of local job creation and industrial development goals. Some port authorities are also motivated by the prospect of earning a profit on container lift charges, but this is often a secondary consideration. In spite of ports' desire to develop rail traffic, the truth is that short-haul trucked containers are the ones that contribute the most to regional growth. Long-haul containers, whether trucked or railed out, contribute very little to the local economy beyond their port handling charges.

For industrial development, some of the older and well-established ports have run into difficulties because of an insufficient supply of suitable industrial land. For example, Baltimore, MD was a traditional port for the upper Midwest region of the United States; however, more recently its port lands, even those with deep-water access, have been under development for residential and commercial uses²⁹. Not just port lands are affected: former industrial buildings are also being converted to residential or office uses; even brownfield sites have been subject to encroachment. Even in outlying areas, commercial or industrial sites with good highway access are no longer available at economical prices and traffic congestion on suburban ring roads is rising.

New Jersey is taking an aggressive approach to reclaiming brownfields for redevelopment³⁰, even so, there is still a shortage of industrial land available for redevelopment within a reasonable distance of the port. The result is that much of the warehousing and industrial base that depends on the Port of New York is migrating west to Bethlehem, Hazleton and Harrisburg, PA, where land and labor costs are cheaper. Some goods are shipped out of New York to distribution centers in Harrisburg, only to be turned around and sent back to New York again³¹. Nonetheless, more of the goods that are sent into New York from Harrisburg arrive by intermodal rail from west coast ports. Thus, the Harrisburg area with its two major intermodal ramps has emerged as a primary logistics center that supplies the needs of the entire East Coast market.

²⁷ Denton, Jake, Part II: Boom Years -- Sitting pretty after 20 years of growth, Inside Business – the Hampton Roads Business Journal, February 2, 2004. See: <http://www.insidebiz.com/output.cfm?ID=2831267>

²⁸ The Port of Hampton Roads: The State of the Region., Old Dominion University Economic Forecasting Project, Chapter 3. See: <http://www.odu.edu/bpa/forecasting/2001chapter3.pdf>

²⁹ Industrial Land Use Analysis, City of Baltimore, Maryland, Executive Summary. Baltimore Development Corp, November 23, 2003. See: http://www.baltimoredevelopment.com/files/pdf/industrial_development/final_baltimore_industrial_report_summary.pdf

³⁰ Holusha, John, Commercial Property; Making Way for Bigger Ships. New York Times, August 5, 2001. See:

<http://query.nytimes.com/gst/fullpage.html?res=9905E2DF173CF936A3575BC0A9679C8B63&sec=&pagewanted=all>

³¹ DMMIWG April 4, 2001 meeting minutes, page 6. See: <http://www.seagrant.sunysb.edu/HEP/minutes/dmmiwg01apr4.pdf>

The addition of container port volumes adds significantly to congestion of already-strained local highway networks, but as industrial activity migrates farther away from the port area, the local economic impact of job creation is minimized. This fact is not lost on New Jersey political candidates³² or community groups who have begun to question the wisdom of investing heavily in port development, only to see the job creation and economic benefit occurring in neighboring jurisdictions. Development of this kind of community resistance may eventually have a restraining effect on the ability of the New York, Philadelphia, and Baltimore ports to continue to expand. These ports will be expected to support local community development objectives in a manner that does not worsen the traffic congestion or air quality problems already existing in those areas. New York's strategy to redevelop brownfield sites to create local jobs meets with community support, but already some New Jersey community groups have suggested that long-haul containers for the Midwest should be diverted to the St. Lawrence Seaway.³³

Port authorities of the major east coast cities must face the reality that their regional economies have shifted away from traditional manufacturing towards a service orientation. Competing land uses may now offer higher values than traditional port uses. For the long term –

- If greenfield or brownfield sites with un-congested highway access and a low-cost labor pool are available, ports may be able to attract manufacturing or distribution businesses and support industrial development.
- However, where land and labor costs are rising, highway congestion is severe and the service sector is growing rapidly, manufacturing and distribution activities are likely to be displaced to other locations where operations can be conducted more economically.

One way to reduce local highway impacts, as well as increase the capacity of dockside port facilities is to divert more traffic to rail. The development of Inland Port facilities can do this. Inland Ports can reduce truck traffic on congested freeways and help operations at the main port, since containers can be removed from the port very quickly and stored remotely away from the dock area. The best-established Inland Port networks today are those in the U.S. Pacific Northwest³⁴ and a single facility operated by the Virginia Port Authority at Front Royal, VA. However, the Virginia Ports are in the process of developing additional facilities in conjunction with their Heartland rail double-stack clearance improvement project.

Most Inland Port proposals are oriented toward converting existing truck traffic to rail movement and are located within a 100-300 mile range of the main port. However, this distance represents an extremely short haul for a rail move. The economics of such a move cannot absorb the cost of double terminal handling. Accordingly, on-dock rail loading capability is practically prerequisite to the viability of such a network. In addition, it is very helpful if some of the main port costs can be *shifted* to the new facility rather than *duplicated* – there should be some savings at the main port to at least partially offset the added cost of terminal operations at the remote site. With some cost savings at the main port and even a small additional benefit from the more efficient rail or water line-haul, the economics of Inland Ports can work.

New York and southern California ports have studied the development of satellite Inland ports. New York implemented the on-dock loading component of their "Expressrail" system but has apparently not yet developed the satellite ports. As the first step in building its PIDN (Port Inland Distribution Network) New York established a once-a-week container barge

³² Creating Good Jobs at Good Wages, Corzine for Governor Campaign, See: http://www.corzineforgovernor.com/i/pdf/plan_ports.pdf

³³ Historic Rails and Rail Freight in 21st Century New Jersey, The League of Historical Societies of New Jersey web site, See: <http://www.lhsni.org/historicrails.html>

³⁴ Northwest Container Services, corporate web site. See: <http://www.nwcontainer.com/>

service to a satellite port in Albany, NY. However, that service never attained commercial profitability and apparently ended in February 2006 when the subsidies ran out.³⁵ Southern California ports are looking to exploit the advantages potentially provided by the Alameda Corridor investment, but have found as rail volumes continue to grow, that community conflicts have emerged in cities east of the entrance to the Alameda trench.

While the Los Angeles port is trying to address grade crossing issues with its "Alameda East" project, it has yet to develop its satellite port network. Inland Port projects, particularly in New York and Los Angeles, seem rather slow in developing, but it appears that they may be coming as port capacity is squeezed more by traffic growth and as highway congestion around the port areas continues to get worse. Nonetheless, for development of satellite facilities in other states, ports face a conflict of interest with respect to their local industrial development goals. For example, by establishing an Inland Port Distribution terminal in Harrisburg, PA., the New York port would be seen as strengthening Harrisburg's competitive position in attracting jobs away from New Jersey. It therefore seems unlikely that the New York inland port network will actually be implemented anytime soon, unless neighboring states start taking more initiative in getting their local terminals built. In the meantime, there is an opportunity for New York and New Jersey to develop satellite facilities within their own states, for example by upgrading US-17 into I-68 and by creating new multimodal hubs in locations like Binghamton. As well, in spite of the failure of conventional Container on Barge service to Albany, a daily PACSCAT shuttle might do well for providing short distance water feeder services to the New York port.

This state boundary-crossing issue stands as a definite impediment to development of Inland Ports in the east. It may eventually come to hinder the ability of the New York port to continue to expand. The situation for the Los Angeles port is perhaps a little better, since with its broader regional focus, the State of California could develop an Inland Port network entirely within its borders. Even California, however, must deal with the reality that much of the distribution warehousing that depends on its ports has migrated across the Nevada border to Las Vegas and Reno.

5.6 UNCONGESTED AND CONGESTION STRATEGIES

Two distinct rail and truck strategies have been developed for this study –

- An "Uncongested" strategy assumes no cost or time increases for truck and rail.
- A "Congestion" strategy reflects higher land transportation costs reflecting highway, rail, and port congestion and assumes an accelerated shift of some southern California port traffic to the Suez routing.

In developing the strategy for dealing with highway, rail and port congestion, the emergence of significant congestion impacts was identified from 2030 through 2050 for modeling purposes. The proposed strategy is neither a recommended policy prescription nor is it even suggested as more than a probable outcome. The congestion scenario is simply a possible outcome based on the congestion assumptions. It takes a moderate view of the prospects for increased costs for inland highway and rail transportation –

- Trucking costs: These were increased by 10% in 2030 and 20% in 2050, to reflect the likelihood of increased congestion in urban areas. Since traffic congestion hurts reliability as well³⁶, the assumed on-time performance of truck deliveries was assumed to degrade from 95% in the base, to 90% in 2030 and 85% in 2050.

³⁵ End of Line for Expressbarge. Weekly Bulletin from the Tri-State Transportation Campaign, March 27, 2006, page 3. See: <http://www.tstc.org/bulletin/pdf/mtr525.pdf>

³⁶ Spazovic, Lazar M. Mobility and the Costs of Congestion in New Jersey: Update 2001. NJ Institute of Technology. See: <http://transportation.njit.edu/nctip/research/ResRep.asp?status=Completed&projectNo=88&grantNumber=992500>

- Railroads: Rather than assuming draconian cuts to an already-weak midwestern rail intermodal network, it is assumed that railroads will be able to obtain at least enough capital to maintain their current (low) levels of intermodal service in 2030 and 2050. Similarly, we assumed that CP Rail's short-haul "Expressway" service in the Montreal-Windsor corridor would continue at about the same service levels. "Congestion" scenarios simply assume that future rail service will be the same as today's.³⁷
- Ports: It is suggested that the potential development of the import/export container market for the GLSLS will hinge primarily on international developments in world markets and in ocean shipping patterns. These include –
 - Since European container trade has been the traditional strength of the East Coast ports of New York, Boston, Halifax, and Montreal, so clearly the GLSLS can participate in this trade. For European traffic, Halifax, Montreal, and New York will compete aggressively. Baltimore and Norfolk provide possible alternatives.
 - With regard to Asian trade, the primary drivers of the available GLSLS container market will be west coast port congestion as well as the limited capacity of the Panama Canal.

Today, port capacity constraints are most severe at the west coast ports, as a result of which some ocean traffic has started to divert to the east coast via either the Panama or Suez Canal routings. East coast ports have been aggressively expanding as they compete to capture Asian vessel calls. Still, the size of the east coast markets is potentially so large that a distinct possibility exists that east coast ports, like their western counterparts, could become "victims of their own success" and start experiencing significant congestion problems as well.

- A major influx of Asian imports started in the late 1970's as the United States moved towards a free-trade orientation. Double-stack container trains invented by American President Lines in 1984³⁸ facilitated use of large post-Panamax vessels in the Pacific trade. The improved efficiency of rail inland distribution encouraged development of transcontinental rail shipping rather than water service to East Coast ports. By 1998, mini-landbridge³⁹ traffic accounted for 60% of all containers arriving in New York.⁴⁰ New port facilities at Oakland⁴¹, Prince Rupert,⁴² and Lazaro Cardenas⁴³ are under development and may add significant west coast capacity in the future. As west coast port capacity continues to be added, mini-landbridge traffic is forecast to continue growing at a high rate.⁴⁴ It is reasonable to assume that mini-landbridge

³⁷ . . . although as railroads are faced with more growth in long-haul traffic lanes, their ability and willingness to maintain even existing short-haul intermodal services into the distant future is by no means assured.

³⁸ See: http://www.apl.com/bulletins/html/bulletin_20060606.html

³⁹ The service is called "mini-landbridge" because, after its transcontinental rail movement, the traffic terminates on the east coast without further ocean movement. A full "landbridge" container would be shipped out by an east coast port. It would cross the United States or Canada but not terminate in either country.

⁴⁰ More ocean containers were arriving into New York and New Jersey by rail from the west coast and other ports, than by ship across the New York docks. Portway Extensions Concept Development Study, 2003, page Page VI-18, See: http://www.state.nj.us/transportation/works/portway/FR_Section_6.pdf

⁴¹ One down and one to go! Port of Oakland to offload second giant container crane Saturday, Port of Oakland news release, March 11, 2005. See: http://www.portofoakland.com/newsroom/pressrel/pressrel_178.asp

⁴² Container port set for Prince Rupert \$120m facility will shorten distance to Asian markets, April 15, 2005. See: <http://www.rupertport.com/pdf/media/VanSun-CPt.set.April.15.05.pdf>

⁴³ KCS announces new, daily, dedicated train service along its international intermodal corridor, BLEET newsletter, June 8, 2006. See: <http://www.ble.org/pr/news/headline.asp?id=16268>

⁴⁴ Even as all-water service to New York has grown, it has not been forecast to displace existing rail volumes. Portway Extensions Concept Development Study, 2003, page Page VII-10, See: http://www.state.nj.us/transportation/works/portway/FR_Section_7.pdf

service will absorb as much traffic as rail and west coast port capacity are able to handle.

- The GLSLS might participate in Asian traffic from Canadian and Pacific Northwest ports via a rail land-bridge to the Port of Duluth and Thunder Bay destined for Ohio and ports east. However, it is not reasonable to assume that GLSLS would participate very much in traffic handled at Oakland, Los Angeles or newly opened Mexican ports.
- Because of congestion at west coast ports, coupled with worsening Chicago rail bottlenecks and line-haul capacity constraints of the western railroads, ocean carriers have resumed all-water shipping via the Panama Canal. This service takes only a little longer to reach the east coast, but has proven more reliable and is cheaper than mini-landbridge service.⁴⁵ As a result, the Panama Canal is now operating near capacity and it will not be able to absorb much more traffic growth in the near future.
 - It is unlikely that GLSLS will be able to participate in any traffic that is shipped by the Panama Canal. Instead, southern ports, particularly Savannah and Norfolk as well as New York are more likely to benefit from this trend. However, the growth potential of this market is limited by the Panama Canal's capacity.
- The third, most recently emerging trend is the use of the "around the world" shipping route from Asia via the Suez Canal. This route has tended to develop after the capacity of the Panama Canal was reached. It tends to be most competitive from Asia ports south and west of Singapore. Changing world patterns of production, particularly towards shifting production from Japan to Korea to China southeast Asia, are reinforcing this tier. Because the Suez route handles American and European trade on the same ship, it also tends to be worked by very large vessels, which give it competitive shipping economics. The primary port competition for Suez traffic is likely to be between the northern ports of Halifax and New York. Montreal is unlikely to be able to participate much because of the use of very large vessels in this trade. See Exhibit 5-3.
- The effect of port capacity constraints at New York and Baltimore is to cause the emergence of Halifax and Norfolk as major hub ports for inland distribution.
 - Halifax is better positioned geographically to accommodate trade via the Suez Canal, while
 - Norfolk is better positioned to accommodate trade via the Panama Canal. In all forecast scenarios, a new Norfolk, VA to Columbus, OH link was added to the rail network, reflecting the anticipated completion of the Heartland rail clearance improvement project. However, this rail link will be most useful for Asian traffic diverted via the Panama Canal, which is capacity constrained. The new rail link may not be enough to overcome Norfolk's geographic handicap versus Halifax with respect to the Suez Canal trade.

While it is clear that New York and Baltimore will remain major ports on the basis of their strong local markets, these ports' future role as major inland transshipment hubs remains to be seen. For the congestion scenario, New York and Baltimore are assumed to remain mostly truck-ports with primary concern for distribution into their own immediate hinterlands. If this occurs, the upper Midwest United States will be left wide open for

⁴⁵ New York Port Hums Again, With Asian Trade, Nov 22, 2004. See: <http://www.wirednewyork.com/forum/showthread.php?t=4746>

development of Great Lakes ports to serve the market via the GLSLS. Already today, Montreal dominates the Atlantic trade into the Midwest region of the U.S.

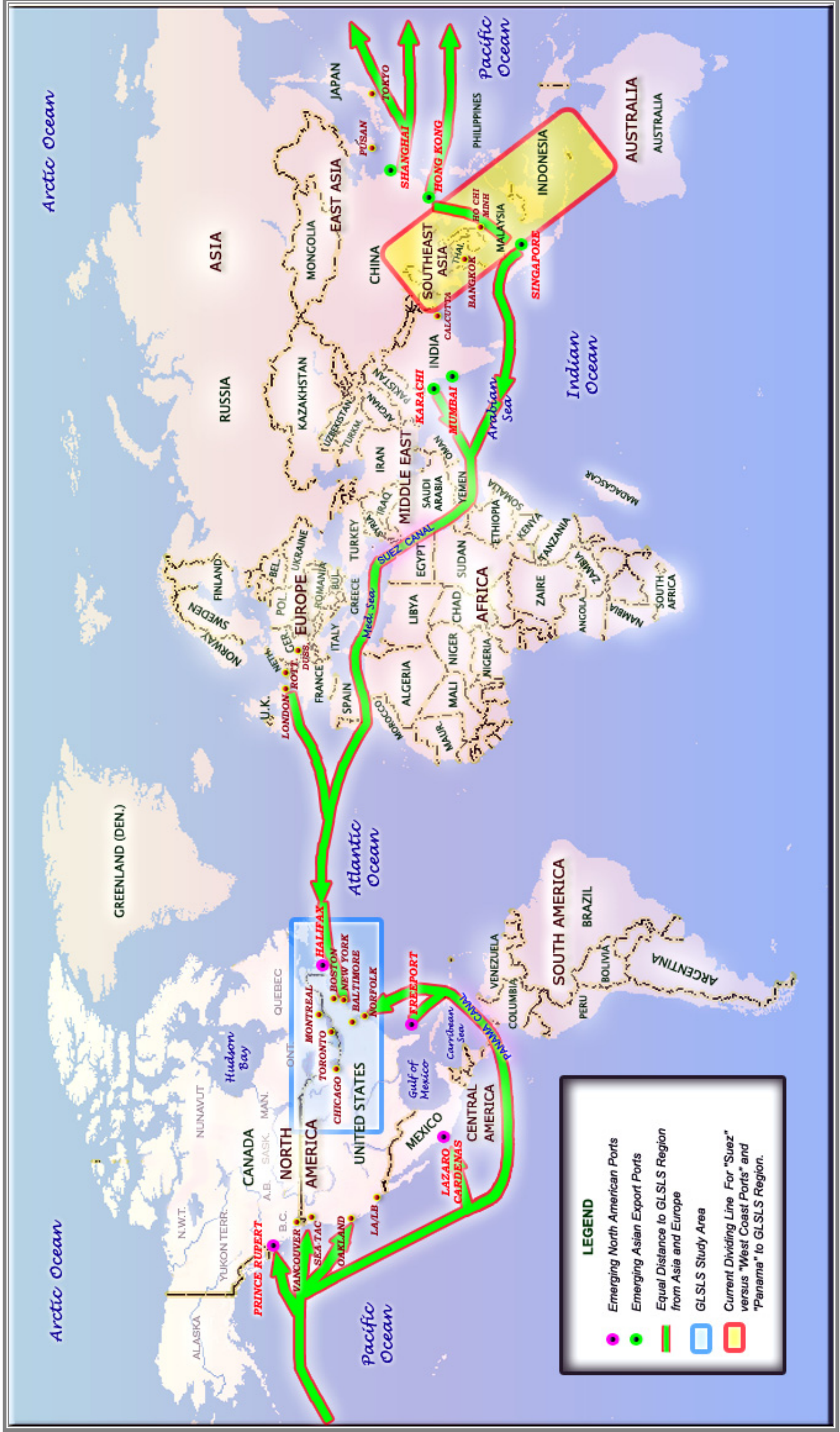
- While it now seems that New York and Baltimore are committed to competing for inland traffic, if these ports start attracting a significant share of their own mini-landbridge rail traffic to an all-water routing, it could significantly raise their own local port volumes.
- At the same time, any reduction in mini-landbridge traffic would actually weaken rail intermodal service to these eastern port cities.
- The GLSLS via the Port of Halifax is well-positioned to attract containers that are routed via the Suez Canal but is poorly positioned to participate in ocean routings via the Panama Canal. Halifax and New York will compete aggressively for the Suez trade. For Asian traffic via the Panama Canal, the most likely port choices are between Savannah, Charleston, Norfolk, Baltimore, and New York.
- The GLSLS via the Ports of Duluth and Thunder Bay are well positioned to attract containers that arrive in U.S. Pacific Northwest or Canadian ports, destined for ports in the U.S. upper Midwest. However, Duluth and Thunder Bay are poorly positioned to attract containers from Oakland, Los Angeles or newly opened Mexican ports.

In developing the “Uncongested” strategy, it is assumed that as traffic grows, new infrastructure investment is put in place to mitigate fully the potential congestion. While this alternative is more than idealistic it provides a floor against which both the impact of congestion and the range of potential outcomes can be judged (i.e., what if congestion is only half the level supported in the “Congested” strategy. Thus the “Congested” and “Uncongested” scenarios bracket the full range of likely outcomes.

In summary, the development of “base” and “congestion” strategies propose –

- “Uncongested” scenarios assume existing rail and highway service levels and that ports maintain their same competitive positions relative to one another. In “Base” forecasts, future port forecasts are scaled proportionately to today’s traffic levels.
- “Congestion” scenarios assume that west coast port capacity grows somewhat but remains saturated and that Panama Canal capacity constraints result in an increased use of the Suez routing. As well, these scenarios assume that Baltimore and New York become saturated by their own local container traffic. Because of high levels of local traffic congestion and competing land uses in Baltimore and New York, it is assumed that these ports would continue to focus mainly on their local markets and play an even smaller role for inland distribution in the future. In the “congestion” scenarios, Halifax and Norfolk would emerge as major hubs for inland distribution, supplementing the historical roles of New York and Baltimore. This would put Halifax and the GLSLS in a very favorable position to compete for Asian traffic via the Suez routing, as well as for a larger role in inland distribution for its “traditional” European traffic base.

Exhibit: 5-3: Evolving Patterns of Asia – North American Trade



6 GLSLS DEMAND AND MARKET ANALYSIS

6.1 INTRODUCTION

This market assessment represents an analysis of the market potential for New Cargoes and New Vessels on the Great Lakes and St. Lawrence Seaway System (GLSLS). The study of cargo market opportunities includes an analysis of shipper preferences, market segments, competitive transport modes, and the longer-term socioeconomic trends in income, employment, population, and import/export cargoes that affect overall transport demand, shipper choices, and mode selection behavior. To develop a full understanding of the market for vessel cargo service in the GLSLS Service Area, an extensive analysis was made of all freight shipping in the region.

Forecasts are developed in terms of Forty-Foot Equivalent units (FEU's) rather than Twenty-Foot Equivalent units (TEU's.) Although TEU's are more prevalent for ocean shipping forecasts, the FEU corresponds more closely to the truckload lot size that is used more commonly in domestic and cross-border shipping. For an equivalent TEU representation, FEU counts that are reported here should be multiplied by two.

6.1.1 MARKET OPPORTUNITIES

The Great Lakes and St. Lawrence Seaway (GLSLS) runs through the heart of one of the most densely populated and leading economic regions of the U.S. and Canada. With a population of just over 155 million settled on just 20% of the land area of the U.S. and Canada, the GLSLS Study region (see Chapter 2) has the highest population density containing 60 percent of the U.S. and Canada population.

While trucking is ubiquitous across the region, there is frequently a lack of an alternative (i.e., rail). This has an impact on the regions competitiveness and its continued economic growth. As a result, in many cases, small, urban areas are today dependent on trucking and lack competitive intermodal transportation. For example, Green Bay, Wisconsin has no intermodal rail service today in spite of the existence of a well-developed industrial base. New GLSLS vessel services could help fill this gap by providing cost-effective shipping capabilities into many regions that are today underserved by rail intermodal transport.

6.1.2 MARKET RESEARCH AND ANALYSIS

To evaluate and quantify the level of demand for New Vessels and New Cargoes water service in the GLSLS service area, an extensive market research effort was undertaken. The market research plan included both primary and secondary research. Primary research is information obtained first-hand through field survey work questioning actual and potential shippers about their mode choice decisions, requirements, and preferences. These surveys provide insight into how the shipping market might respond to new GLSLS services. Secondary research is information collected from published sources and provides broader-based and historical information as well as information on current port issues, development plans, and trends. Both levels of market research provide critical information necessary for a comprehensive market analysis.

Extensive primary market research was conducted as a part of this study. A stated preference methodology was used to derive behavioral results for the key commodity groupings used in this study. The following provides a description on the stated preference surveys that were implemented with respect to the approach, methodology, and key findings.

6.1.3 SURVEY OBJECTIVES AND METHODOLOGY

The stated preference survey was designed to elicit responses from current shippers who may potentially use water, identifying the shippers' criteria for making a shipping mode choice. Using an approach designed to collect attitudinal data, the survey presented four specific shipper choices –

- The trade-off between shipping time and costs in order to derive incremental values of time
- The trade-off between frequency of service (headway) and shipping costs in order to derive incremental values of frequency
- The trade-off between reliability and shipping costs in order to derive values of reliability
- The trade-off between the transaction cost for switching to a seasonal mode and the shipping implications (costs) of doing so

In addition, the survey was also targeted to estimate the importance of service factors such as travel time, frequency, and reliability. Data on shipment by season was also collected.

The surveys were conducted using a quota group sampling approach. Quota surveys, which are now widely used for commercial, political and industrial purposes have the advantage of being relatively inexpensive to conduct, while providing much greater coverage and more statistically significant results than simple random surveys.

The survey questions focused on tradeoffs between shipping times and costs for existing and proposed modes of travel. For an analysis of incremental improvements, tradeoff questions were focused on specific options being considered, (e.g., for example a 2 hour increase in the shipping time). The two critical factors that determine shipping preferences are commodity type and the current mode of shipment. Therefore, the market was segmented into truck and rail for food, raw material, semi-finished and finished commodity types. Exhibit 6-1 shows the primary quota groups covered by each of the survey studies and the response.

Exhibit 6-1: Quota Groups for the GLSLS Surveys¹

Commodity \ Shipping Mode	Truck	Rail
Food	X	X
Raw -Material	X	X
Semi-Finished	X	X
Finished	X	X

Surveys were administered via the Internet following letters of support to members of the U.S. NIT League and the Canadian Industrial Transportation League. In both cases, these organizations informed members by "e-mail" and newsletter of the survey and encouraged members to participate in the survey. A web address was set up for the survey and the participants were sent the web link. The responses to the survey questions were stored in a database that was later used by the study team. In developing specific tradeoff questions, existing truck and rail prices and schedules were used as a general guide and an analysis

¹ Rail results were taken as indicative of the values for Water service.

was made to determine the likely ranges of value of time (VOT), value of reliability (VOR) and value of frequency (VOF) responses.

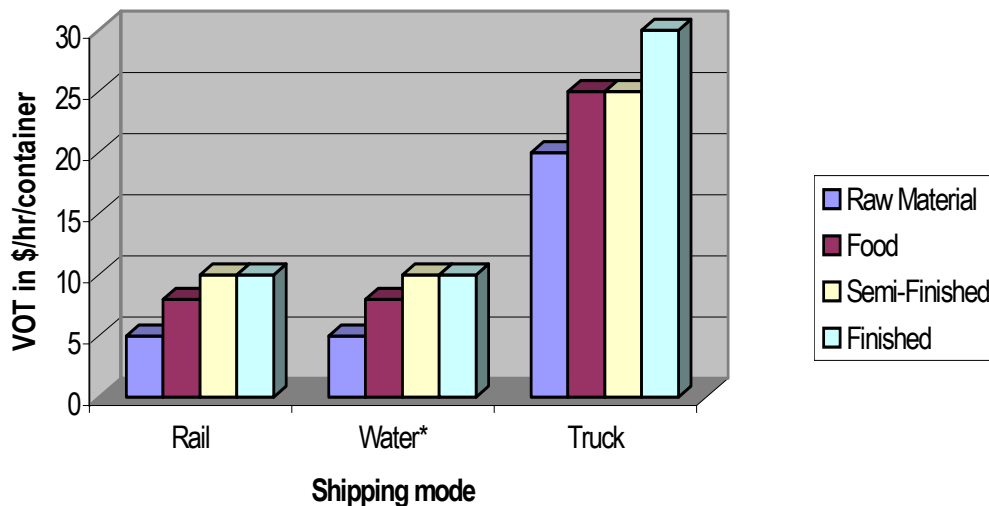
For each questionnaire, five VOT, VOF, VOR, and seasonality questions were formulated to ensure an appropriate range of answers. Respondents were asked to choose one of five levels of preference to indicate the degree to which they liked or disliked a given choice. A total of 200 surveys were collected in the spring of 2006, 113 from Canada and 87 from the United States. Of the completed surveys, 38% were obtained from companies that we recognized as having operations in both Canada and the United States.

A minimum sample from each travel market segment was required to ensure statistical confidence for each quota group. Based on the Central Limit Theorem, a sample size of 20 participants is sufficient to ensure the statistical validity of each quota sample. Therefore, a minimum quota of 20 interviews per commodity/shipping mode was established. Responses from the surveys, in conjunction with the tradeoff analysis, were then used to develop the demand-forecasting model.

6.1.4 VALUE OF TIME

The value of time can be defined as the dollar amount that a shipper is willing to spend to save one hour of freight shipment time. A shipper is likely to pay the most to save an hour of shipment time for finished goods, because they are ready to be sold and the least for raw materials where transportation consists of a significant part of the delivered cost of the product. Therefore, finished goods can be expected to have the highest VOT and raw material the lowest VOT. Truck is a faster and costlier shipping mode compared to rail. Because truck will tend to attract higher value freight than rail, when interviewing shippers it is expected that, the reported VOT of truck freight will be higher than that of rail.

Exhibit 6-2: Values of Time by Commodity Type and Mode (in \$2005)



*Water VOT is conservatively set at the same level as rail given its similar characteristics

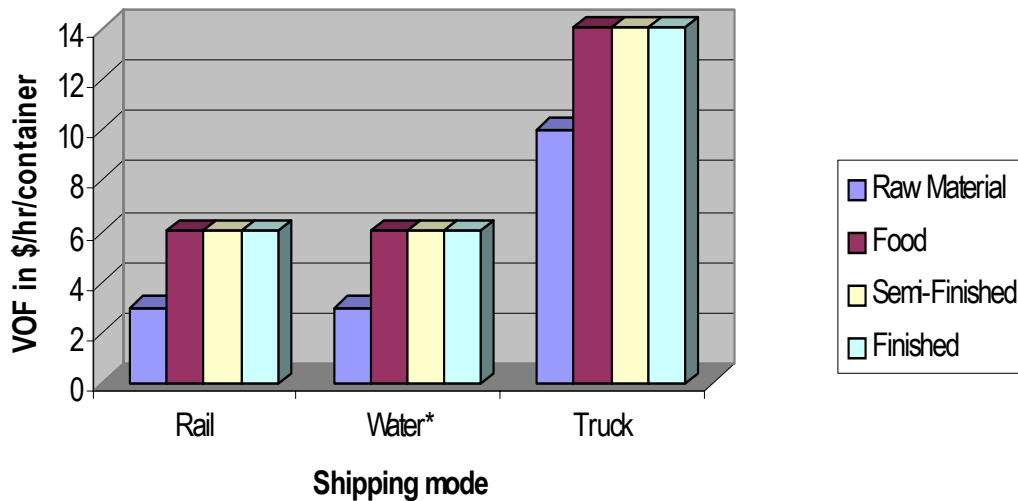
Exhibit 6-2 shows the main result of the Stated Preference survey process: shipper’s values of time by commodity type and shipping mode. A comparison of VOT across commodities show that as expected, finished goods have the highest VOT and raw material the least VOT. A comparison of VOT across the modes indicates that as expected, freight that is currently moving on truck has higher VOT than rail.

6.1.5 VALUE OF FREQUENCY

The value of frequency can be defined as the dollar amount that a shipper is willing to spend to reduce the headway of a shipping mode by one hour. A shipper is likely to pay the most to improve frequency for finished goods, because they are ready to be sold and the least for raw materials. Therefore, finished goods can be expected to have the highest VOF and raw material the lowest VOF. A shipper can ship on a truck whenever he/she desires to make a shipment while shipping on rail or water involves adhering to a fixed schedule. Therefore, the VOF of freight traveling on truck can be expected to be higher than that of rail.

Exhibit 6-3 illustrates the different values of time expressed by commodity type and shipping mode. A comparison of VOF across commodities show that as expected, finished goods have the highest VOF and raw material the least VOF. A comparison of VOF across modes indicates that as expected, freight moving on truck has higher VOF than rail.

Exhibit 6-3: Values of Frequency by Commodity Type and Mode (in \$2005)



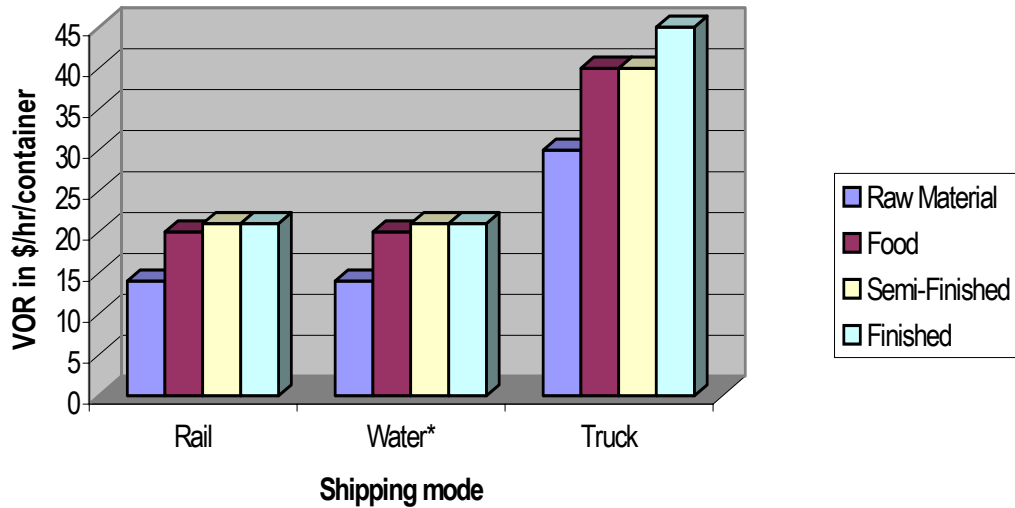
*Water VOT is conservatively set at the same level as rail

6.1.6 VALUE OF RELIABILITY BY TRIP PURPOSE AND MODE

Reliability is a key factor in shipment mode choice, especially in the current market when many commodities are shipped Just-in-Time. The value of reliability can be defined as the willingness to pay a premium to guarantee travel time. A shipper is likely to pay the most to reduce an hour of unexpected delay for finished goods, because they are ready to be sold and the least for raw materials. Therefore, finished goods can be expected to have the highest VOR and raw material the lowest VOR. Truck is a more reliable mode than rail. Therefore, the VOR of freight traveling on truck can be expected to be higher than that of rail.

Exhibit 6-4 illustrates the different values of time expressed by commodity type and shipping mode. A comparison of VOR across commodities show that as expected, finished goods have the highest VOR and raw material the least VOR. A comparison of VOR across modes indicates that as expected, freight moving on truck has higher VOR than rail.

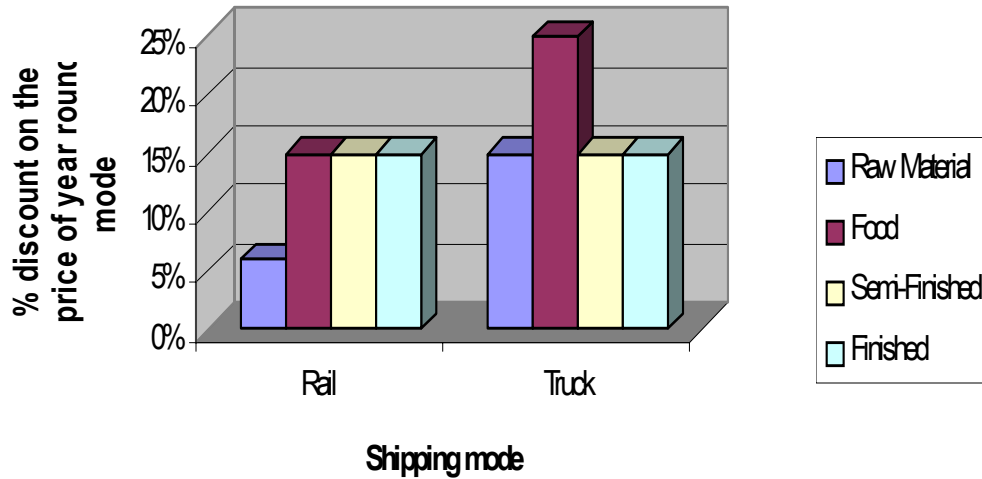
Exhibit 6-4: Values of Reliability by Commodity Type and Mode (in \$2005)



6.1.7 SWITCHING COST FOR A SEASONAL MODE

The impact of seasonality is that a mode cannot operate all year round. The switching cost for a seasonal mode can be defined as the discount required on the shipping cost of a non-seasonal mode to make a shipper willing to switch to the seasonal mode when it is operational. This discount offsets the shipper's transaction or inconvenience cost for having to maintain a backup mode of transportation. Switching costs were developed on a percentage basis. Exhibit 6-5 shows the switching cost by commodity type and truck and rail modes. For example, for shipping raw materials by rail, the survey indicated a 5% switching cost. For a \$100 transportation cost for a year-round service, a \$95 price or \$5 discount would be enough to attract the shipment to the seasonal mode. For food, semi-finished and finished goods the required discount would be 14%, or \$14 per \$100 of cost. The least flexible commodity is food by truck which exhibits a nearly 25% cost for switching to a seasonal mode. This may reflect the highly specialized nature of the equipment needed to transport the commodity.

Exhibit 6-5: Switching cost to a seasonal mode (in \$2005)



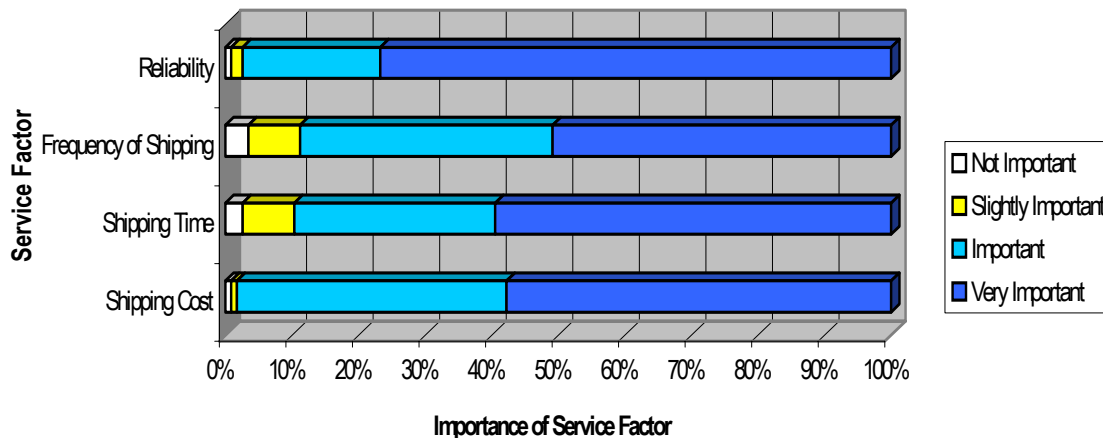
The main reason that seasonality was found to be less of a concern to most shippers was the fact that many contracts are taken out in spot markets, or monthly or short period contracts.

6.1.8 IMPORTANCE OF SERVICE FACTORS

The respondents to the survey were also asked to rank service factors (shipping time, shipping cost, frequency of shipping and reliability) as being not important, slightly important, important, or very important in his/her shipment mode choice. The objective was to find out whether the service factors being evaluated had an effect on shipment mode choice. Exhibit 6-6 illustrates the percentage responses as being considered not important, slightly important, important, or very important for each service factor.

The responses indicate that 99% of the shippers rate shipping cost as an important or very important attribute in mode choice. 89% of shippers rate shipping time as an important or very important attribute, 89% of shippers rate frequency of service as an important or very important attribute, 98% of shippers rate reliability as an important or very important attribute. These responses clearly indicate that a large majority of shippers rank the service factor being considered in the study as important in making mode choice. This confirms the design of the Stated Preference survey that captures explicit tradeoff information on the cost, time, frequency, and service reliability dimensions.

Exhibit 6-6: Service Factor Ranking



6.1.9 TRANSPORTATION ZONES AND NETWORKS

An early step in the development of the GOODS™ Demand Model (See Appendix A) for evaluating shippers' responses to various levels of service, costs and amenities was the establishment of a zone system that would give a good representation of freight shipment between the origins and destinations in the region (For zone map refer to Chapter 2). The county-based zones provide compatibility with the socioeconomic baseline and forecast data (discussed in Chapter 2) that are derived from the U.S. Census Bureau and Woods & Poole data and are county-based.

A 200-zone system was developed to represent the GLSLS Study region using the data collected for each zone, integrating the information from the following sources –

- U.S. Census Bureau and Woods & Poole socioeconomic data on population, manufacturing employment and forestry, fisheries and mining employment
- Network data on all shipping modes, namely truck, rail and water (discussed later)
- Origin and destination freight shipment data by mode and commodity type (discussed later)
- Attitudinal data on the preferences and priorities of shippers

Network links were defined from the centroid of each zone to the nearest GLSLS port representing the cost of system access/egress. Port-specific zones are introduced to aid in the measurement of GLSLS vessel use for foreign inbound/outbound containers. Exhibit 6-7 shows the number of zones in each state/province. Seaports included in the study are Halifax, Montreal, New York, Boston, Baltimore, Philadelphia, Norfolk, Los Angeles, Long Beach, Seattle, Tacoma, and Vancouver. Special zones were provided for each of these seaports to keep their traffic separate from that of the adjacent cities.

Exhibit 6-7: Zone Count by State

State	Number of Zone		
	Statewide Zone	Sea Port Zones	Total
Illinois	10	-	10
Indiana	9	-	9
Iowa	8	-	8
Kentucky	7	-	7
Maryland	6	1	7
Massachusetts	5	1	6
Michigan	9	-	9
Minnesota	7	-	7
New Jersey	4	-	4
New York	12	1	13
Ohio	10	-	10
Pennsylvania	11	1	12
Virginia	11	1	12
Wisconsin	8	-	8
New Brunswick	5	-	5
Nova Scotia	5	1	6
Ontario	11	-	11
Quebec	16	1	17
Other	34	5	39
Total	188	12	200

6.1.10 SOCIOECONOMICS

Freight shipment is dependent on the demographics and socioeconomic of a region. Forecasting of freight demand between the model's zones required base year estimates and forecasts of three socioeconomic variables- population, manufacturing employment and forestry, fishery, and mining employment each zone. To allow for assessment of the financial and operational feasibility of the system over the full life cycle of 40 years, the socioeconomic variables were forecasted through 2050.

6.1.11 TRANSPORTATION NETWORKS

Transportation networks were developed for the base, forecast years and for the four modes of shipment (truck, railcar, intermodal rail, and water) and incorporated in GOODS™ Demand Model. The variables modeled for the GLSLS are shown in Exhibit 6-8. The section describes the process of development of network for each mode of shipment.

Exhibit 6-8 Modal Attributes Used in the GOODS™ Demand Model

	Rail and Water	Truck
Time	<ul style="list-style-type: none"> In-vehicle time Drayage times 	<ul style="list-style-type: none"> Travel time
Cost	<ul style="list-style-type: none"> Price Access/egress costs 	<ul style="list-style-type: none"> Price
Reliability	<ul style="list-style-type: none"> On-time performance 	<ul style="list-style-type: none"> On-time performance
Schedule	<ul style="list-style-type: none"> Frequency of service Convenience of times 	

TRUCK NETWORK

The truck network includes all the major interstates, U.S. and state highways for the United States and Canada. United States trucking regulations allow a truck driver to drive for 11 hours at a stretch and then he has to take a mandatory 10-hour break. Canadian regulations are only slightly more liberal than those in the U.S., allowing 13-hours of driving time in a 24-hour period. This reduces the average trucking speed to 25-mph for a trip that lasts for more than a day's drive. As a rule, rail and intermodal shipping becomes competitive beyond this distance, which is a day's drive for a single driver. Therefore an average trucking speed of 25-mph was used for the truck network for both the U.S. and Canada.

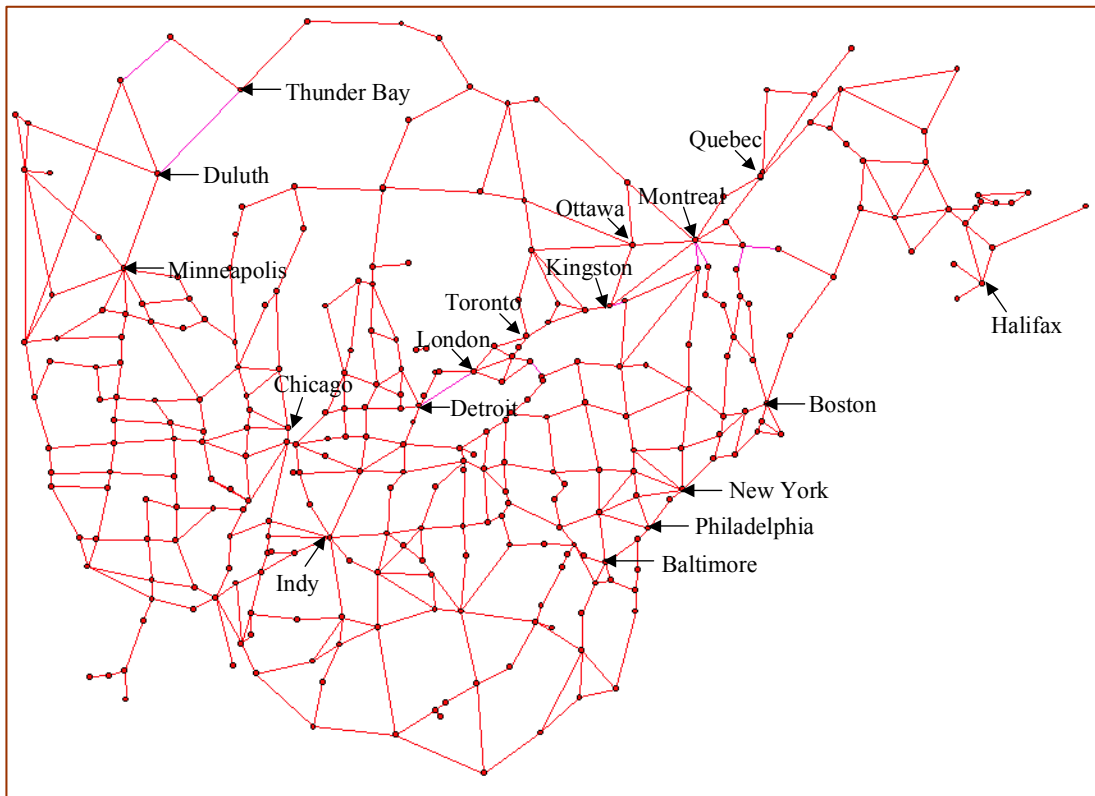
Trucking cost was set up as \$1.75/mile for the base year. This reflects a reasonable composite, or average trucking cost across the entire region without reflecting fronthaul or backhaul economics, that are specific to particular lanes. A consistent cost-based comparison was established across all modes: truck, rail, and water, by applying the average line-haul cost factors appropriate to each mode onto the transportation network links. Increased trucking costs were used for the future year congested and un-congested scenarios and trip times were increased by 0.5 percent per year in the congested network. Exhibit 6-9 shows the trucking costs used for future year truck networks. Exhibit 6-10 shows the truck network developed for the GOODS™ model.

Exhibit 6-9: Trucking cost for base and future years in \$/mile/container

Year	Un-Congested Scenario	Congested Scenario
	2005	\$1.75
2010	\$1.89	\$1.89
2030	\$1.96	\$2.14
2050	\$2.03	\$2.38

Linehaul shipping costs on the rail intermodal network were set up as \$0.36/mile. Terminal costs were reflected in the access/egress links. Future year rail networks for the un-congested scenario were assumed to have the same cost and frequencies as the base year 2005 rail network. A 0.5% per year increase.

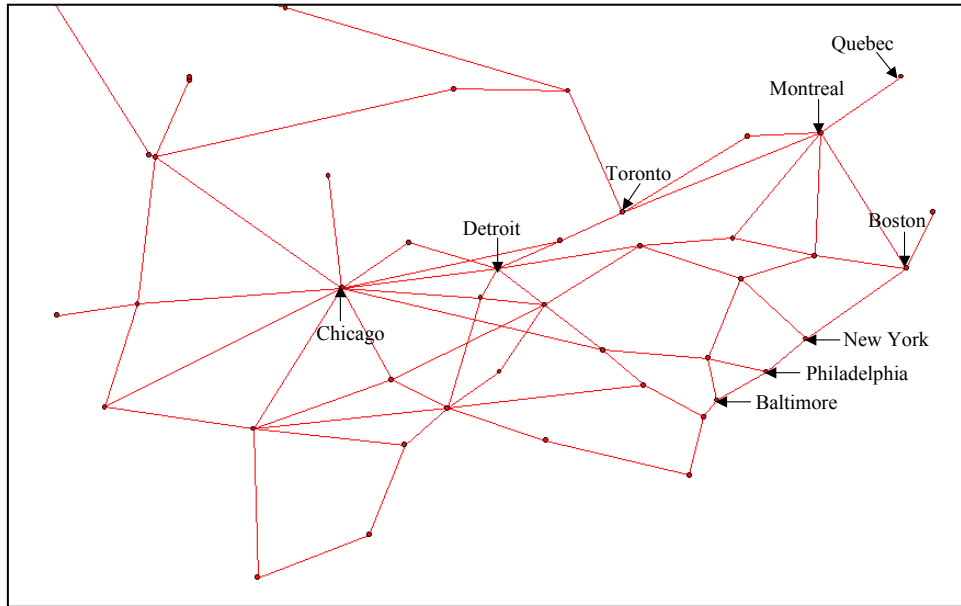
Exhibit 6-10: Truck network developed for GOODS™ model



RAIL-CARLOAD NETWORK

The rail car network, which is relevant to the neobulk analysis, includes the rail connections between major cities in United States and Canada. A cost of \$0.15/mile was set up for the rail car network. Exhibit 6-11 shows the Rail Carload network developed for the GOODS™ model.

Exhibit 6-11: Rail Carload network developed for the GOODS™ model.



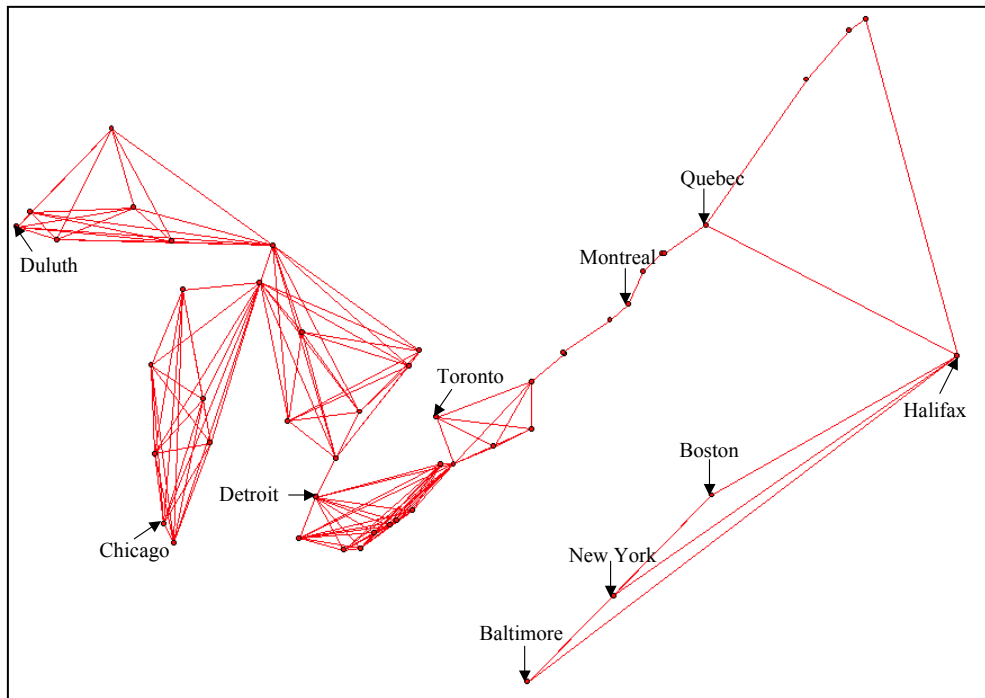
WATER NETWORK

The development of a water network required developing information on the distances between each Great Lakes port. Speed limit restrictions that exist on the various lock and channel sections of the St. Lawrence River and the great Lakes were incorporated in the network. Locks on the St. Lawrence River, Welland Canal, and the Soo Lock on Lake Superior were included. Three different water networks were developed to represent the different speeds of Container Ship, PACSCAT, and Container on Barge (COB) vessels. Exhibit 6-12 shows the cost per mile and maximum speed for each of these technologies. Exhibit 6-13 shows the Water network that was developed for GOODS™ model.

Exhibit 6-12: Vessel Cost and Speed Characteristics

Vessel type	Cost/mile/container	Speed (knots)
Large Containership	\$0.23	20
Small Containership	\$0.48	20
PACSCAT	\$1.26	42
COB	\$0.21	8

Exhibit 6-13: Water network developed for the GOODS™ model



6.1.12 SECONDARY TRAVEL MARKET RESEARCH

The multimodal freight analysis required data on origin-destination basis for each mode (Truck, Rail, and Water). Since water is not a container shipping option currently, base year data was available only for truck and rail modes. This data was compiled by assembling various public and private published datasets, e.g. in the U.S., the Freight Analysis Framework data, U.S./Canada crossborder flows, along with data supplied by USDOT and Transport Canada and data obtained from various prior published studies or downloaded from Port Authority web sites.

Freight movement relevant to the study, based on origin/destination, can be broadly classified into the following five categories -

- a) USA domestic,
- b) Canada domestic,
- c) Transborder (USA to Canada and Canada to USA),
- d) USA import/export via seaports and
- e) Canada import/export via seaports.

Exhibit 6-14 inventories the various sources used for setting up origin-destination database on freight movement in the GLSLS study area.

Exhibit 6-14: Sources for Origin Destination and Traffic Data

Freight type	Data Source
USA domestic	FAF ²
Canada domestic	Truck OD 2003 ³ , Rail in Canada ⁴
Transborder	BTS ⁵
Import/export via seaport	FAF (as cited above), Port Halifax ⁶ , Port Montreal ⁷ , Port Seattle ⁸ , Port Tacoma ⁹ , Short Sea Shipping Market Study ¹⁰ , Final Report Port and Modal Elasticity Study ¹¹ , MARAD ¹² , Port of Vancouver ¹³

Data obtained from these data sources were assigned to the study zone system based on socio-economic data on population and employment in manufacturing, forestry, fisheries and mining.

6.2 THE TOTAL MARKET OF GLSLS

The first step for developing a GLSLS market assessment was to meaningfully segment the market. Three main commodity categories have been identified: Bulk, Neo-Bulk and Containerizable freight. Containerizable freight was further broken down into four subsets: Raw Materials¹⁴, Food, Semi-Finished Goods, and Finished Goods. Exhibit 6-15 lists the specific commodities identified in the US DOT Freight Analysis Framework (FAF) database and how those were classified for the purpose of this study.

² Freight Analysis Framework, 2002

³ Origin Destination Truck matrix 2003 supplied by Transport Canada on study team's request

⁴ Statistics Canada, Rail in Canada 2003

⁵ Bureau of Transportation Statistics

⁶ Halifax Port Authority Website, <http://www.portofhalifax.ca/>

⁷ Montreal Port Authority Website, <http://www.port-montreal.com/>

⁸ Seattle Port Authority, <http://www.portseattle.org/>

⁹ Tacoma Port Authority, <http://www.portoftacoma.com/home.cfm>

¹⁰ Short Sea shipping market Study, Prepared for Transportation development center of Transport Canada, by Marinova Consulting

¹¹ Final Report Port and Modal Elasticity Study, Prepared for Southern California Association of Government, by Leachman & Associates

¹² US Department Of Transportation Maritime Administration

¹³ Vancouver Port Authority, <http://www.portvancouver.com/>

¹⁴ The category of "Raw Materials" has been identified as a specific subset of Containerizable freight. Many Bulk and NeoBulk goods can also be considered Raw Materials, but are not included as part of the Containerizable freight analysis.

Exhibit 6-15: Commodity Classification for GLSL Market Assessment

FAF Commodity	Commodity Type	Containerizable Sub Commodity Grouping
Electronics	Containerizable	Finished Goods
Furniture	Containerizable	Finished Goods
Machinery	Containerizable	Finished Goods
Precision instruments	Containerizable	Finished Goods
Printed prods.	Containerizable	Finished Goods
Pharmaceuticals	Containerizable	Finished Goods
Alcoholic beverages	Containerizable	Food
Meat/seafood	Containerizable	Food
Milled grain prods.	Containerizable	Food
Other ag prods.	Containerizable	Food
Other foodstuffs	Containerizable	Food
Tobacco prods.	Containerizable	Food
Basic chemicals	Containerizable	Raw-Material
Chemical prods.	Containerizable	Raw-Material
Fertilizers	Containerizable	Raw-Material
Nonmetal min. prods.	Containerizable	Raw-Material
Plastics/rubber	Containerizable	Raw-Material
Newsprint/paper	Containerizable	Semi-Finished
Misc. mfg. prods.	Containerizable	Semi-Finished
Mixed freight	Containerizable	Semi-Finished
Paper articles	Containerizable	Semi-Finished
Textiles/leather	Containerizable	Semi-Finished
Wood prods.	Containerizable	Semi-Finished
Base metals	Neo-Bulk	
Logs	Neo-Bulk	
Motorized vehicles	Neo-Bulk	
Transport equip.	Neo-Bulk	
Live animals/fish	Neo-Bulk	
Animal feed	Bulk	
Articles-base metal	Bulk	
Building stone	Bulk	
Cereal grains	Bulk	
Coal	Bulk	
Coal, n.e.c.	Bulk	
Crude petroleum	Bulk	
Fuel oils	Bulk	
Gasoline	Bulk	
Gravel	Bulk	
Metallic ores	Bulk	
Natural sands	Bulk	
Nonmetallic minerals	Bulk	
Waste/scrap	Bulk	

Exhibit 6-16: U.S. Originated Tonnage by Commodity Category For Surface Modes of Transportation

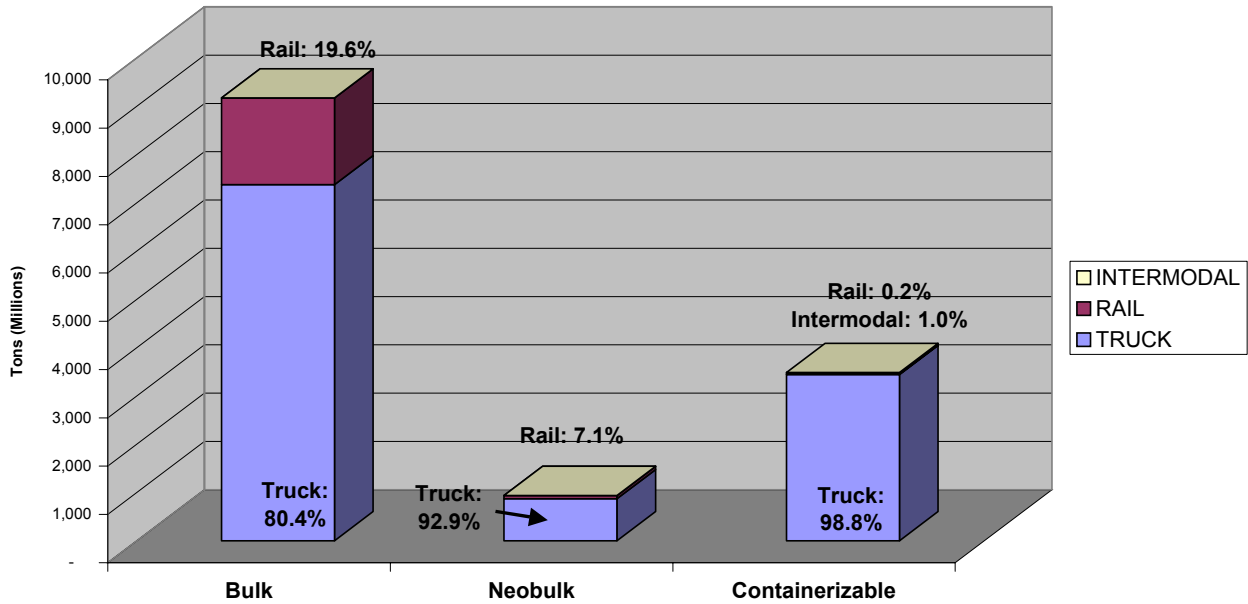


Exhibit 6-16 shows the modal share by commodity category for total U.S. market. This chart shows the predominance of trucking, based only on originated tonnage, across the entire commodity grouping. However, for bulk commodities, the rail carload share of ton-miles is very high¹⁵, even though rail originates less tonnage. Much of the truck tonnage is very short haul – for example, within the same urban area, or to and from a rail, barge or pipeline distribution center. For neo-bulks, trucks compete with rail carload, again, rail tends to take the longer hauls, while trucks concentrate on short hauls. There may be some double counting in the FAF data of “secondary” traffic. This can occur if it is brought into a logistics center by rail but distributed to its final destination by truck. Trucks have nearly all the “containerizable” freight regardless of length of haul except for a small intermodal rail share. The railcar share of containerizable freight is negligible.

This study is concerned with assessing the potential viability of both Container and Neobulk traffic. The container market at over 3 billion tons is only about one third of the bulk market at nearly 9 billion tons, but about four times the size of the Neobulk market, which is under 1 billion tons.

The following sections describe both the GLSLs Container and Neobulk markets providing an evaluation of the total market for each type of traffic, the character of its movements and its potential for water to play a role in its movement.

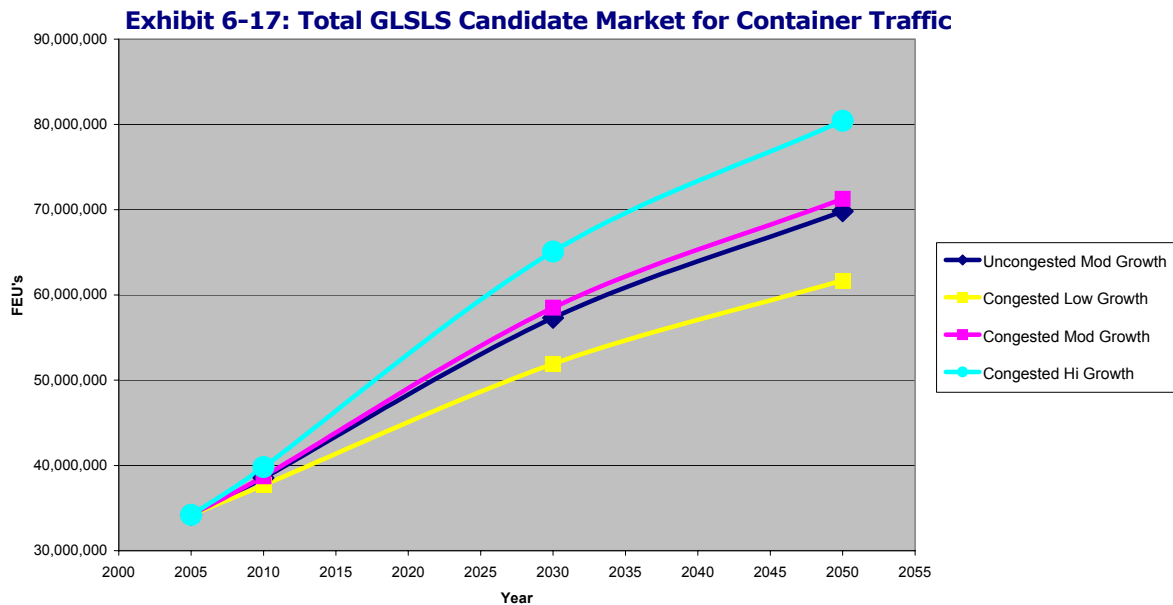
¹⁵ This chart excludes the water and pipeline shares for bulk commodities, which are also very large.

6.3 GLSLS CONTAINER MARKET

Many specific movements within the GLSLS region¹⁶ may not be candidates for GLSLS water movement. For example, a Louisville to Cincinnati shipment would not move by the GLSLS. As well, local shipments within the same city or port area would not be candidates for movement by the Seaway. Non-eligible shipments have been excluded from the market share calculation. Including such shipments would tend to depress the calculated GLSLS modal share and would understate the importance of water service in the lanes that water *can* reasonably serve. Accordingly, a definition of “eligible shipments” was imposed on the traffic data that requires –

- Both the originating and terminating zones, with the exception of Pacific Northwest land bridge traffic, must be within effective truck drayage distance from a GLSLS port. The outer limit cutoff for this drayage was established as 150 miles.
- Traffic must originate and terminate at different ports, e.g. local movements within the same port zone are excluded.

Applying this criteria develops a conservative assessment that identifies about 1/3 of the total containerizable shipments within the GLSLS service area as actually eligible for possible movement on the GLSLS¹⁷. Exhibit 6-17 shows the total market size in terms of eligible FEU’s within the GLSLS market area. The overall market is forecast to grow by a factor of 2.0 to 2.5 times by 2050. High and low growth rate sensitivities were assessed only for the Congested scenario. Comparing the two Moderate growth scenarios, the Congested scenario has only a slightly higher total market forecast than does the Uncongested scenario. This slight difference reflects the increased diversion of Asian traffic to Halifax from Southern California ports via the Suez Express routing. The Suez diversion is very small on a total GLSLS-regional basis but because the traffic is highly concentrated at Halifax, the Seaway could expect a significant share of it. Because of this, Suez traffic can play a highly significant role in the development of GLSLS-container services even though it represents only a small portion of the total traffic generated by the GLSLS service area.

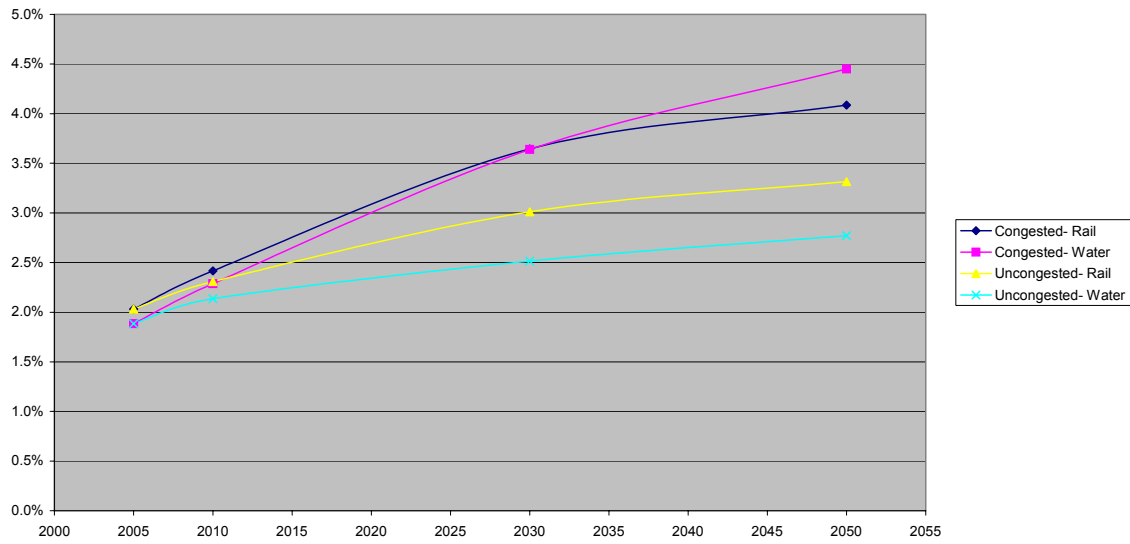


¹⁶ A map of the GLSLS Service Area is shown in Exhibit 2-1 and has been described in the earlier part of this chapter.

¹⁷ Even this basis for calculating modal share is very conservative since some movements like Pittsburgh, PA to Columbus, OH are still included in this base even though the highway system between these cities is obviously much more direct.

Only these candidate movements are included within the base for the rail and water modal share calculations shown in Exhibit 6-18. This exhibit suggested that were a water option in existence with rail intermodal, each would take about 2% market share in the base year 2005. In the uncongested case, each mode's share will grow by 2050 to about 3%, with rail market share slightly higher than water's; but in the congested scenario, each mode's share will grow to about 4% by 2050, with water's market share slightly higher than rail's. Trucking's share of originated tonnage declines from 96% in 2005 to about 94% in the uncongested scenario, or 92% in the congested scenario.

Exhibit 6-18: Forecast Market Shares by Mode



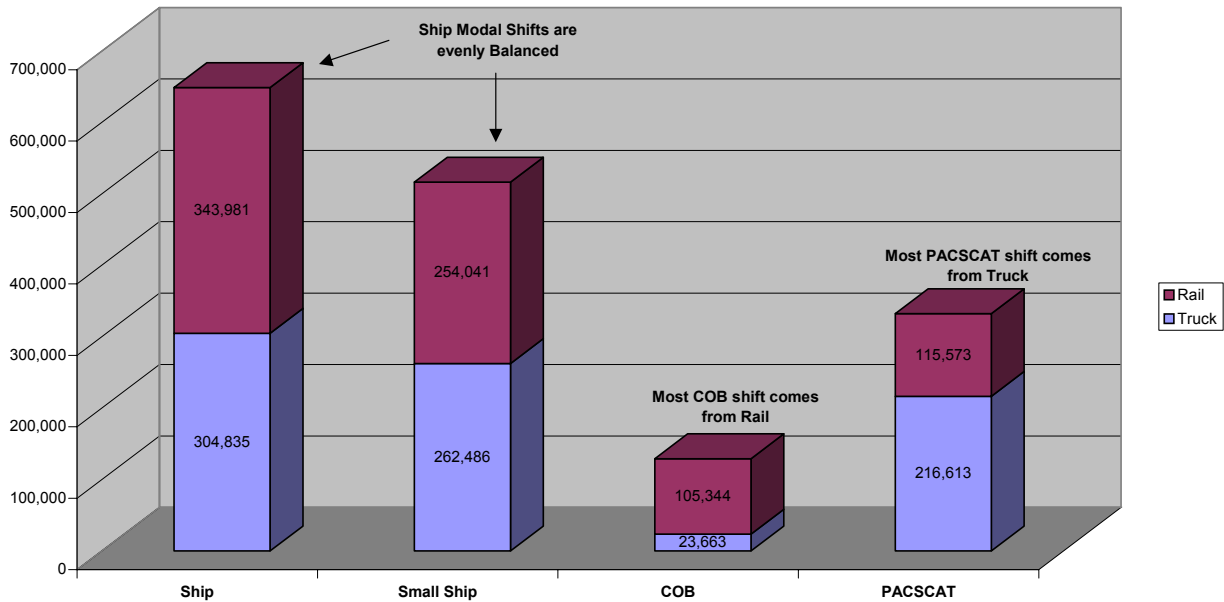
The forecast modal shift for the GLSLS depends on which vessel technology is deployed. Exhibit 6-19 shows the source of shifted FEU's, by mode, for the Base year 2005.

Fast technologies such as PACSCAT tend to attract a higher proportional share of their traffic from truck -- although because of PACSCAT's very high cost, PACSCAT still does not attract as much from truck as does the 20-kt container ship.

The slow COB service tends to attract a higher proportional share from rail – it attracts only the most price-sensitive traffic from rail – although because of COB's very slow speed, COB still does not attract as much from rail as does the 20-kt container ship.

Both the large and small ship technologies show a significant and balanced modal shift showing a 20-kt vessel's ability to attract traffic from both rail and truck modes.

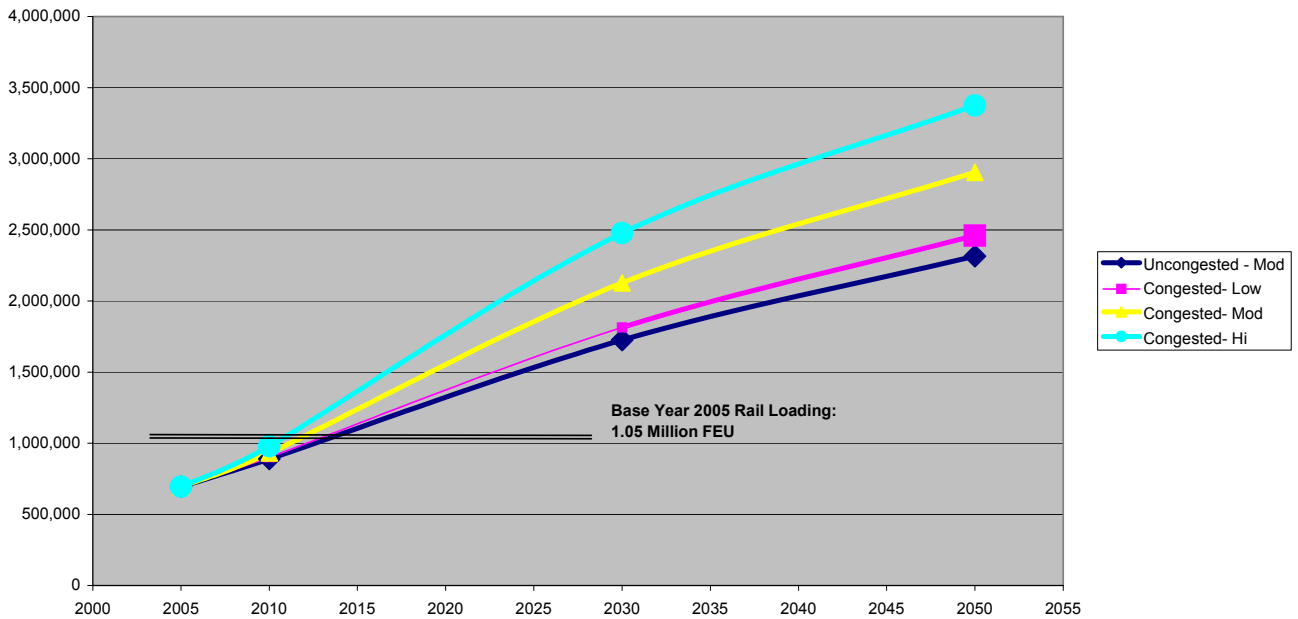
Exhibit 6-19: Forecast Source of Shifted FEUs



The conclusion is that growth in the market will be so high that it will demand the addition of significant capacity and can support the introduction of a new shipping mode without reducing the volumes of existing modes. The total market is growing very rapidly and because of increasing highway congestion, both rail and water intermodal services are forecast to gain significant share and grow even faster than the overall market. Therefore, while the candidate market itself grows only by a factor of 2.0 to 2.5, the rail and water intermodal market will be growing by a factor between 4.0 and 5.0 by 2050. This rate of growth will only be accelerated by any traffic diversion that may occur from west coast ports to the Suez Express routing via Halifax.

Ramping-up GLSLS vessel services gradually will minimize the effect of modal shift on railroads during the implementation period. Exhibit 6-20 shows that even after full introduction of competing vessel services for some markets in the study, the railroads would be expected to fully recover their current traffic volumes by no later than 2012, double their current volumes by 2020 and triple their volumes between 2040 and 2050.

Exhibit 6-20: Forecasted Rail FEU's between GLSLS Port Areas



6.3.1 CONTAINER TRAFFIC DEMAND FORECASTS BY VESSEL TECHNOLOGY

This section presents the overall forecast results by vessel technology type. It defines the key scenarios that have been evaluated for the forecast period from 2005 thru 2050.

Forecasts for four different vessel technologies have been developed under both Congested and Uncongested traffic scenarios. These forecasts were all developed using a midrange economic growth assumption –

- Uncongested strategy forecasts assume current highway and rail travel time, frequency, and reliability. However, the uncongested forecasts do increase trucking cost to account for the expected driver wage rate increases.
- Congested strategy forecasts increase highway costs and travel times and degrade reliability to reflect highway congestion in urban areas. Rail services are assumed to remain at about their base level and conservatively are neither improved nor degraded. However, congestion at southern California ports leads to an increased rate of diversion to the Suez routing in the congested forecasts.

Three vessel types were initially selected as the “best of class” technology on the GLSLS for their given speed capability. However, both a large and small ship variant has been modeled to support implementation planning for the vessel service. The small ship has a somewhat higher unit cost and so is somewhat less able to attract traffic than the larger vessel.

Demand forecasts for four different vessel types were produced. These are –

- 8 knots – Container on Barge
- 20 knots – Small GLSLS Container Ship (Ro/Ro or Lo/Lo configuration)
- 20 knots – Large GLSLS Container Ship (Ro/Ro or Lo/Lo configuration)
- 40 knots – Sea version of PACSCAT

The river version of PACSCAT was not modeled since it gives the same performance, but at a much higher cost than the GLSLS-max container ship. Similarly, the Fast Freighter was not modeled since it gives the same performance at a much higher cost than the Sea version of PACSCAT.

High and Low economic growth scenarios were developed as sensitivities to the Congested Large Ship scenario. Exhibit 6-21 gives the resulting total GLSLS forecast annual traffic volume, in loaded FEU's, for each of the traffic scenarios that have been evaluated in this analysis. Each scenario has been evaluated for the Base Year 2005 as well as Forecast years 2010, 2030 and 2050.

Exhibit 6-21: GLSLS Forecast Loaded FEU's- Summary

UNCONGESTED - MIDRANGE GROWTH				
	2005	2010	2030	2050
SMALL SHIP	508,553	654,612	1,143,319	1,530,624
SHIP	644,170	823,554	1,441,748	1,934,960
PACSCAT	286,565	368,178	634,343	845,224
COB	127,231	159,302	286,634	388,477

CONGESTED - MIDRANGE GROWTH				
	2005	2010	2030	2050
SMALL SHIP	508,553	685,830	1,567,842	2,360,963
SHIP	644,170	882,643	2,134,607	3,183,636
PACSCAT	286,565	373,180	762,729	1,174,656
COB	127,231	166,196	374,610	557,768

LOW and HIGH GROWTH SENSITIVITIES for CONGESTED SHIP SCENARIO				
	2005	2010	2030	2050
LOW GROWTH	644,170	858,200	1,835,896	2,700,821
HIGH GROWTH	644,170	918,421	2,431,252	3,626,578

Vessels in Ro/Ro configuration offer only about half the capacity of an equivalent Lo/Lo ship. Because of this, Ro/Ro ships have higher line-haul operating costs, but lower port costs for loading and unloading. The GLSLS container ship forecasts developed here reflect the higher line-haul costs of a Ro/Ro vessel. Even so, as shown in Exhibit 6-22, a GLSLS-max Ro/Ro ship gives the best market penetration. This vessel is large enough to be able to offer an overall cost savings over rail shipping; with rapid loading, unloading and low terminal costs, suitable for application to short-haul intermodal lanes; and because of its 20-kts top speed, competitive port-to-port times. The initial forecast is for 644 thousand FEU (1.29 million TEU) under base year 2005 conditions; but volumes would grow by a factor of three to five times by 2050. As shown in Exhibit 6-23, a smaller ship is still cost effective and can be used during the startup period. Its base year 2005 forecast is for 500 thousand FEU (1.00 million TEU.) To optimize the economics, GLSLS-max vessels should be deployed as soon as traffic grows enough to support a daily sailing of the larger ship.

Exhibit 6-22: GLSLS-Max Container Ship (Ro-Ro) Annual FEU's Forecast

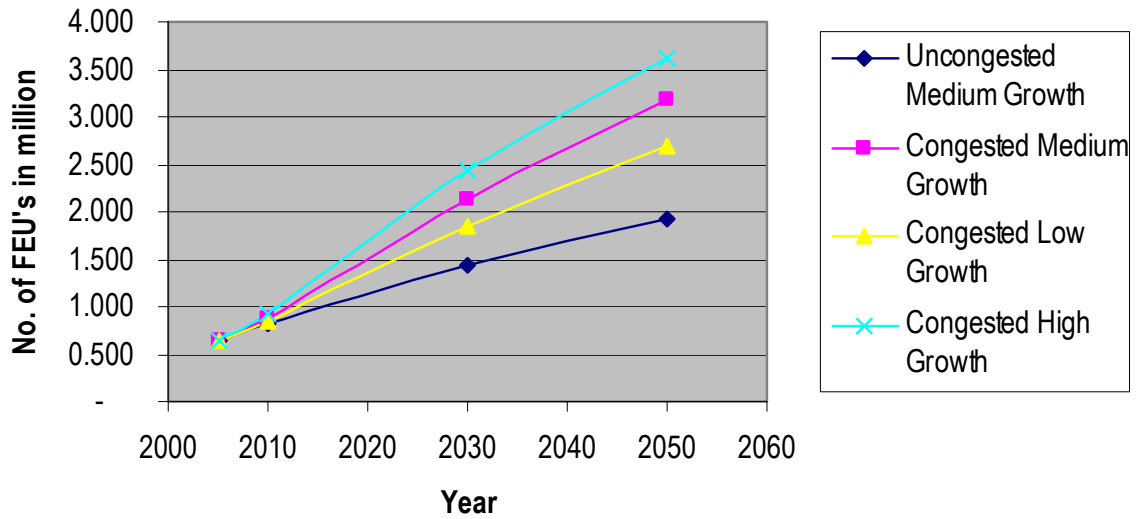


Exhibit 6-23: GLSLS Small Container Ship (Ro-Ro) Annual FEU's Forecast

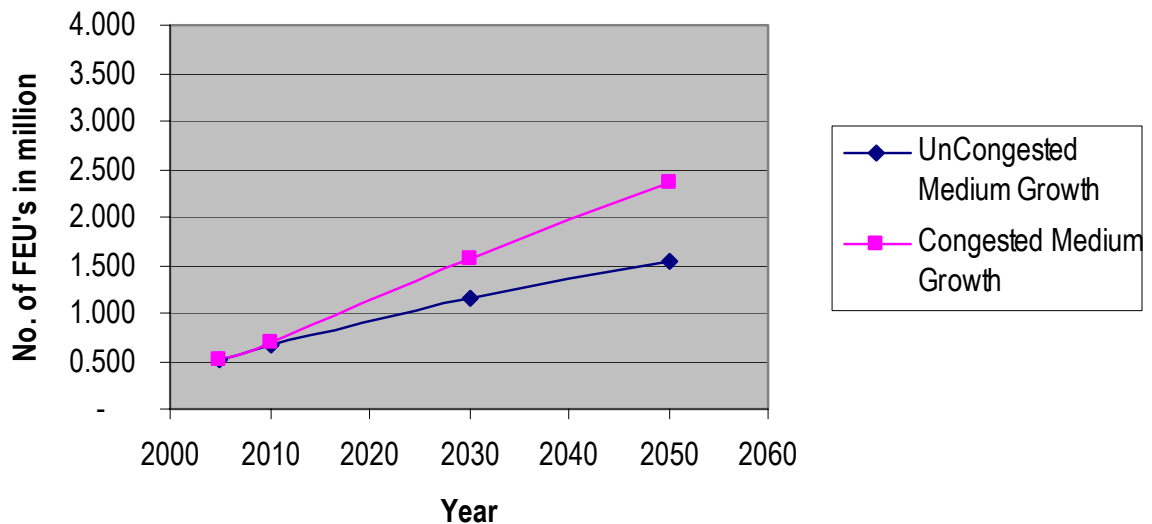
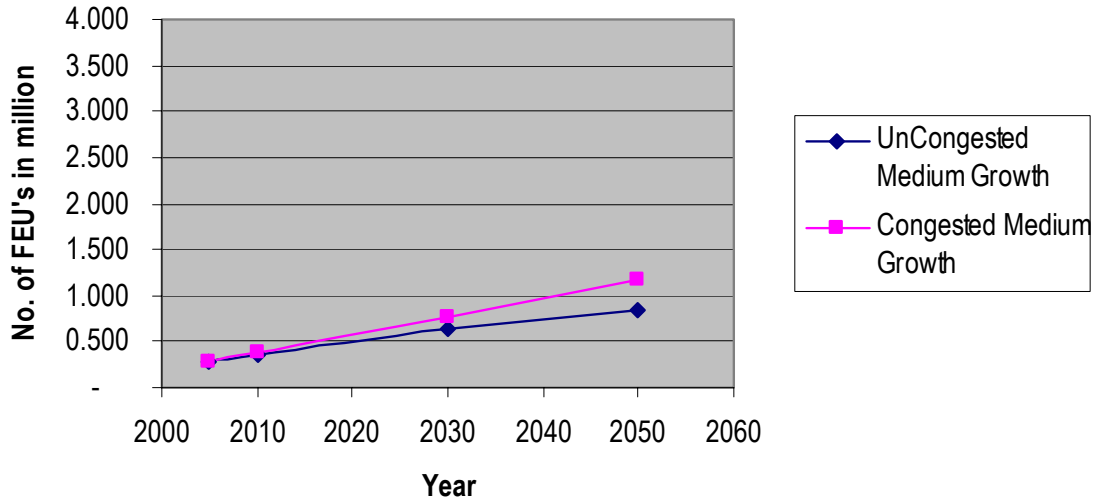


Exhibit 6-24 shows the results for the 40-kts sea version of PACSCAT. Although PACSCAT is still cheaper than trucking, it is much more expensive than rail. PACSCAT's advantage over trucking depends on the relative circuitry of the water versus highway system as well as the assumed level of highway congestion. For the GLSLS, the PACSCAT forecast is substantially lower than for the container ship – PACSCAT captures only 287 thousand FEU (574 thousand TEUs) – less than half the traffic of the container ship, under base year 2005 conditions.

From Halifax to Windsor, PACSCAT costs are too high to compete with parallel Canadian rail intermodal service; because of this, rail would capture most of the available container traffic at Halifax and the water mode would benefit only minimally from the Suez traffic influx. From Chicago to Detroit, because of the circuitry of going around the Mackinac Straits, PACSCAT costs and travel times are both higher than trucking. PACSCAT is most effective for attracting high-value truck shipments that are willing to pay a premium for faster service. However, as a result of PACSCAT not being cost competitive to rail, significant traffic is forecast only in domestic or

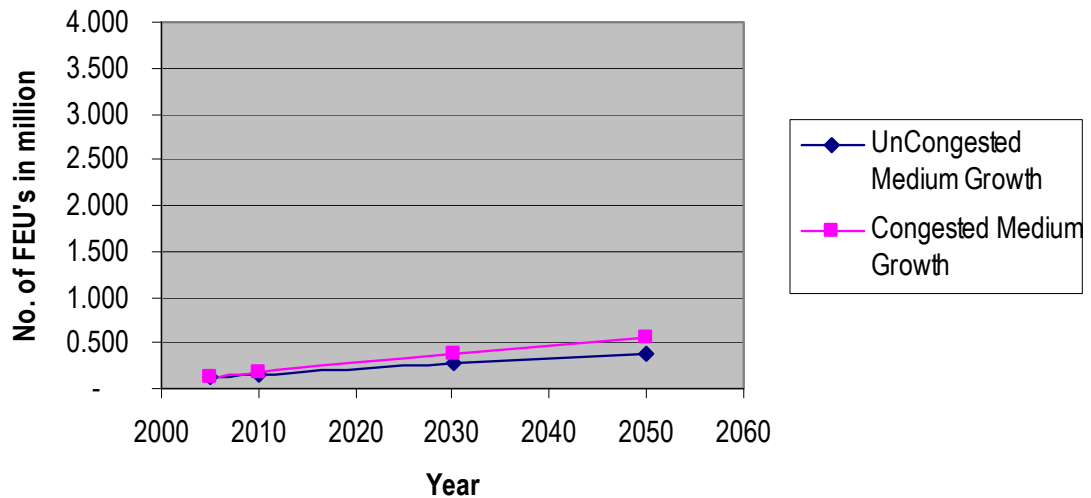
cross border lanes that are not directly competitive to rail intermodal shipping, e.g., Lake Ontario, Erie, or Michigan ferry service.

Exhibit 6-24: PACSCAT Annual FEU's Forecast



Finally, Exhibit 6-25 shows the results for Container on Barge service. COB service captures only 127 thousand FEU (254 thousand TEUs) – less than 20% of the market penetration for the container ship. Although COB service is cost-competitive to rail intermodal, its top speed of 8-kts is simply too slow to be able to offer competitive transit times. Again, the COB forecast is heavily suppressed in areas where it has to compete with rail intermodal that offers comparable costs but a much higher speed. In areas where COB has to compete for higher-value freight that is moving by truck, the service is simply too slow to be cost effective.

Exhibit 6-25: COB Annual FEU's Forecast



Lane and port-specific traffic forecasts will be reported in the Operations chapter.

6.3.2 GEOGRAPHIC REGION'S AND COMPETITIVE CONDITIONS FOR THE CONTAINER MARKET

This section describes the competitive conditions in the various markets served by the GLSLS. Instead of looking at capacity and demand on a modal basis, this section takes a geographic view. As shown in Exhibit 6-26, the GLSLS Service area can be subdivided into at least five distinct sub-regions. A sixth region, the Atlantic Coastal area tends to be served from its own East Coast ports rather than from GLSLS ports. The market and competitive conditions differ within each area and each will be discussed in turn –

- In the U.S. the GLSLS Service area corresponds to the region from the Appalachian Mountains as far west as Iowa and Minnesota and south as far as Kentucky. Since the development of Turnpikes and Interstate highways in the U.S. and the building of the 401/QEW in Canada, the region has been well served by highways. However, today some of these highways face significant congestion in urban areas. Equally, initially the entire region was well served by rail, but today because of cost and capacity constraints in Chicago, the railroads concentrate only on long hauls from Chicago. Since railroads have been skipping over intermediate short-haul markets in the Midwest and Wisconsin, rail intermodal competition in the U.S. is rather weak.
- In Canada, unlike their counterparts in the U.S., Canadian railroads bypass Chicago with a route around the north end of Lake Superior, so the Canadian rail network does not suffer the “bottleneck effect” caused by Chicago congestion problems. Also, Canadian railroads have been willing to accommodate short-haul business, so rail competition in the Halifax to Chicago corridor is strong and well-entrenched. As such, the Seaway will have to be highly competitive with the railways for any market share it can get in Canada.

Exhibit 6-26 GLSLS Service Areas



A key problem for the GLSLS has been its traditional orientation towards European trade. However, the explosion of Asian trade, which initially favored the development of West Coast ports instead of the Seaway, is now spilling over to East coast ports. As a result, there are now several very bright spots in the outlook for development of containerized and neo-bulk shipping on the GLSLS —

- **Atlantic Container Trade.** Although growth in European trade is not quite as fast as Asia's, European trade still continues to grow at a healthy rate. Montreal has been the predominant GLSLS port for European trade. Additionally, the recent emergence of the Suez Express routing raises the possibility that the GLSLS may be able to share in some Asian traffic as well using the port of Halifax. Part of the growth in Suez traffic has been driven by capacity constraints at West Coast ports and the Panama Canal, but it also reflects trade shifts. Trade with Asia is moving south and west to newly emerging economies in the Philippines, Malaysia and India¹⁸. This is complemented by the shipping lines who have taken the opportunity to maximize vessel economics by combining the North American and European trades on a single large ship. With the difference between using the Panama or Suez Canal to go from Hong Kong to New York City being only 482 kilometers (300 miles), distance is not an issue. From the newly industrializing southwestern Asia ports, the distance to New York via Suez is actually shorter.
- **Pacific Container Trade.** The GLSLS does not reach any west coast ports directly, but it may still be possible for GLSLS ports at Duluth and Thunder Bay to participate in Asian trade via a rail land bridge to the Pacific Northwest. While the opportunity for Atlantic trade growth will be primarily driven by development of the Suez Express routing, the development of new port facilities at Duluth and Thunder Bay could allow the GLSLS to participate in existing rail mini-landbridge flows. The motivation for U.S. railroads to participate is for the development of new rail terminal capacity¹⁹ and to bypass the Chicago rail bottleneck. Canadian railroads could use GLSLS to gain improved access to U.S. Midwestern markets that today they can reach only by trucking.
- **Domestic and Cross Border Traffic.** Finally, given recent regulatory changes in trucking hours of service, higher fuel costs, increasing highway congestion, the continuing driver shortage, ongoing delays at U.S.-Canada border crossings and rail's decision to reduce intermodal shipping options to intermediate points in the U.S. Midwest and Wisconsin, there is a significant opportunity for development of domestic and cross border traffic between GLSLS ports.

¹⁸ Over the very long term, an expansion of the Panama Canal represents a possible threat both to Suez traffic as well as to West Coast ports. But, the Panama Canal is currently running at capacity and it will take \$8 billion to \$10 billion and many years to expand the canal, which will also raise the cost of using the canal and that money must be borrowed on the credit of Panama. To avoid West Coast port delays and the Panama Canal's limitations, shippers will increasingly look at having goods sent to North America's East Coast ports via the Suez Canal. See: <http://www.atlantica.org/library.asp?cmPageID=93&fd=0&cid=1209&p=1>

¹⁹ To accommodate the forecasted increased in mini-landbridge rail traffic, U.S. freight railroads will need to spend considerable capital dollars for developing additional Chicago-area intermodal terminal capacity. However, land for terminal expansion in Chicago is becoming increasingly scarce and expensive. This cost could be avoided by diverting some traffic to new port facilities in Duluth or Thunder Bay instead. Using Duluth as a "safety valve" for Chicago could allow existing Chicago terminal capacity to be reallocated to support growth in domestic lanes and from other west coast ports. By delivering containers closer to their actual destination, the proposed water service would also relieve some pressure on the highway systems east of Chicago.

6.3.2.1. GLSLS CANADIAN SERVICE AREA

The GLSLS Canadian Service area lies along the St Lawrence River and the north sides of Lake Ontario and Lake Erie. It includes the major cities of Quebec, Montreal, Ottawa, Toronto, and Windsor. 67% of the Canadian population lives on less than 10% of the Canadian land area making the GLSLS Canadian Service area the most densely populated region of Canada.

Competitive rail and highway services in the area are well developed. There are two competing railroads: the Canadian National (CN) and Canadian Pacific (CP) lines. Both the CN and CP railroads have developed extensive intermodal services in the Halifax-Quebec-Montreal-Toronto-Windsor-Chicago corridor. However, only CN effectively serves the entire length of this corridor. The CP does not reach Halifax and must rely on trackage rights over other railroads to reach Chicago.

Both Canadian railroads offer long-haul intermodal services to the Pacific port of Vancouver. The CN serves a new port on the west coast at Prince Rupert as well. It is not expected that the GLSLS will be able to participate significantly in Asian traffic to Canada arriving at the Canadian west coast ports of Vancouver or Prince Rupert. Both Canadian railroads have their own rail lines from the west coast directly into the eastern Canada cities. However, the Canadian railroads may be willing to work with a vessel operator at Duluth or Thunder Bay for west coast port traffic bound for U.S. destinations in the upper Midwest.

CP is planning to convert its Detroit rail tunnel into a truck tunnel so it can replace the existing bores with a higher clearance rail tunnel, but this remains in the planning stages and has not yet come to fruition. In the meantime, CP has concentrated on developing short-haul traffic in its Montreal-Toronto-Detroit lane with its innovative "Expressway" trailer-shuttle service. In addition, CP Rail's historical relationship to CP Ships has given CP the lion's share of import/export traffic at Montreal. With its more extensive route structure, CN has not needed to develop short-haul business. CN seems more interested in developing long-haul traffic from Halifax to Chicago and Memphis via its Sarnia tunnel.

Two strong rail competitors are well established in the Quebec to Windsor corridor with both conventional and Expressway "shuttle train" intermodal services. However, a short-sea shipping service using GLSLS-max vessels would have a cost advantage over rail with reasonable transit times. Small vessels may not have a cost advantage over rail and thus, they would be more vulnerable to a rail competitive pricing action. Given the speed restrictions imposed by the locks and channels of the Seaway and Welland Canal, rail would probably capture the time sensitive traffic, while shippers interested in lower cost would choose water.

However, in cooperation with CP Rail, there may be an opportunity to introduce a Halifax-Montreal vessel feeder that could even handle time sensitive traffic. From Halifax to Montreal, a 20-kts vessel could offer competitive schedule timings and costs as compared to the current CN rail intermodal service. There are no locks from Halifax to Montreal, most of the distance can be operated at near maximum vessel speed, and the lower St. Lawrence River is open year-round. Tharamangalam and Mortaza²⁰ previously noted that "the near-monopoly in land transport inbound from Halifax is having an adverse impact on the port's traffic potential. Following Noteboom and Rodrigue (2005), we believe the port authority should be more actively involved in proposing distribution alternatives."

²⁰ Michael Tharamangalam* & M. Golam Mortaza, The Halifax Port: its Role and Prospects in the Nova Scotia economy, with special emphasis on the issue of devolution, October 23, 2005, <http://www.unb.ca/econ/acea/documents/Halifaxport.pdf>

With an integrated rail/water service, a 20-knot GLSLS-max vessel could offer competitive schedules and costs even for time sensitive goods from Halifax to Montreal. At Montreal, time sensitive cargoes for Toronto, Windsor, and Chicago would be discharged and transferred to CP Rail. These cargoes would be replaced by lower-valued cargoes or cross-border traffic that is not directly competitive to the Canadian rail system. The vessel would then proceed up the Seaway to Hamilton, ON and possibly even farther into the upper lakes system.

During the winter, this Halifax-Hamilton feeder ship would have to terminate at Montreal, but the Halifax-Montreal segment could still operate year-round. At Montreal, the entire cargo would be transferred to a seasonal rail shuttle from Montreal to Hamilton continuing to a port on Lake Erie. This seasonal rail service would serve as a natural extension of the year-round joint service for time sensitive cargoes. Therefore, while a GLSLS vessel service would compete with CN for Halifax traffic, it would complement rather than compete with CP's rail network. Since the primary focus of the proposed GLSLS service would be on attracting traffic from Halifax primarily to the U.S. Midwest, it would seem that CP Rail would have everything to gain and very little to lose by cooperating with the development of a GLSLS short-sea shipping service.

While CN rail services from Canada to Chicago via Sarnia are well developed, cross-border rail services have not developed via the Niagara gateway. The railroads apparently consider the length of haul too short and development of this cross-border gateway is complicated by the need for two different railroads to work together to develop a service. This missing link in the rail intermodal network provides a market opportunity that short-sea shipping can exploit.

The GLSLS is therefore well positioned to attract cross-border freight from Canada to U.S. ports on Lake Erie and the north end of Lake Michigan. In spite of a lack of rail connectivity, Montreal still maintains a market-dominant position for Atlantic trade into the U.S. Midwest. Strengthening this link by introducing short-sea shipping services can only serve to enhance the competitive positions of Montreal and Halifax for traffic bound to the U.S. Midwest. As well, a GLSLS service would attract substantial domestic and U.S. Canada cross border flows that are seeking to avoid congestion and border-crossing delays in the Niagara Gateway.

Exhibit 6-27 Main Eastern GLSLS Flows: H₂O East

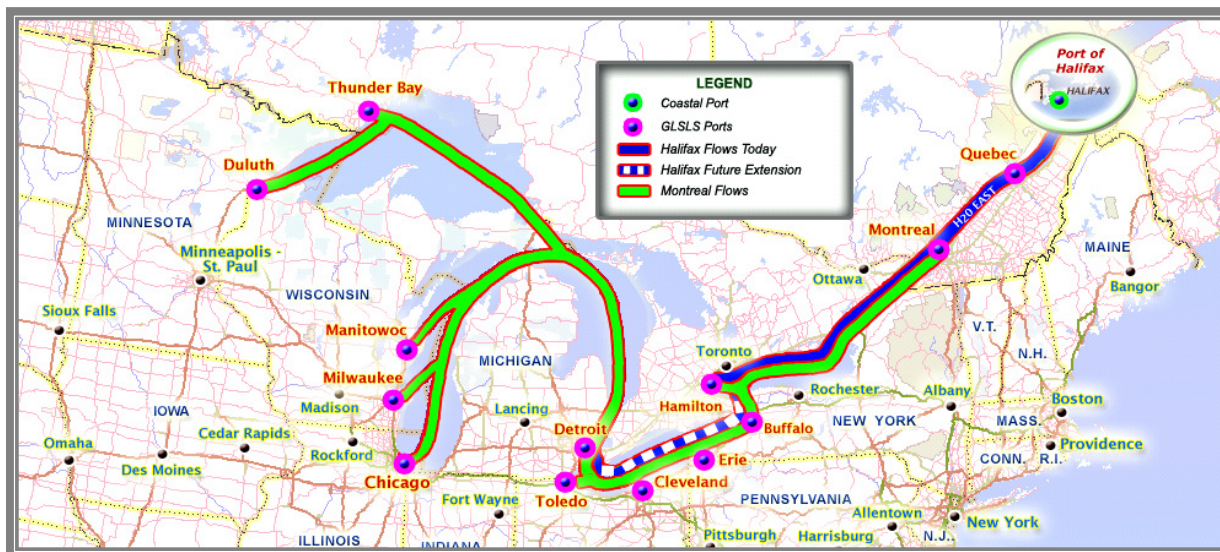


Exhibit 6-27 shows the main flows that are forecasted from the GLSLS Canadian Service area –

- At present, the Port of Montreal generates strong cross-border flows to the U.S. as well as to Canadian cities. Most Montreal-Chicago traffic moves by rail today, but traffic for the U.S. upper Midwest is either trucked from Montreal or shipped by rail as far as Toronto. Montreal focuses on European trade in smaller vessels, so its cargoes penetrate inland to the full extent of the GLSLS system.
- The Port of Halifax is a much smaller port than Montreal, serving a wider variety of destinations. Its position just off the Great Circle trade routes allows for quick stopovers of large ships that are commonly used on long distance ocean routes. These ships discharge only a portion of their cargo at Halifax and then continue on to New York. At present, Halifax traffic is destined mostly for Canadian cities. In the future, Halifax is likely to assume a greater role for distribution of Asian traffic into the U.S. Midwest, but Asian containers are not expected to penetrate much farther west than Detroit. In a sense, distribution of Suez Express traffic inland would be “swimming against the current” of a predominately west-to-east flow of Asian container traffic. West of Lake Michigan, Asian traffic will probably continue to use rail into Chicago from a west coast port. Exhibit 6-28 shows the current extent of penetration of Halifax traffic that is mostly limited to Canada today, as well as showing how the influence area of Halifax is expected to extend into the U.S. upper Midwest as far as Detroit with the growth of the Suez Express traffic.

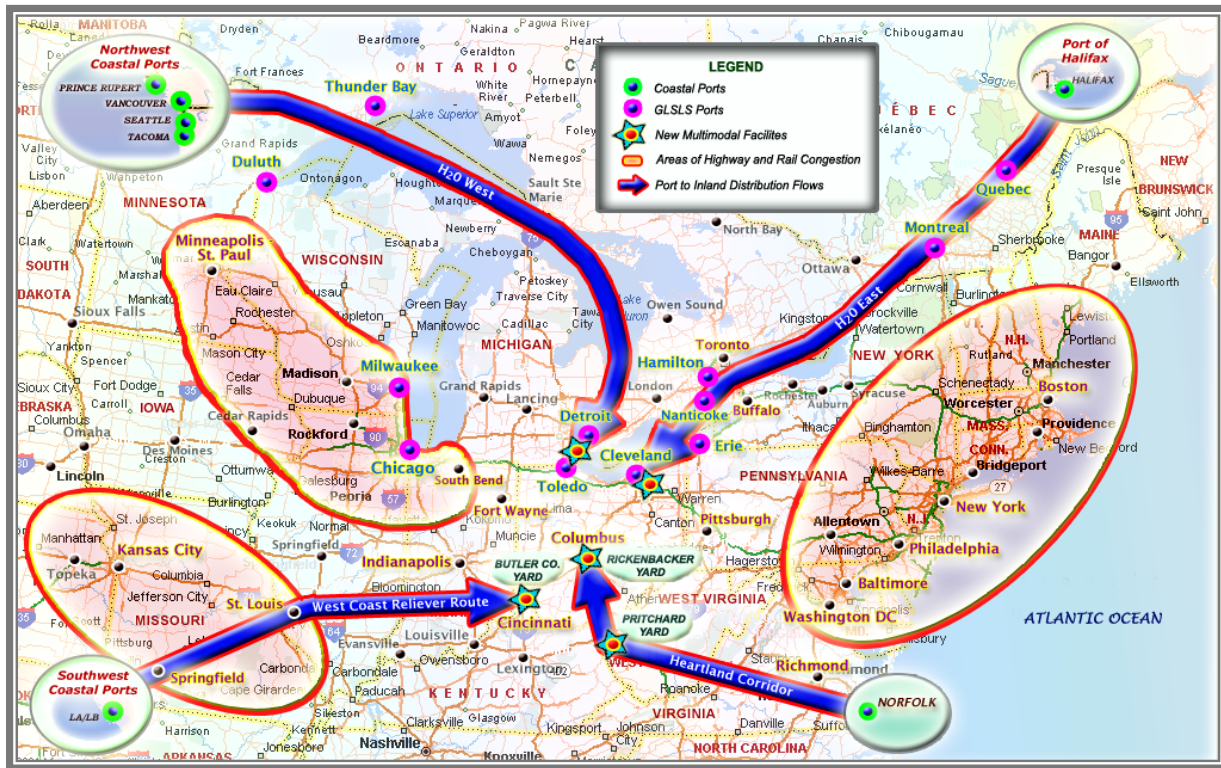
6.3.2.2. GLSLS EASTERN U.S. SERVICE AREA

The GLSLS Eastern U.S. Service area encompasses entire state of Ohio along with the northwestern portions of Pennsylvania, upstate New York and parts of the New England states that are west and north of the Appalachian Mountains.

In contrast to Canada where short-haul intermodal services are well-developed, U.S. railroads have focused on long haul Chicago to east coast lanes, skipping intermediate markets. The difficulty of expanding congested Chicago rail terminals has left “vacuum areas” for intermodal service in the U.S. upper Midwest and Wisconsin. With the exception of a few north/south intermodal lanes, U.S. railroads have not developed effective rail intermodal services to Midwestern cities, which are closer than 700 miles from either New York or Chicago. They consider this length of haul too short to provide a sufficient profit margin that can recover their private investment for providing terminal and line-haul capacity.

Because of increasing rail, port and highway bottlenecks in New York and Chicago, shippers and carriers have begun to seek ways to route freight around these potential trouble spots. For example, some Asian freight is being sent via the Panama Canal to ports in the southeastern U.S., such as Charleston, Savannah, or Norfolk; then by rail into the Midwest. Some west coast freight is starting to use alternative rail gateways such as Kansas City or St. Louis to avoid congestion in Chicago. This has led to development of the “four corners” strategy, as shown in Exhibit 6-28, that helps envision the competitive options available for shipping from east and west coast ports into the U.S. Midwest region. The GLSLS can participate in two of the bypass routes, from Halifax and from Pacific Northwest ports. GLSLS is not able to participate in the Heartland Corridor or west coast reliever routes. These routes are discussed however, in order to define competitive alternatives to GLSLS that have been evaluated and incorporated into this study.

Exhibit 6-28: "Four Corners" Strategy for U.S. Midwestern Freight



From northeastern Canada, the GLSLS provides a routing via Halifax and Montreal that bypasses congestion in the New York area. The Atlantic Coast local market is huge, so even a small shift of Asian traffic to an all-water route would be sufficient to strain the capacity of east coast ports²¹. Baltimore and New York ports will likely continue to concentrate on truck freight for their immediate local markets. These Atlantic coast ports will remain disadvantaged if they fail to effectively develop rail intermodal links to Midwestern cities²² as Norfolk is already doing. Halifax will attract large vessels from the Suez route²³ that, assuming Halifax keeps its harbor just slightly deeper than New York's, will partially discharge cargo on the way to New York; whereas Norfolk will naturally be more competitive for Panama Canal traffic.

From Virginia and southeast, the Heartland Rail Corridor, a new double-stack route is being developed to connect Norfolk, VA to the heart of the Midwest region in Columbus, OH. However, this may not be a serious threat to development of container traffic on the GLSLS, since Panama Canal capacity constraints will probably limit Norfolk's growth potential. If future Asian traffic growth comes from Suez shipping, Halifax and the GLSLS will be in a very strong position in spite of anything the Virginia ports might do.

²¹ The forecast for the congested scenario diverts 1% of the growth in traffic at Los Angeles/Long Beach, to East Coast ports. This was allocated to the ports based on the relative size of markets served. Halifax received only a 27% share of the diverted traffic under the assumption that it would be the port serving the U.S. Midwest. New York's share was 67% larger than Halifax's - an additional 16 million TEU's would need to be handled at New York, on top of current traffic plus normal growth.

²² New York's proposed Port Inland Distribution Network (PIDN) rail satellite service has been designed to convert existing truck traffic to rail movement, mostly within a few hundred-mile radius of the port. New York's proposed IPDN services do not extend as far as the Midwest region. With its Columbus, OH satellite, only the Virginia port has proposed the development of Inland Port links that would directly compete with the GLSLS for Midwestern business.

²³ Montreal is likely to remain competitive primarily for European trade, in smaller vessels that are able to accommodate its channel depth restrictions. Montreal will probably not be very competitive for Asian trade because of the Suez routing's tendency to use very large vessels. This Suez trade is more likely to be served at Halifax than at Montreal.

From the southwest, the Los Angeles ports are forecasted to continue growing at a very high rate. While southern California ports have encountered capacity constraints, they have also undertaken an aggressive capital program for capacity expansion. The natural geography of California tends to funnel Oakland traffic south through the San Joaquin valley, so both Oakland and Los Angeles ports share a common rail network for inland traffic distribution.

Currently, most of the rail traffic from Oakland or Los Angeles is sent through Chicago, although some of the southern California traffic goes via Houston or other southern gateways. However, if southern California ports continue to feed more traffic into Chicago; this will result in a need for more rail terminal capacity in Chicago. As an alternative, the railroads could start to reroute some traffic via other gateways, such as St. Louis or Kansas City. Because of Los Angeles' southerly geographic position, rail traffic to the Midwest can be diverted to these alternative gateways if that makes it possible to start service from southern California directly into the major Midwestern cities.

From the Pacific Northwest (PNW), because of their northerly geographic position, PNW ports are less able to divert traffic to bypass Chicago. As Chicago terminal congestion worsens (in large part due to increasing traffic from southern California ports), this is likely to hurt the competitive position of the U.S. PNW ports. The Canadian ports of Vancouver and Prince Rupert will be less affected by Chicago congestion, since the Canadian railroads have a direct bypass route to eastern Canada around the north end of the Great Lakes.

The ability to efficiently expand terminal capacity in Chicago is limited by a shortage of available land. Previously, Chicago intermodal terminals were developed by converting old rail yards to intermodal ramps, but nearly all such suitable sites have already been converted. Potential new sites for rail intermodal terminals near downtown are very limited, so new terminals have been constructed at sites that are increasingly remote from the downtown area. Unfortunately as the distance from the downtown area increases, the cost of "rubber" interchange to connection railroads rises accordingly which enforces the requirement for more "steel wheel" interchange. Unfortunately, because of the numerous "at grade" rail and highway crossings, a "steel wheel" interchange though Chicago can easily add 24-36 hours to the time required to connect through the gateway and this has been unacceptable for most intermodal shipments.

Development of a short-sea shipping option at Duluth and Thunder Bay would reduce the need for adding more rail terminal capacity in the Chicago area. By diverting some Pacific Northwest business to short sea shipping at Duluth, railroads could reallocate their existing Chicago terminal capacity. Then the projected increases in southern California business could be accommodated without needing to add new Chicago-area intermodal terminals.

There is also a substantial opportunity for attracting domestic and cross-border freight both within the GLSLS Eastern U.S. Service area as well as to all the other GLSLS regions. The largest potential markets are for short-haul local traffic on Lake Erie and Lake Ontario for cross-border movements into Canada and for domestic shipping to points on Lake Michigan from Chicago and Milwaukee.

6.3.2.3. GLSLS DULUTH SERVICE AREA

The GLSLS Duluth Service Area encompasses the parts of Minnesota and Wisconsin that can be effectively served by a port at Duluth on Lake Superior. The Port of Thunder Bay provides direct connectivity to the Canadian rail system and could be served by the same vessel that serves Duluth²⁴. While a port at Duluth would generate local traffic, the main

²⁴ Although the CN railroad serves both Duluth and Thunder Bay, CP Rail's access to Duluth is indirect via the Twin Cities and relies on trackage rights over BNSF. CP Rail directly serves only Thunder Bay.

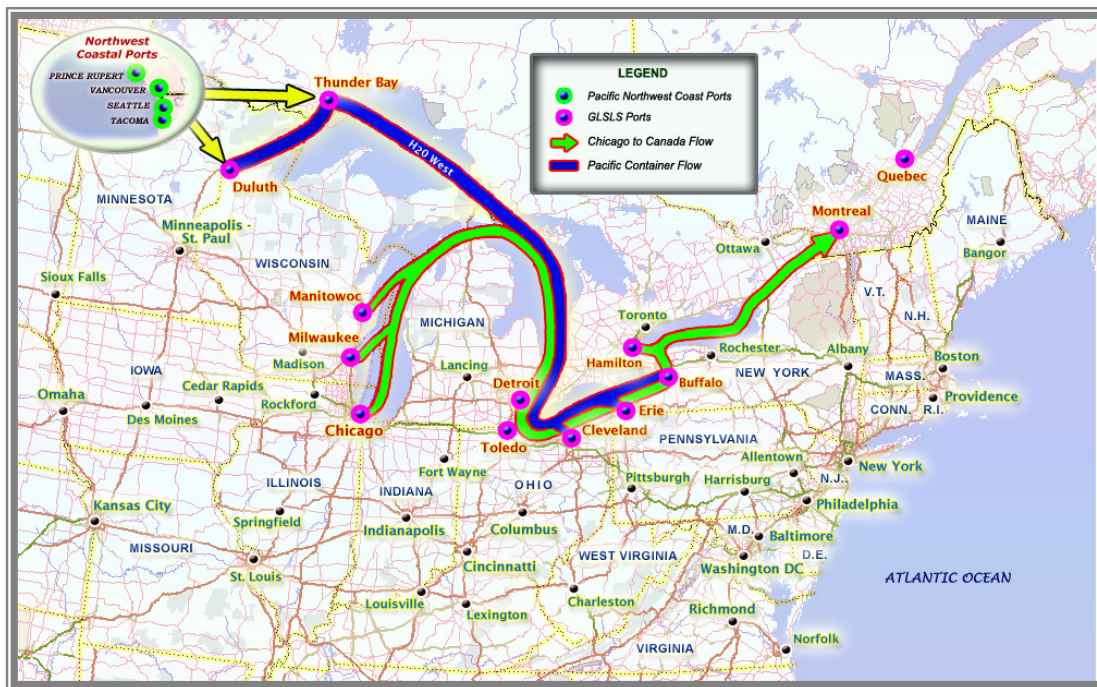
reason for establishing a port there would be to serve as a transfer-hub for land-bridge traffic to the U.S. Pacific Northwest and west coast Canadian ports.

The concept of a Tacoma to Duluth land-bridge is not new. In fact, building this land-bridge was the original goal of the Northern Pacific Railway²⁵. Vessels at Duluth have always been important for sending bulk products like iron ore and grain to eastern markets. As discussed in the previous section, new container ports at Duluth and Thunder Bay would not only implement a bypass around Chicago for Pacific Northwest traffic, but could also deliver Asian container shipments much closer to their final destinations in the U.S. Midwest than currently-available rail options.

Pacific Northwest land bridge traffic is expected to be focused on the U.S. Midwest and not to Canadian points. Accordingly, the distribution of the Pacific container flow as shown in Exhibit 6-29 ends at Buffalo, NY and does not significantly continue down the Welland Canal into Canada²⁶. The ocean shipping lines tend to send their U.S. traffic to Seattle/Tacoma and Canadian traffic to Vancouver. Canadian railroads have direct lines from Vancouver to the eastern Canadian cities and will not need, or have any financial motivation to share this traffic with the GLSLS.

In the future, Canadian port capacity will be expanding with addition of a new port at Prince Rupert, so it seems unlikely that the shipping lines would have any need to send Canadian traffic into a U.S. port. However, Canadian ports may seek to solicit traffic for U.S. destinations. If that occurs, Canadian railroads could bring some of their U.S. traffic to the GLSLS at Thunder Bay.

Exhibit 6-29 Main Western GLSLS Flows: H₂O West



²⁵ The Northern Pacific Railroad's February 15, 1870 groundbreaking occurred at Thompson Junction, Minnesota, just 25 miles west of Duluth. See: <http://www.answers.com/topic/northern-pacific-railway> A direct rail connection to Chicago was not opened until several years later.

²⁶ Some traffic for Oswego, NY and Ogdensburg, NY may continue through the Welland Canal since this traffic is bound for a U.S. destination.

6.3.2.4. GLSLS WISCONSIN SERVICE AREA

The GLSLS Wisconsin Service Area comprises the west shore of Lake Michigan that can be effectively served from GLSLS Wisconsin ports. Wisconsin is an area of intense economic activity that generates substantial traffic connecting to other GLSLS service areas. Furthermore, the region is underserved by rail because it is considered too close to Chicago and the length of haul is not sufficient to produce an adequate return on terminal investment. Ports on Lake Michigan in both southern and northern Wisconsin are envisioned. Milwaukee is a logical location for a southern Wisconsin port. Because of the desire to continue a through vessel service to Chicago, either Manitowoc or Kewaunee are suggested over Green Bay²⁷ as the preferred locations for a northern Wisconsin port.

As shown in Exhibit 6-29, a strong flow is domestic shipments between Wisconsin and the GLSLS Eastern U.S. Service area. There are also strong movements to eastern Canada reflecting the lack of effective rail competition in Wisconsin²⁸, the long drayage distance to CN ramps in Chicago and the physical obstacle that Lake Michigan presents to trucking. There are also significant flows from Wisconsin ports to Duluth and some local short-haul movements between ports on Lake Michigan.

The operating experience of Wisconsin Central Railroad validates the existence of a large market for intermodal service in Wisconsin, even though this market has been neglected by the major railroads. When Wisconsin Central operated as an independent regional railroad, it successfully developed a short-haul intermodal business with ramps at Arcadia, Green Bay, Neenah, and Stevens Point, Wisconsin. However, when CN bought the Wisconsin Central in 2001, the CN closed all four of Wisconsin Central's ramps, since CN preferred to concentrate only on development of long-haul traffic between Chicago and western Canadian cities.

Since the CN ramps closing, Wisconsin has developed into a second "vacuum area" for rail intermodal service just like the U.S. upper Midwest, intermodal trains operate through the region, but do not serve the intermediate markets. Because of the cost of land in Chicago, railroads want to use their limited terminal capacity only for long-haul traffic. Accordingly, railroads discourage the development of business they perceive as "short haul" from locations they perceive as being too close in to Chicago.

There is an opportunity for a vessel service to fill this gap in the marketplace, providing not only long-haul service from Wisconsin to the eastern U.S. and Canada but also short-haul intermodal service from Wisconsin into Chicago, a proven market that CN vacated in 2001.

For international traffic, there is demand for European shipping into Wisconsin. This demand can be competitively served from the port of Montreal. Therefore, Montreal import container flows are forecast to penetrate all the way to Lake Michigan and Lake Superior. However, because Wisconsin is directly served by western railroads, it is more likely that Asian containers will be routed by rail directly from West Coast ports than to use the Suez Express routing. Therefore, forecasted Halifax container flows only penetrate as far west as Lake Erie ports and do not penetrate as far west as the Wisconsin ports.

²⁷ Because "Green Bay is a "cul de sac," a Green Bay port would preclude the desired through vessel service to Chicago.

²⁸ As has been previously noted, flows to Canada from the Chicago area are strongly rail oriented reflecting the CN rail line through the Sarnia tunnel. However, farther north along Lake Michigan, the water mode starts to pick up a significant share of Canadian traffic. The farther north the Wisconsin port, the higher the Canadian share tends to be.

6.3.2.5. GLSLS CHICAGO SERVICE AREA

The GLSLS Chicago Service Area assumes a port facility in the vicinity of Burns Harbor, on the south and east side of the city.

Because of the circuitry of routing via the Straits of Mackinac, it was not initially believed that a Chicago water service could be competitive to rail. However, the market analysis showed that a vessel service would fill the “vacuum areas” that have been left by the absence of rail intermodal shipping to nearby cities in the U.S. Midwest and Wisconsin. The primary competition from Chicago to Ohio and Wisconsin is high-cost truck transportation, as rail is not currently much of a player. As a result, there is a market for a vessel-based short-haul intermodal service from Chicago to Wisconsin ports on Lake Michigan and Lake Superior; and from Chicago to Ohio ports on Lake Erie. These moves would replace lengthy truck drayage that is currently required from Chicago rail intermodal ramps.

Potentially available truck and container volumes from Chicago to Wisconsin and the Midwestern region are huge -- more than 12 million annual GLSLS-candidate FEU's originating in Chicago alone. In addition to all the locally generated truck volumes, both eastern and western railroads bring large numbers of connecting intermodal containers into Chicago. Diversion of only a fraction of one percent of market share -- a 0.5% share is forecasted -- would be sufficient to support a vessel service from Chicago to Wisconsin and the upper Midwest. Many of these intermodal shipments would be able to use the vessel service to reduce the long length of drayage haul from Chicago to their final destinations.

CN Rail provides direct service from Chicago into Canada via the Sarnia tunnel. From Chicago, the forecasted Canadian share of water traffic tends to be lower than from Wisconsin ports, because of the ready accessibility of the CN rail service. However, water service from Chicago into Canada is still less expensive than rail service and so water continues to maintain a small market share from Chicago into Canada even in spite of the apparent circuitry handicap.

6.4 GLSLS NEOBULK MARKET

The category of “Neobulks” consists of commodities that are not bulk goods, but which are not normally shipped in containers either. In ocean shipping parlance, it would be considered “break bulk” freight that is normally crane-loaded onto vessels or else handled on Ro-Ro ships. Some examples of typical “Neobulk” goods would include steel and aluminum ingots, plate and coil steel, finished automobiles, rail transportation equipment, farm machinery and tractors.

From a tonnage perspective, Neobulks are a rather small and declining category, since the trend is towards containerization and more shipments using containers. Nationally in the United States, containerized cargo accounts for 95% of all cargo import/export tonnage²⁹, leaving Neobulks with only 5% and a declining share of the total. This percentage holds for the Port of Montreal as well, where in 2005 non-containerized general cargo accounted for 0.50 million out a total of 11.63 million metric tons, or 4.3% of all cargo tonnage handled.³⁰ The vast majority of this tonnage consisted of imported iron, steel and other metals products, along with some Ro-Ro business.

In the domestic and U.S./Canada cross-border data as shown in Exhibit 6-30, Neobulks account for a somewhat higher share of originated tonnage – about 20%. However, it is believed that there may be some double or even triple-counting of Neobulk tonnage in the

²⁹ *A Means to Establish and Maintain Security in Shipping Containers*, Nadler, See: <http://www.maritimesecurityexpo.com/whitepapers/articles/MTL-ContainerSecurity.pdf>

³⁰ Port of Montreal website, See: http://www.port-montreal.com/site/6_0/6_4_3.jsp?lang=en

public data. For example, the same steel may be counted when it is shipped by rail from the mill into a distribution center; then again when it is sent by truck from the distribution center to its final destination. This double-counting shows up as a very high share of short-distance truck movements for Neobulk commodities. For example, the largest single Neobulk movement in the U.S. Freight Analysis Framework data is 11.5 million tons of raw materials, by truck, local within the Chicago zone. Most Neobulk tonnage involves very short distance movements, and as a result there are only a limited number of movements that lend themselves to use of the GLSLS. Exhibit 6-30 also shows that rail carload handles much of the longer-distance Neobulk shipping and that rail intermodal holds a negligible share.

This means that –

- Available neo-bulk volumes in the distance range that are suitable for GLSLS shipping are much less than would be apparent in a “first cut” of the data.
- The primary competitors for this traffic will be truck and rail carload, not intermodal service.

An overall forecast of the potential Neobulk market has been developed. This forecast, based on the available data, cannot be developed to the same level of detail as the container traffic forecast. The level of aggregation of available public data is very high, e.g. at the State or Province level only. Container traffic includes many consumer goods that can be disaggregated to zones based on demographic statistics such as population, income, and employment. Neobulk commodities however, tend to be produced and consumed based on the locations of specific manufacturing facilities and general demographic statistics cannot be used to localize it. For this forecast, we have not attempted to localize Neobulk to the specific zone level but have simply estimated overall market potential based on the available state-to-state or province level data.

The first step in developing this Neobulk forecast was to assess which State to State or Province OD pairs might conceivably be candidates for GLSLS movement. From the previous analysis of container traffic, we already know which OD pairs are competitive: for example, Wisconsin to Ohio is a market in which the GLSLS may have an advantage. Because many of the Neobulk commodities are heavy, they will approach an average of 30 tons per FEU equivalent. Converting tonnages into average daily FEU's, results in the following Total Market assessment for GLSLS candidate flows –

**Exhibit 6-30: NeoBulks Total Market Assessment:
Average Daily Candidate FEU's in GLSLS Market Area**

TRUCK				
	To:	U.S.	CAN	TOTAL
From:	U.S.	173	420	593
	CAN	347	42	388
	TOTAL	520	462	981
RAIL				
	To:	U.S.	CAN	TOTAL
From:	U.S.	201	45	246
	CAN	177	21	198
	TOTAL	378	66	444
TOTAL				
	To:	U.S.	CAN	TOTAL
From:	U.S.	374	465	839
	CAN	523	63	586
	TOTAL	898	528	1,426

However, many Neobulk origin-destination flows, even those that can potentially be served directly by water, are strongly rail and truck competitive. While in the container traffic assessment the GLSLS share of the total origin destination market seldom rose above 5%, the GLSLS water share of Neobulks will depend on specific agreements between, for example, metal manufacturers and carriers. We do know that many of the steel and aluminum production facilities are located in close proximity to water, as such, a 20% share of the total candidate market of Neobulk has been estimated. In Base year 2005, would produce a total of 284 FEU's per day of Neobulk traffic on the GLSLS system.

Compared to the total forecast of 1,765 FEU per day for containerized traffic it can be seen that the Neobulks would add approximately 16% to the containerized flows at best. Of course, the impact on specific lanes, such as Cheboygan to Detroit or Hamilton to Cleveland, could be much stronger or weaker depending on the ability of the GLSLS vessel operator to capture flows from specific steel or aluminum production facilities.

At 284 FEU, it is anticipated that only 2 or 3 north south specialized Neobulk short sea shipping operations could exist in 2005. Also, given the character of the traffic, the level of growth will be limited by 2030 and 2050. At the most, this might increase potential operation to 4 to 6 specialized services by 2050.

However, it is also possible to accommodate Neobulks as an adjunct to the already-proposed Ro/Ro service for containerizable cargoes.

With regard to how these Neobulk traffics could be handled operationally, proposed GLSLS service will be a large Ro/Ro vessel that makes quick stops at various intermediate ports for picking up and discharging cargo. The Ro/Ro concept is inherently very flexible since it allows for accommodating a wide variety of cargoes on a single vessel. However, crane loading tends to be very slow, so it is doubtful that it will be desirable to delay a large Ro/Ro vessel for crane loading of Neobulk cargoes. Rather, it will make more sense to simply keep the cargoes loaded on whatever vehicle was used to bring them to the dock – whether on a truck trailer or a railcar – and simply roll the trailer or railcar on board the Ro/Ro ship. This

way, Neobulk cargoes can be easily accommodated by the basic Ro/Ro trailer and container service, without disrupting vessel operations in any way.

The possibility for accommodating railcars as well as trailers should be considered. While railcars are not relevant today for most containerizable cargoes, they are still widely employed for neobulk commodities. For a modern railcar on vessel operation, a key requirement for accommodating railcars is to keep them securely tied down, so they will not roll away or tip over.³¹ Exhibit 6-31 shows a securement system designed by Ann Arbor RR. Screw jacks lifted the car off the tracks, and then they were secured by chains and cables. This prevented the cars from moving as a result of pitch and roll in heavy seas.

Exhibit 6-31: Railcar securement on-board a Ro/Ro vessel



In the past, a large number of rail carfloat services operated in the past on the GLSLS, but those mostly consisted of short cross-lake services using uncompetitive COB or obsolete vessel technologies.³²

Vessel services now proposed for the GLSLS are long distance Port-to-Port services that run the entire length of the Great Lakes and seaway, rather than simply across the lakes. It might be possible, for example, to ship a railcar from Montreal to Cleveland by Ro/Ro ship. Shippers would have available a new kind of *highly reliable* long-distance railcar service that has never been offered before. The economics of a large Ro/Ro vessel could make this kind of railcar service affordable.

The question comes down to whether a vessel operator could earn a sufficient financial return by transporting railcars. In the case of the former C&O railroad car ferry from Ludington, MI, the vessel operator found they could earn more money from tourists by hauling automobiles than they could earn by hauling railcars across the lake. However, there appears to be no technical obstacle to designing a general purpose Ro/Ro vessel that could accommodate railcars as well as trucks and even automobiles, farm machinery, or any other kind of shipment that would be suitable for transport in a Ro/Ro vessel.

6.4.1 FERRY BOAT MARKET ASSESSMENT

The primary focus of this study has been on the development of “unaccompanied” container or trailer services, where shipments are brought to the dock by truck or rail, loaded on board a vessel, and then picked up at the destination by another truck for final delivery to the customer. However, the problem with drop-trailer operation is often one of drayage balance – is there another load available at the port to replace the trailer that the truck is dropping off? As a result of imbalance, drayage tractors suffer an inordinate amount of expensive “bobtailing” or repositioning empty without a trailer attached. This type of an operation incurs a cost penalty since the mileage rate for short haul; one-way “drayage” often exceeds that of balanced two-way over-the-road trucking by a factor of two or three. Because of these added costs for local trucking and port operations, a minimum linehaul distance of several

³¹ *Rails That Sail*, See: http://www.chiefengineer.org/content/content_display.cfm/seqnumber_content/2401.htm

³² *Truckdog's Michigan Railroad Car Ferry Page*, See: <http://members.aol.com/carferry/Carferry.htm>

hundred miles is needed to reach the breakeven point with the cost of sending the shipment directly over-the-road.

This high cost of short-distance trucking and port operations effectively reduces the service area that can be economically served from any port or rail intermodal ramp. A rule of thumb is a maximum radius of 50-100 miles, but closer is better.³³ A recent trend is the development of suburban "Freight Villages" or "Logistics Parks" that seek to concentrate industries in the immediate vicinity of ports or intermodal ramps. The primary motivation for doing this is to reduce truck drayage costs to an absolute minimum, while building new intermodal terminals in areas that still have a supply of land available for attracting industrial development.

However, a different model for provision of intermodal service does not suffer the problems associated with those of the drop-trailer operation. In "accompanied" trailer service, the trailer, tractor, and driver are all brought on board the vessel. This is the traditional ferry boat approach.

This study has not attempted to exhaustively evaluate all ferryboat opportunities on the GLSLS but we can report some results from previous studies that have been undertaken by the consulting team. There appear to be two main opportunities for freight ferry operations on the GLSLS –

- **Traditional cross-lake ferryboat lanes** – these tend to be short water crossings that produce a real time and cost savings for both the automobile driver and for the trucker.
- **Longitudinal ferryboat lanes** – these are longer water routes tending to run along the length of the lakes rather than laterally across them. Such routes would operate in direct competition to land transportation, but the truck driver's hours of service laws still provides a rationale for using such services.

CROSS-LAKE FERRYBOAT SERVICES

For cross-lake ferryboat services, the consulting team has evaluated at least two major market opportunities on the Great Lakes. Both opportunities are based on the Toronto, ON market but focus on different traffic lanes. They address the problem of the circuitry of having to drive around the ends of Lake Ontario and Lake Erie through the congested region around Niagara Falls. As shown in Exhibit 6-32, it is much shorter to go directly across Lakes Ontario and Erie than to have to drive around the lakes. The problem is that highway driving is still faster than most vessels in spite of the circuitry disadvantage. The higher speed of ground transportation offsets the mileage savings that would be possible for going straight across the lakes. Fast ferry technology is needed to fully exploit the market opportunity.

As in the current GLSLS study, previous ferryboat studies found that selection of an appropriate vessel technology is key to the commercial success of the services. Prior studies evaluated several different technologies as both freight and passenger auto ferries: a modern 20-kts Ro/Ro vessel, an older slower ship in the 15-kts range as well as a high speed 40-kts Fast Ferry. A recent Lake Erie study developed separate services for autos and trucks using different vessel types, whereas the earlier Lake Ontario study developed only a high speed Fast Ferry evaluation.

³³ Some of the large trucking companies, such as J.B. Hunt and Schneider National have been able to extend this effective limit, due to the large number of trailers they handle as well as their ability to balance intermodal loads with over-the-road trucks.

Exhibit 6-32: Proposed Lake Erie and Lake Ontario Ferries



The Lake Erie study found a strong market for both auto and truck travel. The Nanticoke (or Port Dover) to Erie lane would attract considerable traffic in accompanied long-haul truck traffic from Toronto to Erie, seeking to bypass congestion, border crossing delays and weight limits on the New York thruway. The Lake Erie study assumed a ferry toll of \$120 and found enough accompanied truck traffic to support two daily crossings using a 20-kts vessel. The study also evaluated a single daily crossing using a slower 15-kts vessel that would be better oriented to a drop-trailer service for neobulk commodities to the U.S., from nearby steel mills.

The Lake Ontario study also identified strong passenger and freight ferry markets. Since fast ferry technology was the focus of that study, the freight aspect quickly gravitated towards very high value cargoes such as package express. This follows the general trend in fast ship assessments, which have tended to target air freight rather than the conventional containerized cargo markets.³⁴

Nonetheless, for the current GLSLS study, we wanted to evaluate the potential for deploying PACSCAT as a Great Lakes ferry boat. Since the Lake Erie study was newer than the Lake Ontario study and had a broader focus, we evaluated the potential of PACSCAT technology from Nanticoke to Erie. Rather than running separate services for autos and trucks, the concept would be for a single cross-lake ferry that could economically accommodate both freight and passengers on a single fast vessel. Exhibit 6-33 shows the characteristics of the original 20-kts freight ferry evaluation versus the new PACSCAT evaluation for the link from Erie to Nanticoke.

Exhibit 6-33: Link Attributes for Freight Ferry and PACSCAT

Link Attribute/ Type of Vessel	Freight Ferry	PACSCAT
Distance (miles)	50	50
Time (minutes)	135	62
Speed (mph)	22	48
On Time Performance	100	100
Frequency (rt/week)	14	28
Toll (\$)	120	120

Exhibit 6-33 indicates that PACSCAT is twice as fast as the conventional Ro/Ro freight ferry, which means that twice as many frequencies can be offered using the same vessel. The 20-kts ferry made only two round-trips per day, but a PACSCAT could make four round-trips in the

³⁴ *Speedy delivery: High speed craft operators are finding opportunities in the cargo market.* See: <http://www.marineblog.com/DOCS/hisp.html>

same time. A revenue-optimized truck toll of \$120 had been developed in the earlier study. This level of toll appears to be high enough already to cover PACSCAT’s operating cost, so the toll was not further increased for PACSCAT. Using the same model used in the original Lake Erie freight evaluation, Exhibit 6-34 shows that a 40-kts PACSCAT could nearly double truck traffic using the Erie to Nanticoke ferry. PACSCAT would gain additional economies and gain even more service frequencies by being able to combine both automobile and truck traffic on the same vessel.

Exhibit 6-34: Base and future year demand for Freight Ferry and PACSCAT

Year	Freight Ferry		PACSCAT	
	Traffic	Market Share	Traffic	Market Share
2005	94,607	4.70%	165,443	7.66%
2010	114,501	4.70%	200,221	7.66%
2015	138,584	4.70%	242,315	7.66%
2020	167,738	4.70%	293,269	7.67%
2025	203,036	4.70%	354,952	7.67%
2030	245,775	4.71%	429,627	7.67%

6.4.2 LONGITUDINAL FERRYBOAT LANES

A second market for long-distance accompanied trailer service, quite distinct from the cross-lake ferry market, also exists in the GLSLS region. We did not perform a formal evaluation of this service since we see it only as an adjunct to the proposed drop trailer service. However, the market is worth mentioning for a future study since, if it were desired to pursue this traffic, it does affect the requirements for a vessel procurement.

Recent changes in the U.S. truckers’ hours of service regulations have reduced the number of hours that a single driver can drive. The basic requirement is that no trucker can drive more than 11 cumulative hours, following 10 consecutive hours off duty, or with some exceptions, after the end of the 14th hour after coming on duty following 10 consecutive hours off duty.³⁵ The practical effect of this rule is to limit each driver to no more than 11 hours of driving time and require an up to 13-hour rest break to keep the driver on a regular 24-hour daily rotation.

Single drivers therefore are limited to a maximum 11-hour radius of their origin point for a same-day delivery; beyond this, they must rest at a hotel or truck stop before they can legally resume their trips. For urgent loads that have to get there faster, team-drivers can be employed, but team-driving typically costs much more than single driver service.

The opportunity for GLSLS, therefore, is to pick up trucks near the end of their 11-hour legal driving limit; allow the drivers to rest for up to 13-hours on board the vessel and then discharge the truck with a fully rested driver ready to continue the trip. By this method, a single-driver can keep going overnight to deliver almost as fast as team-drivers could, for only the cost of a single-driver service.

Given the drivers’ required overnight rest time of 10 to 13 hours, a vessel speed of 20-kts (22-mph) would give an effective range of about 200-250 miles for a long-distance truck ferry.

³⁵ Regulations: 395.3 Maximum driving time for property-carrying vehicles. See: <http://www.thetruckersreport.com/hours/395.3.htm>

- On Lake Erie, Toledo to Buffalo is just a bit too long; but Toledo to Erie, Toledo to Nanticoke, Detroit to Cleveland, or Cleveland to Buffalo would all be the perfect distance for an overnight accompanied truck ferry service.
- On Lake Ontario, Hamilton to Oswego would be a good lane for an accompanied truck ferry service.
- On Lake Michigan, Chicago to Manitowoc would be the right length to attract some accompanied truck traffic.

This accompanied truck traffic could be accommodated using the same Ro/Ro vessels that have already been envisioned for drop-trailer service. It is expected that the truck drivers would rest in their tractor sleeper cabs, so some comfort facilities would still be needed on board the vessel, but not nearly as extensive as those that would be required for an auto ferry service.

6.5 CAVEATS AND CONTINGENCIES

The market forecasts for GLSLS services are based on existing rail and highway competitive networks and travel conditions, degraded in some cases to reflect expected future traffic congestion. Forecasts are also based on certain assumptions with regard to diversion of Asian traffic primarily from southern California ports to the east coast via the Suez Express route and assume the willingness of the railroads to cooperate in development of land-bridge services from Pacific Northwest ports to vessel connections at Duluth and Thunder Bay.

The greatest sensitivity in the forecast relates to the timing of development of the Suez Express routing. As has already been noted, the potential container traffic volumes that could become available at Halifax are very significant. Because the primary traffic diversion is expected to come from southern California ports, almost all the new growth at Halifax would consist of traffic bound for the U.S. Midwest region.

- The question of whether Suez Express traffic will actually materialize to the extent forecasted in the "Congested" scenarios remains to be seen.
- "Uncongested" scenarios do not include west coast ports diversion, so they can be seen as a sensitivity for the case where Suez Express traffic fails to develop. The most likely outcome falls somewhere between the "Congested" and "Uncongested" scenarios.

A second area of concern relates to development of additional rail or port competition that did not exist in the Base network. It should be noted that –

- Because of traffic congestion at ports and on the rail network, we have assumed that U.S. railroads will not take any sudden interest in development of short-haul intermodal lanes using their own private capital dollars. However, there is always the possibility of a public-policy driven initiative for development of additional rail or port capacity. As well, rail mergers could change the railroads' competitive posture in certain markets.
- Competition between water and rail in Canada will be very intense from the start. The forecasts for Canada reflect this high level of rail competition that already exists and show that GLSLS-max vessels could offer rail-competitive costs and reasonable travel times. Therefore, the Canadian analysis shows that a vessel service should be able to obtain some share. However, the market share in Canada will not be as high as it is forecast in the U.S. where competitive rail services are not so well established.
- If new directly competing rail services were introduced in the U.S., the GLSLS water forecast would have to be reduced and the economic viability of some proposed GLSLS water services in the U.S. may be called into question.

Some specific concerns regarding the potential development of competitive rail services include the following –

- **The possibility of future rail mergers.** In 2000, the BNSF and CN railroads proposed a merger, which would have created a new entity called North American Railways, Inc. While the merger proposal was eventually withdrawn³⁶, it was widely speculated at the time that this merger would have triggered the final round of rail industry consolidation leading to two mega-railroads (BNSF-CN-NS and UP-CP-CSXT) spanning the whole North American continent.

While a rail merger would solve institutional problems associated with rail marketing, it would not directly address the physical problem of rail interchange at Chicago. For example, eastern railroads would today consider a Cleveland, OH to St. Paul, MN move to be a short-haul from Cleveland to Chicago and western railroads would also view it as a short-haul from Chicago to St. Paul. However, a merged railroad may start to view this as attractive business since the overall length of haul exceeds 700 miles. However, the physical barriers inherent in the Chicago gateway still remain, so it is not clear whether a rail merger would make any difference for the desirability of this particular origin-destination pair or not.

For Pacific containers, this study has explicitly assumed that the BNSF railroad would be willing to support development of a land-bridge service from Tacoma and Seattle to Duluth. However, because of Chicago terminal congestion, it is not clear whether a merged railroad would be able to establish its own competitive run-through service directly to the Midwest rather than transferring those cargoes to a vessel at Duluth.

For Atlantic containers, a merger between a Canadian railroad and a U.S. Eastern railroad would extend the reach of Canadian intermodal service through the Niagara gateway to serve Pittsburgh, Cleveland, and Columbus directly. The railroads could then establish a single-line intermodal service in direct competition to the proposed GLSLS water service from Halifax. A GLSLS-max vessel would still maintain a cost advantage, but the U.S. service would still lose some traffic to rail competition.

- **Port Competitive Strategies.** This analysis has assumed that, with respect to the Atlantic trades, Montreal would maintain its current market-dominant position in the U.S. Midwest and Canada. It has also assumed that Suez Express ships would be willing to discharge cargoes for the Midwestern U.S. at Halifax rather than taking those cargoes into New York.

New York already has on-dock loading at its piers, but its current plans for inland port development are limited to a few hundred-mile radius of New York. If however, New York decides to follow Norfolk's lead and establish a rail double-stack connection to Ohio, the port may be able to convince Suez Express vessel operators to bring all their cargo into New York rather than offloading midwestern cargoes at Halifax.

If this occurs, then most of the forecast growth in GLSLS Atlantic traffic would shift to New York rail instead. The forecast for GLSLS would then be consistent with the "Uncongested" scenario³⁷ rather than the "Congested" scenario.

- **Public Policy Issues.** It seems unlikely that U.S. railroads will be able to spend much private capital for development of short-haul rail services. However, public entities both in the upper Midwest and in Wisconsin may have an economic

³⁶ See: http://www.findarticles.com/p/articles/mi_m0BFW/is_8_96/ai_65195486

³⁷ The uncongested scenario assumes no diversion of traffic from Southern California ports to the Suez routing. It is consistent with the case where either Suez traffic never develops, or where Suez traffic all goes to New York.

development incentive to develop the capacity needed to improve intermodal rail shipping.

As this study has already shown, the problem is the underdevelopment of rail intermodal service in the regions immediately surrounding Chicago – and the fact that within this region, public development of both ports and rail terminals may be required in order to induce any modal shift. Indeed, we assume that the GLSLS ports would be developed as public facilities subject to user fees and lift charges. Further, it is assumed that any ports developed would also have intermodal rail access and therein may lie a problem for the demand forecast.

Consider, for example, the potential development of major GLSLS port facilities at Burns Harbor, near Chicago and a companion port near Cleveland. Because of the current absence of any competitive rail service in this lane, some traffic has been forecast to move by vessel between these points.

Suppose now that the port authorities in both Chicago and Cleveland invite railroads to serve the new container ports. If the rail lift charges are priced low enough and freed of the obligation to invest their own capital in development of terminal facilities, railroads may find it economical to introduce shuttle-train services between the ports modeled after CP's existing Expressway operation. Then, the traffic that was forecast to go by vessel from Chicago to Cleveland would probably move by rail instead.³⁸ An even more extreme example of public policy initiative would be if the railroads were invited to establish a rail shuttle service between the Cleveland port and the New York docks. Then some of the containers that had been expected to arrive by vessel from Halifax would be diverted to New York and they would in fact arrive in Cleveland by rail instead.

This outcome is not necessarily undesirable from the perspective of port and regional economic development. It implies however, that regional or port authorities become responsible for providing multi-use rail and water port facilities in a given region; then treating both rail and water users equitably, the marketplace may be allowed to choose which mode of transportation is most efficient for providing service between any two points.

³⁸ Establishment of a direct Chicago to Cleveland rail link would not "kill" Lake Michigan vessel service. GLSLS vessels on Lake Michigan would still carry significant volumes from Chicago to Wisconsin ports and then would pick up new traffic from Wisconsin ports that they would carry on to Cleveland.

7 GLSLS VESSEL AND PORT OPERATIONS

The vessel operating plan developed for the GLSLS is designed to be competitive with rail and truck modes of transportation. Once-a-week service that is the standard for international ocean shipping is not competitive for inland transportation. Trucks depart on demand and rail intermodal services generally operate every day. Some rail services like CP Expressway focus on short-haul or high-value freight and offer several train departures each day. To compete with inland transportation, a vessel service will have to operate on a daily basis also. Higher service frequency also benefits port operations by minimizing container dwell time in ports, along with the associated land requirements.

The desire to operate vessels on a daily basis rules out use of extremely large vessels. Still, ships employed in feeder service must be large enough to obtain competitive operating economics. This analysis shows that the existing GLSLS locks and channels are large enough to support the introduction of economical feeder vessels. GLSLS-max vessels are large enough to provide rail and truck-competitive economics, but are small enough to allow for daily vessel service to each of the major ports along the Seaway system.

In addition, GLSLS shipping must offer a reasonable transit time. Modern vessels with 20-kts or higher speed can bring water transit times within a competitive range¹ of rail and truck service. By comparison to older, slower ships, modern vessels reduce the capital and crew costs enough to offset most of the higher fuel cost for going faster. Therefore, modern vessels significantly improve transit time without increasing operating costs by very much.

With regard to vessel configuration, a GLSLS-max Ro/Ro vessel with a capacity of about 350-FEU could offer costs and transit times that would be competitive even with the economics of double-stack rail service. Initially, Ro/Ro vessels will offer the fastest and lowest cost terminal operations at GLSLS ports. Because Ro/Ro minimizes terminal handling costs, Ro/Ro is an effective concept for short-haul intermodal lanes less than 1,000 miles. Because of the distances involved, most GLSLS lanes fall into this short-haul category. As well, domestic and cross-border traffic is a significant component of the demand forecast. Ro/Ro ships are extremely flexible in the cargoes that they can handle. Domestic traffic, including Neo-Bulk traffic, can be accepted in standard highway trailers or even railcars without requiring traffic to be converted into less-desirable ISO containers. Even tank trailers, flat beds or other kinds of specialized equipment could be accommodated on a Ro/Ro vessel.

In Lo/Lo configuration, a GLSLS-max vessel could handle about 600 FEU, but given high port costs for loading and unloading Lo/Lo vessels, most GLSLS shipping lanes are not long enough to justify the added terminal costs. As well, the 600-FEU vessel is simply too large for current GLSLS lanes. Until traffic levels build high enough to fill a 600-FEU vessel everyday, deployment of 350-FEU Ro/Ro vessels will minimize both terminal operating and capital costs, while providing more than enough capacity to accommodate expected demand.

Even in Ro/Ro configuration, use of GLSLS-max vessels imposes a high minimum daily traffic requirement for starting a service. At 2005 traffic levels, no GLSLS traffic lanes by themselves would generate enough containerizable volume to support a daily 350-FEU

¹GLSLS Vessel transit times don't have to be quite as fast as rail or truck, but must be in a comparable range. Note that even rail and truck services do not always offer the same transit times. For example, team-driver trucking is much faster than single-driver service for long-haul freight since the single driver must stop for rest breaks, while team-drivers can keep going overnight. Similarly, large heavy double-stack trains that handle international containers tend to operate slower than lighterweight "sprint" trains for higher value domestic mail and parcels traffic that is usually handled in trailers. Rail intermodal schedules are often significantly faster for domestic trailers than for international containers. The proposed GLSLS vessel schedules are often quite competitive or even faster than current rail schedules for international freight.

vessel service. Accordingly, the option of using smaller 100-FEU vessels has been introduced into the analysis. These 100-FEU smaller vessels have a higher unit operating-cost, which has reduced their demand forecast, but still indicates enough demand to support a viable start-up operation. As volume grows, larger vessels could be deployed to lower unit costs, attracting even more traffic to the GLSLS.

Import/export traffic is growing very quickly. Domestic and cross-border traffic is growing at a slower pace, but rising energy prices, traffic congestion, and the truck driver shortage favor its rapid conversion to intermodal movement. Most import/export growth has been focused at only a few major ports; however, the shipping market is very dynamic so if capacity constraints are encountered, shipping lines can quickly adjust to modify their vessel and port strategies. For the GLSLS vessel operating plans and port strategies –

- **Network Development.** Initial start up services on the GLSLS need to be defined according to the needs of the primary markets served. However, as traffic grows, the individual vessel services can be coordinated to operate as a single network. Interconnecting business will serve to boost the traffic volumes that are handled by all services. This chapter will suggest a plan for the initial development of services as well as a strategy for interconnecting the services.
- **Vessel Technology Focus.** Small ships may initially be deployed to get started, but the expected rapid growth in traffic will soon displace small ships in favor of GLSLS-max vessels.
 - COB service does not appear to be commercially viable because the service is too slow and it cannot attract enough traffic to reach breakeven.
 - PACSCAT may be viable in some truck-competitive lanes but is too expensive to effectively compete with rail. Some COB and PACSCAT results will be presented here, but the primary focus will be on developing an implementation strategy for deploying a 20-kts ship.
- **H₂O East and the Hamilton Hub.** At first, there will not be enough traffic to support direct service from Halifax to ports on the upper Great Lakes without making intermediate stops. To fill the Halifax vessel it will be necessary to carry local Canadian traffic between Halifax, Montreal, and Toronto. The Lake Erie vessel will need to make multiple stops at U.S. ports. U.S. and Canadian cabotage restrictions prohibit the development of a through vessel service that makes multiple stops in both countries.
 - For startup, it is suggested to develop a hub at Hamilton, Ontario, so cargoes can be transhipped between U.S. and Canadian vessels.
 - As volumes grow in the future there will eventually be enough traffic to support direct vessel departures from U.S. ports to Montreal and/or Halifax, bypassing the intermediate handling at Hamilton. Direct vessel services could be provided by either U.S., Canadian or even foreign flagged ships.
- **H₂O West and the Cheboygan Hub.** The primary market for Duluth and Chicago will be to ports on Lake Erie, but significant volumes from Lake Michigan ports to Duluth and Thunder Bay have also been identified. The forecasted traffic is not sufficient to support a direct vessel service from Lake Superior to Lake Michigan. However, the flow is sufficiently strong that it can be hubbed at Cheboygan together with traffic from Canada using the Port of Sault Ste Marie. Therefore, a hub port at

Cheboygan, MI near the Mackinac Straits is proposed as a place to transfer cargoes between Lake Michigan and Lake Superior vessels.

In summary, three distinct vessel routes are needed to provide a complete GLSLS service. As shown in Exhibit 7-1, the vessel routes are –

H₂O East – A single route from Halifax to Hamilton with an intermediate stop at Montreal, would also serve smaller ports along the way. It is assumed this H₂O East route would be worked by a Canadian vessel.² A hub port at Hamilton, ON would transfer traffic between the H₂O East (Canadian) and H₂O West (U.S.) portions of the GLSLS network. A seasonal substitute rail service would operate in the winter connecting a port on Lake Erie³ to both Hamilton and Montreal. Halifax to Montreal vessel service would operate year-round.

H₂O West – Two routes: Hamilton to Duluth/Thunder Bay and Hamilton to Chicago would both be worked by U.S. flag vessels, with intermediate port calls along the way and would operate year-round.⁴ A hub port at Cheboygan, MI would be used to transfer traffic between Lake Michigan and Lake Superior until traffic grows enough to support direct vessel service between those two lakes. The Lake Superior vessel would handle all traffic for Duluth and Thunder Bay. The Lake Michigan vessel would handle all traffic for Manitowoc, Milwaukee, and Chicago. The vessel loading analysis assumes that both vessels would serve ports on Lake Erie and that they share local traffic between Hamilton to Detroit on a 50/50 basis.

Traffic forecasts have been developed for each of the three major vessel routes: Halifax-Hamilton, Hamilton-Duluth/Thunder Bay, and Hamilton-Chicago, along with the smaller Chicago-Duluth/Thunder Bay lane. These forecasts are shown in tabular form in Exhibit 7-2 and graphically in Exhibits 7-3 through 7-6. Traffic that is transferred between H₂O East and H₂O West vessels at Hamilton is double counted on more than one route. By backing out this hubbed traffic, the individual route forecasts can be reconciled to the GLSLS totals presented earlier. The graphs have all been plotted to the same vertical scale for better comparability.

² A Canadian-flagged vessel is needed to carry local traffic between Halifax, Montreal and Hamilton, as well as to make other intermediate port stops in Canada. At first there is not enough purely cross-border traffic to fill a vessel every day, so Canadian domestic traffic is also needed to help support the service. As well, there may be a desire to offer services to Canadian domestic shippers, so a Canadian-flagged vessel would need to be used in the H₂O East startup operation. This Canadian vessel would also serve two small U.S. ports at Ogdensburg and Oswego. There is no need for this Canadian vessel to carry local traffic between these two U.S. ports.

³ Port Maitland is suggested on Exhibit 6-1, but possible alternative include Port Colbourne and Nanticoke. These options will be detailed in the rail land-bridge discussion.

⁴ The H₂O West lanes are heavily dependent on U.S. domestic traffic, so a U.S.-flagged vessel is needed to carry traffic locally between Duluth, Chicago, Wisconsin ports, Detroit, Cleveland, Erie and Buffalo, as well as between other intermediate U.S. ports. The same vessel could continue through the Welland Canal to connect to Canadian H₂O east services at Hamilton, or else a Canadian vessel could connect to U.S. services at Cleveland, Buffalo or Erie. However, for this study a Canadian Hub port at Hamilton has been assumed. At first there is not enough purely cross-border traffic to fill a vessel every day, so U.S. domestic traffic is also needed to help support the service. As well, there may be a desire to offer services to U.S. domestic shippers, so a U.S.-flagged vessel would need to be used in the H₂O West startup operation. There are three Canadian ports on the H₂O West vessel routes: Hamilton, Windsor and Thunder Bay. Since the H₂O West routes would be worked by U.S. flag vessels, it may be simpler to handle Windsor traffic at a single port on the Detroit side of the river. This would eliminate cabotage problems associated with including a Canadian port stop at Windsor. It is not expected that there would be any traffic between Hamilton and Thunder Bay, since the Canadian railroads would be expected to cooperate only for traffic that is bound to U.S. destinations.

Exhibit 7-1: GLSLS Vessel Routes



Exhibit 7-2: GLSLS Route Forecast Summary

Technology	Scenario-Year	Halifax-Hamilton	Duluth-Hamilton	Chicago-Hamilton	Chicago-Duluth	Cross-Hamilton	Total FEU's
SmallShip	Base-2005	295,679	131,286	175,687	26,730	120,830	508,553
	Congested-2010	405,955	192,395	236,596	35,204	184,320	685,830
	UnCong-2010	372,904	174,702	221,264	35,206	149,463	654,612
	Congested-2030	1,021,643	543,372	551,351	69,317	617,841	1,567,842
	UnCong-2030	654,022	346,041	351,427	55,218	263,390	1,143,319
	Congested-2050	1,533,411	806,203	834,627	114,210	927,488	2,360,963
	UnCong-2050	901,412	460,018	457,686	72,094	360,587	1,530,624
	Ship						
PACSCAT	Base-2005	395,384	156,239	217,147	33,367	157,967	644,170
	Congested-2010	561,269	241,032	302,466	44,094	266,219	882,643
	UnCong-2010	498,271	208,256	273,160	44,008	200,141	823,554
	Congested-2030	1,515,960	746,899	768,195	87,104	983,551	2,134,607
	UnCong-2030	874,553	413,586	436,539	68,997	351,927	1,441,748
	Congested-2050	2,242,942	1,091,215	1,149,885	143,537	1,443,943	3,183,636
	UnCong-2050	1,205,252	550,340	570,429	90,058	481,119	1,934,960
	COB						
COB	Base-2005	155,495	83,168	102,073	11,315	65,486	286,565
	Congested-2010	200,715	112,774	130,378	15,064	85,750	373,180
	UnCong-2010	196,128	109,892	128,357	14,976	81,176	368,178
	Congested-2030	421,978	263,289	256,739	30,420	209,697	762,729
	UnCong-2030	342,289	208,696	202,468	23,514	142,625	634,343
	Congested-2050	653,804	410,685	397,216	51,630	338,680	1,174,656
	UnCong-2050	470,320	276,904	262,801	30,770	195,572	845,224
	COB						
COB	Base-2005	99,812	30,167	24,972	1,985	29,704	127,231
	Congested-2010	130,225	43,312	33,727	2,600	43,669	166,196
	UnCong-2010	123,188	39,313	30,483	2,601	36,283	159,302
	Congested-2030	298,747	123,757	85,793	5,172	138,860	374,610
	UnCong-2030	216,347	81,177	49,106	4,082	64,077	286,634
	Congested-2050	445,967	182,322	127,370	8,592	206,483	557,768
	UnCong-2050	298,309	107,637	64,326	5,333	87,128	388,477

Exhibit 7-3: Route-Specific Forecasts: GLSLS-Max Ro/Ro Ship

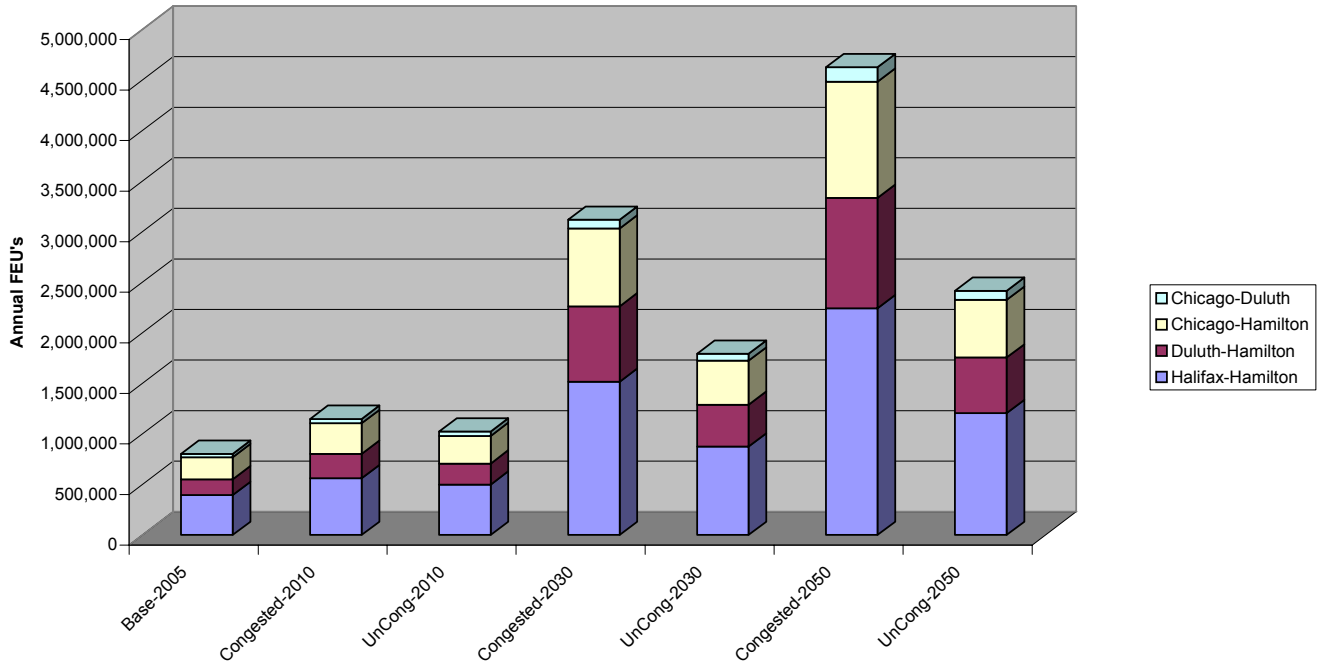


Exhibit 7-4: Route-Specific Forecasts: Small Ro/Ro Ship

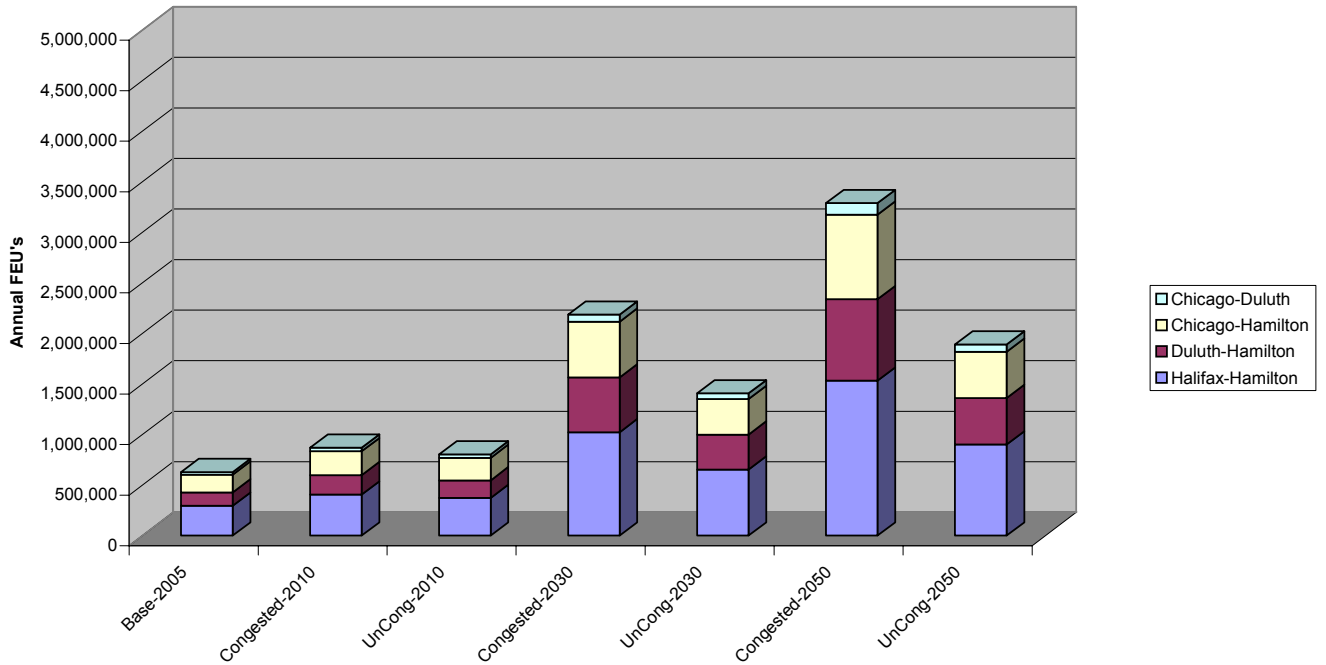


Exhibit 7-5: Route-Specific Forecasts: PACSCAT

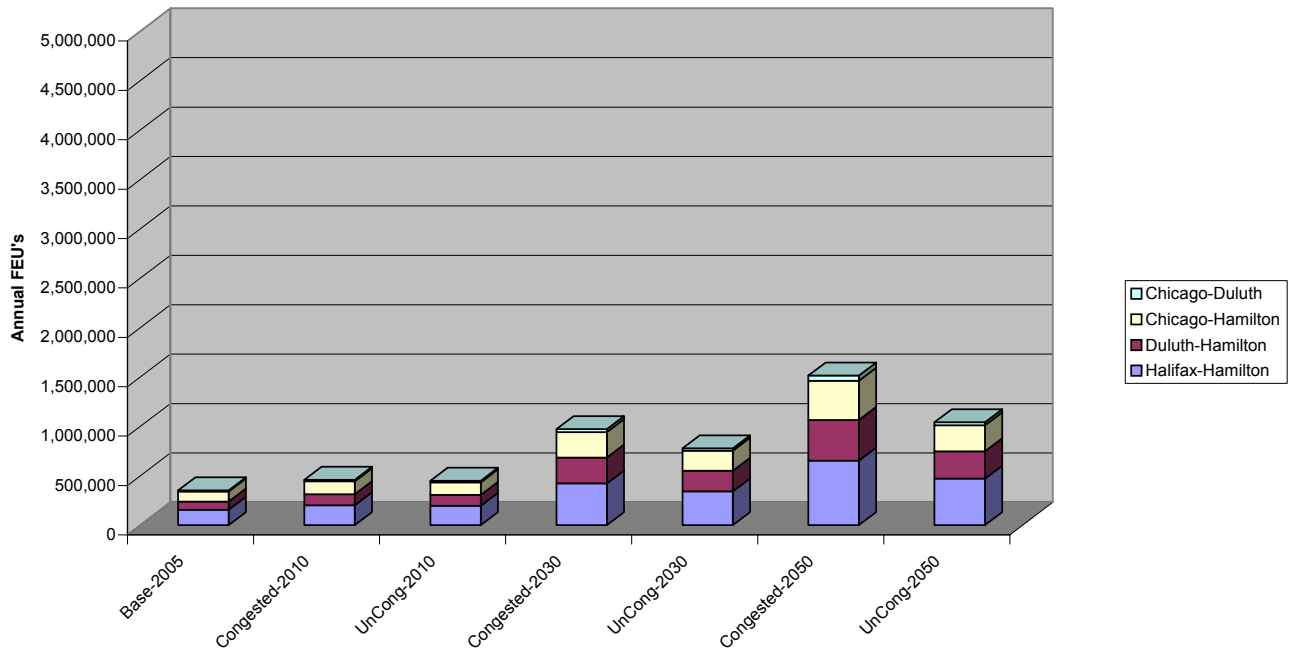
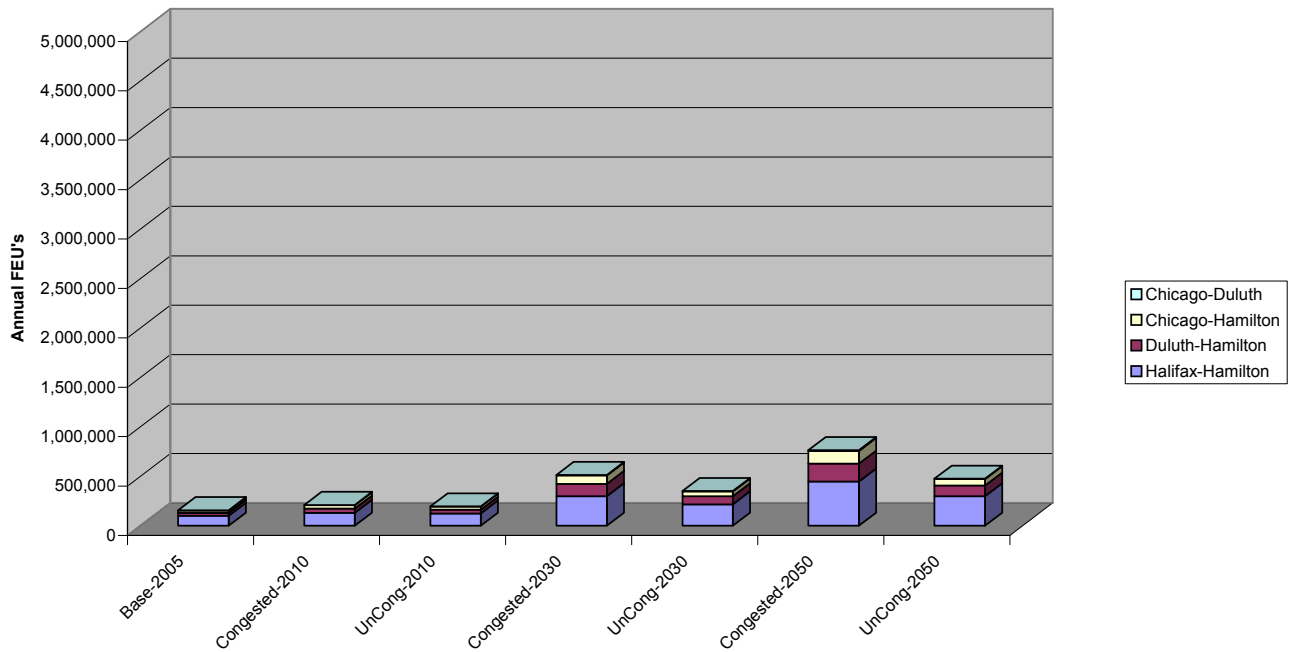


Exhibit 7-6: Route-Specific Forecasts: COB



What is most striking about the traffic forecasts is the forecast rapid rate of growth between 2010 and 2030, as forecast traffic congestion problems start to take effect. Under the congested scenario, higher congestion increases the GLSLS share of domestic traffic as highway congestion compounds the difficulties of the trucking industry and as west coast port congestion starts diverting some Asian traffic to east coast ports via the Suez Routing.

A large difference between the Ship, COB and PACSCAT forecasts are also readily apparent. It can be seen that the COB and PACSCAT forecasts are only for a fraction of the traffic that may potentially be available to a 20-kts GLSLS max Ro/Ro ship service. The very low speed of the COB and very high cost of the PACSCAT both serve to reduce their respective forecasts.

7.1 GLSLS VESSEL LOADING ANALYSIS

Vessel loading charts have been developed for Base Year 2005 as well as for Ship and PACSCAT in Congested Year 2030. These chart, given in the Appendix, help visualize Atlantic, Pacific and Domestic traffic flows in terms of their implications for vessel operations. They show the number of average number of loaded daily FEU's carried on board the vessel departing from each indicated port. Charts were developed for each of the three main vessel routes as well as for the H₂O East (Halifax to Hamilton) service on a stand-alone basis. Duluth to Chicago traffic is shown as interconnecting on the main Duluth and Chicago vessels using a hub port at Cheboygan to make the transfer. It can be seen that these Duluth to Chicago volumes are not huge but on a daily basis, the volumes are still large enough to make it worthwhile to try to retain the business.

The H₂O East and H₂O West routes are relatively well-balanced with the forecast H₂O East volumes about equal to that of the two combined H₂O West routes. Lake Michigan services are generating loads in both directions, but Lake Superior service reflects the heavy eastbound bias of the Asian container flows. Most containers would be heading back to Duluth empty. These empty container flows are not included in the loaded traffic forecasts.

The vessel loading charts have important implications for the economic viability of the proposed services. The reason is that the GOODSTM demand model line-haul costs are based on an approximately 80% load factor assumption for the specified vessel technology.⁵ Therefore, a 350-FEU Ro/Ro vessel would require an average loading of about 280-FEU's to break even. So long as the available traffic is greater than the amount required to achieve an 80% load factor, then it can be assumed that the proposed service will be commercially viable.⁶ If the projected load factor were less than 80% over a significant length of the vessel route, the viability of the proposed vessel service can be called into question.

To summarize the vessel loading charts, segment analyses in Exhibits 7-7 through 7-10 have been developed. These show forecast vessel loadings in terms of average daily FEU's. The segment analyses do not show the peak load segment but rather an average load segment that can be used for load factor comparisons. The H₂O East route from Halifax to Hamilton has been broken into two distinct segments: Halifax to Montreal and from Montreal to Hamilton.

HALIFAX-MONTREAL-HAMILTON

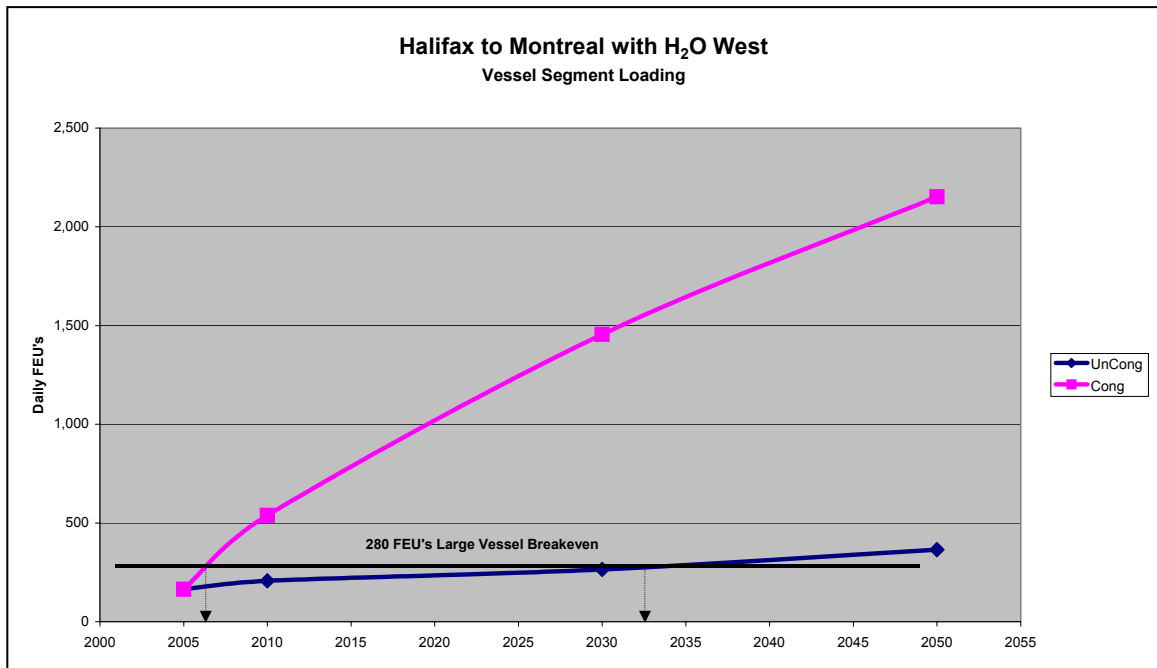
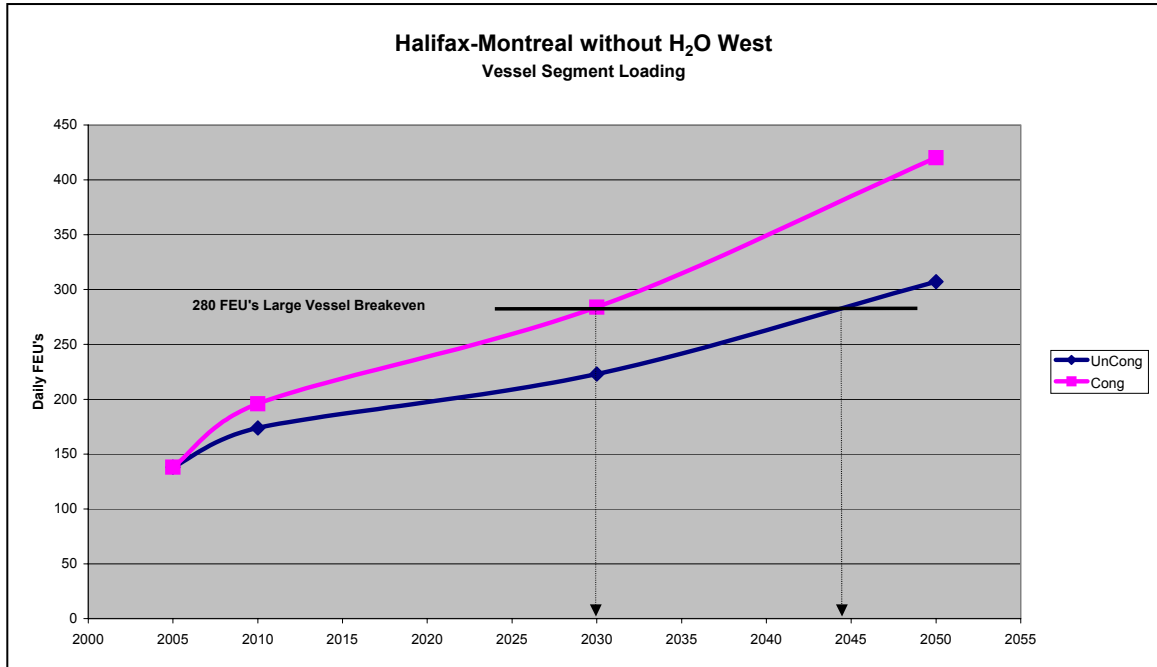
Exhibit 7-7 gives a vessel loading analysis for the Halifax to Montreal segment. It includes two charts, both with and without connectivity to H₂O West services. The Halifax-Montreal segment would be directly competitive to existing rail intermodal service. Since a small Ro/Ro vessel has a higher unit operating cost than rail, it would be a high-risk proposition to launch Halifax-Montreal service using a small vessel. Being in a disadvantaged cost position, a competitive pricing response could quickly put the vessel operator out of business. However, a GLSLS-max Ro/Ro container vessel would have a lower unit cost than rail and therefore could match any rail pricing response. For this reason, it is suggested not to

⁵ In the GOODSTM network, terminal and port costs are built into the cost of the trucking access links.

⁶ This approach to modeling costs is appropriate and sufficient for a concept-level demand forecasting study. It would not be sufficient for the development of an investment-grade business plan. A more detailed approach to modeling the costs and revenues of a specific proposed service would be needed for an investment-grade study.

launch Halifax-Montreal vessel service until the traffic available at Halifax is sufficient to fill a GLSLS-max Ro/Ro container vessel.

Exhibit 7-7: Vessel Segment Loading for Halifax to Montreal



In Exhibit 7-7, the Congested scenario includes diversion of some Asian U.S. Midwest cargoes from West coast ports to the Suez routing, whereas the Uncongested scenario does not include this diversion. This accounts for the very rapid development of traffic at Halifax in the Congested scenario with H₂O West connectivity (i.e., a connection to U.S. ports on Lake Erie and beyond). Without the ability to extend Halifax into the U.S., GLSLS cannot participate in most of the growth in Suez traffic, since most of that diversion is forecast to go to U.S. destinations.

Exhibit 7-7 shows that without either an H₂O West connection at Hamilton or a friendly connection to CP Rail at Montreal, daily feeder service using GLSLS max vessel from Halifax to Montreal cannot be viable until at least 2030. At present, Halifax is only a small port and its traffic does not penetrate far into the U.S. For enough business at Halifax to fill a GLSLS-max Ro/Ro container vessel every day, the Port of Halifax would need to grow from its present level of about 550,000 TEU⁷ to well beyond a million TEU's per year.

As shown in Exhibit 7-8 the small Ro/Ro container ship can attract enough traffic to fill the vessel and be financially viable. However, the vessel operator could be subject to a competitive response, which would put it in an unfavorable position with respect to rail. This is less likely to happen with a GLSLS-max vessel since its costs are less than rail and it will remain competitive regardless of the railroads actions.

With an H₂O West connection to the U.S., the opportunity at Halifax depends on the development of additional Asian cargoes via the Suez route.

- With an H₂O West connection, GLSLS vessel service to the U.S. Midwest could become a key part of Halifax's effort to develop itself into a major hub port. There is a "chicken or egg" problem, however: the viability of GLSLS vessel service hinges directly on Halifax's ability to persuade ocean shipping lines to drop off enough traffic at Halifax to fill the vessel. As soon as the shipping lines agree to do this, feeder vessel service can be viable. A code-sharing arrangement on a daily feeder vessel service may be a possible means to get a service started.
- If however, the Suez Express traffic fails to develop as anticipated or if the ocean lines decide to take their U.S. traffic into New York rather than dropping it off at Halifax, then a Halifax-Montreal vessel feeder service will probably not be viable until a 2030-2045 time frame.

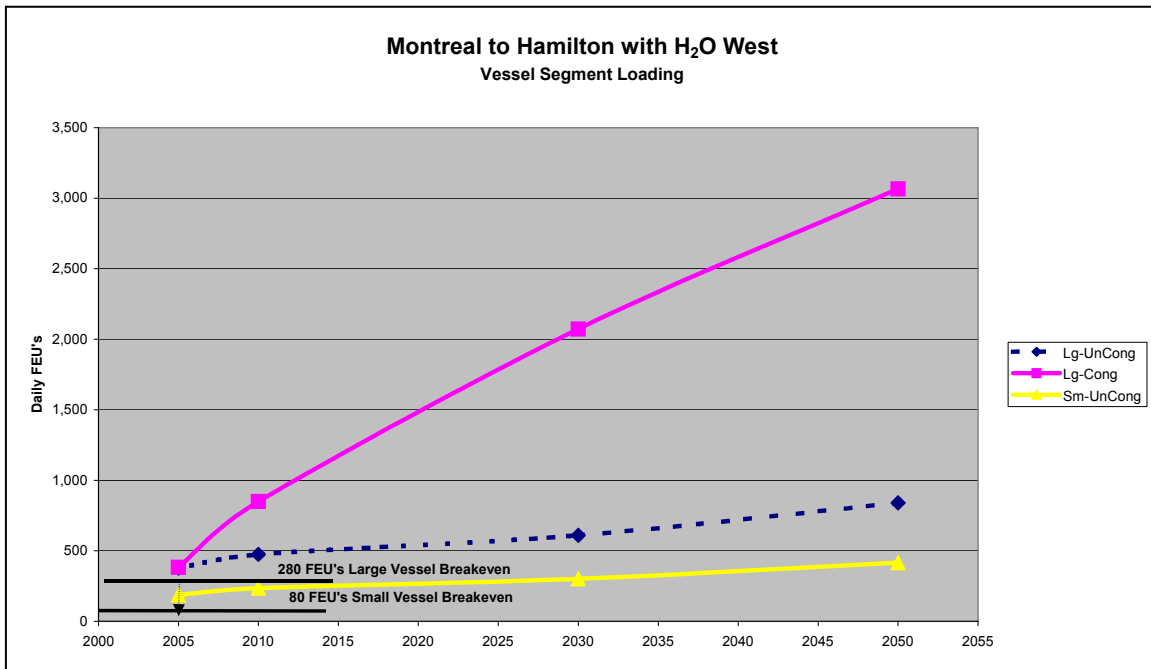
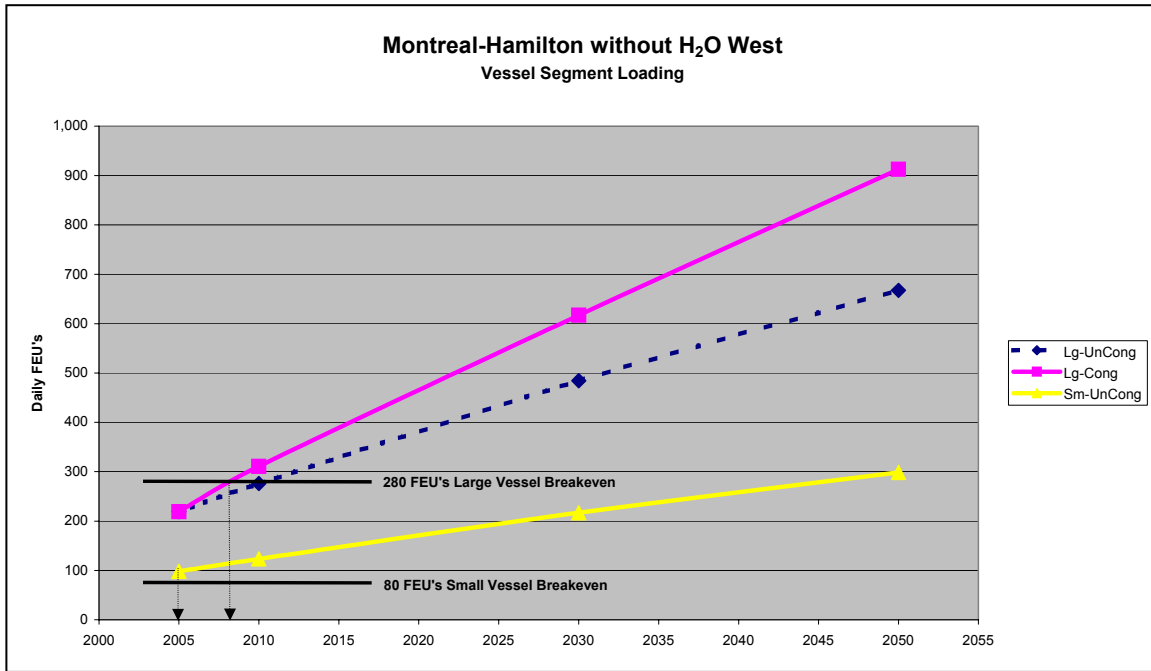
Exhibit 7-8, which shows the loading analysis for the Montreal to Hamilton segment, includes two variants. Again, this Exhibit shows the strong impact of the forecasted influx of Suez cargoes at Halifax, which only occurs, however, in the Congested scenario and also requires connectivity to H₂O West services –

- If the anticipated Suez diversion occurs, then a GLSLS-max Ro/Ro container vessel service from Halifax all the way to Lake Erie ports will become viable in the very near future.
- If Suez diversion does not occur, Halifax to Montreal vessel operation is not viable, so the Montreal-Hamilton segment will not have the benefit of connecting traffic from Halifax. For this reason, the Uncongested large ship scenario forecast is shown only as a dashed line in Exhibit 7-8. There is not enough traffic in the Uncongested scenario to support a GLSLS-max vessel service from Halifax to Montreal and without this connecting traffic, a Montreal-Hamilton large vessel service is not viable either.
- However, Exhibit 7-8 also shows a reduced "Small Vessel" forecast that is valid for stand-alone Montreal to Hamilton service. The higher unit operating cost of a small vessel reduces the forecast by about 20% compared to a GLSLS-max vessel and a

⁷ Halifax Set to Become Canada's Back Door to Asia, See: <http://www.asiapacificbusiness.ca/apbn/pdfs/bulletin268.pdf>

Montreal-Hamilton standalone service would also lose its connecting traffic from Halifax. Nonetheless, there is enough traffic from Montreal at present to support introduction of a daily feeder ship service, based on deployment of a small 100-FEU, 20-kts Ro/Ro vessel in the Montreal-Hamilton lane.

Exhibit 7-8: Vessel Segment Loading for Montreal to Hamilton



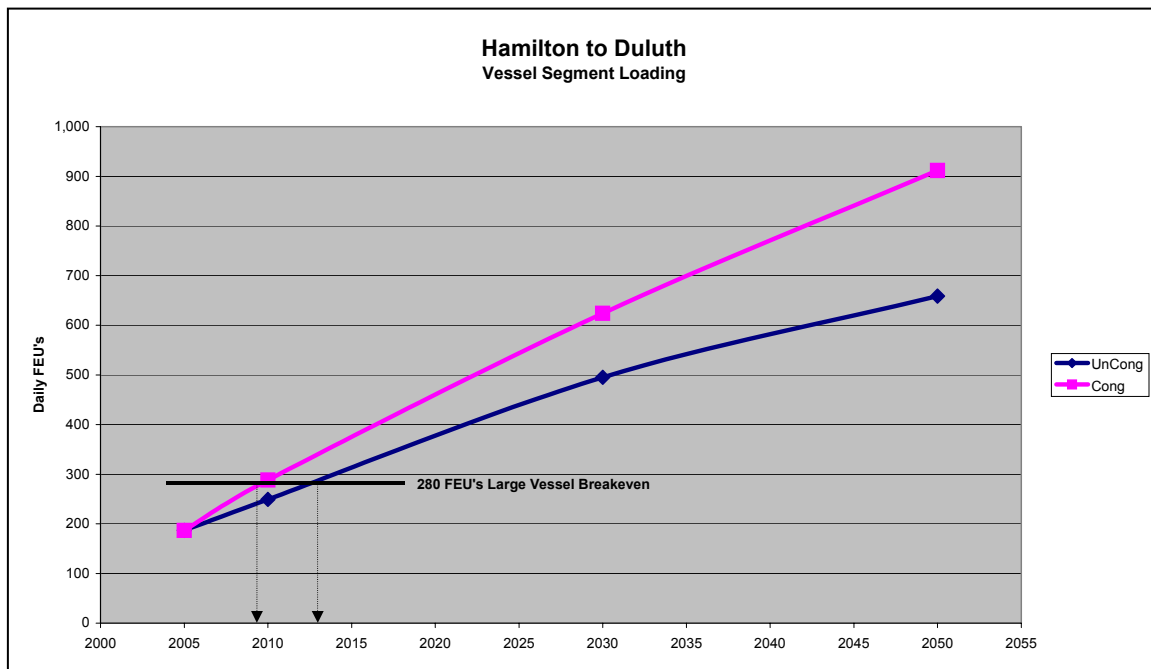
HAMILTON-DULUTH

Exhibit 7-9 shows the loading analysis for the Hamilton to Duluth segment. The H₂O West lane from Duluth to Hamilton does not show quite enough traffic to support a GLSLS-max vessel service in 2005. The Duluth to Hamilton lane would have about 200-FEU's per day eastbound and 150-FEU's westbound, which falls short of the 280-FEU's that are required to sustain a GLSLS-max vessel service.⁸ Of this eastbound 200-FEU's per day, about half would consist of domestic traffic and half land-bridge traffic from Pacific northwest ports.

For domestic traffic at Duluth, 100-FEU per day would be sufficient to support the introduction of a small vessel. The problem is whether the 100-FEU per day of land-bridge traffic will be enough to gain the interest of the railroads. A typical double-stack train can haul 250-FEU's, so railroads may not want to initiate land-bridge service unless they can get at least one full train each day to Duluth. With GLSLS-max economics and projected traffic growth at the Pacific northwest ports, there would be 190-FEU's per day of land-bridge traffic for Duluth by 2010, which would be sufficient to justify running a train. A full double-stack train from PNW along with the locally generated domestic traffic at Duluth and Thunder Bay would provide enough traffic to fill a GLSLS-max Ro/Ro vessel by 2010.

Duluth domestic shipping would be mostly to U.S. ports on Lake Michigan and Lake Erie. These lanes are not rail competitive. A small vessel can be introduced as a Duluth to Cheboygan shuttle that makes a connection at Cheboygan to the Lake Michigan ship. If the railroads start bringing land-bridge traffic to Duluth or Thunder Bay, a larger vessel could be deployed that would provide direct service from Duluth directly to Lake Erie ports and possibly through the Welland Canal as far as Hamilton.

Exhibit 7-9: Vessel Segment Loading for Hamilton to Duluth

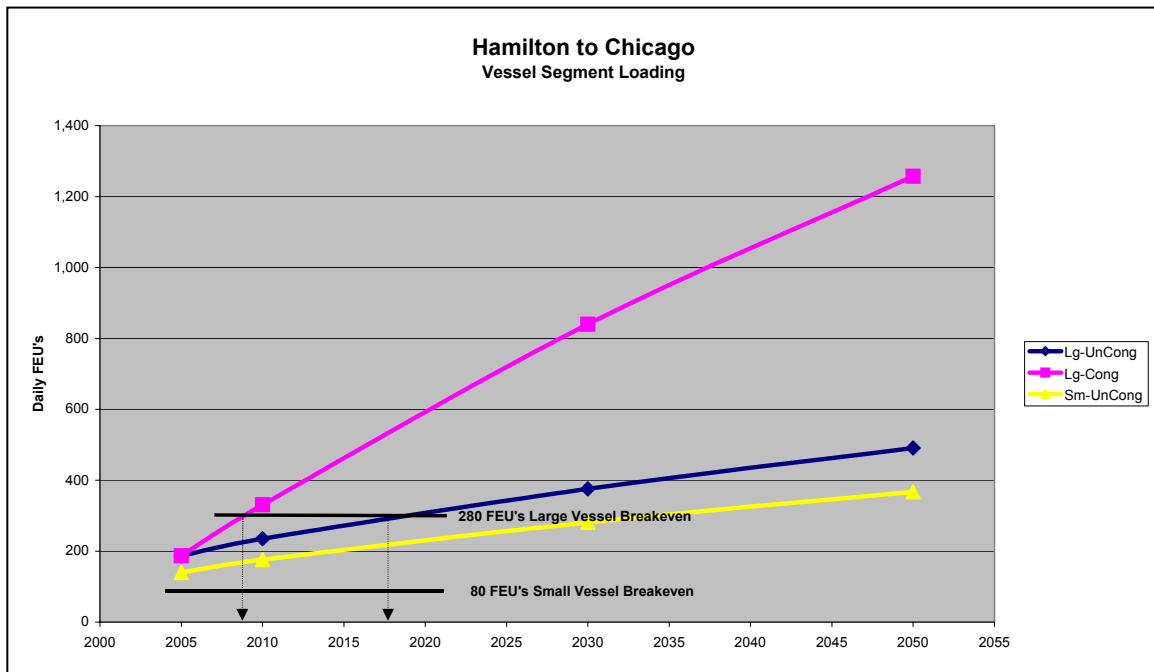


⁸ The economics of the Duluth land-bridge are likely to be hampered by the directional imbalance of Asian container traffic. Determining whether the revenue from the empty back-haul can be made up on the head-haul will require a more specific assessment that is consistent with the requirements of an investment-grade study.

HAMILTON - CHICAGO

Exhibit 7-10 shows the loading analysis for the Hamilton to Chicago route. Chicago to Hamilton service exploits a strong market for local transportation at Wisconsin ports along the west shore of Lake Michigan. It would also attract some local traffic from Lake Erie ports connecting to H₂O East services at Hamilton. The Chicago vessel forecast shows a strong sensitivity to the level of traffic congestion, because of its close proximity to Chicago and greater reliance on domestic and cross-border traffic. With the addition of Lake Superior traffic connecting at Cheboygan, current traffic levels would appear to support the deployment of a GLSLS-max Ro/Ro vessel in the Hamilton to Chicago lane⁹.

Exhibit 7-10: Vessel Segment Loading for Hamilton to Chicago



7.2 SUMMARY OF FINDINGS

H₂O West vessel service from Hamilton to Duluth/Thunder Bay and Chicago can be launched based on the strength of current domestic and cross border markets. There appears to be enough import/export traffic at Montreal to support an H₂O East service from Hamilton to Montreal. It appears that the market would support a daily 100-200 FEU Ro/Ro vessel from Montreal-Hamilton and Duluth-Cheboygan and a 350-FEU vessel from Chicago-Hamilton.

If the railroads are willing to bring land-bridge traffic from the Pacific Northwest ports to Duluth or Thunder Bay, then a direct vessel service can be started from Duluth/Thunder Bay to Hamilton and larger vessels deployed in this lane.

⁹ If the Duluth to Hamilton service is not launched right away, then a single Chicago to Hamilton vessel would have to handle all the traffic from the Lake Erie ports. The vessel loading charts in the Appendix allocate half the Lake Erie traffic to Duluth and the other half to the Chicago vessel. If the Duluth vessel operates only as a feeder a Cheboygan, then the Chicago vessel loading will be heavier than has been shown on the vessel loading charts. The suggestion to deploy a GLSLS-max vessel on the Chicago to Hamilton lane is based on the operation of a Duluth to Cheboygan shuttle service.

GLSLS-max Ro/Ro container vessels are needed in order to confidently compete with rail intermodal economics at Halifax. At present, not enough traffic is available at Halifax to support a Halifax extension of the proposed Hamilton-Montreal vessel service. This could quickly change, however, if ocean shipping lines agreed to start bringing more cargoes for the U.S. upper midwest and eastern Canada into Halifax. The ability to institute at least a daily vessel feeder service out of Halifax is predicated on the attainment of some minimum volume threshold, in the vicinity of 300-FEU each day each way, or about ½ million TEU's that must be committed to the vessel feeder service in both directions. Since the current total port volume at Halifax is today barely over ½ million TEU's, the port needs to grow to at least 1 million TEU's in order to be able to support both rail and competing vessel service options to Montreal.

Significant traffic volumes are potentially available from the Suez routing at Halifax. By 2030, the traffic levels would appear to be sufficient to support the operation of 3-4 GLSLS-max Ro/Ro vessels per day from Halifax to Lake Erie, with perhaps 1-2 additional vessels from Montreal. At this level of traffic, it may be economical to start converting some of the vessels into Lo/Lo configuration in order to reduce unit costs and increase capacity. The H₂O West lane from Duluth and Chicago also shows the capability to support multiple vessel departures per day or to start converting traffic from Ro/Ro into a Lo/Lo configuration by 2030.

As shown in the vessel loading diagrams in the Appendix, COB falls well short of the minimum commercial thresholds required to sustain the viability of the service. The most COB gets is 100-FEU per day on the Hamilton to Montreal segment. Therefore, COB forecasts fall well short of minimum acceptable load factors. However, the relative strength of the COB forecast from Hamilton to Montreal suggests that a COB service might be successful in that lane *if* its operating speed across Lake Ontario were raised from 8-kts to say, 15-kts and if smaller vessels and/or tugs could be employed to obtain acceptable load factors.

PACSCAT does better than COB, again suggesting the strongest lane as Hamilton to Montreal. This is a somewhat surprising result for PACSCAT considering the speed limitations of the locks and channels, but it also reflects the reduced operating cost and fuel consumption of PACSCAT because of these imposed speed restrictions. PACSCAT's high costs for the circuitous water route from Chicago to Detroit exceed trucking costs, which has heavily suppressed the demand forecast for Chicago-Hamilton. As compared to the alternative of using a conventional 20-kts vessel, the river version of PACSCAT costs considerably more to operate but does not go any faster. The additional fuel costs for operating the sea version of PACSCAT are prohibitive relative to the value of timesavings.

7.3 GLSLS PORT PROFILES

This analysis has considered four different vessel technology options and Congested and Uncongested scenarios along with sensitivities for High and Low demographic growth rates. This would lead to a multiplicity of port forecasts; however, to show the potential of GLSLS shipping services, this section examines ports based on the Congested Large Ship scenario through 2050. The Uncongested scenario forecasts about 1/3 less traffic than the Congested scenario. Each port will be considered in turn.

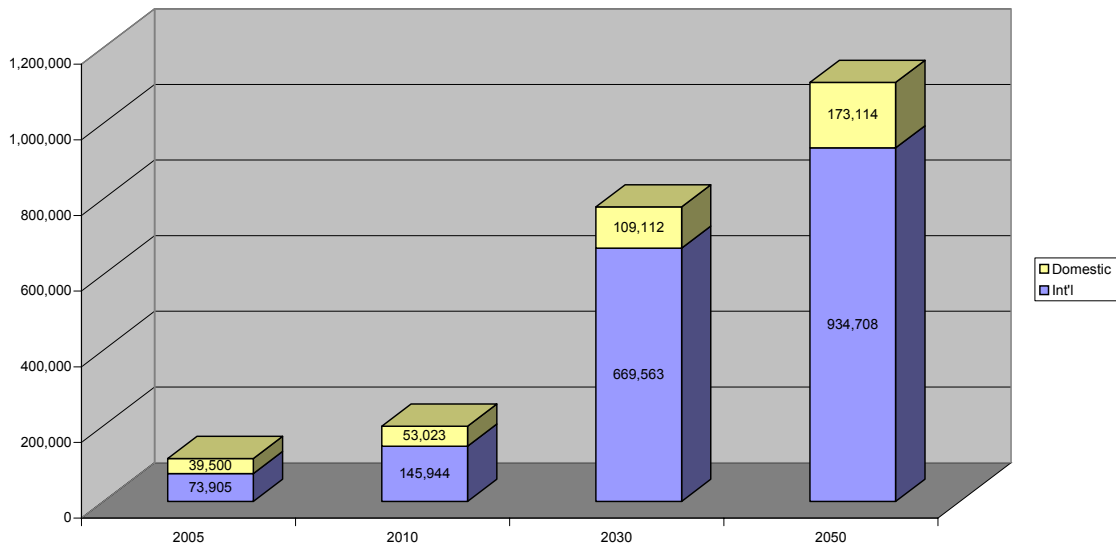
HALIFAX

Given the increasing size of vessels used in the long-haul ocean trades, a hub port is needed at the mouth of major river systems to transload cargoes into smaller vessels. This is certainly true of Europort (Rotterdam), located at the mouth of the Rhine River and Shanghai, located at the mouth of the Yangtze. Even though small ships can go a short way upriver, this has not diminished the importance of these river-mouth ports, or the strategic role that the river systems have played in the development of the ports.

Conversely, a river system lacking a hub port near its mouth will be hard to develop into a major channel of commerce. Halifax could play the role of the river-mouth port for the GLSLS. The role of Halifax would be to receive large ships tending towards Suez-max size¹⁰ and offload a portion of their cargoes for distribution inland. That distribution can be done either by rail or by GLSLS feeder vessel service to Montreal and beyond.

Exhibit 7-11 shows the GLSLS forecast for Halifax, in terms of inbound plus outbound loads. By 2010, the GLSLS by itself would be generating almost 200,000 FEU's (400,000 TEU) which is nearly the total number of TEU's that are handled at the Halifax port today. By 2030, on the strength of the influx of Asian traffic via the Suez routing, this number would expand to over 1.5 million loaded TEU's (0.75 million FEU's) which is three times the number of TEU's (FEU's) that Halifax handles today.

Exhibit 7-11: Halifax GLSLS Loaded FEU's Forecast



QUEBEC AND MONTREAL

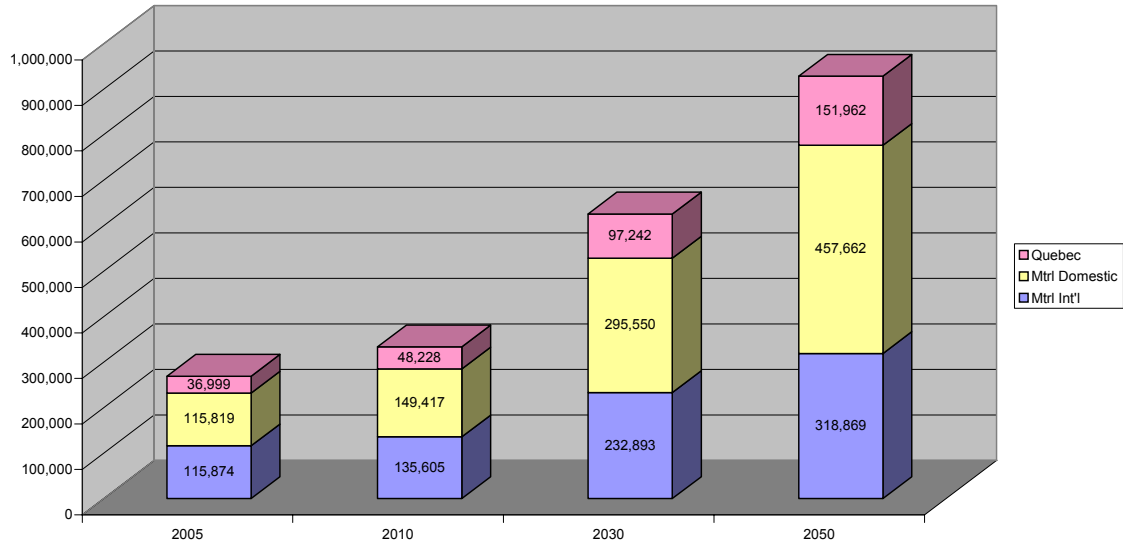
Quebec and Montreal show a much more moderate growth rate than does Halifax, based on projected demographics and increases in European import/export trade. These are growing at a much slower pace than Asian trade, starting from a base where Montreal is already a well-established port. Domestic and cross-border traffic is actually forecast to grow at a

¹⁰ Service delivery of the world's first Suez-max containership, the Emma Maersk (not to be confused with an earlier oil tanker that had the same name) is scheduled for September 14, 2006 after sea trials. See:

http://www.shipspotting.com/modules/newbb/viewtopic.php?topic_id=1722&forum=2&post_id=7878@forumpost7878

slightly faster rate than import/export traffic, due to the impact of increasing highway congestion and the opportunity to divert some traffic from trucks.

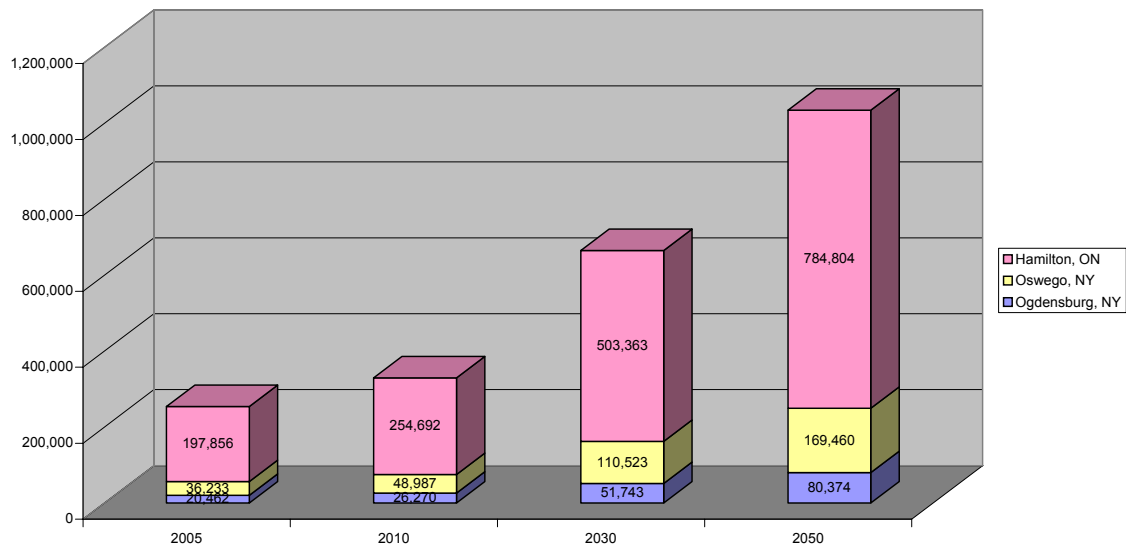
Exhibit 7-12: Quebec and Montreal GLSLs Loaded FEU's Forecast



LAKE ONTARIO PORTS

The principal port on Lake Ontario is the port of Hamilton, ON, which handles not only its own traffic, but also serves as the main industrial port for Toronto. As shown in Exhibit 7-13, based on locally originated traffic only, not including hubbed traffic from interconnecting H₂O East and H₂O West services, the Hamilton port has the potential to reach the 1 million TEU mark by 2030. The smaller ports of Oswego and Ogdensburg also show the potential to handle considerable volumes compared to the size of the cities that they serve.

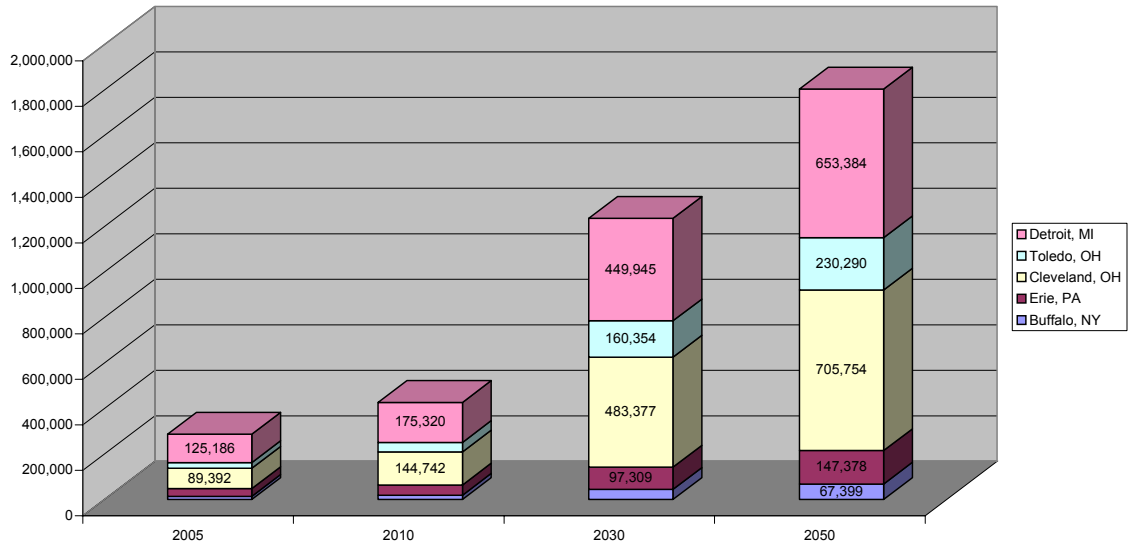
Exhibit 7-13: Lake Ontario Ports GLSLs Loaded FEU's Forecast



LAKE ERIE PORTS

Detroit, MI and Cleveland, OH are the largest Lake Erie ports. Both have the potential to reach 1 million TEU's (0.5 million FEU's) by 2030.

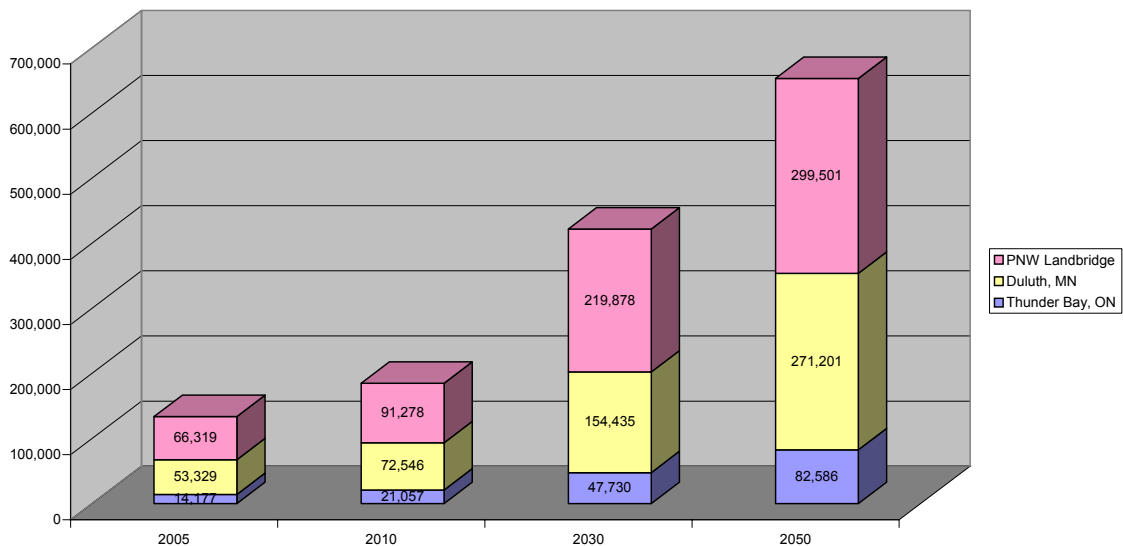
Exhibit 7-14: Lake Erie Ports GLSLS Loaded FEU's Forecast



LAKE SUPERIOR PORTS

Pacific northwest land bridge traffic is currently forecasted based only on traffic currently handled at Seattle and Tacoma, headed to destinations in the U.S. upper midwest. At present, Vancouver does not generate significant volumes for U.S. destinations, although Prince Rupert is clearly targeting the U.S. market. Therefore, it is really not clear how much Land bridge traffic would be handled at Duluth versus at Thunder Bay. Traffic originating from Seattle or Tacoma will probably be handled at Duluth; while Vancouver or Prince Rupert traffic could be handled at either Duluth or Thunder Bay. As shown in Exhibit 7-15, the combined potential for Lake Superior ports is about 800,000 TEU's (400,000 FEU's) by 2030.

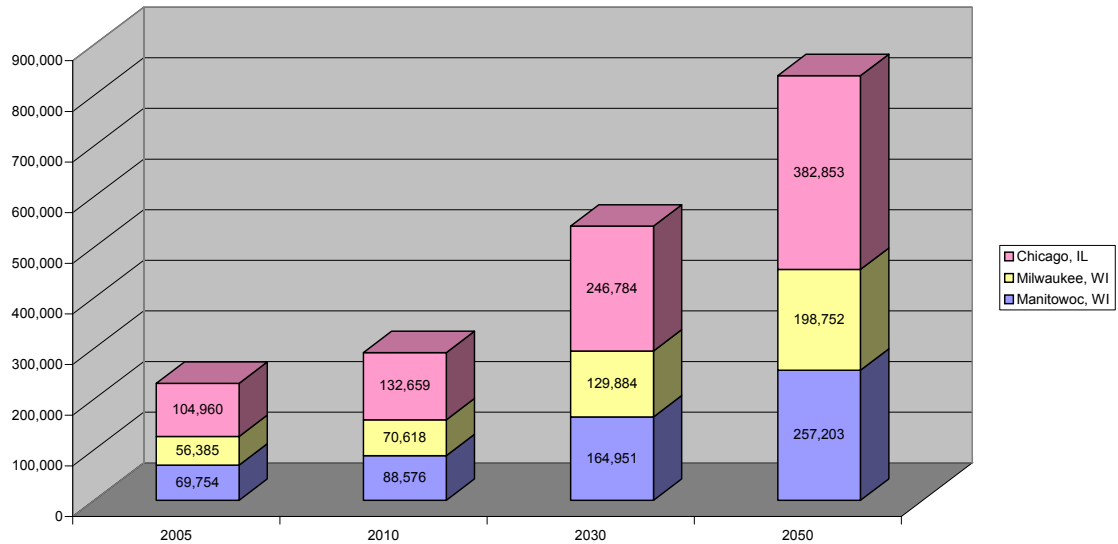
Exhibit 7-15: Lake Superior Ports GLSLS Loaded FEU's Forecast



LAKE MICHIGAN PORTS

Chicago is the largest port on Lake Michigan, followed by Manitowoc (or Kewaunee) and Milwaukee. As shown in Exhibit 7-16, the combined potential for Lake Michigan ports is about 1 Million TEU's (0.5 million FEU's) by 2030.

Exhibit 7-16: Lake Michigan Ports GLSLS Loaded FEU's Forecast

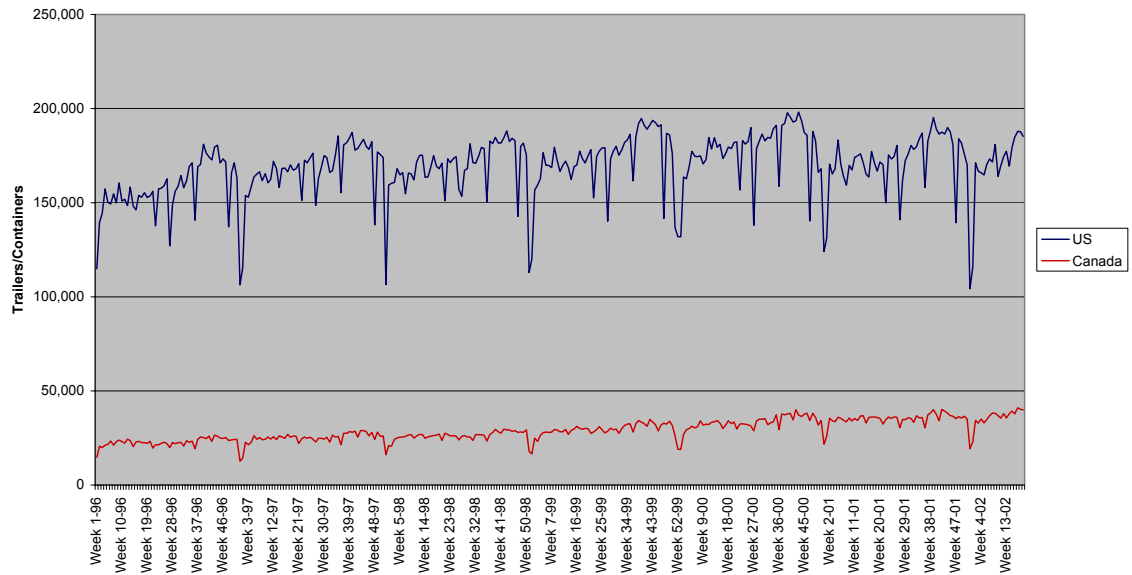


LAND BRIDGE OPTIONS

The system map in Exhibit 7-1 shows a seasonal substitute rail service from Montreal to a port on Lake Erie. The purpose of this rail service is to bypass locks on the Welland Canal and St. Lawrence River during the winter months, when the Seaway is closed. H2O East vessel service could continue during the winter months using ice-class vessels on the St. Lawrence River below Montreal and on Lake Ontario. H2O West service could also continue on Lake Erie and the upper lakes. A proposed substitute rail shuttle would provide a winter link between the H2O East and H2O West services as well as the port of Hamilton in order to maintain the continuity of services year-around.

With regard to seasonality, both truck and rail experience traffic downturns after the Christmas period. As shown in Exhibit 7-17, U.S. intermodal traffic patterns start low during the early winter months and steadily built up through the summer until the Christmas rush in late November. Canadian rail intermodal shipping, while more uniform experiences the same phenomenon.

Exhibit 7-17: Railroad Intermodal Loadings 1996-2002



Accordingly, it can be seen that the added GLSLS capacity is available just when it is needed to relieve peak loading on the U.S. rail intermodal system. Perhaps more significantly to the GLSLS however, is the implication that there is up to 25% excess intermodal railcar capacity during the winter months when the Seaway would be shut down. The winter months are also slack periods for demand of other rail traffic types, particularly coal – electric demand peaks in the summer due to air conditioning demands, which exceed winter heating demands. Because of this, there is not only the availability of intermodal railcar fleet, but also an excess supply of locomotives to pull the cars. These cars and locomotives could presumably be leased at favorable prices for short-term use during the period when the GLSLS locks are closed for the winter.

The objective of the rail shuttle would be to provide substitute service between the Port of Montreal and a port on Lake Erie. Both the CN and CP railroads have access to the Port of Montreal docks, where the necessary port facilities are already in place. The U.S. railroad CSX offers a third possible option for providing GLSLS substitute rail service, since CSX serves Montreal to Buffalo via a rail line through upstate New York.

It is envisioned that a CP or CN rail shuttle would operate from the Port of Montreal through to Hamilton. The port facility at Hamilton must be designed for both rail and water access. H₂O East shipments bound for Hamilton would be unloaded at the port, while connecting shipments for H₂O West would stay on board and any Hamilton loads for H₂O West would be added to the train. The train would then depart for a port on Lake Erie and connecting vessel services.

The choice of port and rail routing is complicated by the fact that the CP and CN rail networks serve different ports. The Port of Nanticoke on Lake Erie would be a natural destination for a rail shuttle service since the facilities there are already controlled by the Port of Hamilton. However, there are two possible downsides to the Port of Nanticoke: the branch line to Nanticoke is captive to the CN and part of the direct route from Nanticoke to Hamilton has been abandoned.

Either Port Maitland near Dunnville or Port Colbourne near the mouth of the Welland Canal are suggested as possible alternatives to Nanticoke. Both of these locations can be accessed by a CP Rail shuttle. Port Colbourne can be accessed by either CN or CP.

In order to maintain year-round operations, a new rail/water port must be developed at Nanticoke, Port Maitland, or Port Colbourne. There is no reason to believe that development of these port facilities or that the operation of a seasonal rail shuttle is infeasible, however, the matter will require considerable additional work to identify viable alternatives and to select a preferred site.

If the seasonal rail shuttle proves to offer an attractive transportation option, there is also no reason why the service could not be continued year-round. This may offer a bypass option for certain time sensitive goods for reducing the transit time required to pass through the St Lawrence Seaway and Welland Canal sections.

8 CONCLUSIONS AND RECOMMENDATIONS

The Great Lakes and St. Lawrence Seaway (GLSLS) plays a key role in North America's transportation system. It provides a vital transportation link for movement of bulk traffic, such as coal and iron ore within the interior of the U.S. and Canada (i.e., Central Canada, Midwest and the Great Plains and Prairies) as well as for grain exports to Europe and other destinations. However, containerized and palletized traffic penetrates up the St. Lawrence River only as far as Montreal where it is transferred to ground transportation modes, e.g. rail and truck.

The success of the GLSLS in moving bulk traffic raises the question about its ability to support the movement of other kinds of goods. This question is particularly relevant in an era when both highway and rail systems are facing capacity challenges as documented in the AASHTO "Bottom Line"¹ reports. As well, because of continued growth in domestic, crossborder and import/export traffic, a threshold will soon be crossed where available traffic volumes are sufficient to provide the "economies of scale" that are needed to support a viable cargo vessel service on the Seaway.

To evaluate this, the New Cargoes/New Vessels Market Assessment has assessed the relative strengths and capabilities of the Great Lakes and St. Lawrence Seaway in the new "capacity constrained transportation" environment. The analysis has evaluated four different prospective vessel types: Container on Barge (8 to 12 knots), large and small container ship (both 20 knots) and a Partial Air Cushion Support Catamaran, or PACSCAT (40 knots). As compared to conventional Container on Barge services that have been suggested in the past, the modern container ship, as well as PACSCAT would represent a whole new dimension in water transportation capabilities, as high speed technologies capable of 20 to 40 knots. The results of the analysis show:

Total Market: The total market for container traffic which includes raw materials, food, semi finished and finished products, is expected to grow for relevant origin destination pairs in the study area by over 100 percent by 2050 from 35 million FEU to over 70 million FEU. Today truck dominates the market carrying over 98 percent of the containerizable tonnage (much of this short-haul) with rail carrying about 2 percent of the tonnage, nearly all in rail/truck intermodal service. The railcar share of containerizable goods was significant in the past but has now declined to a negligible amount.

Water Mode Share: In the future, the impact of congestion is to significantly raise truck and rail transit time and costs as they struggle to absorb an almost doubling of traffic by 2030. The lack of capacity and its impacts on time and cost creates an opportunity for water transportation, particularly if it can offer competitive travel times. Modal diversion analysis shows that at a minimum speed of 20 knots the modern modes of small and large container ships can gain a market share of 2 percent in 2005 similar to that of intermodal rail. By 2050, the water share could increase significantly. Much of this market share will be in lanes that are not well-served by rail intermodal today.

In a 2050 "Uncongested" environment where congestion on rail and highway are fully mitigated, water share will still increase to 3 percent. If there is a failure to invest to mitigate congestion in a "Congested" environment both rail intermodal and water's market share will grow to over 4 percent reducing truck traffic to 92 percent. Since rail and water diversion tends to be in long-haul traffic, this would result in much more than an 8 percent reduction in truck ton-miles (possibly as high as 12-15 percent). However, clearly all three modes: water, truck and rail will experience significant overall growth: rail more than

¹ Transportation Investment in America: Freight-Rail Bottom Line Report. P.80. AASHTO.

doubling its traffic, truck traffic almost doubling and water achieving very rapid growth to 4 percent, or over 3 million FEU.

Water Technology: The most important finding of this analysis is that modern water technology can compete with rail and truck for inland container distribution from Halifax, Montreal, Duluth and Thunder Bay, as well as for domestic traffic moving across the system.

The most successful water technologies are small and large 20-knot container ships that can carry both international and domestic traffic. These are considered to be variants of the same vessel technology: a small ship may be deployed at first, but it would be replaced with a larger ship as soon as traffic levels are high enough to maintain daily service using the larger vessel. As traffic volumes continue to rise above those that can be handled by a single daily large ship, then additional vessel frequencies can be added on an “incremental” basis to provide additional capacity as needed. However, to compete with ground transportation modes, it is very important to maintain at least a base-line minimum level of daily service frequency.

- Initially, Ro/Ro ships are large enough to handle the forecasted traffic, while still offering very competitive line-haul economics and minimizing port costs. Ro/Ro services are also very flexible and are able to accommodate both accompanied and unaccompanied domestic trailers, containerized and Neobulk goods and possibly even railcars on the same vessel.
- Later, as traffic volumes grow, more direct services that bypass intermediate ports can be operated. Alternatively, some portion of the long-haul container traffic can be converted to a Lo/Lo vessel once traffic volumes are strong enough to support it. However, to get started it is recommended to deploy Ro/Ro at first and convert to Lo/Lo only when the additional vessel capacity provided by Lo/Lo is really needed and when traffic levels are strong enough to introduce a Lo/Lo vessel without sacrificing daily service frequency.

The forecast traffic volumes for the GLSLS are significant. For a large container ship service, the base year 2005 demand levels suggest that if containership service had existed, the available traffic could be as much as 600,000 FEU split equally between international and domestic traffic. In the congested scenario, this traffic would grow to over 3 million FEU by 2050.

The faster PACSCAT (40 knots) achieves only about half the demand of the container ship, because its energy consumption is so high that its costs are nearly as high as trucking. This offsets its time advantage, particularly in the St. Lawrence River and Welland Canal where there are a significant number of speed restrictions and PACSCAT cannot be used to full advantage. However, PACSCAT still shows promise as a ferryboat for accompanied trailer service and possibly even as an auto ferry on the open waters of the Great Lakes. The slow Container on Barge (COB) option is the least attractive option producing only half the PACSCAT traffic and only 15 to 25 percent of the fast container ship.

Water Routes: In terms of the water routes on which vessels could be deployed, the study area has been divided into two regions –

- H₂O East – the primarily Canadian portion of Lake Ontario and the Seaway downstream from the Welland Canal, from Hamilton to Halifax
- H₂O West – the primarily U.S. portions of the upper Great Lakes upstream from the Welland Canal, from Chicago and Duluth to Hamilton.

H₂O East: The eastern end of the seaway is the traditional route of the GLSLS for serving Atlantic traffic. Because of capacity restrictions at U.S. West Coast ports, East Coast ports

could have an opportunity for handling increased "round the world" traffic via the Suez Canal from Southwestern Asia.

- Halifax, on the great circle route from the Straits of Gibraltar to New York is in an ideal position to benefit from the forecast growth of Suez trade with southwestern Asia. Other East Coast ports, such as the one at Norfolk, Virginia have benefited from Panama Canal trade, but since the Panama Canal has reached capacity, the opportunity for further growth in Panama trade is likely to be limited in the future.
- Montreal continues to remain competitive in its traditional European trade lanes that tend to be handled in smaller ships than the large Asian corridors. Montreal is forecast to continue to grow, albeit at a more moderate, steadier pace than the potentially explosive growth in Asian traffic at Halifax.

There is an immediate opportunity for GLSLS participation in domestic, cross border and import/export traffic at Montreal and a longer-term opportunity for extending GLSLS vessel services to Halifax. This opportunity depends on Halifax's ability to attract more vessel calls that are expected to come from growth in Suez trade with Asia. In the future, Halifax, Quebec and Montreal are all expected to see increased traffic for both the U.S. Midwest and Central Canada and will grow accordingly.

H₂O West: There are substantial domestic and cross border flows from Chicago and eastern Wisconsin to Lake Erie ports, Central Canada and Montreal. Besides this, given increasing congestion in Chicago and the limited ability of railroads to expand terminal capacity there, the Great Lakes could provide a Chicago by-pass for some West Coast container traffic. From the ports of Tacoma, Seattle, Vancouver, and Prince Rupert, the BNSF, CN, and CP railroads reach Lake Superior ports at Duluth and Thunder Bay. There, an intermodal transfer could be made to vessels that could take this traffic to ports in the midwestern United States.

As such, there is an immediate opportunity for developing domestic and cross border traffic on the upper Great Lakes and a longer-term opportunity for developing land-bridge traffic in conjunctions with West coast ports and the railroads.

Service Implementation Plan: The key requirement for starting a vessel service is the need to meet the minimum volume requirements for maintaining daily service. In the past, this threshold has not been met.

Current opportunities for implementing a vessel service must mainly focus on attracting domestic and cross-border traffic that mostly moves by truck today. This traffic currently moves in truck trailers, rather than ISO containers and so a Ro/Ro trailer service would be more conducive to its needs. Similar services are provided, for example, by Crowley Maritime in its U.S. Puerto Rico lane using marine barges. A start-up GLSLS vessel service could attract some import/export traffic from Montreal as well. Specific lanes for a startup service would include –

- The Montreal to Hamilton market is strong enough today to sustain a daily small Ro/Ro vessel service. While a large vessel service would have a cost advantage over rail, a small vessel service would be potentially vulnerable to a rail competitive response during its start-up period. However, the Hamilton port location provides a drayage cost advantage to some shippers, which could help protect the water market share. A connection to U.S H₂O West services at Hamilton would provide an additional measure of protection, since direct rail intermodal service is not provided through the Niagara gateway today so cross-border traffic to Lake Erie would be mostly truck, not rail-competitive.

- There is also a market for primarily U.S. domestic freight from Lake Superior to ports on both Lake Michigan and Lake Erie. A small vessel could shuttle traffic from Duluth and Thunder Bay to Cheboygan, where a connection would be made to a larger ship that would serve both Lake Michigan and Lake Erie.
- The strongest GLSLS market today is in U.S. domestic and cross-border traffic from Chicago and eastern Wisconsin to ports on Lake Erie, with smaller flows connecting to Lake Superior and Canadian ports. Chicago and Wisconsin ports offer an attractive opportunity for water service that could support a daily Ro/Ro large vessel service at 2005 traffic levels. A Chicago to Hamilton vessel service would connect to Lake Superior service at Cheboygan and to Lake Ontario and Montreal service at Hamilton.

Future opportunities for the GLSLS key primarily on growth of Pacific and Atlantic import/export traffic, but development of these opportunities depends on the interest and cooperation of major ocean shipping lines, ports and railroads for development of these proposed service. For example –

- The Port of Halifax is not yet large enough to support an extension of water service from Montreal to Halifax using a GLSLS-max container ship. This situation could change very quickly, however, if any of the major ocean carriers agreed to start dropping off enough traffic at Halifax to sustain a GLSLS-max vessel service from Halifax to Hamilton. Filling a single GLSLS-max Ro/Ro vessel's capacity of about 350 FEU per day would nearly double the size of the Halifax port. While the traffic currently available at Montreal is enough to sustain a small vessel service from Hamilton to Montreal; a major traffic influx at Halifax would permit extension of GLSLS service all the way to Halifax and a large vessel could be substituted for the small one.
- The development of land bridge traffic at Duluth and Thunder Bay depends on the cooperation of the west coast ports, connecting railroads BNSF, CN and CP and the steamship lines' interest and willingness to utilize GLSLS shipping services. This idea for expanding Lake Superior shipping may be discussed with them in the future, but should not stand in the way of developing ports at Duluth and Thunder Bay to serve currently available domestic traffic.

Caveats on the Estimates: The results of this analysis are subject to a number of caveats and contingencies.

- The growth forecasts are largely an extrapolation of historic trends and projected GDP growth. It may be that growth of trade with Asia will slow. If this occurs, it would impact the volumes of traffic overflowing from West Coast ports into other trade routes.
- The H₂O West forecast of Duluth land-bridge potential is dependent on congestion in Chicago growing as rail traffic doubles. Such congestion may well ease if the 'CREATE' project were accelerated or if the existing six major railroads merge to form two transcontinental railroads. Such mergers are anticipated by the rail industry, but probably not for at least another five years.
- The H₂O East forecast is dependent on continued development of congestion at both East and West Coast U.S. ports as they struggle to meet increasing traffic volumes. Ports from Boston to New York to Philadelphia and Baltimore already find it difficult to serve Midwest and Great Plains markets. Expected congestion at the traditional east coast ports would require that Halifax and the Virginia Ports absorb significant traffic growth in the next twenty years and beyond. It would appear that they have the resources to do so.

- To develop viable H₂O East and West shipping services, there is a need for a concerted effort by the shipping industry and its ports.
 - Clearly, Halifax, Quebec, Montreal, Hamilton, and Cleveland need to cooperate and work together with the railroads for developing H₂O East. In particular, rail cooperation is needed to develop a seasonal substitute rail shuttle for the winter months when the Welland Canal and Seaway locks are closed.
 - The ports of Duluth, Thunder Bay, Detroit, Windsor, Toledo, Cleveland and Hamilton need to work together with the railroads BNSF, CN and CP to develop H₂O West.

In both cases, a required investment must be made in modern ships and port facilities. In both cases, a proactive private public partnership is needed to implement the opportunity.

Recommendations for Further Development: Based on the above analysis and considering all the forecasting limitations, assumptions and institutional issues, the consultant team believes there is a strong case for further developing implementation plans for H₂O East and H₂O West. Needed planning efforts include –

- Further business planning studies are needed to develop investment grade traffic forecasts, to consider the potential for public/private partnerships and funding and financing of port and intermodal port development with a view to providing incentives for infrastructure development by local port authorities. These studies should also include a further detailed assessment of vessel operations and costs, port and hinterland services and the potential of niche market opportunities including ferry operations, neobulk services, railcar ferries and accompanied truck and trailer services.

APPENDICES