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FOUR CORRIDOR CASE STUDIES OF SHORT-SEA SHIPPING SERVICES

SHORT-SEA SHIPPING BUSINESS CASE ANALYSIS

Ref. #DTOS59-04-Q-00069

Submitted to:

U.S. Department of Transportation
Office of the Secretary/Maritime Administration

Submitted by:

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I. Executive Summary

Background

The United States' transportation system has undergone a number of major changes in recent years as the center of gravity of the U.S. economy has shifted away from heavy manufacturing toward services with an increased reliance on international trade, particularly imports. Businesses throughout the nation have responded to the pressure of global competition by developing increasingly sophisticated supply chain management processes in order to drive down costs and get products to market faster. With the increased internationalization of the U.S. economy, company's supply chains typically extend over great distances, frequently all around the world. As transportation and logistics costs were driven down following transportation industry deregulation in the 1980s, these more complex supply chains have tended to increase the intensity of use of freight transport. At the same time, the domestic transportation infrastructure, particularly highway capacity but also the rail intermodal network, has not kept pace with the growth in demand for their services. The resultant strain from growth in freight transport activity has impacted all modes of transport, but none more than trucking. Significantly increased highway congestion has come from the compound influences of the growth in freight and passenger traffic, especially in the densely populated regions along the U.S. coasts, while a host of economic, political, and environmental pressures have constrained the ability of highway capacity to keep pace with the growth in traffic.

Given the current limited plans for new highway construction and likely ongoing federal and state fiscal constraints, it is likely that congestion on U.S. highways, as well as on the rail intermodal network, will continue to increase. This will have the virtually inevitable effect of degrading the productivity of the nation's businesses in terms of their transportation and logistics performance. At the same time, the traveling public will be inconvenienced by further increases in traffic delays and the environment will be subject to additional damage from vehicle emissions (especially freight diesel emissions) that reduce air quality.

One potential avenue that offers to relieve some of this strain on the nation's transport infrastructure is the accommodation of truck traffic from congested highways to the open sea – that is, to use what is termed "short-sea shipping" operations both along the nation's coasts as well as on inland waterways to absorb a significant part of the projected growth in highway and rail freight traffic. These short-sea shipping operations would move freight on an intermodal basis by combining a relatively short overland "drayage" move by truck to transport goods from their origin to a nearby port from which a vessel would carry the freight to another port where a second truck would transport the load over another relatively short distance to its ultimate destination. This land-sea-land intermodal transportation model for containerized and roll-on/roll-off (RoRo) trailer traffic is already used extensively in the U.S. for international traffic as well as in the domestic freight services that connect the U.S. mainland with noncontiguous parts of the country such as Alaska, Guam, Hawaii, and Puerto Rico.

With the extensive development of the U.S. highway network following World War II, the coastwise movement of non-bulk freight virtually disappeared. This traffic primarily migrated to truck transport as a consequence of the comparatively slow transit times for water freight, the additional cost of marine terminal handling and inland drays, and the cost of U.S. citizen crews and American-built vessels as required under U.S. law for domestic shipping operations.[1] Coastwise water transportation for non-bulk freight had to compete with the relatively fast point to point transit times offered by truck and intermodal rail service, moving over networks with sufficient capacity to handle the nation's commerce at the time, and benefiting from the relatively low fuel costs of that period.

In recent years however, there has been a significant shift in the transportation equilibrium: highway and rail intermodal capacity has not kept up with the growth in demand, labor shortages for truck drivers have become increasingly acute, and fuel prices have risen dramatically from their low levels of the 1980's and 1990's. With this major shift in the balance of factors impacting the supply, cost, and performance of transportation services within the United States, it is timely to take an objective and pragmatic look at whether short-sea shipping can provide a means to relieve some of the pressure on the nation's highways.

This study evaluates that opportunity on four potential traffic lanes as business case studies for the short-sea shipping concept in order to identify the potential for market viability of such services, as well as any key challenges to that success being achieved, and the steps that may be taken to overcome any such obstacles.

The United States is not alone in seriously considering short-sea shipping initiatives. The European Union (EU) has established a policy to increase short-sea shipping operations within Europe in its efforts to alleviate road traffic congestion and to mitigate the environmental impact of freight transportation. One of the impediments to developing large scale short-sea shipping operations within Europe has been the treatment of inter-coastal shipping as a foreign to foreign activity with regard to documentation, inspections, and security issues. The EU has also provided some financial support to short-sea shipping through such programs as the *Marco Polo* initiative that provides for 30 percent co-financing of eligible projects and the possibility of government ownership of assets and leasing them back to the industry. However, the total fund budgeted between 2003 and 2006 was only 75 million Euros.

A number of commentators have sought to demonstrate the success of short-sea shipping in Europe by quoting very large cargo volumes being moved by that mode. However, the basis of comparison is not the same as the short-sea initiative in the United States. European "short-sea" data include three major elements of cargo movements that are geographically specific to European traffic and therefore are not directly comparable to U.S. domestic short-sea shipping operations.

[1] The Merchant Marine Act of 1920, commonly known as "the Jones Act" and related statutes require that vessels used to transport cargo and passengers between U.S. ports be owned by U.S. citizens, be built in U.S. shipyards, and be manned by U.S. citizen crews.

EUROPEAN DATA ELEMENTS IN CONTRAST TO U.S. DATA ELEMENTS:

- Transshipment traffic - this relates primarily to international container traffic entering main ports of call such as Rotterdam and Hamburg that is then relayed by feeder vessel to their ultimate destination. This cargo is outside the scope of this study as it is not a real domestic move.

- Bulk cargoes - the primary shipments of bulk cargoes counted in European short-sea statistics originate primarily in Rotterdam and are made up of such commodities as coal, oil and various metals such as copper. For these cargoes, many of which originate outside Europe, a port serves as a major storage and distribution center for the bulk trades. As this traffic almost never enters the highway system, it is misleading to consider it as short-sea cargo in the context of this study.

- Factory to factory movements - the one element of success in European short-sea shipping has been the movement of single, dedicated products (e.g. paper and autos) from producer to distributor. These shipments tend to be in-house.

In summary, while the European example provides some useful lessons and insights on how the U.S. may proceed with a short-sea shipping initiative, there is to date no real success in short-sea shipping in Europe that can genuinely be considered to have taken a significant volume of traffic off the highways and replaced it with a maritime movement.

Objectives of the Study

This project was carried out in response to the U.S. Department of Transportation's Request for Applications No. DTOS59-04-Q-00069, *Four Corridor Study Templates of Short-sea Shipping Services.* The project's objective was to assess the feasibility of short-sea shipping operations on four potential domestic U.S. traffic lanes or corridors in order to determine if such services could serve as an economically viable alternative to overland freight transportation. Although U.S. commerce with our neighbors, Canada and Mexico, also moves over relatively short distances and may also be divertible to sea, these lanes were not included in the scope of the study in order to focus on issues that are specific to U.S. regulations, procedures, and economics pertaining to domestic maritime transportation.

The four domestic U.S. corridors selected on the basis of their respective volumes of potentially divertible truck traffic and geographic diversity were the following:

- *Gulf to/from Atlantic Coast Corridor* – between the ports of Beaumont, TX and Camden, NJ

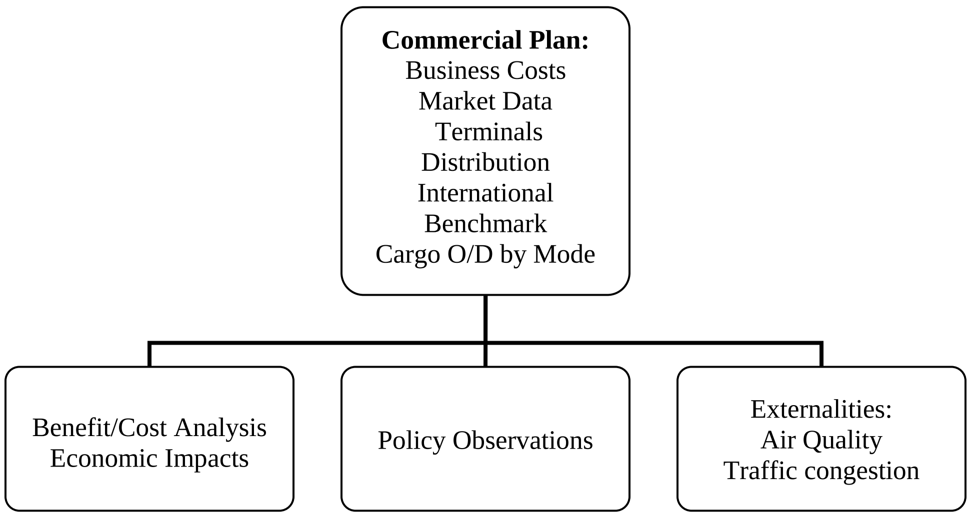
- *Atlantic Coast Corridor* – between the ports of Port Canaveral, FL and New Haven, CT

- *Pacific Coast Corridor* – between the ports of San Diego and Oakland, CA, and Astoria, OR

- *Great Lakes Corridor* – between the ports of Milwaukee, WI and Muskegon, MI

The commercial feasibility of a short-sea shipping (SSS) operation for each of the corridors was evaluated on the basis of potential costs and benefits from a number of perspectives including transportation cost, transit times, schedule reliability, required investment and foregone investment in other modal facilities and infrastructure, environmental impact, job creation, and national security issues. The same economic analytical template was used for all four corridors evaluated as shown in the diagram below.

Short Sea Shipping Corridor Study
Template Design



It is intended that the information gained from this project will both better inform U.S. public policy makers to develop a policy framework that will be pragmatically supportive of future short-sea shipping initiatives and for entrepreneurial short-sea-shipping operators to launch commercially viable short-sea-shipping options based on a thorough understanding of market factors and competitive realities.

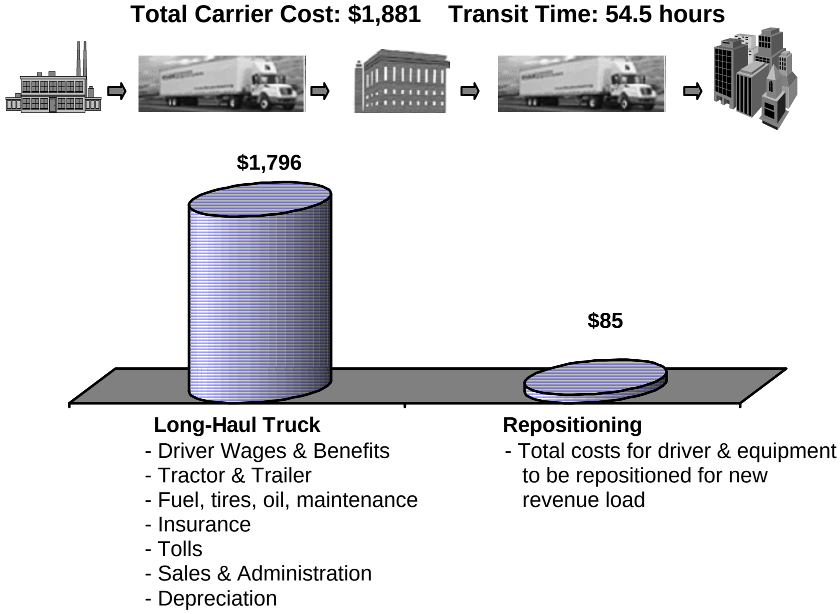
In evaluating the commercial potential for each short-sea corridor, a business model based on industry costs for ocean and land transport, container, trailer, and chassis equipment, marine terminal operations, other logistics expenses, asset depreciation, and sales and administrative overhead was developed using measures of fixed and variable costs. This analytical tool enabled the project team to evaluate the total origin to destination costs of the respective short-sea corridors versus door-to-door truck and rail intermodal alternatives. It also allowed for the testing of different options such as variable port and terminal-handling costs under different labor and policy scenarios, and different vessel size and operating costs under alternative manning levels and capital cost assumptions.

The flexibility to test different operational strategies for short-sea shipping was found to be important as variances in geographies, market size, and shipper requirements demonstrated that a “one size fits all” approach was unlikely to be commercially effective. Although vessel acquisition and operations are a key component of the total short-sea shipping product, they must be carefully integrated into a complete intermodal service product that will require the acquisition and operation of marine terminals in locations that will most effectively serve the domestic freight market as well as the provision of inland transportation connections that will provide a total door-to-door move for the shipper that can be competitive with alternative modes in terms of cost and speed. Consequently, any government policies that address short-sea shipping will need to address the complete transportation chain on a multi-modal basis, achieving a balance between maritime and landside transportation issues as well as port and marine terminal ones.

The primary economic advantage of short-sea shipping is its ability to generate significant economies of scale by moving large numbers of highway trailer-loads on a single vessel providing advantages in capital asset productivity, labor and energy savings, as well as removing some of the pressure on the nation's highway infrastructure. However, the downside for short-sea shipping is that achieving these economies will require the substantial absorption of a large segment of the road freight market on specific corridors. This will require some time before the breakeven point is passed.

The key cost components for each of the alternative modes are described in the following graphics that summarize the result of the analysis of the modal options on the Atlantic Coast corridor.[2] The short-sea shipping economics in this example represent the achievement of a reasonable vessel utilization level following a start-up period.

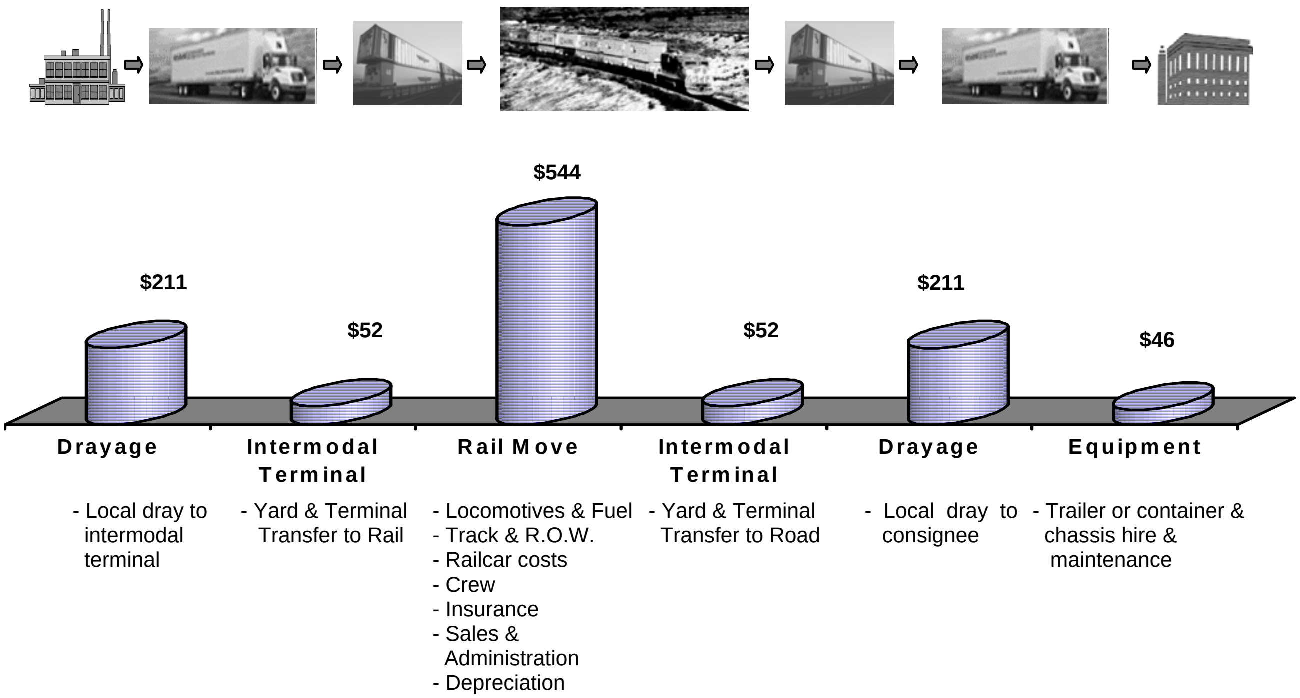
Trucking Move Transportation Components on Atlantic Coast Corridor
Total Carrier Cost: $1,881 Transit Time: 54.5 hours



[2] Refer to Chapter IV of this report for a complete description of these cost elements on all four corridors.

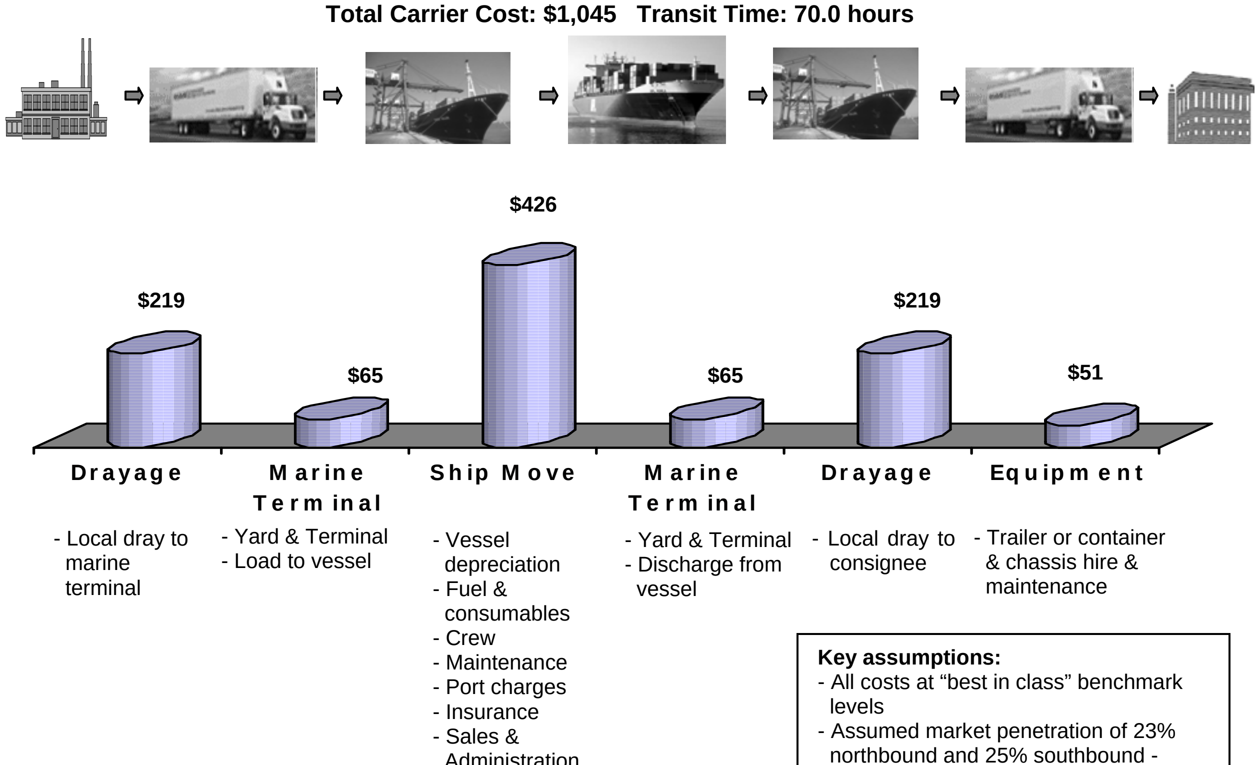
Rail Intermodal Move Transportation Components on Atlantic Coast Corridor

Total Carrier Cost: $1,070   Transit Time: 60.5 hours



Short-Sea Shipping Move Transportation Components on Atlantic Corridor

Total Carrier Cost: $1,045   Transit Time: 70.0 hours



Key assumptions:
- All costs at "best in class" benchmark levels
- Assumed market penetration of 23% northbound and 25% southbound - providing vessel (140 truckload equivalents capacity)utilization of 83% northbound and 71% southbound

Initial Hypotheses

As an initial working hypothesis, the project team assumed that in order for short-sea shipping to serve as a viable transportation option, it needed to be competitive with trucking in terms of its combination of cost and service level features. However, the intent was not to create a directly competing mode for highway traffic, but rather one that would complement current services provided by U.S. trucking companies. Consequently, U.S. trucking companies (and third-party intermediaries) were assumed to be the primary customers of the service. Within this scenario, domestic short-sea vessel operators would function primarily as line-haul water transportation service wholesalers, comparable to how existing U.S. intermodal rail line-haul service is provided by the railroads. Under this business model, the cargo base for the short-sea mode would continue to be retailed to cargo shippers by the motor carriers and intermodal marketing companies (IMC's) that market overland services today. Consequently, the critical decision makers for the success of short-sea shipping would be the trucking companies and IMC's that might use short-sea services based on a value proposition that could combine a lower total cost of delivering door to door transportation within the freight corridors they currently serve with acceptable service levels of transit time and schedule reliability. As with over the road trucking and intermodal rail service, the quality of service in terms of schedule reliability and loss and damage to cargo and equipment was considered likely to be an important factor in short-sea shipping's commercial success as well as the per-mile rate charged for the service.

In a two-phased research effort, the project team began with a market-sizing analysis in multiple dimensions, utilizing freight traffic data resources to define competitive opportunities for short-sea shipping services in multiple coastal and inland corridors. The initial market-sizing phase was designed to lay the groundwork and to establish the focus for the second phase of research, in which stakeholder interviews and corridor specific logistics assessments would examine the more promising corridor opportunities in finer detail.

Key Findings

The Potential Market

- Around 78.2 million trailer loads of highway and rail intermodal freight is calculated to have moved between origins and destinations at least 500 miles apart and within 250 miles of a port along the U.S. contiguous coasts in 2003. This long-haul coastal truck and rail intermodal traffic accounted for 15 percent of total U.S. intercity truck and intermodal rail traffic.

- The potential domestic coastal shipping market is significantly imbalanced, with "northbound" flows of 51.8 million trailer loads being almost twice the volume of the 26.4 million "southbound" flows

- The largest inter-regional traffic flow is from the Gulf Coast to the New York, New Jersey, Pennsylvania (NYNJPA) region at 10.1 million trailer loads

- Three other northbound lanes also have substantial volumes of around six million trailer loads a year: South Atlantic to the NYNJPA region, Gulf of Mexico (Gulf) to the Mid Atlantic, and the Gulf to Florida

- Four potential short-sea shipping corridors were selected to be evaluated as corridor projects on the basis of their potential traffic volumes, the balance of directional flows, prospective port locations outside of major congestion areas, and geographic diversity – i.e. a selection of routes that covered a variety of U.S. coastal regions as well as the Great Lakes rather than simply the largest volume corridors:

  – *Gulf to Atlantic Coast Corridor* – between the ports of Beaumont, TX and Camden, NJ

  – *Atlantic Coast Corridor* – between the ports of Port Canaveral, FL and New Haven, CT

  – *Pacific Coast Corridor* – between the ports of San Diego and Oakland, CA, and Astoria, OR

  – *Great Lakes Corridor* – between the ports of Milwaukee, WI and Muskegon, MI

Stakeholder Interviews

Interviews were conducted with a total of 29 organizations that have a potential stake in the successful development of short-sea shipping services in the United States. These "stakeholders" include motor carriers and intermodal marketing companies, ocean carriers, port operators, shipbuilders, and industry organizations. The following were the key findings from the interviews:

Motor carriers and intermodal marketing companies:

- Indicated interest in how short-sea shipping may help alleviate their problems with driver shortages, rising fuel and labor costs, and increasing road and rail network congestion.

- A number of interviewees, however, voiced some skepticism on whether domestic maritime transport would be able to deliver the necessary speed and schedule reliability for short-sea shipping to be considered an alternative to current ground transport services.

- Key issues were the perceived risk of potentially costly delays for traffic moving through ports due to the involvement of longshore labor as part of the transportation service and the possibility of a high volume of empty equipment repositioning.

- Motor carrier interviewees tended to look at short-sea shipping as a complete "value proposition" in terms of both cost and service attributes when comparing to current modes of operation – i.e. if the cost advantage of short-sea shipping was sufficient to offset longer transit times, they would consider using it for a portion of their freight.

Ocean carriers:

- Generally indicated strong interest in the concept.
- Believed that a "fresh approach" was necessary to make domestic coastal shipping an operational reality in terms of avoiding current international port congestion points and entering into longshore and seafaring labor agreements that are specially designed for domestic coastal shipping to provide the necessary level of efficiencies to compete with ground transport.
- Were prepared to work closely with trucking companies in the planning and marketing of short-sea shipping as an additional "lane" to their current services rather than a competing mode.
- Noted that the principal obstacles to effective development of short-sea shipping services were the cost of domestically built cargo vessels, high stevedoring costs in U.S. ports, and manning levels for self-propelled vessels engaged in domestic commerce, as well as the cost to shippers of Harbor Maintenance Tax (HMT) assessed on domestic shipments.
- Would look to develop a "partnership" between ocean carriers, shipbuilders, and perhaps the U.S. government to facilitate the development of standard vessel designs for short-sea shipping that could be built by U.S. shipyards and suppliers on a modular basis with long production runs, thereby bringing vessel costs down.

Port operators:

- Identified several key success factors for domestic short-sea shipping including ensuring that port labor agreements are developed up front that provide the necessary high levels of productivity and cost-efficiency necessary to be competitive with ground transport, providing immediate access to major highways and close proximity to major cargo origins and destinations, and the availability of sufficient terminal capacity.
- Some viewed HMT as a major obstacle for shipper acceptance as well as the likely difficulty in obtaining new labor agreements for short-sea shipping on the Pacific Coast.

Shipbuilders:

- Noted that the high cost of U.S.-built ships was due to several factors including lack of shipbuilding subsidies, small volume of commercial shipbuilding in U.S., high mark-ups charged by suppliers of vessel machinery and equipment to U.S. shipyards, and U.S. regulations.
- Indicated that a major sustained commercial vessel-building program (12-15 vessels for a yard over 3 to 4 years at least) would significantly bring down U.S. new building prices, although they may not be able to fully close the gap with foreign shipyards.

Corridor Projects

The project team analyzed four corridor case studies to evaluate the commercial feasibility of short-sea shipping on four prospective corridors:

- *Gulf to Atlantic Coast Corridor* – between the ports of Beaumont, TX and Camden, NJ
- *Atlantic Coast Corridor* – between the ports of Port Canaveral, FL and New Haven, CT
- *Pacific Coast Corridor* – between the ports of San Diego and Oakland, CA, and Astoria, OR
- *Great Lakes Corridor* – between the ports of Milwaukee, WI and Muskegon, MI

In addition to the carrier's costs for the respective modes on each corridor, the total cost for moving a trailer-load of freight on the corridor that would be incurred by a shipper was calculated. The shipper's cost would include any "mark-up" or profit margin added by the carrier as well as the incremental inventory carrying costs incurred by the shipper due to the slower transit times of the rail intermodal and short-sea shipping service options, and the payment of Harbor Maintenance Tax (HMT) that would apply in the short-sea case alone. The shipper's cost for short-sea shipping was calculated on the basis of current domestic shipping costs as well as on a hypothetical "best in class" basis. The results for the four corridors are provided in the table below.

Table I-1
Comparative Performance of Short-Sea Shipping
versus Alternative Modes on the Four Corridors
in terms of Shipper Cost per Highway Mile and Transit Time

	Truck		Rail Intermodal		Short-Sea Status Quo		Short-Sea "Best in Class"	
	Cost	Time	Cost	Time	Cost	Time	Cost	Time
Gulf/North Atlantic	$1.77	67.5 hrs	$1.06	86 hrs	$1.13	111 hrs	$1.03	111 hrs
South Atlantic/North Atlantic	$1.73	54.5 hrs	$1.09	60.5 hrs	$1.12	70.0 hrs	$1.00	70.0 hrs
South Pacific/North Pacific								
- San Diego/Astoria	$1.58	56.0 hrs	$1.01	62.0 hrs	$1.29	115 hrs	$1.14	115 hrs
- Oakland/Astoria	$1.59	33.0 hrs	$1.35	39.5 hrs	$0.95	68.7 hrs	$0.86	68.7 hrs
- Oakland/San Diego	$1.56	22.0 hrs	$1.90	34.0 hrs	$1.93	55.1 hrs	$1.75	55.1 hrs
Intra-Great Lakes	$1.51	9.5 hrs	N.A.		$1.32	7.5 hrs	$1.24	7.5 hrs

The results of the corridor case studies demonstrate that short-sea shipping service may be commercially viable on a cost basis although it cannot match the transit times of over the road trucking. The following conditions appear to be important factors for short-sea shipping to be commercially viable:

- The market in a traffic corridor has enough density to enable relatively large vessels that provide scale economies in terms of operating and capital cost to be deployed with high enough service frequency to be competitive with trucking – this appears to be the case in the Gulf to Atlantic Coast corridor and not so in the particular port-pairs selected for the Atlantic Coast corridor in this project

- Vessel capital and crew costs as well as marine terminal expenses must be set at “best in class” levels for U.S. operations for short-sea shipping to be price competitive with ground transport alternatives on a door-to-door basis – this appears to be doable in three of the four corridor projects with the Pacific Coast corridor being the exception in terms of marine terminal expenses

- Short-sea shipping can be particularly competitive for heavy and/or hazardous shipments currently moving over the road such as chemicals

- When short-sea shipping provides a more direct point-to-point routing and/or avoids areas of traffic bottlenecks and urban congestion, it can be highly competitive with ground transportation in terms of both cost and transit time – such as in the Great Lakes corridor

II. Market Sizing

The great majority of U.S. truck freight travels only a relatively short distance, and is thus not conducive to intermodal transportation such as short-sea shipping. Likewise, many freight movements occur in volumes and at frequencies not generally appropriate for intra-coastal ocean service. Consequently, successful market penetration by SSS will be a function of two primary factors: (1) relative length of haul, and (2) the level of concentration of volume in specific traffic lanes. As the distance between freight origin and destination increases and lane volume (density) grows, intermodal services – such as short-sea shipping – become more competitive relative to highway transport, and their cost advantage increases. Analyzing the relative lengths-of-haul and lane densities of truck traffic moving into and out of various regions of the U.S. with access to coastal ports was the first step in quantifying transportation market prospects for short-sea shipping.

TRANSEARCH® Database and the Market Analysis Methodology

In order to determine the scope of potential new business opportunities for short-sea shipping, the study team utilized a well-tested methodology to quantify the overall cargo markets for this project. Using Global Insight's TRANSEARCH® freight flow databases, road and rail intermodal freight traffic volumes moving into and out of specific geographic market zones were identified and analyzed for their potential to be diverted to the short-sea mode. TRANSEARCH® is a commodity flow database produced annually from over 100 public and private data sources for traffic samples that are converted into a common framework. Economic modeling is used to develop a comprehensive picture of U.S. freight movements to compensate for situations where data are limited or confidential, and to check elements such as spatial patterns and logic, and to create forecasts. TRANSEARCH® geographic definitions are produced at the level of county, Business Economic Area (BEA), 3-digit zip code, metropolitan area, or state. Goods are defined by commodity (STCC), with volumes in terms of truckloads, tonnage, and value. For this project, the 2003 edition of county-level TRANSEARCH® was used. For the rail carload and intermodal rail data, the Surface Transportation Board's (STB) Private Rail Waybill Sample for 2003 was used. The rail and truck data were processed separately, and the results combined.

Working together with the project team from the U.S. Department of Transportation (USDOT), the study team identified several candidate origin-destination corridors that contained a combination of factors favorable to the economic and service requirements of short-sea shipping services, including:

High potential volume: Whereas current short-sea shipping services target less service sensitive traffic and specific market niches, we sought to identify markets in which economic volumes of similar traffic were likely to exist. Thus we filtered out candidate lanes that could not generate sufficient traffic to support a short-sea shipping's niche service focus working on the assumption that for SSS to be competitive with truck services there needed to be enough volume to support sailing frequencies on a near daily basis.

Port operating conditions: USDOT and the study team evaluated the relative attractiveness of individual U.S. ports based on capacity to handle a significant increase in cargo volume, labor availability and cost, vessel and motor carrier access, market reach and catchment area, and, in particular, the lack of highway congestion in the immediate port area. Evaluation of these factors helped focus the region-to region traffic flow opportunities to a select group of port facilities that were evaluated in the second phase of work[3].

Moderate pick-up and delivery lengths of haul: The coastal nature of short-sea shipping services suggests that areas with catchment areas concentrated around port regions are more likely to be successful from an operating and economic standpoint as truck repositioning costs are reduced and utilization improved. Discussions with steamship lines, motor carriers and port operators suggested that the greatest cargo opportunities would stem from shippers and receivers within a 250 mile radius of the port. Thus, markets that offered densely populated or industrially concentrated volumes proximate to coastwise shipping were favored over those for which pick-up and delivery services were more dispersed.

Determination of Port Hinterland Zones and Lake Crossings

To determine SSS potential market hinterland zones or catchment areas and inter-regional traffic flows to use for the analysis, a comprehensive list of U.S. ports was created and TRANSEARCH flows originating and terminating within a round-trip day's truck dray (250 miles radius) were identified (see Table II-1 below for examples of port hinterlands). The study team, working together with the USDOT project managers, then selected port pairs that have a high volume potential from the market demand side, based on the historic TRANSEARCH market demand, the potential of the ports to handle SSS freight traffic, and lengths of haul. Subsequently, all available traffic was assigned to unique zone-to-zone origin-destination pairs, which forms the basis of the results reported here.

[3] To some extent, these facilities are substitutable. Bridgeport, CT might be substitutable for New Haven, CT or Wilmington, DE for Camden, NJ. <u>The opportunities identified in the study are not necessarily specific to the port facilities indicated, but rather are "regionally" constrained to the proximate coastal area.</u>

Table II-1
Coastal Market Hinterland Definitions

East/Gulf Coasts Market Zones

Port City	Maximum Dray Miles	Hinterland Definition
Beaumont, Texas	250	Texas Coast, Shreveport, and Lake Charles
Canaveral, Florida	250	Florida peninsula north to Jacksonville
Savannah, Georgia	250	Charleston, Atlanta, and south to Jacksonville
Camden, N.J.	250	Northeast region, south to DC and east to Hudson River
New Haven, Conn.	250	New England, west to Hudson River

West Coast Market Zones

Port City	Maximum Dray Miles	Hinterland Definition
San Diego, Calif.	100	Southern Los Angeles basin, northwest to Orange County line
Port Hueneme, Calif.	100	Northern Los Angeles basin, southeast to Orange County line
Bay Area, Calif.	100	Most of Bay Area
Astoria, Oregon	250	Canadian border to Eugene, OR

Source: Global Insight, Inc.

While dray mileages for the East/Gulf Coast zones were set at approximately 250 miles, drayage distances at California locations were substantially reduced. For San Diego and the Los Angeles region (Port Hueneme), this was done to eliminate overlapping markets, recognizing that it would be unlikely that freight would move significant distances in the "wrong" direction (i.e. away from its ultimate destination) given the relatively short distances between Southern California and the Bay Area region.

For Great Lakes traffic, a number of lanes were identified (see Table II-2 below) based on geographical constraints and routing considerations, with the implicit assumption that if a bridge offered a shorter origin-termination mileage, the bridge or land crossing would be used.

Table II-2
Great Lakes Market Hinterland Definitions

Great Lakes Crossing Lanes

Lake Crossing	Hinterland Definition
Lake Erie	London, Ontario to Conneaut, Ohio
Lake Ontario	Brighton, Ontario to Rochester, NY
Lake Superior	Thunder Bay, Ontario to Chicago or Copper Harbor
Lake Michigan	Grand Haven, MI to Milwaukee, WI

Source: Global Insight, Inc.

Nautical mileage data for vessel operations was obtained from the NOAA publication *U.S. Port to Port Distances*, while the highway and rail mileages were based on shortest path data from the Oak Ridge National Laboratory (ORNL) national highway and intermodal network, and routed using ORNL county-to-county routing protocols.

The Potential Coastal Market

In identifying the potential short-sea shipping market for coastal shipments, traffic flows that had a highway travel distance of less than 500 miles were eliminated to avoid short-distance traffic that would be unrealistic for a short-sea intermodal service to capture. This also removed local flows that were routed through the same port or an adjacent port in the same county (i.e. resulting in two long drays with ocean transit of only a few miles). To limit the size of the database, flows that generated less than one truckload per year were also removed. Bulk commodities that are not commonly containerized or carried in highway trailers but would move by water in large bulk ships or barges were also removed as potential traffic. Excluded were such commodities as ores (STCC 10), coal (STCC 11), crude oil (STCC 13), and minerals (STCC 14). Following these steps, a database was developed that contained the total prospective market that represented traffic flows that could conceivably be captured by short-sea shipping services if certain other conditions were met. Other conditions that were not analyzed in this initial assessment include scheduling concerns, transit time, commodity type and value, and cost of transportation.

Working within these market definitions, a total of around 78.2 million trailer loads of highway and rail intermodal freight are calculated to have moved between origins and destinations 500 miles apart along the U.S. contiguous coasts in 2003.[4] This long-haul coastal truck and

[4] A distinction should be drawn between the measurement of domestic truck and rail intermodal volumes versus international container shipments. In the case of international traffic, volume is typically measured in Twenty-foot Equivalent Units (TEUs), which correspond to multiples of a standard twenty-foot ISO container. In contrast, domestic traffic as represented in this report is stated in trailer loads as would be operated for a given commodity. For dry van traffic, typically this would be either a 48 or 53-foot long trailer. This difference in capacity must be taken into account when ship capacity requirements are examined.

intermodal traffic accounted for 15 percent of total U.S. intercity truck and intermodal rail traffic in 2003 that is estimated by Global Insight at 527 million trailer loads. The inter-regional flows of coastal truck and intermodal traffic are described in Table II-3 below. It should be noted that the data in the table identifies revenue-paying freight traffic in trailer loads and consequently does not include empty trailer and container traffic moving within the U.S. inland transportation system.

Table II-3
U.S. Inter-Regional Coastal Truck and Rail Intermodal Traffic
(Thousands of Truckloads of Freight in 48' and 53' Trailers)

Destination: \ Origin:	New England	NYNJPA	Mid Atlantic	South Atlantic	Florida	Gulf	East Gulf	West Gulf	South Pacific	North Pacific
New England			895	1,627	1,087	2,766				
NYNJPA			1,200	6,019	3,470	10,110				
Mid Atlantic	527	457		1,265	2,716	5,920				
South Atlantic	474	3,075	636		1,598	4,821				
Florida	417	2,688	2,134	522		5,689				
Gulf	737	2,995	2,123	3,701	2,667					
East Gulf								619		
West Gulf							1,785			
South Pacific										1,447
North Pacific									1,969	

(shaded cell): Denotes northbound traffic flow

Source: Transearch® a product of Global Insight, Inc.

The data in Table II-3 demonstrates several key factors concerning the potential coastal shipping market:

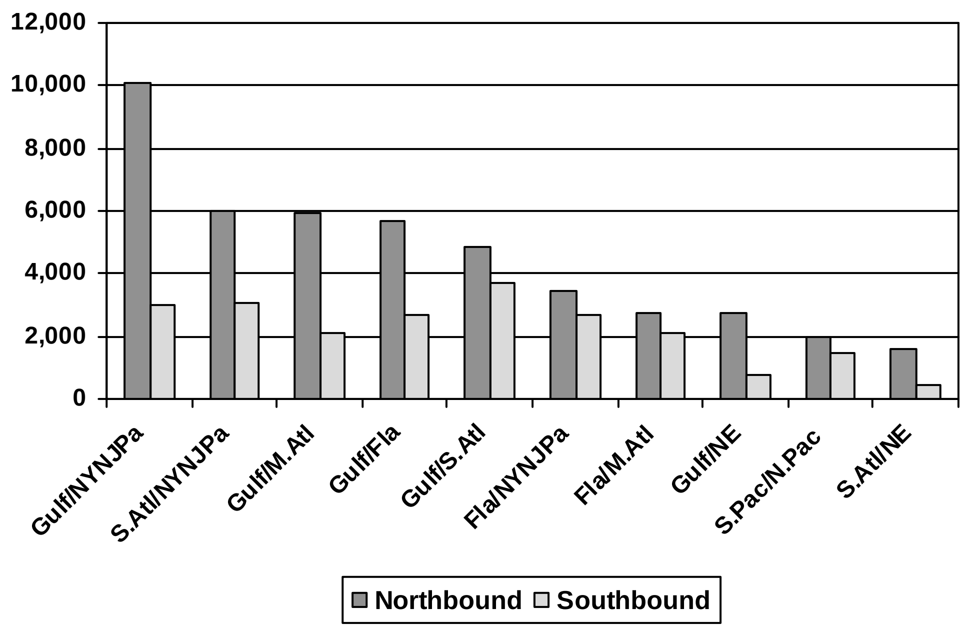
- The market is significantly imbalanced, with "northbound" flows of 51.8 million trailer loads being almost twice the volume of the 26.4 million "southbound" flows
- The largest inter-regional traffic flow is from the Gulf Coast to the New York, New Jersey, Pennsylvania (NYNJPA) region at 10.1 million trailer loads
- Three other northbound lanes also have substantial volumes of around six million trailer loads a year: South Atlantic to the NYNJPA region, Gulf to the Mid Atlantic, and the Gulf to Florida

- On a "daily" basis (excluding weekends – i.e. for a total of 260 work days per year), these flows account for around 23,000 trailer loads per day for the six million trailer load lanes up to almost 39,000 trailer loads per day moving from the Gulf to the NYNJPA area

The extent of the imbalance issue is further demonstrated in Table II-4 below that shows that in the largest single corridor, Gulf Coast to and from the NYNJPA region, southbound flows are less than 30 percent of northbound traffic volumes. The lanes with the best balance, Gulf/South Atlantic, Florida/NYNJPA, Florida/Mid Atlantic, and South Pacific/North Pacific have much less density.

Table II-4
Truck and Rail Intermodal Traffic Volumes
in Major Domestic Coastal Corridors

(Truckload equivalents in thousands in 2003)



Source: Transearch®, a product of Global Insight, Inc.

The Potential Great Lakes Market

In order to determine the potential markets for cross-Great Lakes traffic, a distance-based best routing method was used. For example, for traffic moving from one side of Lake Michigan to the other, counties on either side of the lake that had a shorter distance to the port (either Grand Haven, MI or Milwaukee, WI) than to the southern tip of Lake Michigan (i.e. the Gary/Portage, IN area) were selected as the potential "catchment area" for that particular cross-lake service. Selecting the appropriate county-to-county flows from the TRANSEARCH database then identified truck and rail traffic that could flow over the cross-lake links.

Within a particular "catchment area," all traffic was assumed to be theoretically "capturable" if certain other conditions were met, such as scheduling concerns and transit time. For this part of the analysis, the total amount of potentially capturable traffic was first identified without a market-penetration assumption being applied. It was assumed that all traffic with a shorter all-land routing would use the all-land routing, while all traffic with a shorter combined land plus water mileage would be a candidate for the shipping service.

In the case of the Great Lakes crossings, the potential base cargo volumes were calculated using the routing assumption as described above. Although all the traffic as shown in Table II-5 below can theoretically attain mileage savings by utilizing a cross-lake shipping service, these mileage savings do not necessarily translate into time savings, and no attempt was made to quantify the number of miles saved. Thus, the results as described in Table II-5 should be treated only as a total potential market sizing exercise and not as conclusions on divertible volumes based on a percentage-of-market assumption.

Table II-5
Annual Truck and Rail Intermodal Volumes for Great Lakes Crossing on Best Routing Assumption
(Truckload equivalents in 2003)

	Lake Crossing:			
Mode & Direction:	**Lake Erie**	**Lake Ontario**	**Lake Superior**	**Lake Michigan**
Northbound or Westbound				
Rail loads	0	780	0	0
Truck loads	2,340	59,800	7,020	207,740
Southbound or Eastbound				
Rail loads	0	12,480	2,340	2,340
Truck loads	260	40,820	1,820	81,900

Source: Transearch®, a product of Global Insight, Inc.

As demonstrated in the table above, the most promising cross-lake corridor appears to be the Lake Michigan crossing that bypasses the congested Chicago area. Generally the rail traffic traveling in these corridors is of a long-haul nature and does not achieve mileage savings by crossing the lake, whereas substantial short-haul truck traffic appears to have contributed to the large size of the corridors shown above. The other lake crossings lack significant centers of economic activity on the north shore of the lake, and thus do not appear to generate a large volume of traffic. Although there is substantial mining and farming business activity in some of these regions, large volumes of commodities generated by these industries such as iron ore and grain tend to move in bulk in vessels or barges, and are not suitable for the envisioned truck-water intermodal shipping service.

Short-Sea Shipping Corridors Selected for Analysis as Corridor projects

Based on the market sizing exercise described above, the study team in conjunction with USDOT representatives selected four potential short-sea shipping corridors to be evaluated as corridor projects. The selection criteria for these corridors included such factors as the volume of traffic, the balance of directional flows, prospective port locations outside of major congestion areas, and geographic diversity – i.e. a selection of routes that covered a variety of U.S. coastal regions as well as the Great Lakes rather than simply the largest volume corridors.

The following are the pilot project corridors selected with the representative ports in each region:

- *Gulf to Atlantic Coast Corridor* – between the ports of Beaumont, TX and Camden, NJ
- *Atlantic Coast Corridor* – between the ports of Port Canaveral, FL and New Haven, CT
- *Pacific Coast Corridor* – between the ports of San Diego and Oakland, CA, and Astoria, OR
- *Great Lakes Corridor* – between the ports of Milwaukee, WI and Muskegon, MI

Coastal Corridors

The total of potentially daily truckload volumes for the coastal corridors was calculated assuming a port catchment area of up to 250 miles from the ports at each end of the corridor. The results for coastal truck freight between a number of selected ports in the Atlantic/Gulf and Pacific Coast ranges are summarized in Tables II-6 (a) and II-6 (b) below, with the high-potential lanes highlighted.

Table II-6 (a)
Daily Truck Traffic Volumes between
Selected Atlantic and Gulf Coast Port Hinterlands

Destinations

Origins	New Haven	Camden	Savannah	Florida	Beaumont
New Haven			412	377	346
Camden			1,132	585	729
Savannah	892	1,961		206	649
Florida	478	705	290		239
Beaumont	700	2,037	1,080	677	

Daily Truck Volumes, East Coast

Source: Transearch®, a product of Global Insight, Inc.

Table II-6 (b)
Daily Truck Traffic Volumes
between Selected Pacific Coast Port Hinterlands

Destinations

Origins	Oakland	Hueneme	Astoria	San Diego
Oakland			525	397
Hueneme			700	.
Astoria	1,176	477		336
San Diego	555	.	144	

Daily Truck Volumes, West Coast

Source: Transearch®, a product of Global Insight, Inc.

Potentially base daily rail intermodal trailer load volumes were also calculated based on a 250-mile port hinterland. These results, shown in truckload equivalent units, are summarized in Tables II-7 (a) and II-7 (b) below, with the high-potential lanes highlighted.

Table II-7 (a)
Daily Rail Intermodal Traffic Volumes
between Selected Atlantic and Gulf Coast Port Hinterlands

Destinations

Origins	New Haven	Camden	Savannah	Florida	Beaumont
New Haven			449	385	360
Camden			1,450	644	776
Savannah	958	2,328		249	687
Florida	487	892	305		246
Beaumont	779	2,390	1,233	762	

Daily Truck and Intermodal Volumes, East Coast

Source: Transearch®, a product of Global Insight, Inc.

Table II-7 (b)
Daily Rail Intermodal Traffic Volumes
between Selected Pacific Coast Port Hinterlands

Destinations

Origins	Oakland	Hueneme	Astoria	San Diego
Oakland			665	406
Hueneme			907	
Astoria	1,495	833		474
San Diego	587		166	

Daily Truck and Intermodal Volumes, West Coast

Source: Transearch®, a product of Global Insight, Inc.

As demonstrated in the above tables, there is significantly less rail intermodal traffic moving in these corridors than truck traffic, with high potential rail intermodal volumes occurring only in two market pairs in each case. Rail intermodal markets are also noticeably less balanced than truck markets. As a result, a total traffic flow of 150 daily carloads or above is considered significant, compared with at least 500 daily truckloads required to make the cut as in Table II-6.

Great Lakes Corridors

Potentially daily truckload volumes were calculated for the intra-Great Lakes lanes on the same basis as employed for the coastal corridors. The identified market opportunity for the Great Lakes candidate corridors is described in Table II-8 below.

Table II-8
Daily Rail Intermodal and Truck Traffic
across Great Lakes Regions

Lake Crossing

Mode & Direction			Lake Erie	Lake Ontario	Lake Superior	Lake Michigan
Northbound or Westbound		Rail (Loads)	0	3	0	0
		Truck (Loads)	9	230	27	799
Southbound or Eastbound		Rail (Loads)	0	48	9	9
		Truck (Loads)	1	157	7	315

Daily Volumes in Truckloads, Best Routing Assumption

Great Lakes

Source: Transearch®, a product of Global Insight, Inc.

Transportation markets around the Great Lakes provide some of the largest potential volumes of truck traffic for a short-sea service of any of the market pairs studied. This is a logical result of the fact that both road and rail intermodal alternatives are appreciably handicapped by time, distance, and urban congestion when moving around the perimeter of the Great Lakes compared to a maritime service directly across the lake. Because of this significant short-sea potential cargo base, the *Great Lakes Ferry* operations – specifically for a lane across Lake Michigan – were selected for further analysis as one of the business cases to be evaluated as a pilot project.

III. Results of Stakeholder Interviews

A series of 29 interviews were conducted with potential stakeholders in domestic short-sea shipping services as Phase II of the project. The organizations that participated in the interviews are listed in Table III-1 below. The purpose of the interviews was to obtain insights on key issues concerning short-sea shipping operations from the perspective of potential *users* of such a service (including, in particular, trucking companies and domestic intermodal service providers), and the possible *providers* of both the services and assets to support such a service (including ocean carriers, port operators, and shipbuilders). The interviews helped the project team to gain additional perspectives on the extent of the market opportunity, key service and cost requirements for short-sea shipping relative to other modes, potential obstacles to implementation, and areas for further evaluation by policy makers regarding the development of domestic short-sea shipping services. Interviewees were also able to confirm a number of initial working hypotheses for the project team, refute others, and helped to identify others that were not visible from the initial quantitative market analysis. Fieldwork was conducted in stages. A first round of interviews explored general impressions of the proposed service option, while a second round of interviews was used to test the economic and service assumptions of the corridor case studies.

Table III-1
Participants in Short-Sea Shipping Feasibility Interviews

Motor Carriers and Intermodal Intermediaries • C.H. Robinson • Hub Group • J. B. Hunt • Major Integrated Transportation Company • Schneider National • Trimac Transportation • Xpress Global Systems **Ocean Carriers** • Crowley Maritime • Detroit-Windsor Truck Ferry • Horizon Lines • Matson Navigation • Osprey Lines • SeaBridge • Sea Star Lines • Totem Ocean Trailer Express • Tropical Shipping	**Port Authorities and Operators** • Bridgeport, CT • Massachusetts Port Development Director (Fall River & New Bedford) • New Haven, CT • Port of Astoria, OR • Port Canaveral, FL • Port Hueneme, CA • Port of Milwaukee, WI • Port of San Diego, CA • Port of Tacoma, WA **Shipbuilders** • A.P. Moller • Kvaerner Philadelphia Shipyard • VT Halter Marine **Others** • Short-Sea Shipping Cooperative

Key findings from each of the groups of participants in the interview process are described below.

Motor Carriers and Intermodal Intermediaries

Seven major motor carriers and intermodal marketing companies were interviewed in the course of the project. In general, the companies interviewed indicated an interest in how short-sea shipping may help to alleviate the very real problems they face in terms of driver shortages, rising fuel and labor costs, and increasing road and rail network congestion. However, several of the interviewees voiced a healthy skepticism on whether domestic maritime transport would be able to deliver the required speed and reliability of service necessary for short-sea shipping to be considered as an alternative to current long-haul trucking and rail intermodal services.

Key issues for the ground transport operators were the perceived risk of costly delays for traffic going through ports due to relatively inefficient port operations caused, in part, by prevailing labor practices and the potentially high volume of empty equipment that may need to be repositioned. Ground transportation operators tended to look at short-sea shipping as a total "value proposition" offering both cost and service attributes that would have to be compared to their current modes of operation. Cost on its own may serve as an incentive or a disincentive to switch modes but was typically not viewed as the dominant decision factor. They typically felt that a shipper would consider a short-sea intermodal service as a viable option if it offered a price advantage versus an all-highway truck movement – provided that the short-sea intermodal operator met speed and reliability requirements.

Perceived Opportunities for Short-Sea Services

Several interviewees stated that they are interested in new ways to move freight within the U.S. The shift of large volumes of long-haul truck freight to rail intermodal over the last twenty years provides a useful example of such a modal shift. However, with the rail intermodal network facing increasing capacity constraints of its own, ground carriers stated that they are open to new transport solutions. In the face of current high fuel costs, driver shortages, increasing traffic congestion, and tighter emission regulations, short-sea services were perceived as a possible source of much-needed growth capacity that may otherwise not be attainable. The benefits of a short-sea intermodal operation for truckers would be to focus driver resources on more profitable regional work, allowing short-sea vessels to perform the long-haul segment of door-to-door transportation. Several motor carriers indicated that rail intermodal operations are currently providing better profit margins than their long-haul over-the-road trucking services. Motor carriers were interested in whether similar financial performance could be obtained from short-sea shipping services.

While virtually all interviewees noted that short-sea shipping needed to offer economies and service reliability and consistency similar to levels being obtained today by long-haul trucking and rail intermodal operations, opinions differed on the required frequency of service. Some carriers felt that daily frequency would be a requisite in high volume corridors, while others believed that two to three day service frequency would be adequate, particularly in the early stages of service development. Short-sea shipping tended to be viewed as being primarily suitable for less time-sensitive freight that would then require a competitive price for truckers to switch.

Consistent with the traffic data reviewed in the previous chapter, several interviewees believed that the Gulf/Mid to North Atlantic corridor offered particular potential. However, it was noted that for sensitive commodities such as chemicals that appear to make up a large portion of the loads moving out of the Gulf, having a trained driver accompany the shipment in its entirety was an important service feature to chemicals shippers. A short-sea shipping service would need to meet chemicals shippers' concerns about safety and quality control of their cargoes while in transit by assuring shippers that vessel crews, on-board cargo monitoring systems and drayage operators had equivalent training and skills in handling chemicals shipments as current over the road operators. It was also noted that many chemical shipments require an empty return leg for the specialized equipment. If short-sea shipping could reduce the repositioning cost by moving the trailer or container on an unaccompanied basis in addition to the cost advantage of a water versus over the road movement, this could be an added benefit in penetrating the Gulf/Mid to North Atlantic corridor, particularly for chemicals and hazardous materials. One interviewee noted that it was becoming increasingly difficult for trucking companies to hire and retain hazardous materials-qualified drivers, particularly for long-haul movements. Short-sea shipping on coastal routes could help alleviate this particular driver shortage, provided drayage operators were suitably qualified.

Despite the relatively low density of the Pacific Coast prospective short-sea market and possible high port costs, some interviewees suggested that this market may still have strong potential due to the very weak north-south rail service provided and increasingly serious road congestion. Also, it was noted that the Pacific Coast corridor had generally better balance in northbound versus southbound loads compared to the Gulf and Atlantic Coast corridors.

Several of the ground carriers also noted that ports served by a short-sea shipping service needed to be in areas of high freight density that would minimize drayage distances, while still avoiding areas of high congestion. For example, one interviewee noted that the ability of a short-sea service to bypass areas of extreme congestion such as the New York City area and still deliver freight to markets such as Long Island, NY would be a major plus.

There was close to unanimity among interviewees that a short-sea shipping service fully integrated into the domestic transportation system must be set up for 48' and 53' trailers and/or containers. While it was conceded that some heavy cargoes such as chemicals moving out of the Gulf may be carried efficiently in ISO marine containers, the larger "high cube" units as used on U.S. highways today would be necessary to capture the high volumes of consumer goods and merchandise moving along the coastal corridors. Motor carriers tended to be more interested in using their own equipment for a short-sea operation and consequently looked at RoRo trailer vessel operations as being more attractive than LoLo containership operations.

Perceived Obstacles to Short-Sea Adoption

Ground carriers interviewed frequently used domestic rail intermodal service as a benchmark for cost and service level comparisons to a short-sea shipping alternative. Key concerns were that short-sea service reliability and consistency may not be acceptable to their shipper customers that marine terminal cut-off times would not match truckload carriers' needs, and that door-to-door transit times via short-sea would not meet customers' needs and expectations. In addition, some of the ground carriers interviewed expressed concern that ocean carriers are sometimes difficult to do business with, and that the economics of short-sea services, with the multiple container handlings and prevalent labor shortages would be questionable. A particular concern was that coastal transit times would be too slow to meet shippers' requirements even if consistent on-time performance levels were achieved.

Motor carriers noted that they would be generally willing to provide highway trailers if used in a roll-on/roll-off vessel service but that they would be unwilling to provide marine containers, seeing that as the role of the ocean carrier or perhaps a third-party provider.

Several other issues were identified that would require resolution for short-sea services to be successful, including:

- *Container chassis management*: Motor carriers are looking to the ocean carriers to assume the responsibility for chassis supply and coordination

- *Ground Storage Capacity* is currently at a premium at most ports. The current policy of managing capacity through surcharges will discourage growth of comparatively low revenue domestic transportation

- *Equipment tracking and security*: Motor carriers expect that ocean carriers can supply frequent and timely GPS location information (not necessarily at the trailer level, however) on in-transit goods. Shipment protocols would need to address shipment security while on the water, including the transfer of liabilities to the ocean carrier

- *Equipment flexibility*: Motor carriers indicated that any short-sea service that sought to attract domestic trade needed to accommodate 48 and 53-foot domestic containers

- *Ride quality*: Motor carriers were uncertain what "ride quality" issues might emerge in short-sea shipping, particularly in "roll-on-roll-off" (RoRo) trailer service. They suggested some testing might be appropriate to develop baseline metrics for RoRo, LoLo (lift-on-lift-off) and stevedoring activities

- *Information systems support* to coordinate "hand-offs", between motor carriers, ports and ocean carriers would be a critical service component to ensure a seamless service

- *Growth risk*: Who will absorb start-up losses, and what commitments will be made by ocean carriers to provide dependable service, and the assurance to its continuation?

Ocean Carriers

Almost all of the nine current and prospective operators of domestic short-sea shipping services interviewed were supportive of the concept and believed it could be effectively implemented on a large scale with the removal or resolution of a number of critical obstacles. Several of the companies interviewed also indicated that they were currently conducting their own internal analyses of possible domestic coastal shipping services. All of those interviewed indicated that the major market potential for short-sea shipping would be on relatively long-haul routes of well over 500 miles where the cost advantage and consistent steaming speed of ocean transport would compensate for additional port terminal-handling time and costs and incremental drayage time and cost.

Perceived Opportunities for Short-Sea Services

Ocean carriers saw at least two key market segments that may be effectively served by a short-sea shipping intermodal option over a relatively long-haul domestic route:

- High value time-sensitive cargo that would require a door to door transit comparable to existing modes and a superior transportation cost – this cargo may need to move on roll-on/roll-off (RoRo) vessels operating on close to daily frequencies between particular port-pairs, using conventional highway trailers as rolling stock with minimal dwell time in the marine terminals at each end of the ocean transit.

- Heavy, hazardous, and relatively low value cargoes that do not place such a high premium on transit time and frequency and for which lower cost and service reliability may be important selling factors – this cargo segment may be effectively served by conventional containerships carrying cargo in marine containers (20', 40', 45', and possibly larger) that would be transferred to/from the vessel on a lift-on/lift-off (LoLo) basis, with the vessels operating with less frequency than the RoRo option, and using chassis to transport the containers for the ground drayage portion of the intermodal movement.

Almost all of the carriers interviewed believed that self-propelled vessels rather than tug-barge combinations would be required to make domestic shipping services operationally feasible, primarily due to the considerably faster speed of a vessel (21 to 25 knots for conventional propulsion and much faster for advanced high speed designs that may provide speeds in excess of 40 knots). While it was generally recognized by ocean carriers that there is not a large supply of vessels in the Jones Act fleet that could be used to start up domestic shipping services in the short term, a few of those interviewed did point to a limited number of container and RoRo vessels that could be available for pilot services within 12 to 18 months.

Virtually all of the ocean carriers interviewed stated that a fresh approach was necessary to make domestic coastal shipping an operational reality. This fresh approach included such issues as the following:

- Avoiding current international port congestion points by locating domestic coastal shipping marine terminals in different locations.

- Entering into longshore and seafaring labor agreements that are specifically designed for domestic coastal shipping and that will provide efficiencies that will enable this mode to be cost and time-competitive with over the road trucking.

- Ensuring that trucking companies were directly involved in the planning and marketing of the service as an additional "lane" to their current services rather than a competing mode – several of the ocean carriers interviewed stated that they could see trucking companies doing most of the retailing of the shipping service to their current shipper clientele rather than ocean carriers primarily filling this role.

- Developing a "partnership" between the ocean carriers, shipbuilders, and perhaps the U.S. government that would facilitate the development of standard vessel designs that could be built by U.S. shipyards and suppliers on a modular basis with production runs of at least 15-20 vessels – it would be anticipated that this type of "partnership" may reduce U.S. shipbuilding costs for commercial vessels to levels approaching world prices.

Perceived Obstacles to Short-Sea Adoption

Principal among the obstacles noted by ocean carriers interviewed were the high cost of domestically built cargo vessels, high stevedoring costs in U.S. ports, and high manning levels for self-propelled vessels engaged in domestic commerce as compared to tug-barge combinations moving an equivalent amount of freight. Other governmental and regulatory hurdles that were mentioned included the additional cost that Harbor Maintenance Tax would apply to shipments moving on a domestic coastal shipping service, and the lack of capital financing guarantees for new ship construction through the Title XI program. The carriers were unanimous in their belief that the Harbor Maintenance Tax provided an unnecessary obstacle. Feelings on the provision of Title XI guarantees were mixed with some carriers supporting the program while others believed that ready access to private capital sources could be obtained on the basis of a well-supported proposal for finance.

Ocean carriers perceived that the high capital cost of U.S.-built ships was the single largest obstacle to successful implementation of domestic coastal short-sea shipping services. Carriers believed that prices from U.S. yards for a container or RoRo vessel were two to three times higher than for an equivalent ship from a foreign yard. Several of the carriers indicated that they were prepared to work with U.S. shipyards to bring the cost of new ships down by agreeing on standardized designs that could benefit from modular construction. One issue that was mentioned by a number of carriers was that U.S. shipyards appeared to pay significantly higher prices for vessel equipment and parts such as engines than do their foreign competitors, even when both are buying from the same supplier.

The carriers interviewed generally saw the opportunity to undertake a "green field" approach with labor on stevedoring and shipboard manning issues as being relatively good, particularly on routes involving ports on the Atlantic and Gulf Coasts. However, waterfront labor practices on the Pacific Coast were seen as presenting a major potential hurdle with a possible lack of concessions on labor productivity. Some believed that the costs on the West coast could deter the implementation of a commercially viable domestic shipping service on that coast.

Port Operators

Nine port authorities and operators were interviewed. With the exception of Tacoma, all of the other ports interviewed do not currently have large volumes of international liner shipping traffic. All of the ports interviewed, with the exception of the Port of Astoria, expressed strong interest in the possibility of handling domestic short-sea liner traffic, either in containers or in "roll-on/roll-off" (RoRo) mode trailers, and a number were actively looking at the market opportunity. The Port of Astoria is space constrained and therefore suggested nearby Columbia River ports that have more available terminal space.

Perceived Opportunities for Short-Sea Services

Port operators identified a number of key success factors that they believed would be essential for domestic short-sea shipping services to be fully commercially developed:

- Ensuring that port labor agreements are developed up front that provide the necessary high levels of productivity and cost-efficiency necessary to create a door-to-door transportation service package that will be competitive with costs and service levels currently being achieved by trucking and rail intermodal.

- Providing immediate access to major highways but avoiding existing landside congestion points.

- Close proximity to major cargo origins and destinations.

- The availability of sufficient terminal capacity for a dedicated domestic short-sea terminal.

The opinions of port operators on the merits of mixing international and domestic freight within the same terminal were mixed. A few did not see any potential operational problems in combining domestic and international traffic that would allow a domestic short-sea service to act as a coastal feeder for international cargoes as well as a prime mover of domestic freight. However, others felt that the combination of domestic and international traffic would undercut the development of the most cost-effective longshore labor agreements for domestic port traffic

The point was also made that the start-up of a domestic short-sea service should not be done on a tentative basis – the appearance of total commitment and permanence by service providers would be very important in winning the support of shippers and ground carriers. It was also stated that short-sea shipping must be viewed as a "total transportation system solution" by government policy makers and not be pigeonholed as simply a maritime transportation initiative.

Perceived Obstacles to Short-Sea Adoption

The port operators interviewed were unanimous in their belief that the charging of Harbor Maintenance Tax (HMT) on domestic shipments would be a serious economic disincentive for shippers to shift from ground transportation to a short-sea shipping service. It was pointed out that virtually no HMT revenue would be lost if domestic cargo moving in a short-sea liner service were to be exempted from HMT as this cargo, with only a few exceptions, is currently not moving through ports. Also, the removal of the economic disincentive of HMT could be revenue positive for the government as the accommodation of significant highway traffic to a short-sea intermodal service would reduce wear and tear on the nation's highways as well as alleviating some of the pressure for new highway capacity.

Several of the stakeholders interviewed suggested that the longshore labor situation in Pacific Coast ports may be a potential obstacle. The ILWU has a virtual monopoly on labor within Pacific Coast ports and is not viewed as being willing to negotiate new agreements that would lower the cost for domestic coastal cargo, despite its potential contribution to new waterfront jobs.

While there appears to be substantial port terminal capacity at potential locations on the Atlantic and Gulf Coasts that would meet the needs of a domestic short-sea service, interviewees noted that available terminal capacity on the Pacific Coast was very limited, particularly in locations close to major cargo origins and destinations in Southern California and the Bay Area.

Shipbuilders

Interviews with current and prospective U.S. domestic shipping operators identified the high cost and limited supply of U.S.-built cargo vessels suitable for coastwise service as being a major potential obstacle to the successful implementation of domestic short-sea shipping services. Consequently, the project team interviewed two major U.S. builders of commercial vessels as well as the U.S. representative of a major European shipyard. Both of the U.S. shipyards interviewed expressed strong interest in the market for domestic short-sea shipping vessels, and indicated that they were staying current with developments in the area.

The U.S. shipyards recognized that commercial vessel construction prices were two to three times higher than foreign shipyards for a number of reasons:

- Lack of shipbuilding subsidies in the U.S. compared to the large amounts of direct and indirect government subsidies paid to foreign shipyards, particularly in the Far East and Europe.

- Lack of commercial shipbuilding volume in the U.S. that prevents the shipyards from benefiting from scale economies in purchasing and production as well as labor productivity improvements from moving down the experience curve.

- High premiums charged by suppliers of vessel machinery and equipment to U.S. shipyards compared to prices paid by foreign yards for the same equipment – interviewees claimed that suppliers add 25 to 50 percent to prices for U.S. shipyards "because they can".

- U.S. regulations also add cost – such as workers compensation coverage of shipyard workers being assigned to the same category as longshore workers that reportedly doubles the cost to the shipyard compared to levels paid by a non-maritime U.S. industrial concern.

The shipyards did indicate that a major sustained commercial vessel-building program (12-15 vessels for a yard over three to four years at least) would bring down U.S. new building prices, although they may not be able to fully close the gap with foreign yards. It was noted by the representative of a major European shipyard that U.S. shipyards are using work processes that are not as automated as that company's operations in Europe. That company also made considerable use of outsourcing construction of a vessel on a modular basis to other yards throughout Europe to take advantage of lower labor costs, and would then bring together those components at the main yard in Denmark where final construction of the vessel was completed on a highly automated basis. This company stated that it was able to match Korean shipyards on a comparable cost basis because of its extensive investment in automated manufacturing processes.

Areas of government policy that the shipyards felt would be useful in increasing the competitiveness of U.S. shipbuilding included the following:

- Providing some means of lowering the capital risk for investors in U.S. ships through programs such as the currently unfunded Federal Title XI program.

- Providing tax incentives such as accelerated depreciation for investment in new shipbuilding infrastructure.

- Build in militarily useful features in new ship construction such as roll-on/roll-off ramps and heavy weight bearing decks that could be paid for by the Department of Defense as part of a military sealift contingency program such as the current Maritime Security Program.

- Ensuring that government regulations concerning U.S. vessels' safety and manning levels and U.S. shipyards' work processes are consistent with similar measures maintained by leading shipbuilding nations such as Japan, Germany, and Denmark.

IV. Corridor Case Studies

On completion of the market sizing analysis and first round interviews with prospective users and service and asset providers, the project team focused its attention on four corridor studies in order to assess the extent to which a short-sea intermodal service could be competitive with current highway or rail intermodal transport alternatives and, consequently, to determine the potential economic viability of a short- sea service in those corridors.

The four pilot project corridors with the specific port-pair catchment areas evaluated in the business case analyses were the following:

- *Gulf to Atlantic Coast Corridor* – between the port catchment areas of Beaumont, TX and Camden, NJ
- *Atlantic Coast Corridor* – between the port catchment areas of Port Canaveral, FL and New Haven, CT
- *Pacific Coast Corridor* – between the port catchment areas of San Diego and Oakland, CA, and Astoria, OR
- *Great Lakes Corridor* – between the port catchment areas of Milwaukee, WI and Muskegon, MI

For each of the corridors, the potential service levels and economics of a short-sea service operating in competition with existing truck and rail intermodal transportation options were analyzed in addition to an assessment of the potentially divertible ground freight traffic volumes to a short-sea service. The intent of the corridor studies was not to pick the four lanes with the greatest potential for short-sea shipping, but rather to select four lanes that represent the wide and diverse range of geographies and market segments in which short-sea services may be developed, and then to do an in-depth "drill-down" of each one to identify the key economic and operational issues that a company implementing short-sea service in these corridors may face.

Corridor Business Case Economic Model

An economic model for short-sea shipping and alternative modes was developed to help determine the relative competitiveness and prospective viability of a short-sea intermodal service on each of the four corridors. This analysis built upon the earlier market analysis that determined the volume of rail and motor carrier freight that is available for potential movement by a cost competitive short-sea service. The model calculates the revenue and costs likely to be generated by such an operation, whether the resultant cash flows can support the vessel and infrastructure investments required to support the service, and compares the economic results to those of existing land transport alternatives.

The output from this analysis is a direct comparison of the price and service features of a short-sea service to current alternative ground transport modes by either highway or rail intermodal service. The analysis assumes that if the short-sea service provides either superior service or price versus highway or rail intermodal transport, ground carriers will be more likely to divert existing trailer-load volumes to the short-sea alternative. Within the 250-mile port hinterlands at each end of the prospective short-sea corridor, it was assumed that for traffic originating or terminating at the further extremes of the 250-mile radius from the respective port terminals ground carriers would derive correspondingly less benefit from highway congestion avoidance than closer-in traffic, and are therefore less likely to use the short-sea service product.

Consequently, there are two key components that impact the assumptions on market share that drive the financial results of the economic analysis for each of the corridor projects:

- *Geography:* an evaluation of traffic volumes within the 250-mile radius hinterland surrounding the origin and destination ports, and an analysis of the freight volumes, types of commodities, and types of carriers currently operating between the endpoints of the respective corridors in order to identify the segment of the market most susceptible to market penetration by short-sea shipping

- *Competition:* analysis of the respective performance levels for the alternative transport modes on the corridor corridors relative to a short-sea shipping service for door-to-door cost, transit time, and key service elements such as equipment utilization and repositioning, service frequency, schedule cutoffs, ship and train sizes and speeds, and terminal handling efficiency, availability times, blocking, and intermediate transfers

Market Penetration Estimates

The extent of potential market penetration for short-sea service in each of the corridors was estimated based on the projected overall relative competitiveness of the short-sea intermodal service on the particular corridor as well as findings from the interview process that probed on specific issues concerning those corridors, and the project team’s experience with market penetration of previous new intermodal service products.

In practice, shippers will routinely trade-off slower service for a reduction in transportation cost depending on the type of goods being shipped. For most commodities, slower transport services are offered in the marketplace on a discounted basis versus faster transport alternatives. As the comparative transit times within or between modes approach equilibrium, the level of discounting tends to decline, and market rates approach variable cost for the least efficient carriers (and/or modes). A statistical interpretation of this trade-off principle is built into the economic model used in this analysis to estimate the level of marketplace acceptance for a potentially slower, but cost-competitive short-sea shipping service product.

In modeling market penetration for the short-sea shipping service, we sought to balance equipment utilization (to reflect carrier discounting to fill available capacity), with reasonable modal shares for new intermodal products (new rail intermodal service market shares were used as a proxy). This resulted in penetration estimates of between 12 and 25 percent of the particular market by lane direction, depending on relative lane density, vessel capacity, and sailing frequency projected in the particular corridor.

Competitive Service Analysis

The quantitative analysis built into the economic model identifies and compares the individual cost and service attributes of current highway and rail intermodal transportation alternatives to a short-sea shipping option on each corridor. The model that underlies this analysis covers the range of distribution cost and service considerations that shippers likely would take into account if faced with a choice between the proposed short-sea service over current highway and rail intermodal options. In terms of the business economics of the transport options in each of the corridors, the model contains both revenue and cost components.

Revenue Projections

The revenue analysis assumes that a prospective short-sea shipping service must be priced competitively versus alternative highway and rail intermodal services. It was assumed that a short-sea service would likely be required to offer a price discount over existing transport modes with all other factors being equal in order to gain initial market acceptance and significant penetration, at least initially. Using the potential traffic volumes identified in the market analysis, a cost and service indifference model was developed for each of the relevant carrier market segments. This model identified the approximate switching point at which shippers would likely opt for a short-sea service versus highway or rail intermodal transportation. The price discounts by individual mode were based on the availability of competitive service options, their relative market participation, the transit time differentials between modes, and the need to "incentivize" shifting from one mode to another.

The model reflects current service levels for each of the three modes[5]. However, it is likely that if highway service deteriorates in the future due to increasing congestion and driver shortages, the value to shippers of a short-sea service's arguably superior schedule reliability would increase, providing leverage to raise prices in the future above those reflected in the current state analysis. Also, future increases in fuel costs would impact both truck and rail intermodal carriers more heavily than short-sea shipping, expanding any current cost advantage that the short-sea alternative may have over the other modes.

Cost Projections

For each of the four corridors projects, the estimated operating costs and service performance of short-sea intermodal, rail intermodal, and motor carrier operations were developed for a trailer-load of freight moving on a door-to-door basis between origin and destination points for the particular corridors. These costs were built up from a number of different elements in order to reflect time, mileage, and routing variances among the different modes.

[5] No rail intermodal option is provided for the Great Lakes ferry analysis as rail intermodal is not competitive vis-à-vis motor carrier in this lane for reasons of overall distance and equivalent circuity.

Developing the costs per trailer-load by mode required the following steps:

- Identify the origins and destinations of all the traffic moving over the respective corridors
- Determine the railroads that could serve these origin-destination pairs with rail intermodal products
- Determine the railroad routing (specific railroads, interchanges and miles on each) that would be involved in providing rail intermodal service
- Determine the practical highway miles that would be traversed by a motor carrier serving the same origin-destination pair
- Determine the ocean or inland waterway vessel steaming miles between port of load and port of discharge for the short-sea option
- Determine the cost for intermodal drayage from shipper to origin rail ramp or marine terminal and from destination rail ramp or marine terminal to ultimate receiver
- Determine terminal handling costs appropriate for each movement
- Determine the cost of providing comparative door-to-door service on each mode using mode-specific cost models

For a truck operator, fully allocated cost data provided by a major motor carrier was used as the starting point in developing the truck economics. Truck operations were based on a single driver operating within current hours of service (HOS) restrictions. Future road congestion was not addressed – service and cost parameters are reflected as "current steady state". Additional highway cost data was developed using the TTS Blue Book of Trucking Companies (2004-2005 Edition) and allowed for the desegregation of wages and benefits, equipment, insurance, fuel and other expenses. Global Insight's Intermodal Cost Analysis Model (ICAM) was used to prepare estimates of the rail intermodal door-to-door delivery costs for each of the corridors[6].

The key cost elements for motor carriers include pick-up and delivery, over the road vehicle operations, fuel, driver costs, dispatching, insurance, as well as other factors that would be directly affected by the choice of transport mode between the origin and destination markets in the project lanes. Highway tolls are reflected as a separate cost item in the model, and are estimated based on average toll costs per mile and average toll miles adjusted for specific corridors. Sales and administrative overhead are also included. Source information was developed from public data, carrier interviews, and general industry knowledge of the project team.

Rail intermodal direct operating cost elements include locomotives and fuel, track and right-of-way, yard and terminal operations, lift-on and lift-off movements, railcar, crew,

[6] No rail intermodal costs were developed for the Great Lakes Ferry option as this lane was considered too short for competitive rail intermodal service.

trailer/container, and drayage expense. Sales and administrative overhead are also included. Again, this information was developed from public data, carrier interviews, and general industry knowledge of the project team.

The economics of a short-sea shipping service include both direct vessel operating costs, capital costs, and other costs associated with the movement of a trailer-load of freight. Direct vessel operating costs include vessel manning, maintenance and repair, insurance (Hull & Machinery and P&I), capital, and vessel management costs, fuel and consumables, and port charges. These costs were developed based on information developed from ocean carrier and port operator interviews, and general industry knowledge of the project team.

Non-vessel operating costs for the short-sea shipping service include stevedoring and marine terminal operations, container, trailer, and chassis leasing and maintenance, drayage operations, and sales and general administrative overhead. These were developed from prior intermodal analyses, the carrier and port operator interviews, and professional experience of the project team. In addition, the cost to shippers of Harbor Maintenance Tax (HMT) charged on shipments moving in and out of U.S. ports was also added as a line item in the model for short-sea shipping operations as would be applicable under the current U.S. tax regime.

The cost of repositioning trailers or containers in a particular corridor was also built into the model for each mode. Trucking and rail intermodal operations have an advantage in this area as they have greater latitude to search for return loads than the short-sea service that was assumed to be tied to a particular port-pair. In this case, the short-sea service was charged with the cost of vessel loading and discharging for all empty trailers/containers in the backhaul direction of each particular corridor.

The economics of the short-sea shipping option used in the transportation model are based on a theoretical level of costs that reflect some significant changes in current working practices that would need to be instituted by industry, labor, and government specifically for short-sea shipping but that are nevertheless reasonably achievable in the near term. The key areas for which these theoretical cost levels were used include vessel capital costs, vessel crew costs and manning levels, and port stevedoring costs. Although these cost levels are lower than those for most current domestic shipping operations, they should be attainable based on an analysis of current "best in class" industry practices and U.S. and international benchmarks. Short-sea shipping costs were calculated on the basis of both this "best in class" hypothetical level and for vessel capital, crew, and stevedoring costs that are representative of the "status quo" of costs as currently pertaining in the noncontiguous Domestic liner shipping trades.

The following are key assumptions made concerning the operations and costs for a prospective short-sea shipping service:

- Both roll-on/roll-off (RoRo) trailer vessels and lift-on/lift-off (LoLo) container vessels were tested for all corridors except the Great Lakes where only a RoRo vessel was evaluated given the short steaming distance across Lake Michigan and the consequent premium put on minimizing port time for such a ferry service.

- Vessel capacities tested were for a 1200 TEU container ship (carrying around 500 trailer-load equivalents in a mix of container sizes up to 53') and a RoRo vessel of 400 trailers capacity on the Gulf/Atlantic and Pacific Coast Corridors and a 200 trailer container vessel and 140 trailer RoRo vessel on the Atlantic Coast corridor – these vessel capacities reflect the relative freight densities of the specific lanes and service frequency requirements

- Crew sizes of 12 for the larger coastal vessels and 10 for the smaller vessels were based on the assumption that new manning agreements with the seafarer unions and the Coast Guard would be developed for a two-watch system for self-propelled vessels operating along the contiguous coasts of the U.S.

- Marine terminal loading and discharging costs are on an all-in basis and reflect current best practices that would require labor agreements specially designed for coastal short-sea shipping – Pacific Coast marine terminal costs were estimated at a level 50 percent higher than those used for the Atlantic and Gulf Coasts given the prevailing labor situation with the ILWU.

- An average vessel operating speed of 25 knots was used for the coastal corridors and 20 knots for the Great Lakes ferry – this relatively high speed for conventional RoRo or container vessels was deemed necessary to provide "truck-competitive" transit times in the particular corridors.[7]

- The vessel capital costs used (see exhibit below) are lower than current prices from U.S. shipyards but still substantially higher than international prices – the lower U.S. prices reflect the assumption that long vessel-building runs, more aggressive purchasing practices, and improved productivity by U.S. shipyards would bring down the cost of U.S.-built vessels.

The principal assumptions concerning vessel characteristics and operating costs that were used in the economic analyses for the four corridors are described in Table IV-1 below.

[7] Vessels capable of higher speeds than 25 knots that include a number of prototypes under development were not tested at this stage in order to focus our analysis on readily implementable strategies using current technology.

Table IV-1
Short-Sea Shipping Vessel Prototypes
Key Characteristics and Operating Costs

	Container Ship	Container Ship	RoRo Vessel	RoRo Vessel	RoRo Ferry
Cargo capacity	500 Trailers	200 Trailers	350 Trailers	140 Trailers	200 Trailers
Key assumptions:					
Capital cost:	$80 million	$38 million	$90 million	$44 million	$50 million
Vessel speed:	25 knots	25 knots	25 knots	25 knots	20 knots
Fuel consumption:	60 TPD	30 TPD	60 TPD	30 TPD	30 TPD
Crew size:	12	10	12	10	8
Vessel expense per day					
Crew	$7,500	$6,500	$7,500	$6,500	$5,000
Maintenance & Repair	$1,750	$875	$1,750	$875	$1,000
Consumables	$1,000	$600	$1,000	$600	$600
Insurance & Other	$1,250	$625	$1,250	$625	$700
	$11,500	$8,600	$11,500	$8,600	$7,300
Depreciation*	$8,767	$4,164	$9,863	$4,822	$5,479
Total	**$20,267**	**$12,764**	**$21,363**	**$13,422**	**$12,779**

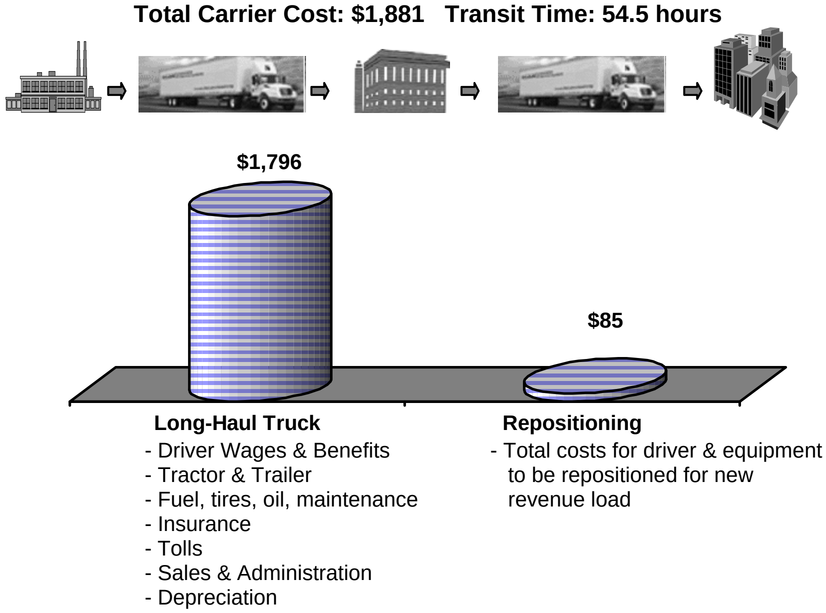
***Assumes straight-line depreciation over vessel life of 25 years.**

Source: Reeve & Associates

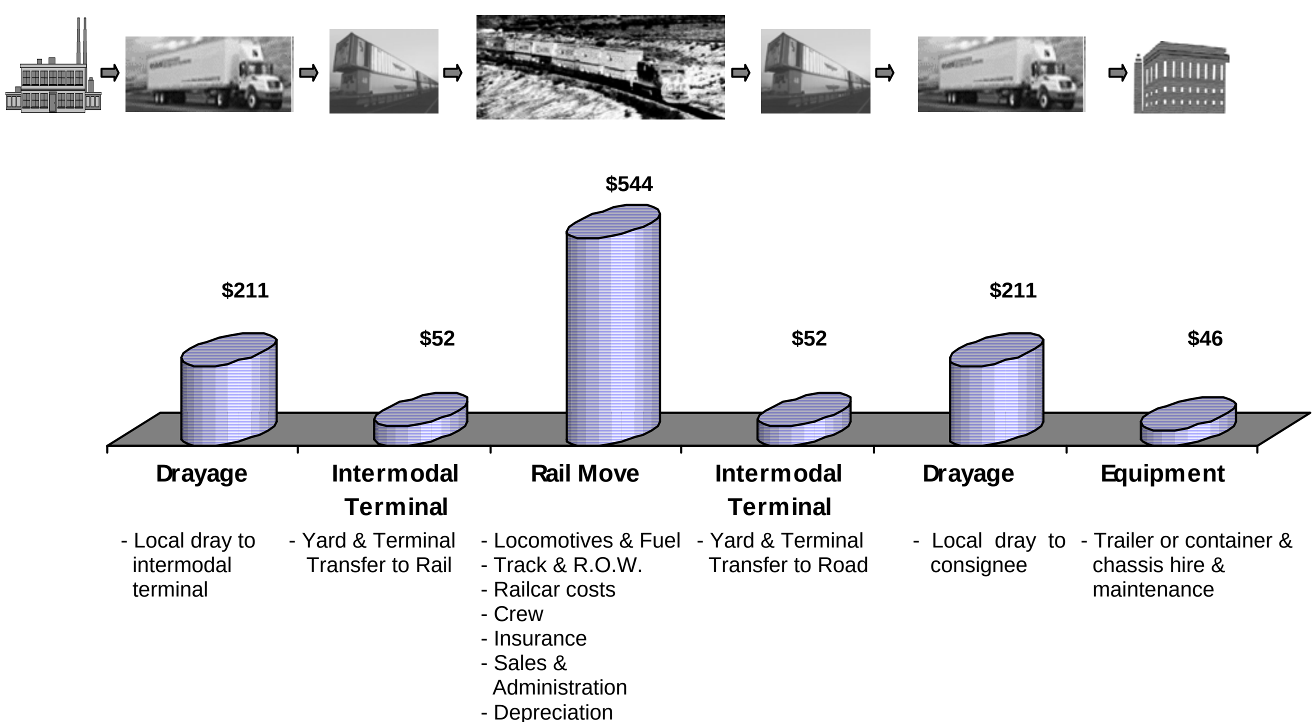
The different components of a carrier's costs that are built into the transportation models for each mode's operational "value chain" are described in the following examples for each of the corridor projects that show the relative proportions of each major cost component and the total cost to the carrier and the transit time involved in moving a trailer-load of freight on the particular corridor.[8] In the case of the short-sea shipping example, the economics are based on "best in class" benchmarks for vessel manning, stevedoring, and vessel capital costs as well as market penetration rates that reflect levels projected to be achieved in a relatively mature state rather than in a start-up period.

[8] Refer to the appendix to this report for details of the economics of each of the corridor projects. An allowance for repositioning costs is included in the drayage and terminal costs for both rail intermodal and the short-sea shipping trailer-load moves.

Trucking Move Transportation Components on Atlantic Corridor
Total Carrier Cost: $1,881   Transit Time: 54.5 hours

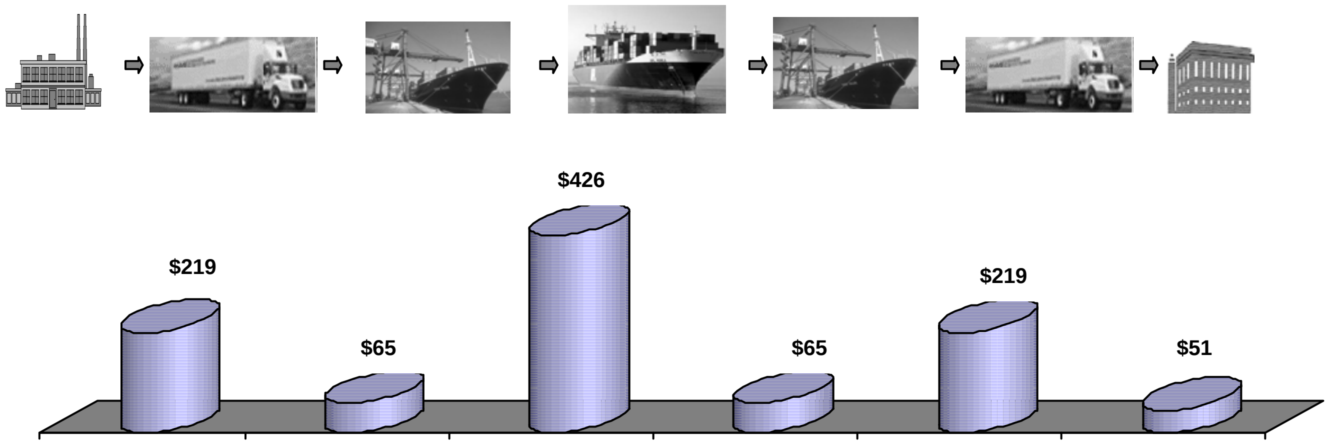


Rail Intermodal Move Transportation Components on Atlantic Corridor
Total Carrier Cost: $1,070   Transit Time: 60.5 hours



Short-Sea Shipping Move Transportation Components on Atlantic Corridor

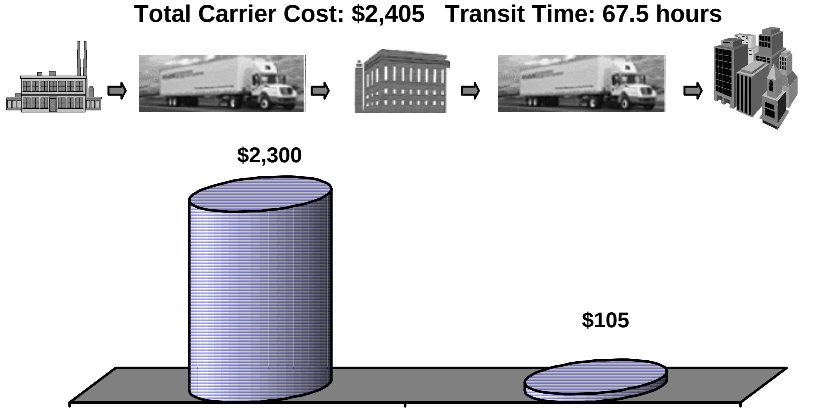
Total Carrier Cost: $1,045 Transit Time: 70.0 hours



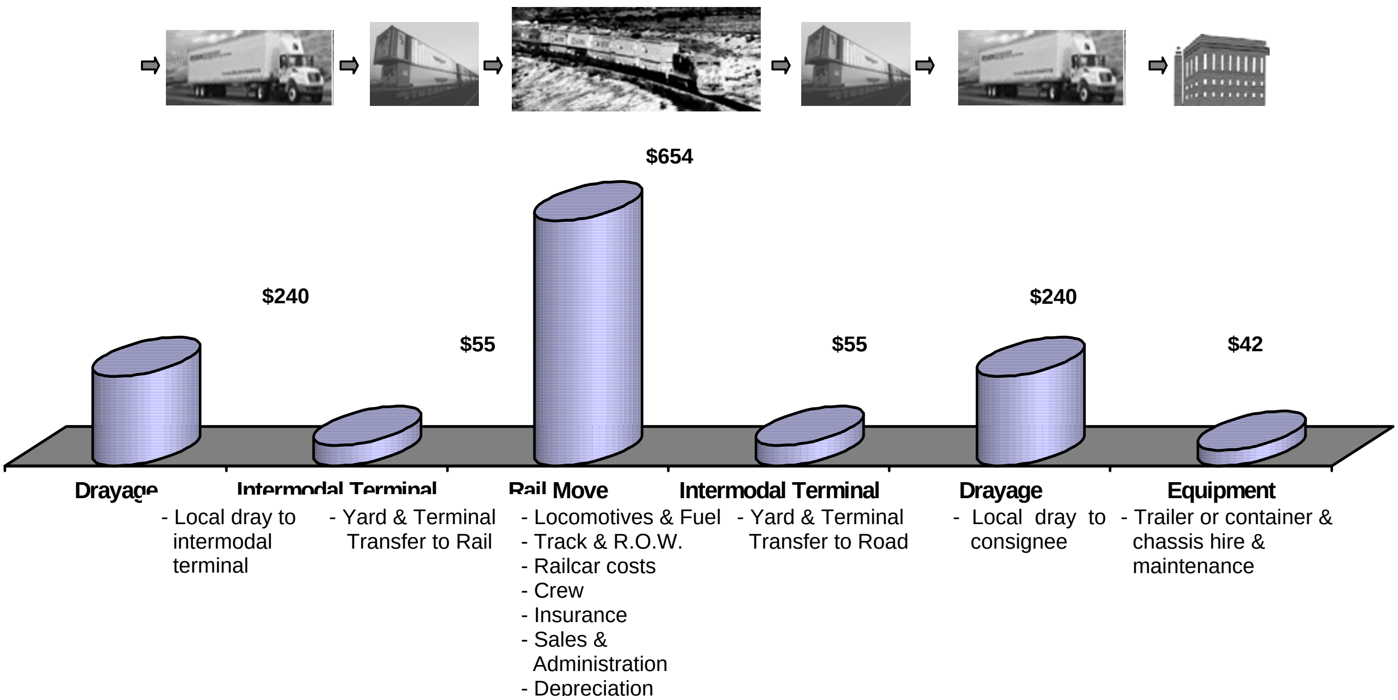
Key assumptions:
- All costs at "best in class" benchmark levels
- Assumed market penetration of 23% northbound and 25% southbound - providing vessel (140 truckload equivalents capacity)utilization of 83% northbound and 71% southbound

Trucking Move Transportation Components on Gulf/Atlantic Corridor

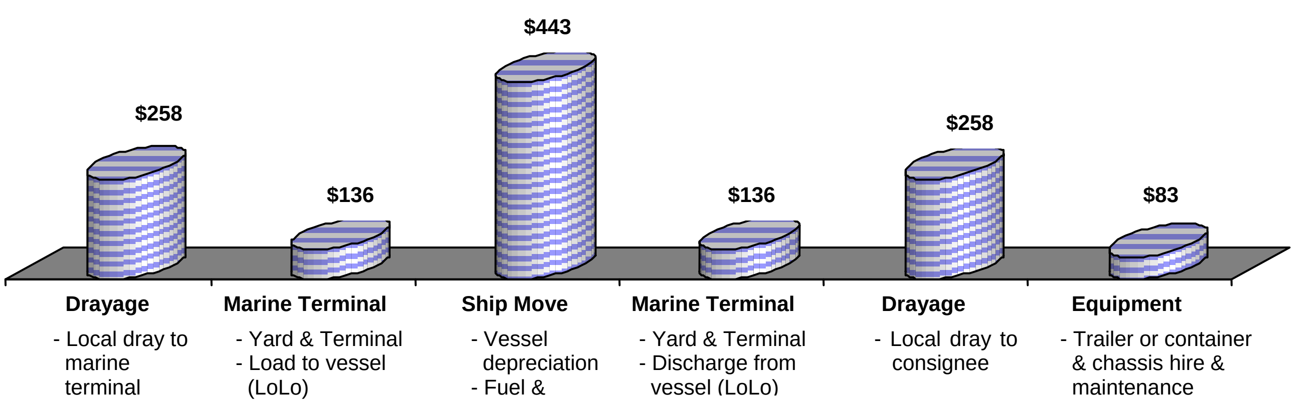
Total Carrier Cost: $2,405 Transit Time: 67.5 hours



Rail Intermodal Move Transportation Components on Gulf/Atlantic Corridor
Total Carrier Cost: $1,286   Transit Time: 86.0 hours

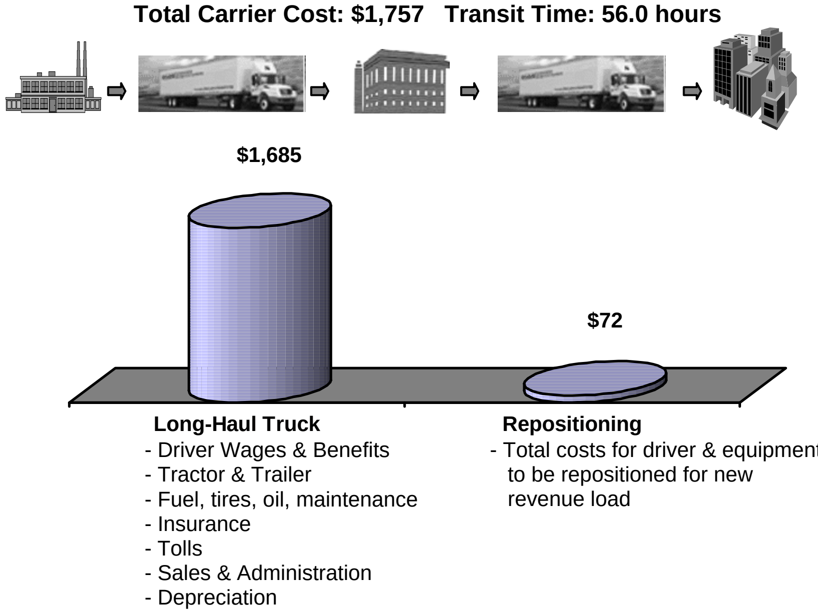


Short-Sea Shipping Move Transportation Components on Gulf/Atlantic Corridor
Total Carrier Cost: $1,314   Transit Time: 111.0 hours

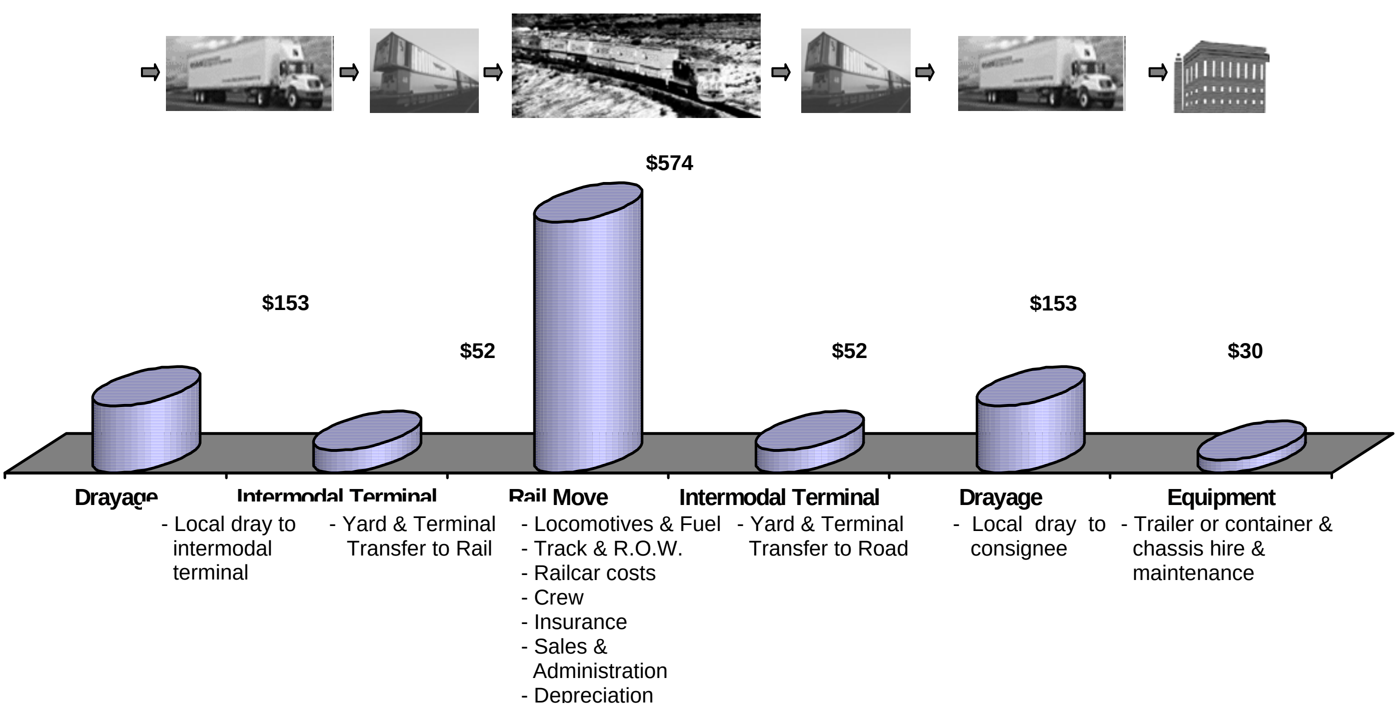


Key assumptions:
- All costs at "best in class" benchmark levels
- Assumed market penetration of 17% northbound and 25% southbound - providing vessel (500 truckload equivalents capacity)utilization of 84.5% northbound and 40.4% southbound

Trucking Move Transportation Components on Pacific Corridor
(San Diego CA/Astoria OR)
Total Carrier Cost: $1,757 Transit Time: 56.0 hours



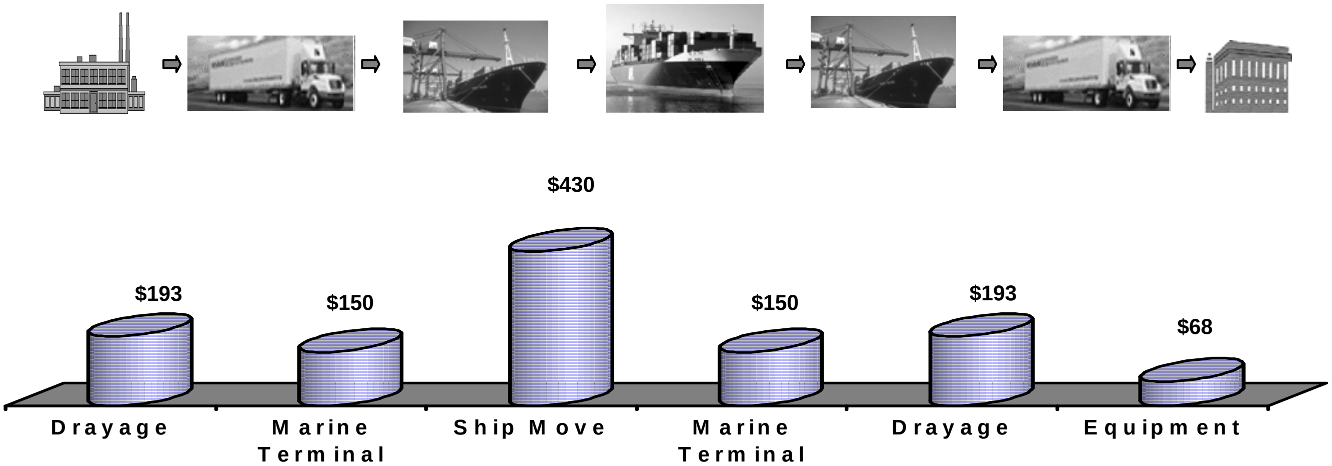
Rail Intermodal Move Transportation Components on Pacific Corridor
(San Diego CA/Astoria OR)
Total Carrier Cost: $1,014 Transit Time: 62.0 hours



Short-Sea Shipping Move Transportation Components on Pacific Corridor

(San Diego CA/Astoria OR)

Total Carrier Cost: $1,184   Transit Time: 115.0 hours



Drayage
- Local dray to marine terminal

Marine Terminal
- Yard & Terminal
- Load to vessel (RoRo)

Ship Move
- Vessel depreciation
- Fuel & consumables
- Crew
- Maintenance
- Port charges
- Insurance
- Sales & Administration

Marine Terminal
- Yard & Terminal
- Discharge from vessel (RoRo)

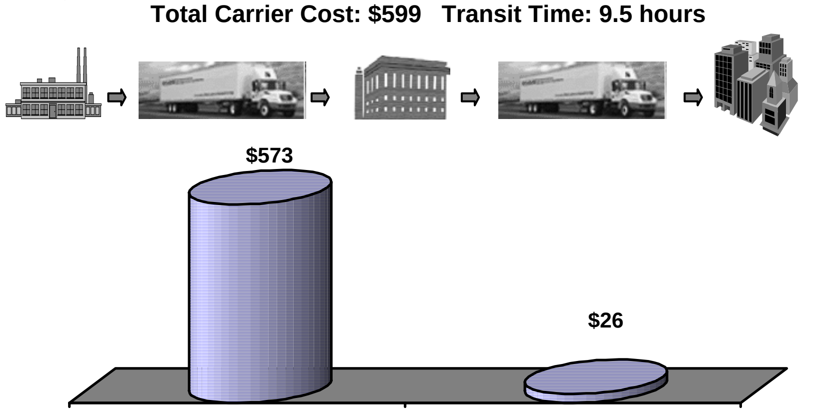
Drayage
- Local dray to consignee

Equipment
- Trailer or container & chassis hire & maintenance

Key assumptions:
- All costs at "best in class" benchmark levels
- Assumed market penetration of 15% northbound and 12% southbound - providing vessel (350 truckload equivalents capacity)utilization of 63% northbound and 85% southbound

Trucking Move Transportation Components on Great Lakes Corridor

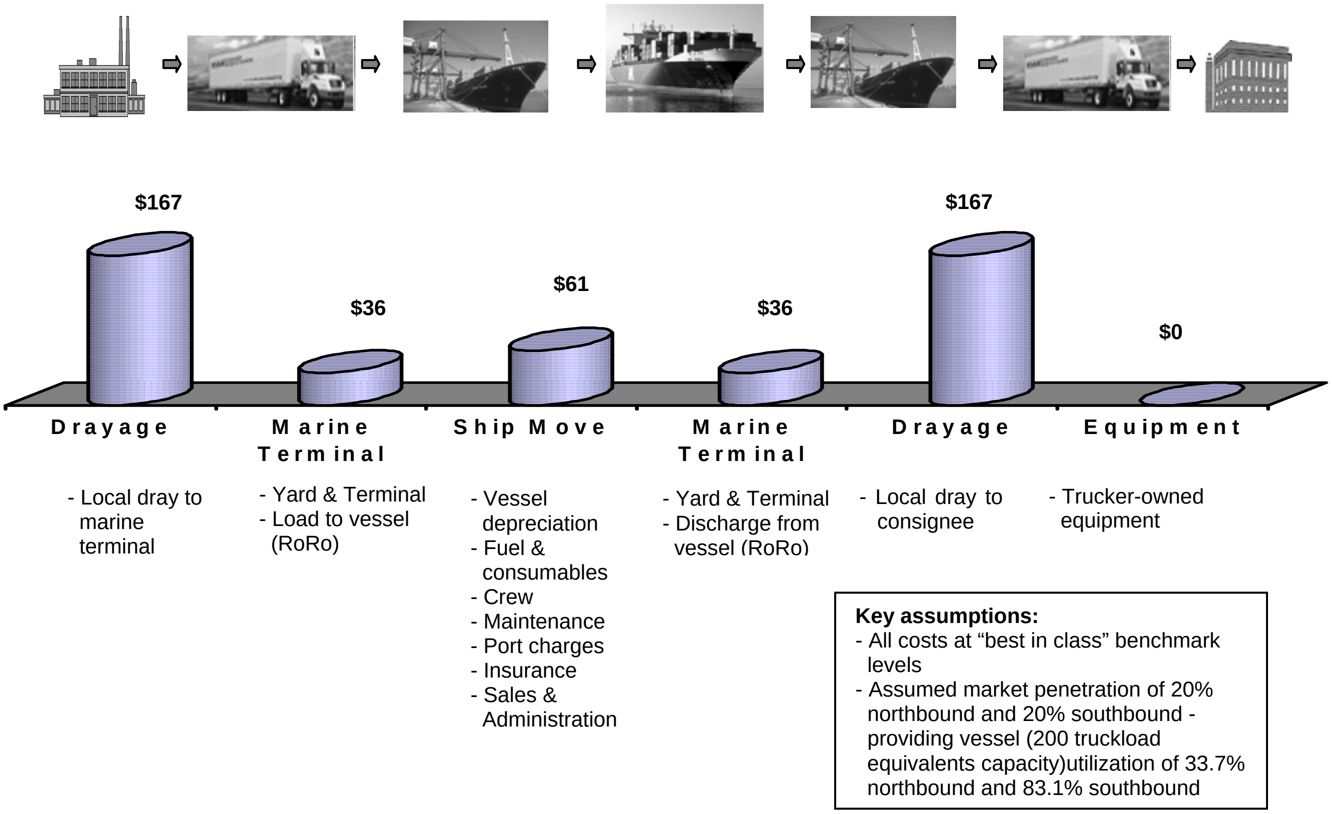
Total Carrier Cost: $599   Transit Time: 9.5 hours



Long-Haul Truck
- Driver Wages & Benefits
- Tractor & Trailer
- Fuel, tires, oil, maintenance
- Insurance
- Tolls
- Sales & Administration
- Depreciation

Repositioning
- Total costs for driver & equipment to be repositioned for new revenue load

Short-Sea Shipping Move Transportation Components on Great Lakes Corridor
Total Carrier Cost: $467 Transit Time: 7.5 hours



In addition to the carrier's costs for the respective modes on each corridor, the total cost for moving a trailer-load of freight on the particular corridor that would be incurred by the shipper of that freight was calculated. The shipper's cost would include any "mark-up" or profit margin added to the carrier's costs as well as the incremental inventory carrying costs caused by the slower transit times of the rail intermodal and short-sea shipping service options as well as the imposition of Harbor Maintenance Tax (HMT) that would apply to only the short-sea option. Carrier mark-ups were estimated based on current practices and conditions in the U.S. domestic freight markets for each of the modes. The intense competition and relatively fragmented nature of the U.S. trucking industry led to an 8.5 percent mark-up being used for each of the trucking cases. A 20 percent mark-up was used for rail intermodal reflecting the competitive environment in that industry while still setting a challenging competitive hurdle for the other modes. A 10 percent mark-up was used for the short-sea shipping service option reflecting its need to attract new business and be competitive with the other two established modes.

The results of the competitive service and economic analyses of the four corridors are described in the following sections.

Gulf Coast/North Atlantic Coast Corridor

Comparisons of door-to-door transit times and the cost to a shipper for trailer loads moving between the port hinterlands of Beaumont, TX and Camden, NJ are described in Table IV-2 below. The costs for the rail intermodal and short-sea shipping options are benchmarked against trucking on a "per highway-mile" basis as trucking provides the most direct route to the shipper. Costs for all three modes are shown on the basis of both the cost to the carrier for all transportation elements and the final cost to the shipper that includes carrier margins, incremental inventory cost for the slower modes, and other direct charges to the shipper such as HMT. The short-sea service was assumed to achieve a 17 percent share of northbound loads in the corridor and a 25 percent share of southbound traffic.

Table IV-2
Comparative Performance of Short-Sea Shipping versus Alternative Modes on the Gulf Coast/North Atlantic Coast Corridor

	Truck	Rail Intermodal	Short-Sea Shipping Status Quo	Short-Sea Shipping "Best in Class"
Total miles (door to door)	1,470	1,699	2,091	2,091
Transit hours (door to door)	67.5	86.0	111.0	111.0
Carrier cost per highway mile	$1.64	$0.87	$0.99	$0.89
Estimated operating margin	10%	30%	10%	10%
Shipper cost per highway mile	$1.77	$1.06	$1.13	$1.03
Differential versus Truck	--	-40%	-36%	-42%

The analysis shows that short-sea shipping provides the lowest cost to the shipper on a highway-mile basis, but at a significantly greater transit time due to the longer distance that a vessel traveling between Beaumont and Camden must steam to round Key West, Florida before proceeding either north or west. The choice of Camden as the North Atlantic port, which was driven primarily by Camden's large cargo hinterland, also adds 3.6 hours to the short-sea transit time as vessel speed was reduced to 10 knots for the 36-mile trip up and down the Delaware River.

The cost per load for a RoRo vessel versus a containership operating on this route in the "best in class" analysis was calculated as being relatively close: $1,314 for the RoRo versus $1,328 for the containership.[9] Faster terminal turnaround time for the RoRo enables this service to provide five sailings per week with a total of six vessels versus the seven vessels required by the container operation that offsets the greater cargo lifts per vessel that the container service is able to achieve.

[9] Refer to Appendix for details.

Comparing the results for the three modes suggests that the short-sea option may be competitive for less time-sensitive, lower value cargoes that could be diverted by the significant price differential against trucking that the short-sea mode would be able to provide. Of particular note in this corridor is the large volume of chemical and petroleum shipments moving out of Beaumont hinterland that is estimated to account for 61 percent of total truckload traffic to the Camden hinterland. This cargo is typically heavy (causing excessive wear and tear to highways), frequently hazardous, and often requiring a 100 percent empty return[10] for a tank-trailer. It also does not generally move by rail intermodal service. Diverting chemicals currently moving by truck to a short-sea service would reduce highway damage and the threat of spills, as well as providing a significantly lower cost to the shipper at the expense of a longer transit time. The cost differential shown in the table above is for all cargo types on the route. The truck cost per highway mile to a chemicals shipper is calculated to be $1.82 reflecting additional costs for the overland movement of chemicals, particularly hazardous materials, such as higher wages for hazardous materials certified drivers and lower equipment utilization due to the high incidence of empty backhauls.

South Atlantic Coast/North Atlantic Coast Corridor

Table IV-3 below compares the door-to-door transit times and the all-in cost to shippers for trailer loads moving via the alternative modes between the port hinterlands of Port Canaveral, FL and New Haven, CT. The short-sea service was assumed to achieve a 23 percent share of northbound loads in the corridor and a 25 percent share of southbound loads.

Table IV-3
Comparative Performance of Short-Sea Shipping versus
Alternative Modes on the South Atlantic/North Atlantic Coast Corridor

	Truck	Rail Intermodal	Short-Sea Shipping Status Quo	Short-Sea Shipping “Best in Class”
Total miles (door to door)	1,183	1,213	1,289	1,289
Transit hours (door to door)	54.5	60.5	70.0	70.0
Carrier cost per highway mile	$1.59	$0.90	$0.99	$0.88
Shipper cost per highway mile	$1.73	$1.09	$1.12	$1.00
Differential versus Truck	--	-37%	-35%	-42%

In the case of the Atlantic corridor, the transit time of the short-sea mode is closer to that of the other two modes, while the short-sea service’s economics have a slight advantage over rail

[10] A 100% empty return reflects the fact that many long-haul chemical and petroleum trailers are unsuitable for reloading due to contamination or that suitable return freight is unavailable. In this case, trailers will often move back to origin empty; hence with 100% of their return miles uncompensated.

intermodal and retain a significant advantage over truck. The primary difficulty faced by the short-sea service in this corridor is the relatively low density of freight. This required that a relatively small vessel (140 trailer RoRo vessel) be deployed in order to provide five sailings per week. The economics of a RoRo service also proved economically superior to a containership on this route. However, while it is technically feasible that a RoRo service could turn on a weekly basis on this corridor,[11] there is little slack in the schedule. With increasing congestion in the I-95 highway corridor, the short-sea service may be able to offer shippers greater schedule reliability as well as the possibility of a narrowed gap in transit time as highway congestion along the Atlantic seaboard increases in the future.

South Pacific Coast/North Pacific Coast Corridor

In the analysis of the Pacific Coast corridor, it was determined that a service calling at three ports, San Diego, CA and Astoria, OR as end-points with an intermediate call at Oakland, CA would most effectively capture the available trailer-load flows on a relatively balanced basis. This has the effect of creating relatively competitive transit times between the end-points and the intermediate port of Oakland, while disadvantaging transit times between the end-points due to the stopover in Oakland. As shown in Table IV-4 below, the comparative analysis of transit time and cost for trailer-loads moving between the three cargo hinterlands of San Diego, Oakland, and Astoria indicates that short-sea shipping will have a significant transit time disadvantage vis á vis trucking that must be overcome through price discounting. The same principal also applies to rail intermodal, which offers only limited service in this corridor, as the West Coast rail infrastructure is largely committed to higher revenue East-West traffic volumes. The short-sea service was assumed to achieve shares of 18 to 20 percent of the northbound traffic segments in the corridor and between 14 and 17 percent of the southbound segments.

[11] Refer to Appendix for details.

Table IV-4
Comparative Performance of Short-Sea Shipping versus Alternative Modes on the South Pacific Coast/North Pacific Coast Corridor

	Truck	Rail Intermodal	Short-Sea Shipping Status Quo	Short-Sea Shipping "Best in Class"
San Diego/Astoria				
Total miles (door to door)	1,210	1,495	1,164	1,164
Transit hours (door to door)	56.0	62.0	115.0	115.0
Carrier cost per highway mile	$1.45	$0.84	$1.12	$0.98
Shipper cost per highway mile	$1.58	$1.01	$1.29	$1.14
Differential versus Truck	--	-36%	-18%	-28%
Oakland/Astoria				
Total miles (door to door)	711	929	695	695
Transit hours (door to door)	33.0	39.5	68.7	68.7
Carrier cost per highway mile	$1.46	$1.12	$0.79	$0.71
Shipper cost per highway mile	$1.59	$1.35	$0.95	$0.86
Differential versus Truck	--	-15%	-40%	-46%
Oakland/San Diego				
Total miles (door to door)	498	798	558	558
Transit hours (door to door)	22.0	34.0	55.1	55.1
Carrier cost per highway mile	$1.43	$1.56	$1.65	$1.49
Shipper cost per highway mile	$1.56	$1.90	$1.93	$1.75
Differential versus Truck	--	+22%	+24%	+12%

The results for the short-sea shipping option on the Pacific Coast corridor are clearly mixed. The inclusion of the intermediate port call at Oakland obviously undermines the San Diego/Astoria transit time that could be close to the rail intermodal option's 62 hours without the stopover. However, the overall economics are improved by the higher vessel capacity utilization that is achieved by inclusion of the Oakland stopover. A major disadvantage to short-sea service in the Pacific Coast corridor is the high cost of marine terminal services, which can be fifty percent greater than those in the Gulf and Atlantic Coasts.[12] This may well be a "deal breaker" for short-

[12] Refer to Appendix for details.

sea shipping on the Pacific Coast unless a way can be found to bring marine terminal costs down to levels similar to those likely to be achievable on the other coasts.

Intra-Great Lakes Corridor

Comparisons of door-to-door transit times and the cost to shippers for trailer-loads moving between the Great Lakes region port hinterlands of Milwaukee, WI and Muskegon, MI are provided in Table IV-5 below. This port pair was selected because it connects two primary interstate networks (I-94 and I-90 in the Milwaukee region, and I-96 in Muskegon). As Milwaukee and Muskegon represent the Great Lakes ports-of-call but not necessarily the origin or destination markets of the freight, a sample lane (hinterland to hinterland) was selected that (1) could more reasonably display the comparative economics between short-sea shipping and motor carrier service, and (2) did not exaggerate the circuitry of motor freight around the lakes. For the benchmarking analysis, we selected a specific movement of freight, between Madison, WI and Detroit, MI. As noted earlier, rail intermodal service was excluded from this analysis due to the relatively short distance covered, and the degree of rail route circuitry. The short-sea service was assumed to achieve a 20 percent share of traffic moving in the corridor.

Table IV-5
Comparative Performance of Short-Sea Shipping versus Trucking on the Intra-Great Lakes Corridor

	Truck	Short-Sea Shipping Status Quo	Short-Sea Shipping "Best in Class"
Total miles (door to door)	432	303	303
Transit hours (door to door)	9.5	7.5	7.5
Carrier cost per highway mile	$1.39	$1.15	$1.08
Shipper cost per highway mile	$1.51	$1.32	$1.24
Differential versus Truck	--	-12%	-18%

The results of the Great Lakes corridor project show that the short-sea mode is superior to trucking in terms of both transit time and cost. The assumed frequency of the vessel making the Lake Michigan transit was a daily service in each direction employing a single vessel. The economics as shown above were based on an assumed market share of 20 percent in each direction.[13] Given the superior transit time and cost of the short-sea service, it may be possible to increase market penetration through a twice-daily sailing frequency.

[13] Refer to Appendix for details.

Conclusions

The four corridor studies indicate that short-sea shipping service may be commercial viable when the following conditions are present:

- The market has enough density to enable relatively large vessels that provide scale economies in terms of operating and capital cost to be deployed with high enough service frequency to be competitive with trucking.
- Vessel capital and crew costs as well as marine terminal expenses must be achieved at “best in class” levels for U.S. operations for short-sea shipping to be price competitive with ground alternatives on a door-to-door basis – this appears to be doable in three of the four corridors with the Pacific Coast corridor being less successful primarily due to higher marine terminal expenses.
- Short-sea shipping can be particularly competitive for heavy and/or hazardous shipments currently moving over the road such as chemicals.
- When short-sea shipping provides a more direct point-to-point routing and/or avoids areas of traffic bottlenecks and urban congestion, it can be highly competitive with ground transportation in terms of both cost and transit time – such as in the Intra-Great Lakes corridor.

V. Roles for the U.S. Department of Transportation

There are a number of roles that the U.S. Department of Transportation (USDOT) may play alone, or in conjunction with other agencies (such as the Department of Defense) that would be constructive in moving short-sea shipping forward to effective implementation.

USDOT advances policy and planning directives that affect the interests of shippers, carriers and public agencies involved in transport. As it does not directly control any assets, USDOT's role is one of facilitation and advocacy to produce more efficient transportation networks for the nation. This role could be likened to a 'business development' or 'strategic planning' department in a large corporation, where business plans are constructed, their feasibility explored, and once funding agreement is secured, the plans are passed to project delivery (i.e. the public agencies and private operators) for implementation.

Given the strategic conclusions of this study, three actions could help advance the development of short-sea shipping services:

- Attract, develop and nurture expertise in short-sea service operations
- Encourage and facilitate private and public sector initiatives to develop intra-coastal container services.
- Provide leadership in advocating and facilitating the promotion of cost-reducing practices to remove barriers to short-sea service development

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Appendix

U.S. Domestic Short-Sea Liner Shipping Domestic Model Output

U.S. Domestic Short-Sea Liner Shipping Domestic Model: Gulf to Atlantic Corridor

US Coastal Liner Shipping Service Economic Model	Pilot Lane #1				Pilot Lane #1			
Origin:	**Beaumont, TX**				**Beaumont, TX**			
Destination:	**Camden, NJ**				**Camden, NJ**			
Ocean Transit (Nautical Miles):	1891.00	36.00			1891.00			
Vessel type:	RoRo				Container			
Vessel speed: (Knots)	25	10			25			
One Way Steaming Time (Hours)	79.0				79.0			
Frequency in R/T voyages per week:	5.00				5.00			
No. R/T voyages per year:	250				250			
R/T Ocean Transit Days:	7.00				7.00			
TTL Terminal Days:	1.00				1.50			
Total Ship Days	8.00				8.50			
TTL Drayage Days	2.00				2.00			
Total Container Days	10.00				10.50			
Total Volume of Lane Traffic (Truckloads):	**Truckloads**				**Truckloads**			
Northbound:	621,400				621,400			
Southbound:	201,760				201,760			
Share of Total Lane Traffic:	**Base**	**Freq. Adj**	**Net Share**		**Base**	**Freq. Adj**	**Net Share**	
Northbound:	12%	100%	12%		17%	100%	17%	
Southbound:	25%	100%	25%		25%	100%	25%	
Vessel Capacity (truckloads):	350				500			
NB capacity payload utilization:	85.2%				84.5%			
SB capacity payload utilization:	57.6%				40.4%			
	Per Unit	**Per Voyage**	**Per Year**	**Percent**	**Per Unit**	**Per Voyage**	**Per Year**	**Percent**
Freight Volumes (truckloads)								
Northbound Loads		298	74,568	50%		423	105,638	50%
Northbound Empties		-	-	0%		-	-	0%
Southbound Loads		202	50,440	34%		202	50,440	24%
Southbound Empties		97	24,128	16%		221	55,198	26%
Total Volumes		**597**	**149,136**	**100%**		**845**	**211,276**	**100%**
Service Economics								
Variable Costs								
Marine Terminal Cargo-Handling								
RoRo cost per unit (load & discharge): $120	$ 120	$ 71,585	$ 17,896,320		$ -	$ -	$ -	
LoLo cost per unit (load & discharge): $200	$ -	$ -	$ -		$ 200	$ 169,021	$ 42,255,200	
Mean terminal cargo handling cost per load	$ 143				$ 271			
Land Transportation								
Origin Dray	$ 225	$ 112,685	$ 28,171,318		$ 225	$ 140,693	$ 35,173,133	
Destination Dray	$ 253	$ 126,656	$ 31,663,909		$ 253	$ 158,135	$ 39,533,786	
Long haul drays	$ 143	$ 17,931	$ 4,482,743		$ 143	$ 22,388	$ 5,596,902	
Mean Truck Dray Expense	$ 515	$ 257,272	$ 64,317,969		$ 515	$ 321,215	$ 80,303,821	
Equipment Costs								
Container/Trailer	$ 117	$ 58,730	$ 14,682,439		$ 64	$ 40,243	$ 10,060,762	
Chassis	$ -	$ -	$ -		$ 19	$ 11,831	$ 2,957,864	
Mean Equipment Costs	$ 117	$ 58,730	$ 14,682,439		$ 83	$ 52,075	$ 13,018,626	
Total Variable Costs	**$ 775**	**$ 387,587**	**$ 96,896,729**		**$ 869**	**$ 542,311**	**$ 135,577,647**	
Fixed Costs								
Vessel	$ 342	$ 170,904	$ 42,726,000	26%	$ 276	$ 172,270	$ 43,067,375	21%
Vessel fuel (MFO at $180 per ton/60 TPD)	$ 151	$ 75,600	$ 18,900,000	11%	$ 121	$ 75,600	$ 18,900,000	9%
Port Charges	$ 8	$ 4,000	$ 1,000,000	1%	$ 6	$ 4,000	$ 1,000,000	0%
Sales & Administration	$ 50	$ 25,000	$ 6,250,000	4%	$ 40	$ 25,000	$ 6,250,000	3%
Non-Vessel Depreciation	$ 2	$ 1,000	$ 250,000	0%	$ 2	$ 1,000	$ 250,000	0%
Total Fixed Costs	**$ 553**	**$ 276,504**	**$ 69,126,000**	**42%**	**$ 445**	**$ 277,870**	**$ 69,467,375**	**34%**
Total Operating Expenses	**$ 1,328**	**$ 664,091**	**$ 166,022,729**	**100%**	**$ 1,314**	**$ 820,180**	**$ 205,045,022**	**100%**
Operating Expense per Revenue Load:		**$ 1,328**				**$ 1,314**		
	$ -							

Operating Statistics	**Pilot Lane #1**	**Pilot Lane #1**
Number of Ships	6.00	7.00
Door-to-Door Transit (days)	9.00	9.50
Vessel Turns per Week	0.88	0.82

Footnote: Estimated stevedoring costs have been adjusted to reflect regional differences in operating practice.

U.S. Domestic Short-Sea Liner Shipping Domestic Model: Atlantic Coast Corridor

US Coastal Liner Shipping Service Economic Model	Pilot Lane #2				Pilot Lane #2			
Origin:	**Port Canaveral, FL**				**Port Canaveral, FL**			
Destination:	**New Haven, CT**				**New Haven, CT**			
Ocean Transit (Nautical Miles):	947.00				947.00			
Vessel type:	**RoRo**				**Container**			
Vessel speed: (Knots)	25				25			
One Way Steaming Time (Hours)	38.0				38.0			
Frequency in R/T voyages per week:	5.00				4.00			
No. R/T voyages per year:	250				200			
R/T Ocean Transit Days:	3.50				3.50			
TTL Terminal Days:	1.00				1.50			
Total Ship Days	4.50				5.00			
TTL Drayage Days	2.00				2.00			
Total Container Days	6.50				7.00			
Total Volume of Lane Traffic (Truckloads):	**Truckloads**				**Truckloads**			
Northbound:	126,620				126,620			
Southbound:	100,100				100,100			
Share of Total Lane Traffic:	**Base**	**Freq. Adj**	**Net Share**		**Base**	**Freq. Adj**	**Net Share**	
Northbound:	23%	100%	23%		25%	80%	20%	
Southbound:	25%	100%	25%		25%	80%	20%	
Vessel Capacity (truckloads):	140				200			
NB capacity payload utilization:	83.2%				63.3%			
SB capacity payload utilization:	71.5%				50.1%			
	Per Unit	**Per Voyage**	**Per Year**	**Percent**	**Per Unit**	**Per Voyage**	**Per Year**	**Percent**
Freight Volumes (truckloads)								
Northbound Loads		116	29,123	50%		127	25,324	50%
Northbound Empties		-	-	0%		-	-	0%
Southbound Loads		100	25,025	43%		100	20,020	40%
Southbound Empties		16	4,098	7%		27	5,304	10%
Total Volumes		**233**	**58,245**	**100%**		**253**	**50,648**	**100%**
Service Economics								
Variable Costs								
Marine Terminal Cargo-Handling								
RoRo cost per unit (load & discharge): $120	$ 120	$ 27,958	$ 6,989,424		$ -	$ -	$ -	
LoLo cost per unit (load & discharge): $200	$ -	$ -	$ -		$ 200	$ 50,648	$ 12,662,000	
Mean terminal cargo handling cost per load	$ 129				$ 223			
Land Transportation								
Origin Dray	$ 193	$ 41,837	$ 10,459,280		$ 193	$ 43,794	$ 10,948,444	
Destination Dray	$ 228	$ 49,275	$ 12,318,798		$ 228	$ 51,580	$ 12,894,930	
Long haul drays	$ 70	$ 3,802	$ 950,494		$ 70	$ 3,980	$ 994,947	
Mean Truck Dray Expense	$ 438	$ 94,914	$ 23,728,572		$ 438	$ 99,353	$ 24,838,321	
Equipment Costs								
Container/Trailer	$ 51	$ 11,094	$ 2,773,581		$ 53	$ 12,059	$ 3,014,762	
Chassis	$ -	$ -	$ -		$ 16	$ 3,545	$ 886,340	
Mean Equipment Costs	$ 51	$ 11,094	$ 2,773,581		$ 69	$ 15,604	$ 3,901,102	
Total Variable Costs	**$ 619**	**$ 133,966**	**$ 33,491,577**		**$ 730**	**$ 165,606**	**$ 41,401,423**	
Fixed Costs								
Vessel	$ 279	$ 60,399	$ 15,099,750	27%	$ 282	$ 63,895	$ 15,973,750	24%
Vessel fuel (MFO at $180 per ton/60 TPD)	$ 87	$ 18,900	$ 4,725,000	8%	$ 83	$ 18,900	$ 4,725,000	7%
Port Charges	$ 18	$ 4,000	$ 1,000,000	2%	$ 18	$ 4,000	$ 1,000,000	2%
Sales & Administration	$ 37	$ 8,000	$ 2,000,000	4%	$ 35	$ 8,000	$ 2,000,000	3%
Non-Vessel Depreciation	$ 5	$ 1,000	$ 250,000	0%	$ 4	$ 1,000	$ 250,000	0%
Total Fixed Costs	**$ 426**	**$ 92,299**	**$ 23,074,750**	**41%**	**$ 423**	**$ 95,795**	**$ 23,948,750**	**37%**
Total Operating Expenses	**$ 1,045**	**$ 226,265**	**$ 56,566,327**	**100%**	**$ 1,153**	**$ 261,401**	**$ 65,350,173**	**100%**
Operating Expense per Revenue Load:		**$ 1,045**				**$ 1,153**		

Operating Statistics	Pilot Lane #2	Pilot Lane #2
Number of Ships	4.00	3.00
Door-to-Door Transit (days)	5.50	6.00
Vessel Turns per Week	1.56	1.40

Footnote: Estimated stevedoring costs have been adjusted to reflect regional differences in operating practice.

U.S. Domestic Short-Sea Liner Shipping Domestic Model: Pacific Coast Corridor

US Coastal Liner Shipping Service Economic Model	Pilot Lane #3				Pilot Lane #3			
Origin:	**San Diego / Oakland, CA / Astoria, OR**				**San Diego / Oakland, CA / Astoria, OR**			
Destination:	**Astoria, OR / Oakland, CA/ San Diego, CA**				**Astoria, OR / Oakland, CA/ San Diego, CA**			
Ocean Transit (Nautical Miles):	1028.00				1028.00			
Vessel type:	RoRo				Container			
Vessel speed: (Knots)	25				25			
One Way Steaming Time (Hours)	83.0				83.0			
Frequency in R/T voyages per week:	6.00				5.00			
No. R/T voyages per year:	300				250			
R/T Ocean Transit Days:	7.00				7.00			
TTL Terminal Days:	2.00				3.00			
Total Ship Days	9.00				10.00			
TTL Drayage Days	2.00				2.00			
Total Container Days	11.00				12.00			
Total Volume of Lane Traffic (Truckloads):	**Truckloads**				**Truckloads**			
Northbound:	368,680				368,680			
Southbound:	617,500				617,500			
Share of Total Lane Traffic:	**Base**	**Freq. Adj**	**Net Share**		**Base**	**Freq. Adj**	**Net Share**	
Northbound:	15%	120%	18%		20%	100%	20%	
Southbound:	12%	120%	14%		17%	100%	17%	
Vessel Capacity (truckloads):	350				500			
NB capacity payload utilization:	63.2%				59.0%			
SB capacity payload utilization:	84.7%				84.0%			
	Per Unit	**Per Voyage**	**Per Year**	**Percent**	**Per Unit**	**Per Voyage**	**Per Year**	**Percent**
Freight Volumes (truckloads)								
Northbound Loads		221	66,362	37%		295	73,736	41%
Northbound Empties		75	22,558	13%		-	-	0%
Southbound Loads		296	88,920	50%		420	104,975	59%
Southbound Empties		-	-	0%		-	-	0%
Total Volumes		**593**	**177,840**	**100%**		**715**	**178,711**	**100%**
Service Economics								
Variable Costs								
Marine Terminal Cargo-Handling								
RoRo cost per unit (load & discharge): $120	$ 180	$ 106,704	$ 26,676,000		$ -	$ -	$ -	
LoLo cost per unit (load & discharge): $200	$ -	$ -	$ -		$ 300	$ 214,453	$ 53,613,300	
Mean terminal cargo handling cost per load	$ 206				$ 300			
Land Transportation								
Origin Dray	$ 225	$ 116,646	$ 29,161,533		$ 225	$ 161,094	$ 40,273,618	
Destination Dray	$ 293	$ 151,677	$ 37,919,348		$ 293	$ 209,474	$ 52,368,623	
Long haul drays	$ 238	$ 30,828	$ 7,706,977		$ 238	$ 42,575	$ 10,643,742	
Mean Truck Dray Expense	$ 578	$ 299,151	$ 74,787,857		$ 578	$ 413,144	$ 103,285,983	
Equipment Costs								
Container/Trailer	$ 55	$ 28,229	$ 7,057,143		$ 48	$ 34,040	$ 8,510,048	
Chassis	$ -	$ -	$ -		$ 20	$ 14,297	$ 3,574,220	
Mean Equipment Costs	$ 55	$ 28,229	$ 7,057,143		$ 68	$ 48,337	$ 12,084,268	
Total Variable Costs	**$ 839**	**$ 434,084**	**$ 108,521,000**		**$ 946**	**$ 675,934**	**$ 168,983,550**	
Fixed Costs								
Vessel	$ 371	$ 192,267	$ 48,066,750	26%	$ 284	$ 202,670	$ 50,667,500	21%
Vessel fuel (MFO at $180 per ton/60 TPD)	$ 146	$ 75,600	$ 18,900,000	10%	$ 106	$ 75,600	$ 18,900,000	8%
Port Charges	$ 8	$ 4,000	$ 1,000,000	1%	$ 6	$ 4,000	$ 1,000,000	0%
Sales & Administration	$ 48	$ 25,000	$ 6,250,000	3%	$ 35	$ 25,000	$ 6,250,000	3%
Non-Vessel Depreciation	$ 2	$ 1,000	$ 250,000	0%	$ 1	$ 1,000	$ 250,000	0%
Total Fixed Costs	**$ 575**	**$ 297,867**	**$ 74,466,750**	**41%**	**$ 431**	**$ 308,270**	**$ 77,067,500**	**31%**
Total Operating Expenses	**$ 1,414**	**$ 731,951**	**$ 182,987,750**	**100%**	**$ 1,377**	**$ 984,204**	**$ 246,051,050**	**100%**
Operating Expense per Revenue Load:		**$ 1,414**				**$ 1,377**		

Operating Statistics	**Pilot Lane #3**	**Pilot Lane #3**
Number of Ships	8.00	8.00
Door-to-Door Transit (days)	10.00	11.00
Vessel Turns per Week	0.78	0.70

Footnote: Estimated stevedoring costs have been adjusted to reflect regional differences in operating practice.

U.S. Domestic Short-Sea Liner Shipping Domestic Model: Great Lakes Corridor

US Coastal Liner Shipping Service Economic Model	Pilot Lane #4			
Origin:	**Milwaukee, MI**			
Destination:	**Muskegon, MI**			
Ocean Transit (Nautical Miles):	69.52			
Vessel type:	RoRo			
Vessel speed: (Knots)	20			
One Way Steaming Time (Hours)	3.5			
Frequency in R/T voyages per week:	5.00			
No. R/T voyages per year:	250			
R/T Ocean Transit Days:	0.50			
TTL Terminal Days:	0.20			
Total Ship Days	0.70			
TTL Drayage Days	1.00			
Total Container Days	1.70			
Total Volume of Lane Traffic (Truckloads):	**Truckloads**			
Northbound:	84,240			
Southbound:	207,740			
Share of Total Lane Traffic:	**Base**	**Freq. Adj**	**Net Share**	
Northbound:	20%	100%	20%	
Southbound:	20%	100%	20%	
Vessel Capacity (truckloads):	200			
NB capacity payload utilization:	33.7%			
SB capacity payload utilization:	83.1%			
	Per Unit	**Per Voyage**	**Per Year**	**Percent**
Freight Volumes (truckloads)				
Northbound Loads		67	16,848	20%
Northbound Empties		99	24,700	30%
Southbound Loads		166	41,548	50%
Southbound Empties		-	-	0%
Total Volumes		**332**	**83,096**	**100%**
Service Economics				
Variable Costs				
Marine Terminal Cargo-Handling				
RoRo cost per unit (load & discharge): $120	$ 50	$ 16,619	$ 4,154,800	
LoLo cost per unit (load & discharge): $200	$ -	$ -	$ -	
Mean terminal cargo handling cost per load	$ 71			
Land Transportation				
Origin Dray	$ 225	$ 52,640	$ 13,159,896	
Destination Dray	$ 215	$ 50,223	$ 12,555,754	
Long haul drays	$ 52	$ 3,043	$ 760,839	
Mean Truck Dray Expense	$ 453	$ 105,906	$ 26,476,490	
Equipment Costs				
Container/Trailer	$ -	$ -	$ -	
Chassis	$ -	$ -	$ -	
Mean Equipment Costs	$ -	$ -	$ -	
Total Variable Costs	**$ 525**	**$ 122,525**	**$ 30,631,290**	
Fixed Costs				
Vessel	$ 38	$ 8,945	$ 2,236,325	6%
Vessel fuel (MFO at $180 per ton/60 TPD)	$ 12	$ 2,700	$ 675,000	2%
Port Charges	$ 4	$ 1,000	$ 250,000	1%
Sales & Administration	$ 17	$ 4,000	$ 1,000,000	3%
Non-Vessel Depreciation	$ 4	$ 1,000	$ 250,000	1%
Total Fixed Costs	**$ 76**	**$ 17,645**	**$ 4,411,325**	**13%**
Total Operating Expenses	**$ 600**	**$ 140,170**	**$ 35,042,615**	**100%**
Operating Expense per Revenue Load:		**$ 600**		

Operating Statistics	Pilot Lane #4
Number of Ships	1.00
Door-to-Door Transit (days)	1.50
Vessel Turns per Week	10.00

Footnote: Estimated stevedoring costs have been adjusted to reflect regional differences in operating practice.

Comparative Transport Economics for Selected Study Corridors: Gulf to Atlantic Corridor

Short Sea Shipping Corridor Case Study
Cost Benefit Analysis of Gulf & Atlantic Corridor - "Best in Class" Case

Beaumont, TX to Camden, NJ

Truck

OPERATING STATISTICS		
Highway Miles		1470.3
Transit Hours		32.5
Projected Door-to-Door Transit (Hours)		67.5
ESTIMATED OPERATING COSTS (Per Load)		
Driver - Wages & Benefits	$	905
Equipment (Tractor & Trailer)	$	148
Fuel - Tires - Oil - Maint.	$	534
Insurances	$	99
Repositioning	$	105
Tolls	$	59
All Other	$	428
Depreciation	$	126
Total	$	2,405
Estimated Operating Cost per HWY Mile	$	1.64
Estimated Markup	$	0.14
SHIPPER COSTS		
Total	$	-
Estimated Shipper Cost per HWY Mile	$	1.77
PUBLIC SECTOR		
PUBLIC COSTS		
Net emissions non-conformity	$	197
PUBLIC BENEFITS		
Increase in Hwy Fuel Tax Revenue	$	93
Long-Haul Trucking jobs		3.27

Rail Intermodal

OPERATING STATISTICS		
Rail and Dray Miles		1699.2
Transit Hours		86.0
Projected Door-to-Door Transit (Hours)		86.0
ESTIMATED OPERATING COSTS (Per Load)		
Locomotives & Fuel	$	182
Track & R.O.W	$	129
Yard & Terminal / Lift On/Lift Off	$	110
Railcar Costs	$	39
Crew & Other	$	199
Trailer/Container Costs	$	42
Drayage Expense	$	479
Depreciation	$	107
Total	$	1,286
Estimated Operating Cost per HWY Mile	$	0.87
Estimated Markup	$	0.17
SHIPPER COSTS		
Incremental Inventory Carrying Cost	$	16
Total	$	16
Estimated Shipper Cost per HWY Mile	$	1.06
Discount vs. Highway Transport		40%
PUBLIC SECTOR		
PUBLIC COSTS		
Reduction in Hwy Tax Revenue	$	84
PUBLIC BENEFITS		
Increase in Hwy Fuel Tax Revenue	$	9
Local Trucking jobs		0.31

Short Sea Shipping

OPERATING STATISTICS		
Ocean and Dray Miles		2091.00
Transit Hours		111.0
Projected Door-to-Door Transit (Hours)		111.0
ESTIMATED OPERATING COSTS (Per Load)		
Vessel Costs	$	276
Fuel Costs	$	121
Port Charges	$	6
All Other	$	42
Marine Terminal Costs	$	271
Trailer/Container Costs	$	83
Drayage Expense	$	515
Depreciation (included in vessel costs)	$	-
Total	$	1,314
Estimated Operating Cost per HWY Mile	$	0.89
Estimated Markup	$	0.09
SHIPPER COSTS		
Shipper HMT Expense	$	24
Incremental Inventory Carrying Cost	$	38
Total	$	63
Estimated Shipper Cost per HWY Mile	$	1.03
Discount vs. Highway Transport		42%
PUBLIC SECTOR		
PUBLIC COSTS		
Reduction in Hwy Tax Revenue	$	84
PUBLIC BENEFITS		
Increase in HMT Revenue	$	24
Maritime / Port / Shipyard jobs		0.04
Local Trucking jobs		0.31

Comparative Transport Economics for Selected Study Corridors: Atlantic Coast Corridor

Short Sea Shipping Corridor Case Study
Cost Benefit Analysis of Atlantic Coast Corridor - "Best in Class" Case

Port Canaveral, FL to New Haven, CT

Truck			Rail Intermodal			Short Sea Shipping		
OPERATING STATISTICS			OPERATING STATISTICS			OPERATING STATISTICS		
Highway Miles		1182.6	Rail and Dray Miles		1213.2	Ocean and Dray Miles		1289.05
Transit Hours		26.5	Transit Hours		60.5	Transit Hours		70.0
Projected Door-to-Door Transit (Hours)		54.5	Projected Door-to-Door Transit (Hours)		60.5	Projected Door-to-Door Transit (Hours)		70.0
ESTIMATED OPERATING COSTS (Per Load)			ESTIMATED OPERATING COSTS (Per Load)			ESTIMATED OPERATING COSTS (Per Load)		
Driver - Wages & Benefits	$	738	Locomotives & Fuel	$	165	Vessel Costs	$	279
Equipment (Tractor & Trailer)	$	121	Track & R.O.W	$	114	Fuel Costs	$	87
Fuel - Tires - Oil - Maint.	$	435	Yard & Terminal / Lift On/Lift Off	$	103	Port Charges	$	18
Insurances	$	81	Railcar Costs	$	46	All Other	$	42
Repositioning	$	85	Crew & Other	$	86	Marine Terminal Costs	$	129
Tolls	$	71	Trailer/Container Costs	$	46	Trailer/Container Costs	$	51
All Other	$	251	Drayage Expense	$	421	Drayage Expense	$	438
Depreciation	$	99	Depreciation	$	89	Depreciation (included in vessel costs)	$	-
Total	$	1,881	Total	$	1,070	Total	$	1,045
Estimated Operating Cost per HWY Mile	$	1.59	Estimated Operating Cost per HWY Mile	$	0.90	Estimated Operating Cost per HWY Mile	$	0.88
Estimated Markup	$	0.14	Estimated Markup	$	0.18	Estimated Markup	$	0.09
SHIPPER COSTS			SHIPPER COSTS			SHIPPER COSTS		
						Shipper HMT Expense	$	24
			Incremental Inventory Carrying Cost	$	5	Incremental Inventory Carrying Cost	$	14
Total	$	-	Total	$	5	Total	$	38
Estimated Shipper Cost per HWY Mile	$	1.73	**Estimated Shipper Cost per HWY Mile**	$	1.09	**Estimated Shipper Cost per HWY Mile**	$	1.00
			Discount vs. Highway Transport		37%	**Discount vs. Highway Transport**		42%
PUBLIC SECTOR			PUBLIC SECTOR			PUBLIC SECTOR		
PUBLIC COSTS			PUBLIC COSTS			PUBLIC COSTS		
Net emissions non-conformity	$	150	Reduction in Hwy Tax Revenue	$	66	Reduction in Hwy Tax Revenue	$	66
PUBLIC BENEFITS			PUBLIC BENEFITS			PUBLIC BENEFITS		
Increase in Hwy Fuel Tax Revenue	$	75	Increase in Hwy Fuel Tax Revenue	$	9	Increase in HMT Revenue	$	24
Long-Haul Trucking jobs		2.63	Local Trucking jobs		0.31	Maritime / Port / Shipyard jobs		0.04
						Local Trucking jobs		0.31

Comparative Transport Economics for Selected Study Corridors: Pacific Coast Corridor

Short Sea Shipping Corridor Case Study
Cost Benefit Analysis of Pacific Corridor - "Best in Class" Case

San Diego, CA to Astoria, OR

Truck			Rail Intermodal			Short Sea Shipping		
OPERATING STATISTICS			**OPERATING STATISTICS**			**OPERATING STATISTICS**		
Highway Miles		1209.7	Rail and Dray Miles		1495.0	Ocean and Dray Miles		1164.00
Transit Hours		27.0	Transit Hours		62.0	Transit Hours		115.0
Projected Door-to-Door Transit (Hours)		56.0	Projected Door-to-Door Transit (Hours)		62.0	Projected Door-to-Door Transit (Hours)		115.0
ESTIMATED OPERATING COSTS (Per Load)			**ESTIMATED OPERATING COSTS (Per Load)**			**ESTIMATED OPERATING COSTS (Per Load)**		
Driver - Wages & Benefits	$	752	Locomotives & Fuel	$	161	Vessel Costs	$	284
Equipment (Tractor & Trailer)	$	123	Track & R.O.W	$	158	Fuel Costs	$	106
Fuel - Tires - Oil - Maint.	$	444	Yard & Terminal / Lift On/Lift Off	$	103	Port Charges	$	6
Insurances	$	83	Railcar Costs	$	52	All Other	$	36
Repositioning	$	72	Crew & Other	$	121	Marine Terminal Costs	$	300
Tolls	$	48	Trailer/Container Costs	$	30	Trailer/Container Costs	$	68
All Other	$	143	Drayage Expense	$	305	Drayage Expense	$	385
Depreciation	$	92	Depreciation	$	85	Depreciation (included in vessel costs)	$	-
Total	$	1,757	Total	$	1,014	Total	$	1,184
Estimated Operating Cost per HWY Mile	$	1.45	Estimated Operating Cost per HWY Mile	$	0.84	Estimated Operating Cost per HWY Mile	$	0.98
Estimated Markup	$	0.12	Estimated Markup	$	0.17	Estimated Markup	$	0.10
SHIPPER COSTS			**SHIPPER COSTS**			**SHIPPER COSTS**		
						Shipper HMT Expense	$	24
			Incremental Inventory Carrying Cost	$	5	Incremental Inventory Carrying Cost	$	52
Total	$	-	Total	$	5	Total	$	76
Estimated Shipper Cost per HWY Mile	$	1.58	**Estimated Shipper Cost per HWY Mile**	$	1.01	**Estimated Shipper Cost per HWY Mile**	$	1.14
			Discount vs. Highway Transport		36%	**Discount vs. Highway Transport**		28%
PUBLIC SECTOR			**PUBLIC SECTOR**			**PUBLIC SECTOR**		
PUBLIC COSTS			**PUBLIC COSTS**			**PUBLIC COSTS**		
Net emissions non-conformity	$	154	Reduction in Hwy Tax Revenue	$	68	Reduction in Hwy Tax Revenue	$	68
PUBLIC BENEFITS			**PUBLIC BENEFITS**			**PUBLIC BENEFITS**		
Increase in Hwy Fuel Tax Revenue	$	77	Increase in Hwy Fuel Tax Revenue	$	9	Increase in HMT Revenue	$	24
Long-Haul Trucking jobs		2.69	Local Trucking jobs		0.31	Maritime / Port / Shipyard jobs		0.04
						Local Trucking jobs		0.31

Comparative Transport Economics for Selected Study Corridors: Pacific Coast Corridor

Short Sea Shipping Corridor Case Study
Cost Benefit Analysis of Pacific Corridor - "Best in Class" Case

San Diego, CA to Oakland, CA

Truck			Rail Intermodal			Short Sea Shipping		
OPERATING STATISTICS			**OPERATING STATISTICS**			**OPERATING STATISTICS**		
Highway Miles		498.4	Rail and Dray Miles		798.0	Ocean and Dray Miles		558.00
Transit Hours		11.0	Transit Hours		34.0	Transit Hours		55.1
Projected Door-to-Door Transit (Hours)		22.0	Projected Door-to-Door Transit (Hours)		34.0	Projected Door-to-Door Transit (Hours)		55.1
ESTIMATED OPERATING COSTS (Per Load)			**ESTIMATED OPERATING COSTS (Per Load)**			**ESTIMATED OPERATING COSTS (Per Load)**		
Driver - Wages & Benefits	$	306	Locomotives & Fuel	$	80	Vessel Costs	$	136
Equipment (Tractor & Trailer)	$	50	Track & R.O.W	$	82	Fuel Costs	$	51
Fuel - Tires - Oil - Maint.	$	181	Yard & Terminal / Lift On/Lift Off	$	103	Port Charges	$	3
Insurances	$	34	Railcar Costs	$	41	All Other	$	17
Repositioning	$	30	Crew & Other	$	60	Marine Terminal Costs	$	144
Tolls	$	20	Trailer/Container Costs	$	23	Trailer/Container Costs	$	32
All Other	$	57	Drayage Expense	$	324	Drayage Expense	$	361
Depreciation	$	38	Depreciation	$	65	Depreciation (included in vessel costs)	$	-
Total	$	715	Total	$	778	Total	$	744
Estimated Operating Cost per HWY Mile	$	1.43	Estimated Operating Cost per HWY Mile	$	1.56	Estimated Operating Cost per HWY Mile	$	1.49
Estimated Markup	$	0.12	Estimated Markup	$	0.31	Estimated Markup	$	0.15
Estimated Operating Margin		10%	Estimated Operating Margin		20%	Estimated Operating Margin		10%
SHIPPER COSTS			**SHIPPER COSTS**			**SHIPPER COSTS**		
						Shipper HMT Expense	$	24
			Incremental Inventory Carrying Cost	$	11	Incremental Inventory Carrying Cost	$	29
Total	$	-	Total	$	11	Total	$	53
Estimated Shipper Cost per HWY Mile	$	1.56	**Estimated Shipper Cost per HWY Mile**	$	1.90	**Estimated Shipper Cost per HWY Mile**	$	1.75
			Discount vs. Highway Transport		-22%	**Discount vs. Highway Transport**		-12%
PUBLIC SECTOR			**PUBLIC SECTOR**			**PUBLIC SECTOR**		
PUBLIC COSTS			**PUBLIC COSTS**			**PUBLIC COSTS**		
Net emissions non-conformity	$	37	Reduction in Hwy Tax Revenue	$	23	Reduction in Hwy Tax Revenue	$	23
PUBLIC BENEFITS			**PUBLIC BENEFITS**			**PUBLIC BENEFITS**		
Increase in Hwy Fuel Tax Revenue	$	32	Increase in Hwy Fuel Tax Revenue	$	9	Increase in HMT Revenue	$	24
Long-Haul Trucking jobs		1.11	Local Trucking jobs		0.31	Maritime / Port / Shipyard jobs		0.04
						Local Trucking jobs		0.31

Comparative Transport Economics for Selected Study Corridors: Pacific Coast Corridor

Oakland, CA to Astoria, OR

Truck			Rail Intermodal			Short Sea Shipping		
OPERATING STATISTICS			**OPERATING STATISTICS**			**OPERATING STATISTICS**		
Highway Miles		711.3	Rail and Dray Miles		929.0	Ocean and Dray Miles		695.00
Transit Hours		16.0	Transit Hours		39.5	Transit Hours		68.7
Projected Door-to-Door Transit (Hours)		33.0	Projected Door-to-Door Transit (Hours)		39.5	Projected Door-to-Door Transit (Hours)		68.7
ESTIMATED OPERATING COSTS (Per Load)			**ESTIMATED OPERATING COSTS (Per Load)**			**ESTIMATED OPERATING COSTS (Per Load)**		
Driver - Wages & Benefits	$	446	Locomotives & Fuel	$	87	Vessel Costs	$	169
Equipment (Tractor & Trailer)	$	73	Track & R.O.W	$	90	Fuel Costs	$	63
Fuel - Tires - Oil - Maint.	$	263	Yard & Terminal / Lift On/Lift Off	$	112	Port Charges	$	3
Insurances	$	49	Railcar Costs	$	45	All Other	$	22
Repositioning	$	42	Crew & Other	$	66	Marine Terminal Costs	$	179
Tolls	$	28	Trailer/Container Costs	$	24	Trailer/Container Costs	$	40
All Other	$	84	Drayage Expense	$	305	Drayage Expense	$	385
Depreciation	$	55	Depreciation	$	66	Depreciation (included in vessel costs)	$	-
Total	$	1,040	Total	$	795	Total	$	862
Estimated Operating Cost per HWY Mile	$	1.46	Estimated Operating Cost per HWY Mile	$	1.12	Estimated Operating Cost per HWY Mile	$	0.71
Estimated Markup	$	0.12	Estimated Markup	$	0.22	Estimated Markup	$	0.07
SHIPPER COSTS			**SHIPPER COSTS**			**SHIPPER COSTS**		
						Shipper HMT Expense	$	24
			Incremental Inventory Carrying Cost	$	6	Incremental Inventory Carrying Cost	$	32
Total	$	-	Total	$	6	Total	$	56
Estimated Shipper Cost per HWY Mile	$	1.59	**Estimated Shipper Cost per HWY Mile**	$	1.35	**Estimated Shipper Cost per HWY Mile**	$	0.86
			Discount vs. Highway Transport		15%	**Discount vs. Highway Transport**		46%
PUBLIC SECTOR			**PUBLIC SECTOR**			**PUBLIC SECTOR**		
PUBLIC COSTS			**PUBLIC COSTS**			**PUBLIC COSTS**		
Net emissions non-conformity	$	72	Reduction in Hwy Tax Revenue	$	36	Reduction in Hwy Tax Revenue	$	36
PUBLIC BENEFITS			**PUBLIC BENEFITS**			**PUBLIC BENEFITS**		
Increase in Hwy Fuel Tax Revenue	$	45	Increase in Hwy Fuel Tax Revenue	$	9	Increase in HMT Revenue	$	24
Long-Haul Trucking jobs		1.58	Local Trucking jobs		0.31	Maritime / Port / Shipyard jobs		0.04
						Local Trucking jobs		0.31

Comparative Transport Economics for Selected Study Corridors: Great Lakes Corridor

Short Sea Shipping Corridor Case Study
Cost Benefit Analysis of Great Lakes Corridor - "Best in Class" Case

Sample Lane: Madison, WI to Detroit, MI

Truck		Short Sea Shipping	
OPERATING STATISTICS		**OPERATING STATISTICS**	
Highway Miles	431.60	Ocean and Dray Miles	302.52
Transit Hours	9.5	Transit Hours	7.5
Projected Door-to-Door Transit (Hours)	9.5	Projected Door-to-Door Transit (Hours)	7.5
ESTIMATED OPERATING COSTS (Per Load)		**ESTIMATED OPERATING COSTS (Per Load)**	
Driver - Wages & Benefits	$ 265	Vessel Costs	$ 38
Equipment (Tractor & Trailer)	$ 43	Fuel Costs	$ 12
Fuel - Tires - Oil - Maint.	$ 156	Port Charges	$ 4
Insurances	$ 29	All Other	$ 42
Repositioning	$ 26	Marine Terminal Costs	$ 71
Tolls	$ 17	Fuel/Maintenance Savings	$ (33)
All Other	$ 32	Drayage	$ 333
Depreciation	$ 31	Depreciation (included in vessel costs)	$ -
Total	$ 599	Total	$ 487
Estimated Operating Cost per HWY Mile	$ 1.39	Estimated Operating Cost per HWY Mile	$ 1.08
Estimated Markup	$ 0.12	Estimated Markup	$ 0.11
SHIPPER COSTS		**SHIPPER COSTS**	
		Shipper HMT Expense	$ 24
		Incremental Inventory Carrying Cost	$ (2)
Total	$ -	Total	$ 22
Estimated Shipper Cost per HWY Mile	$ 1.51	**Estimated Shipper Cost per HWY Mile**	$ 1.24
		Discount vs. Highway Transport	18%
PUBLIC SECTOR		**PUBLIC SECTOR**	
PUBLIC COSTS		**PUBLIC COSTS**	
Net emissions non-conformity	$ 26	Reduction in Hwy Tax Revenue	$ 9
PUBLIC BENEFITS		**PUBLIC BENEFITS**	
Increase in Hwy Fuel Tax Revenue	$ 27	Increase in HMT Revenue	$ 24
Long-Haul Trucking jobs	0.96	Maritime / Port / Shipyard jobs	0.03
		Local Trucking jobs	0.31

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