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Feasibility Assessment of Short Sea Shipping to Service the Pacific Coast

BY

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EXPERIENCE | Transportation

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1 PROJECT OVERVIEW

The objective of the study "*Feasibility Assessment of Short Sea Shipping to Service the Pacific Coast*" is to demonstrate the preliminary market, economic, and technical feasibility of a commercial short sea service on the Pacific Coast that handles domestic and international (feeder) freight moving between major transportation hubs and population centers. The effort also addresses the potential emissions of Short Sea Shipping compared to traditional trucking and the military applications of short sea service and vessels including their scope for contributing to military deployment requirements.

The overall approach was to apply commercial market requirements to determine the feasibility of short sea service along the Pacific Coast. Commercial requirements include costs and service standards (transit time, frequency, on-time reliability, etc.) that are competitive with today's modes (road and rail). Commercial requirements were determined through surveys of shippers and service providers. Market sizing was derived from assessment of current cargo flows and creation of a diversion model to quantify the cargo available to short-sea service. Vessel requirements were derived on the basis of assessments of port constraints and required vessel speed based on simulation modeling of a door to door model. Economic analysis of SSS compared to traditional trucking in three routes, Northern California to Southern California, Northern California to the Pacific Northwest, and Southern California to the Pacific Northwest was performed to determine the economic feasibility of SSS on the West Coast. Finally, an estimate of SSS emissions was developed and compared to traditional trucking in these three routes using two different propulsion plants and grades of fuel.

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Cargo Flows and Trade Lane Analysis

The Cargo Flows and Trade Lane Analysis identified 5,663 truck and rail county traffic lanes, grouped according to a very broad definition of the potential market for west coast short sea service: 107 Business Economic Areas (BEAs)[1] that had at least minimal potential to be suitable for cargo diversion into the coastwise service. Northbound and southbound Pacific Coast shipments in general, with sufficient length of haul or origin/destination pairs that do not fall within a single port area were generally identified as being eligible. Truck cargo was analyzed at the county level in the US. All counties within the states of California, Oregon and Washington were included, and the truck traffic data provided was split into three types, common carrier truckload and less-than-truckload (LTL), and private truckload. US rail cargo, both intermodal and carload[2], was analyzed at the BEA level. This is the most

[1] There are 172 defined Business Economic Areas in the US, see Appendix A for a definitional map
[2] Carload refers to all other types of rail cars other than trailers or containers moving by intermodal car

detailed level that can be provided without special permission from the Surface Transportation Board. Each origin / destination pair included traffic mode (truck or rail), length of haul, and commodity type.

Table 1-1: 2004 Estimated "Filtered" Truckload (000's) Flows by Origin / Destination BEA

Destination BEA	Origin BEA								
	Los Angeles, CA	San Francisco, CA	San Diego, CA	Seattle, WA	Sacramento, CA	Portland, OR	Richland, WA	Other	Total
Boise, City, ID	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Eugene, OR	35.5	9.1	2.0	203.5	4.3	61.5	1.5	1.1	318.5
Fresno, CA	0.0	0.0	12.6	25.2	0.0	19.4	93.9	18.4	169.6
Los Angeles, CA	146.5	**7,160.0**	1,382.9	444.6	1,355.8	416.6	110.8	439.5	11,456.7
Pendleton, OR	89.5	1.8	0.2	0.0	0.5	0.0	0.0	0.5	92.4
Portland, OR	102.4	143.3	8.3	396.8	23.2	0.0	0.0	136.7	810.7
Redding, CA	218.2	0.0	21.7	40.1	0.0	3.6	0.0	0.0	283.6
Reno, NV	17.5	0.0	6.9	0.4	0.0	0.6	0.0	0.0	25.5
Richland, WA	17.6	17.7	0.6	0.0	2.6	0.0	0.0	6.8	45.3
Sacramento, CA	1,327.9	0.0	142.7	29.6	0.0	25.4	17.8	17.5	1,560.8
San Diego, CA	1,020.8	734.6	0.0	29.6	126.2	26.4	4.5	46.4	1,988.6
San Francisco, CA	**7,218.4**	0.0	799.1	240.3	0.0	132.2	266.1	109.9	8,765.9
Seattle, WA	238.8	97.9	10.3	252.0	27.7	233.0	0.0	96.1	955.7
Spokane, WA	33.5	9.8	0.7	0.0	2.7	0.0	0.0	2.5	49.2
Grand Total	10,467.5	8,174.3	2,388.1	1,662.3	1,542.8	918.7	494.5	875.3	26,523.5

Source: Global Insight, Reebie Transearch Database, 2004, Manalytics International

Cargo Diversion Shipper Survey

The Cargo Diversion Shipper Survey results are based on a relatively small sample and should be viewed as preliminary, subject to analysis in subsequent subtasks of this project, which may include additional survey research with shippers, consignees and transportation companies. In addition, because these results are based on a test of a new transportation concept, where the respondents have no direct experience, respondents' estimates of the likelihood of use, and extent of use if receptive, are likely to be biased downward. Nevertheless, these results provide quantitative parameters that can be used in developing preliminary, lower-bound estimates of the magnitude and key aspects of the potential demand for coastal shipping service. This information can be used to help determine whether the service is feasible and, if so, the type of vessel deployment (vessel size and speed, port rotation, call frequency, number of vessels required, etc.) that would be most appropriate.

To summarize, the principal quantitative results of the survey were:

- About 43 percent of the respondents indicated that they would consider using coastal shipping service as an alternative to their current modes of transportation for North-South shipments along the West Coast.

- Statistical analysis suggests that respondents' (1) average length of haul for eligible shipments, and (2) the percentage of their eligible freight that moves via rail both positively affect the likelihood that they would consider the coastal shipping alternative.

- The main reason for lack of interest in the coastal shipping service was skepticism about the service's ability to provide adequate transit time and reliability, particularly for those respondents with shipments involving a high degree of circuity (if they were to utilize a short sea shipping service) or perishability.

- Among those respondents that did express an interest in coastal shipping service, statistical analysis indicates that (1) the total transit time relative to truck service and (2) the all-in price relative to truck service both had significant negative effects on percentage diversion to coastal shipping from current transport modes. The estimated impact of the reliability of coastal shipping service relative to truck was not significant. Furthermore, these statistical results suggest implicit tradeoffs made by shippers between the transit time and price of coastal shipping service.

- The majority, 57 percent, of those shippers that are receptive to coastal shipping service requires at least twice-weekly service, and 32 percent require at least daily service. There is moderate seasonality of demand—relatively heavy in the Summer and Fall, and relatively light in Winter.

High Capacity Ro-Ro Vessels of Required Speed Technically Feasible

Four notional point designs for large commercial roll-on/roll off vessels with speed capabilities covering the speed range of interest (24 to 32 knots) given potential port locations, and 24, 48, and 72 hour service goals for Northern California to Southern California, Northern California to the Pacific Northwest, and Southern California to the Pacific Northwest respectively were developed using CDI Marine's design synthesis models. These point designs are summarized in Table 1-1, and served as input to vessel construction cost estimates, as well as operating and support cost estimates.

Table 1-2 summarizes the potential locations that were assessed in this study. In addition to surveying potential terminal locations, and assessing their associated impacts on vessel requirements and required speed, a discrete event simulation was developed to explore infrastructure requirements. This simulation model included activities from the time a vessel was ready to unload, to the time that all loads had been delivered to receivers, all loads had

been loaded onto the vessel for the return trip, and all loads that would be staged for the next vessel were staged.

Table 1-2: Potential West Coast SSS Terminal Locations

Terminal	Restricted Channel (NM)	VTS Regulated (NM)	Constraints	Navigational Draft (MLLW)	Comments
Richmond CA	3	20		35' In Channel	Preferred terminal for Northern CA
Pittsburg CA	23	26	Air Draft 132'	35' In Channel	Alternative terminal for Northern CA
Stockton CA	60	26	Air Draft5 132' – Largest vessel to call on Port has been 796'	35' In Channel	Alternative terminal for Northern CA
Sacramento CA	64	26	Air Draft 132' – 5 Berths each 600' long	30' In Channel 35' Alongside	Alternative terminal for Northern CA
LA/LB CA	9*	0**		45'+ In Harbor	Primary terminal for Southern CA
Seattle WA	0	176		50' Most Terminals	Alternative terminal for Pacific Northwest
Tacoma WA	0	198		51' In Channel	Assumed terminal for Pacific Northwest

Speed ranges required for each of the three primary routes considered are:

- 27 to 35 knots for Northern to Southern California
- 24 to 27 knots for Northern California to the Pacific Northwest
- 20 to 22 knots for Southern California to the Pacific Northwest

Short Sea Shipping Economically Feasible Assuming Market Volume Exists

Tables 1-3 provide a comparison of estimated SSS costs, door to door, to prevailing truck rates in the three primary markets considered assuming a minimum of two 700 trailer capacity vessel sailings per day from each terminal. This table provides low and high estimates associated with lower and higher required vessel speeds, and also a lower and higher per-load terminal cost. In the Northern California to Southern California route, SSS costs compared to prevailing truck rates range from 70% to 100% depending on the assumed scenario (with our without favorable negotiated terminal costs, and with a 27 knot cruising speed or 32 knot cruising speed). In the Northern California to Pacific Northwest route, SSS costs range from 67% to 95% of prevailing truck rates depending on the scenario.

In the Southern California to Pacific Northwest route, SSS costs range from 36% to 47% of the prevailing truck rates.

Table 1-3: Total SSS Costs Per Load

	Baseline Vessel Costs			Higher Vessel Costs		
	NC - SC	NC - PNW	SC - PNW	NC - SC	NC - PNW	SC - PNW
Vessel:	$236	$780	$487	$297	$1,068	$546
Trailers:	$21	$26	$31	$21	$26	$31
Yard Tractors:	$21	$21	$21	$21	$21	$21
Truck Drayage:	$270	$270	$270	$270	$270	$270
Terminals:	$28	$28	$28	$28	$28	$28
TOTAL/LOAD:	$576	$1,124	$836	$636	$1,412	$895
W/ HMT:	$651	$1,199	$911	$711	$1,487	$970
Northbound Truck Rate:	$945	$2,375	$3,265	$945	$2,375	$3,265
Southbound Truck Rate:	$693	$963	$1,325	$693	$963	$1,325
Notional Average Truck Rate:	$819	$1,669	$2,295	$819	$1,669	$2,295
SSS/Trucking:	70%	67%	36%	78%	85%	39%
SSS/Trucking with HMT:	79%	72%	40%	87%	89%	42%

These estimates should be considered preliminary, rather than the basis for a final business plan. Some key variables that should be the focus of future efforts include:

- Fuel consumption is the primary factor in costs per load for the SSS operation. Therefore, special attention should be paid to fuel consumption during vessel design development. This should include trade studies of alternative hullforms, as well as improved propulsion plant efficiency.

- Vessel construction costs are the 2nd largest vessel cost contributor next to fuel. Subsequent efforts should involve shipbuilder participation to develop highly producible designs at the least cost possible. The impact of long production runs on the average cost per vessel should be further explored.

- Truck drayage costs are a significant portion of the total costs per load, equal to vessel costs (including construction and fuel) in the case of the shorter Northern to Southern California route, and second to vessel costs for the longer routes. Truck drayage costs are therefore an area worthy of additional special attention as business models are developed.

- Detailed discussions with port authorities and terminal operators are needed to develop an accurate estimate of terminal costs, which at the time of this writing appeared to be highly variable. If priced as a per-load rate based on a percentage of prevailing container lift-on/lift-off rates it is anticipated that terminal costs will be highly inflated compared to current revenues based on the utilization anticipated from SSS operations. A more favorable rate, negotiated on the basis of replicating current revenue should be pursued.
- Simulation results of shipboard trailer maneuvering for specific designs and trailer arrangements to confirm potential throughput rates and required vessel speed should be conducted.

- Collection of maintenance cost data for commercial vessels in similar routes to reduce the conservatism of the maintenance cost estimates.

- Development of a minimum crewing plan consistent with a specific maintenance philosophy and coast guard requirements.

- More accurate assessments of the HMT based on projections of cargo values specific to given routes and markets, and continued efforts to eliminate the HMT.

- In developing a detailed business model the costs of financing, not included in the estimate, must be considered.