Market Analysis for the Port of Pittsburgh Commission

SCOPE OF POTENTIAL AND NEW BUSINESS DEVELOPMENT OPPORTUNITIES

Final Report

Prepared for

Mr. James McCarville, Director

Prepared by

Reebie Associates

with

Martin & Associates

Study Participants

The Port of Pittsburgh Commission

- Mr. James McCarville, Director

Reebie Associates

- Joseph Bryan, President
- Allan DeChello, Operations Executive
- Peter V. Stone, Senior Principal
- Jean Thomson, Transportation Researcher
- Lexcie Lu, Transportation Analyst

Martin & Associates

- John C. Martin, President
- Mark Papineau, Director of Research
- Michelle Wingenroth, Economic Development Director
- Jeffrey Sweeney, Research Associate

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FINAL REPORT

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1. Executive Summary

The Port of Pittsburgh is important to the economy of the Pittsburgh region, providing high volume supply and distribution services to industry and supporting the efficiency of their logistics systems. The Port is the easternmost deep-river terminus of the Mississippi & Ohio waterway system, which has traditionally helped attract business to the region, and gives it a strategic ascendancy over other inland ports for access to the eastern consuming markets, and as a conduit to the growing producing centers of the south. As the U.S. economy has shifted toward the service sector and away from heavy manufacturing, businesses throughout the industrial heartland have adapted with more sophisticated products and processes, and with complex supply chains linking global enterprises. These trends have favored highway transportation more than the rivers or rails, yet the congested roads of America are evidence that the highways cannot do it all, and the inland water system is vital not only for the tremendous tonnage it continues to carry, but as part of the capacity solution for the nation's freight. The Port of Pittsburgh was able to grow during the manufacturing shifts of the 1990's, it performs extremely well in its traditional markets, and it remains an engine of local economic activity. The question it now faces is how to define its opportunities, and how to adjust to new patterns of business with appropriate capabilities and institutions, that integrate waterborne transport in modern supply chains.

The objective of this study is to evaluate freight traffic patterns in markets the Port serves or could serve, examine ways to remarket or adapt barge services and support capabilities for new opportunities, and to consider institutional responses by the Port that may improve the competitive effectiveness of waterway transportation. In a two-phase research effort, the study team began with a quantitative analysis of commodity transportation markets, utilizing freight traffic data resources to define the competitive position of the Port and the scope of its development options. The subsequent phase undertook fieldwork to refine and assess particular market niches through customers who exemplified them. A series of 190 interviews was conducted in stages, focusing on chemical and metals industries and other market participants, and supported by analysis of competitive logistics. The analytic approach used throughout the study was a kind of drill-down method, which is a process of examining data and opportunities at increasingly detailed levels to zero-in on attractive prospects and the ways of acting upon them. Based on the character and scope of its options, several steps were recommended for the Port to take, which extend its strategic advantage and strengthen the logistical capabilities of the region for the benefit of the waterway.

The initial phase concluded that the Port of Pittsburgh has done well in traditional markets and compares favorably to other inland ports. This is a positive result, but it implies there is little low hanging fruit left for rapid harvest. In general, water transport dominates water lanes, although some traffic prospects currently handled by rail and truck are available for conversion, and there are certain kinds of backhaul options worth pursuing. The larger opportunities are also the most challenging ones, involving longer drays into the surrounding region, or extended dray operations utilizing Pittsburgh as a transload hub. More complex logistical management is called for, but that also helps adapt the capabilities of waterborne transport to the information intensive control requirements of current industrial supply chains.

The fieldwork phase derived a set of eight market niches or tactics for waterborne business opportunities. For each of these, a general analysis was carried out to define the magnitude of benefits to the shippers, the operators, and the Port of Pittsburgh. The categories fell mainly into variants of forward distribution and catchment area exploitation; in terms of market development, forward distribution for certain classes of chemicals is by far the most important, while rationalization, geographic competition, and backhaul utilization contribute to other opportunities. Container traffic presents substantial obstacles, yet the market is unavoidably important in the contemporary economy. The introduction of basic service could well attract incremental volume, and be the foundation for long-term business expansion. Thus, forward distribution and the container market become the key opportunities for pursuit. Prospects across the board hinge on new levels of service partnership with ground transportation firms, on alliances that ensure higher degrees of service and market coordination, and on the exploration of new roles for the Port in stimulating such developments.

Four strategic conclusions were drawn from the study:

- *First*, the geographic position of the Pittsburgh Port as a gateway to the inland water system is a valuable asset that should be developed as such, and therefore a tactical focus should be on ways to extend the waterway's scope of services beyond the local market. Doing so requires efficient access to eastern markets, and this implies a higher degree of control over access cost factors.

- *Second*, new business opportunities mean adaptation to categorically new logistics systems, with complex coordination and again, control over cost factors. The development of such capabilities in the Pittsburgh region should be a target for the Port Commission, identifying third party logistics firms or other agents with an intrinsic interest in the bulk business where the waterway has particular strength, or with a credible connection to water for the container business.

- *Third*, there is a need for a coordinating function that consolidates waterway volume – not operationally, but institutionally, for the sake of creating bargaining power to drive down pickup and delivery costs. This function would act as a negotiating agent and a kind of 'core carrier' program for the Port, fostering partnerships and efficiency in the pickup, delivery, and transload process. A particular payoff is that the capacity to modify access costs may facilitate the production of baseload volumes for new container services, which would yield a beachhead into one of the major contemporary freight markets.

- *Fourth*, is that while forward distribution and the container market differ in their handling and transport requirements, they demand comparable skill sets in logistics management and access cost control. Thus, pursuit of both can be productive and mutually supporting to a degree, and make new institutional initiatives more worthwhile.

These points all affect the marketing and coordinating role of the Port Commission, and could lead it to consider new functions. Three actions are critical to the continued growth of Pittsburgh as a waterway freight port and influence that role: (1) Facilitate consolidated bargaining and promote cost-reducing practices; (2) Recruit 3rd party logistics providers to organize the complex management of forward distribution; (3) Attract, develop and nurture expertise in container-on-barge operations.

1) The Commission as Agent: The strategic utility of lower dray costs, supported by improved utilization of truck equipment, has been asserted in this study. To achieve it, a coordinating agent negotiating with motor carriers on behalf of multiple waterway operators, could cut pickup and delivery costs to their mutual benefit, and to the advantage of the region. The Port should explore establishment of an agency function, to be undertaken by a qualified party or conceivably by the Port itself, with appropriate staffing and resources. Either inside the agency or parallel to it, the Port should consider steps that modify access costs in other ways. One is to arrange financing for modern transloading equipment or facility upgrades, another is to institute a best practices benchmarking program with interested operators, and a third is to improve landside access to port districts via transportation improvement programs, organized with the Regional Planning Commission.

2) The Commission as Recruiter: Management of intermodal container or forward distribution systems requires complex logistical coordination among multiple entities. The marketing of such services to large organizations must overcome modal stovepiping, appeal to business developers in addition to transportation departments, and win the support of finance and manufacturing groups. Third party logistics companies make a business out of this, and can bring such functions together not only in Pittsburgh, but at

remote origins and destinations for which Pittsburgh may function only as a hub. The Port Commission should identify and qualify third party firms, then extend their capabilities into the Pittsburgh region, by involving these parties in marketing programs, connecting them to local companies, and aiding their local efforts.

3) The Commission as Developer: Container-on-barge is an infant market that will require groundbreaking marketing efforts to establish a regularly scheduled service at Pittsburgh. Such a service will require fixed sailing schedules and be "induced" into the Pittsburgh area by a sufficient volume of cargo to justify the Pittsburgh call. This may require innovative pricing in order to penetrate the rail/truck market, and as a result, a detailed cost based analysis will not likely be representative of the pricing that will be required in order to initiate and grow the business. Furthermore, it is unlikely that one shipper will be the catalyst for such an inducement volume, and as a result, it will be necessary to consolidate multiple shippers/consignees in the Pittsburgh region. The fact that the service will require such steps opens a role for the Port of Pittsburgh Commission. The Port can engage in active marketing to key shippers/consignees in the area along with direct marketing to potential barge operators; it also will be necessary that the Port initiate discussions with ocean carriers regarding intermodal pricing, and potential repositioning of empties into the Gulf. The pricing can be divided into its components for analysis, but only the total price will be relevant. A high or low barge component rate, terminal rate or dray rate can be offset by an advantageous component rate in the supply chain. Steps can, and should be undertaken to reduce all component rates and recommendations follow for each.

Barge carriers typically quote barge load rates, usually on a long term contract with an invoice to a single shipper. This method of pricing does not lend itself to the numerous customers that would make up a container-on-barge movement. The service delivery must be regular and predictable with pricing quoted on a per container basis. The barge needs to sail as scheduled, whether it is full or not. Therefore, the per container rate must anticipate varying load factors.

The total quoted per container rate will reflect terminal charges at the river terminals, the linehaul barge cost, the inland dray costs to and from the river terminal, and the ocean cost and stevedoring charge from barge to vessel or vessel to barge for an international move. The quoted terminal charges, which include stevedoring as well as truck loading, mounting on chassis, weighing, container inspection and repair, account for a significant share of the total inland river cost of moving a container. These are fixed charges and represent about one-third of the transportation cost (excluding the dray to and from the river terminal). In order for the river system to be competitive with competing deep sea ports and inland modes, it is necessary that the river terminals need to competitively price

their terminal charges. Some indications are that initial rates quoted in Pittsburgh were more than 50% higher than similar inland ports in the Lower Mississippi handling container-on-barge movements. The handling cost can be expected to be reduced with experience and with more appropriate equipment.

Currently, a number of Pittsburgh terminals have experience with steel coils and other heavy lifts and do have equipment appropriate to start a container-on-barge terminal operating service. However, the terminal costs will most likely fall as terminal operators gain experience and new specialized equipment is added at the terminals. This will require investments in equipment with greater productivity than currently exists at the terminals. However, the private sector will likely be reluctant to make investments in new terminal equipment due to risk factors. The Port of Pittsburgh Commission considers this concept as a regional economic development tool, and the Port of Pittsburgh Commission could provide certain financing incentives to the private terminals to upgrade equipment, or, if there is no interest, consider more drastic measures such as direct investment in equipment.

The establishment of an inaugural service is crucial, because a baseload volume operating on a schedule attracts incremental business that will not come to the waterway otherwise, and that solidifies but could not justify the service in itself.

Another role that the Port of Pittsburgh Commission can pursue is the continued marketing of the river system for the traditional cargo moving on the river system, as well as for the potential container business. The Port should be in contact with the barge operators interested in service in the Pittsburgh area as well as with steamship line operators and local shippers/consignees. The Port should continue to work to identify potential opportunities to attract a regular container-on-barge service, marketing the system as a whole to potential users, and have in place a system to disseminate this information to interested parties including barge operators, steamship lines and terminal operators. Again, the importance is on aggressive marketing to the ocean carriers to integrate intermodal service via barge to customers in the Pittsburgh region.

Finally, the Port can work on project specific issues brought forward by terminal operators or local shippers/consignees. These could include specific feasibility analyses, funding assistance, and/or working directly with the ocean carriers in developing innovative pricing techniques.

Conclusions: New business opportunities in traditional waterborne traffic have become fewer in the changing marketplace. However, new business of material magnitude is available that will require creativity and new marketing expertise, as the assessment of

container-on-barge, forward distribution, and its variants determined. The steps required to exploit such a market niche, and the concomitant capabilities and cost elements that must be developed, in fact would move the Port toward the complex management of logistics that modern supply chains have adopted and nurtured for competitive advantage. Recognizing that conventional markets are not wholly exhausted, and that some actions should be taken in that direction for prospects identified in this research, the larger steps forward are steps in transition that develop new capabilities for industries that are themselves in transition into global markets and global-to-local logistics. Whether the role of the Port Commission – or just the capabilities it fosters – should change along with its opportunities, is a subject the Commission must explore.

2. Introduction

The Port of Pittsburgh is important to the economy of the Pittsburgh region today as it has been historically, providing high volume supply and distribution services to industry and supporting the efficiency of their logistics systems. As the U.S. economy has shifted toward the service sector and away from heavy manufacturing, businesses throughout the industrial heartland have adapted with more sophisticated products and processes, and with complex supply chains linking global enterprises. These trends have favored highway transportation more than the rivers or rails, yet the congested roads of America are evidence that the highways are strained, and the inland water system is vital not only for the tremendous tonnage it continues to carry, but as part of the capacity solution for the nation's freight. The Port of Pittsburgh was able to grow during the manufacturing shifts of the 1990's, and it remains an engine of local economic activity. However, it must continue to adapt to a changing market place, locate new business opportunities, and perhaps remarket old solutions to new players. Encouraging the investment of capital resources, reaching out to new customers, and evolving in its own role, may open markets that are otherwise unavailable to waterways.

The Port of Pittsburgh is the easternmost deep-river terminus of the Mississippi & Ohio waterway system. As such, it enjoys a strategic ascendancy over other inland ports for access to the Northeastern and Middle Atlantic consuming markets, and as a potential conduit for through freight providers connecting to the growing industrial south. Its location is a strategic asset whose benefits the region enjoyed historically, and whose advantages should be sharpened and extended for modern logistics.

The objective of this study is to determine to what extent barge services can be remarketed or redesigned for better competitiveness in today's marketplace, and what support capabilities and improvements will enhance the barge's competitive position. The Port Commission recognizes that its traditional markets, such as Coal and Aggregates, are slowing. This study was designed to verify if any traditional markets have been overlooked, and to explore new markets that have unfulfilled potential.

In a two-phase research effort, the study team began with a quantitative analysis of commodity transportation markets in multiple dimensions, utilizing freight traffic data resources to define the competitive position of the Port and its potential development options. The initial phase was designed to lay the ground and establish focus for the subsequent stage of research, in which fieldwork and logistics assessment would examine the more promising market niches in finer detail. At the conclusion of Phase I, options were reviewed with the Port Commission and avenues for further pursuit were agreed

upon. In Phase II, the remainder of market analysis became concerned with narrowing and evaluating specifics, and turned on particular categories of opportunity and customers who exemplified them. Forward distribution, geographic sourcing, and hinterland dray opportunities, among others, were investigated. This report begins with the characterization of markets and classification of available opportunities, and will provide a variety of details from Phase I of the study. While the second phase is summarized more broadly in this report, the Port has received additional analyses on a confidential basis.

3. Phase I: Results of Quantitative Analysis

To determine the scope of potential new business opportunities, Reebie Associates analyzed its TRANSEARCH and FREIGHT LOCATER databases [1] for characteristics of freight movement to, from, and through the region (the former is a database of freight traffic flows for geographic, commodity, and modal markets; the latter is a database of freight shipping establishments). In this phase, the team evaluated Pittsburgh freight traffic in terms of geographic concentrations, commodity composition, benchmark comparisons with other ports, modal competition, market imbalances, and other market development opportunities such as spot-barging and catchment area traffic from the Pittsburgh hinterlands. The results of this analysis shaped the Phase II fieldwork, which will be presented in Section 4.

The major conclusions of Phase I was that Pittsburgh barging does well in its primary markets, there is not much low hanging fruit in consequence, and new business prospects are complex ones. In general, water transport dominates water lanes, although there were a few prospects for business conversion now moving by rail and truck, and there were certain prospects for backhaul. The larger opportunities were also the most challenging opportunities, involving longer drays into the service area, or extended dray operations utilizing Pittsburgh as a transload hub.

3.1 Pittsburgh Market Overview

The purpose of this section is to provide an overview of the Pittsburgh freight transportation market, focusing particularly on the current position of the inland water

[1] Data resources are described further in Section 7.

mode in that market, and the extent of the mode's opportunities. Various analyses conducted in the study's initial phase are summarized and highlighted here; more details on trends and profiles be found in Appendix A – Pittsburgh Market Assessment. Analysis methodology appears in Appendix B.

According to quantifications from the TRANSEARCH database, a total of 249 million tons were carried in to, out of, and within the Pittsburgh Port District in 2001; and 22% of tonnage involved a water movement. The goods had a total value of $133 billion, 7% ($9 billion) of which was carried by water.

Water is a strong contender in lanes where it is active – 68% of all available traffic by tonnage is carried by water in water lanes. In this analysis, 'water lanes' is defined as any market with waterborne volume in the base year of 2001. This definition includes some markets that may be too circuitous for general development, although water is effective for some classes of goods traveling such routes; indeed, there is substantial movement by barge of waste and scrap between Pittsburgh and the East Coast using an out-of-the-way routing via the Gulf. Thirty-three percent of total Pittsburgh market freight tonnage occurs in water lanes – reflecting in part the constraint of the Mississippi River System franchise and its ocean connections.

The top water commodities were: Coal (66%), Sand and Gravel, Waste and Scrap – consistent with the relative low valuation of goods compared to the tonnage. The top water markets by tonnage were: movements within the Port District; movement to/from the West Virginia portion of the Pittsburgh business economic area (BEA, see 3.1.1); and movements to/from Charleston and Wheeling market areas in West Virginia. In terms of tonnage, it is clearly evident that the Port of Pittsburgh is dominated by coal traffic from the Western Appalachians.

3.1.1 Geographical Definitions

The ports in the Pittsburgh Port District are marketed under an umbrella organization known as the Port of Pittsburgh Commission. The Port District (hereafter the "service area") covers water activity in the following eleven counties in Pennsylvania: Allegheny, Armstrong, Beaver, Butler, Clarion, Fayette, Greene, Indiana, Lawrence, Washington, Westmoreland (See Figure 1).

Ten out of the eleven counties (excluding Clarion) also form the Pennsylvania portion of the Bureau of Economic Analysis's Business Economic Areas (BEA). The Pittsburgh BEA represents the counties adjacent or close to Pittsburgh which are culturally and

economically connected with Pittsburgh. In addition to the Pennsylvania portion, the BEA also includes a West Virginia portion, consisting of the following nine counties in West Virginia: Barbour, Doddridge, Harrison, Lewis, Marion, Monongalia, Preston, Taylor, and Upshur. For the purpose of this analysis, this nine-county market area is shown as "Pittsburgh, WV", to distinguish it from the service area of "Pittsburgh, PA."

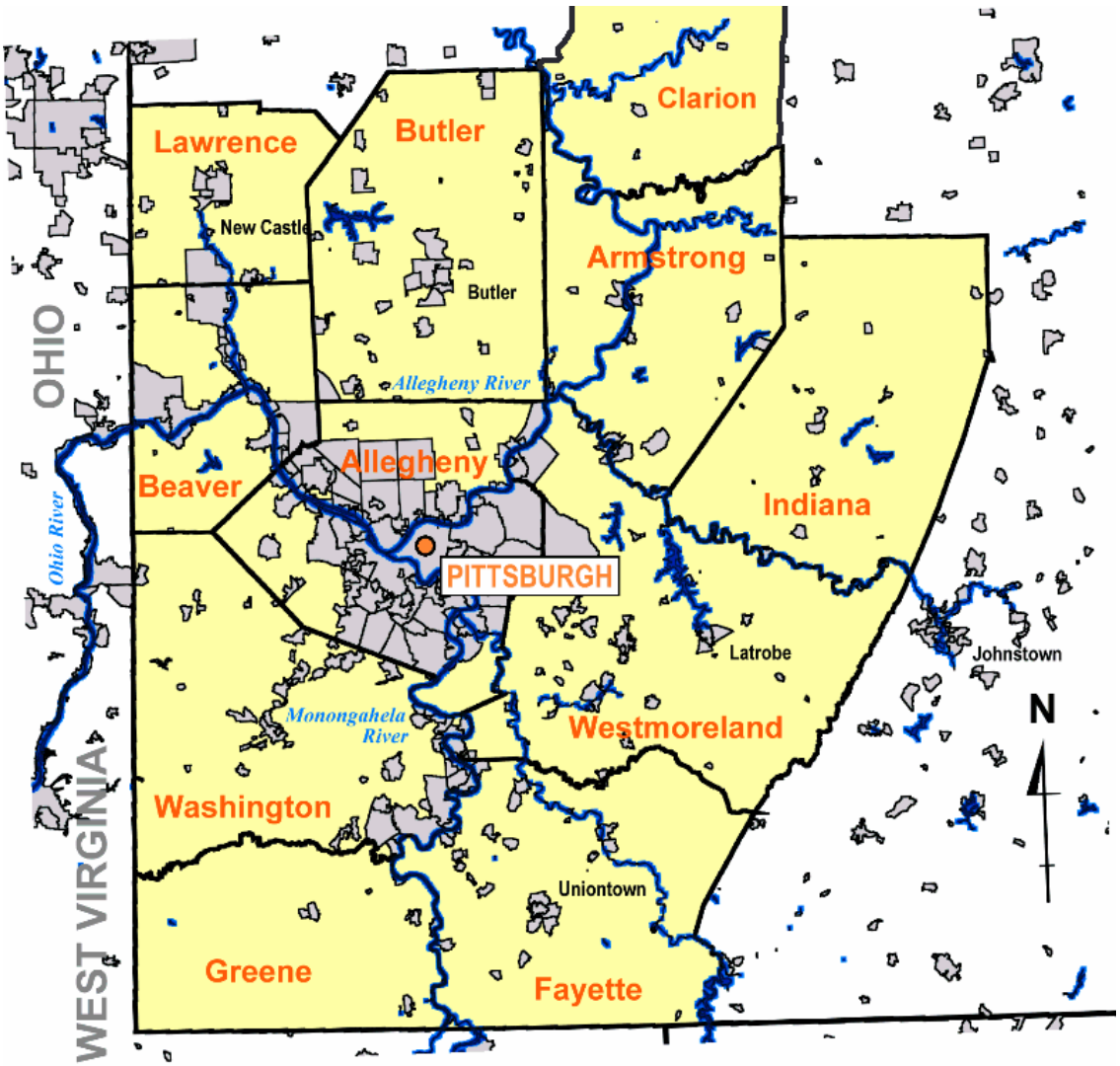


Figure 1: The Port of Pittsburgh –Three Rivers Service Area, in Southwestern Pennsylvania

3.1.2

Analysis of Traffic Data

Analysis of TRANSEARCH traffic data demonstrates that the Pittsburgh Port Commission service area (refer to 3.1.1) has approximately equal inbound and outbound volumes measured as total tonnage, as Figure 2 depicts. However, because of different commodity values inbound and outbound, the tonnages are not distributed equally amongst the different modes, leading to modal imbalances. In terms of water traffic, the inbound volume is two-thirds higher than the outbound. Barges also carry a significant portion of the intra-market freight, which is composed of coal and other bulk and non-bulk commodities moving for short distances within the service area.

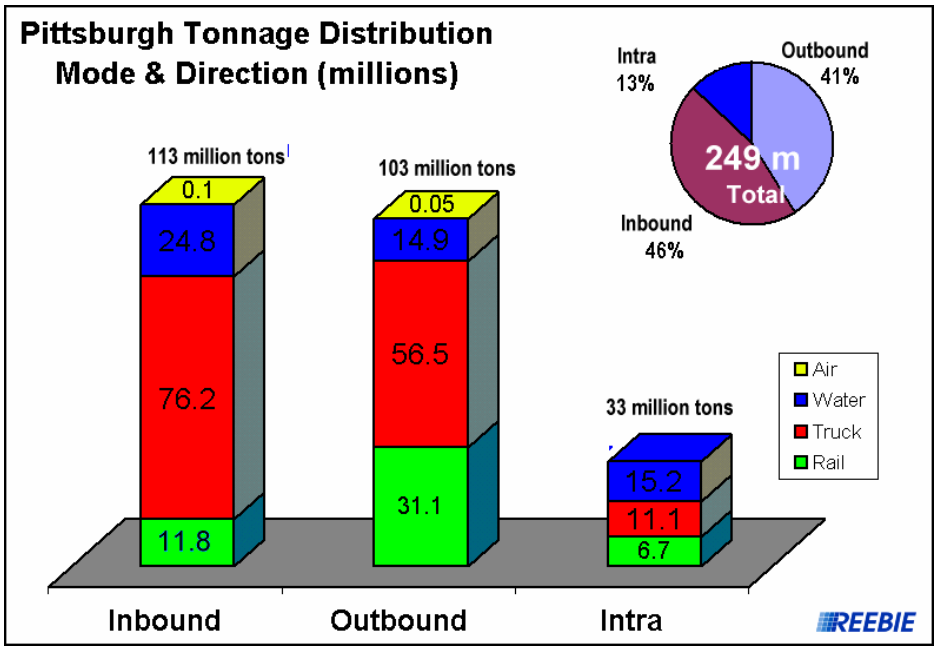


Figure 2: Pittsburgh Tonnage Distribution, by Mode & Direction

The New York metro market is the top source of Pittsburgh inbound freight by tonnage, as New York is an economic center of national importance and host to several international deepwater ports. In close second place are inbound goods from Charleston, WV – dominated by coal, a logical market for the Port of Pittsburgh. Regional and east coast markets also figure prominently for outbound freight; Cleveland and New York are major off-river points, and West Virginia markets are large on-river. The geographic

distribution of freight traffic for water markets linked to the service area manifests the natural constraint of the water mode in its Mississippi River System franchise, which is best positioned to serve a northeast – Gulf Coast and southwest market. Within that franchise, waterborne freight accounts for the majority of tonnage, although truck and rail modes certainly are active, especially in lanes that lie away from the core of the river routes. In sum, water dominates lanes where convenient river access is available: Charleston, Wheeling, New Orleans, Louisville; trucks dominate in most other markets.

In 2001, water carried 55 million tons in the Pittsburgh market. Coal is the chief commodity in this profile, accounting for 74% of the top five commodity groups. Barge mode share is good in coal and excellent in waste/scrap and non-metallic minerals, but is not nearly as dominating in the smaller and higher-value commodities: petroleum products and chemicals. Some commodity shipments are more concentrated in certain geographic origin-destination pairs than others; the transportation of certain ones represents a gathering network where product from many origins is funneled into a central collection point for processing.

3.1.3 Geographic Origins and Destinations by Mode

As already discussed, the geographic distribution of inbound freight traffic from water markets to the service area (Figure 3) demonstrates the natural constraint of the water mode in its Mississippi River System franchise. Within the franchise, waterborne freight dominates, although truck and rail are active, especially in lanes that lie away from the core of the river routes. For example, while there is significant amount of Pittsburgh-Philadelphia traffic moving by water via New Orleans and the Florida Peninsula, the more direct highway route from the Middle Atlantic markets displays heavy truck volume.

The map also demonstrates that railroads have traditionally thrived in an East-West traffic direction, with the Upper Mississippi River originating much less Pittsburgh traffic than the Lower Mississippi River.

The Pittsburgh Outbound Traffic (Figure 4) similarly shows the constraint of the Mississippi River System, and the effect of the core river routes. In the Pittsburgh water markets as a whole, barging captures a commanding 68% of the total 81 million tons of freight, followed by rail at 17% and truck at 16%.

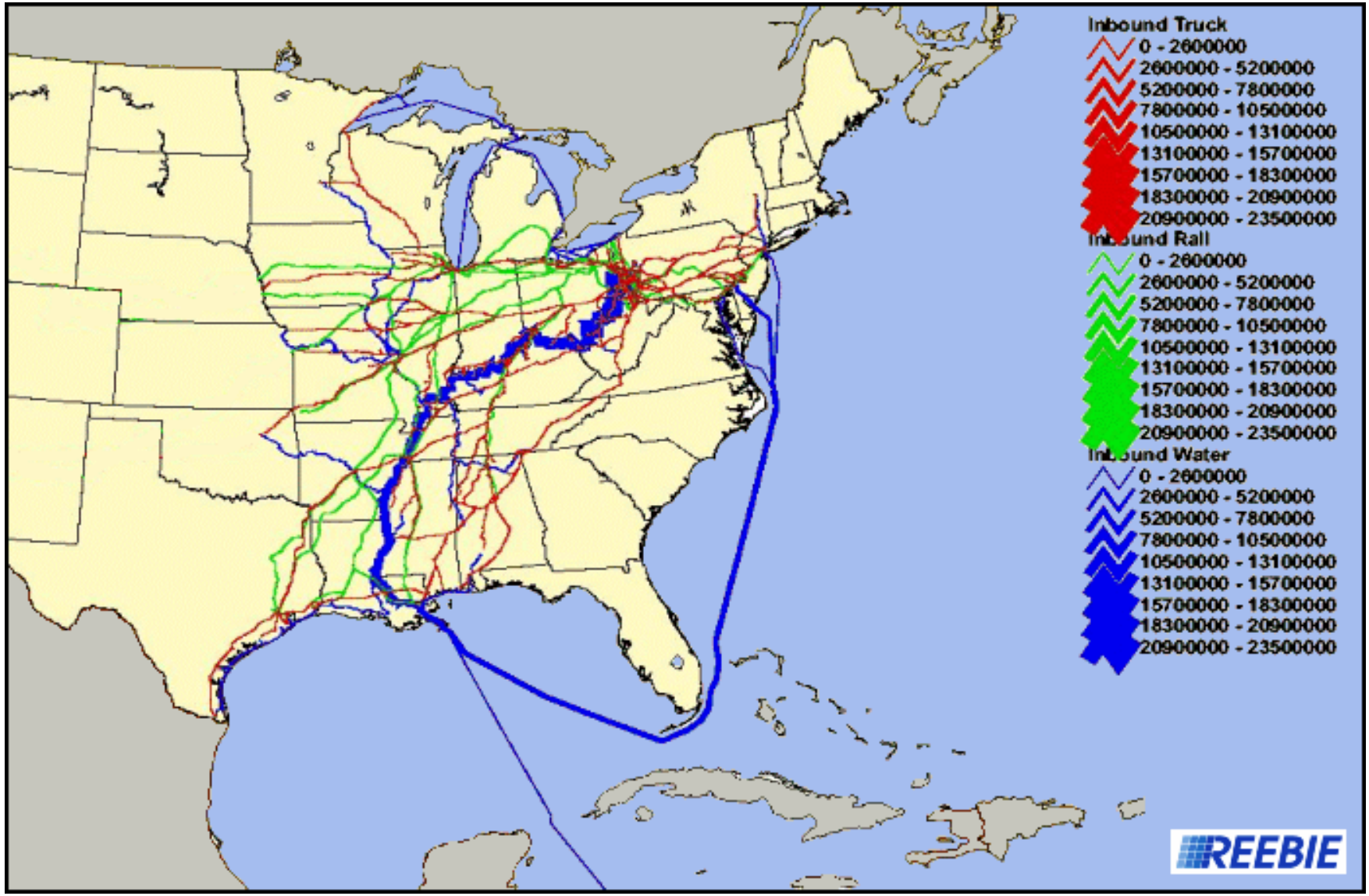


Figure 3: Pittsburgh Inbound Traffic from Water Markets, by Mode & Geography

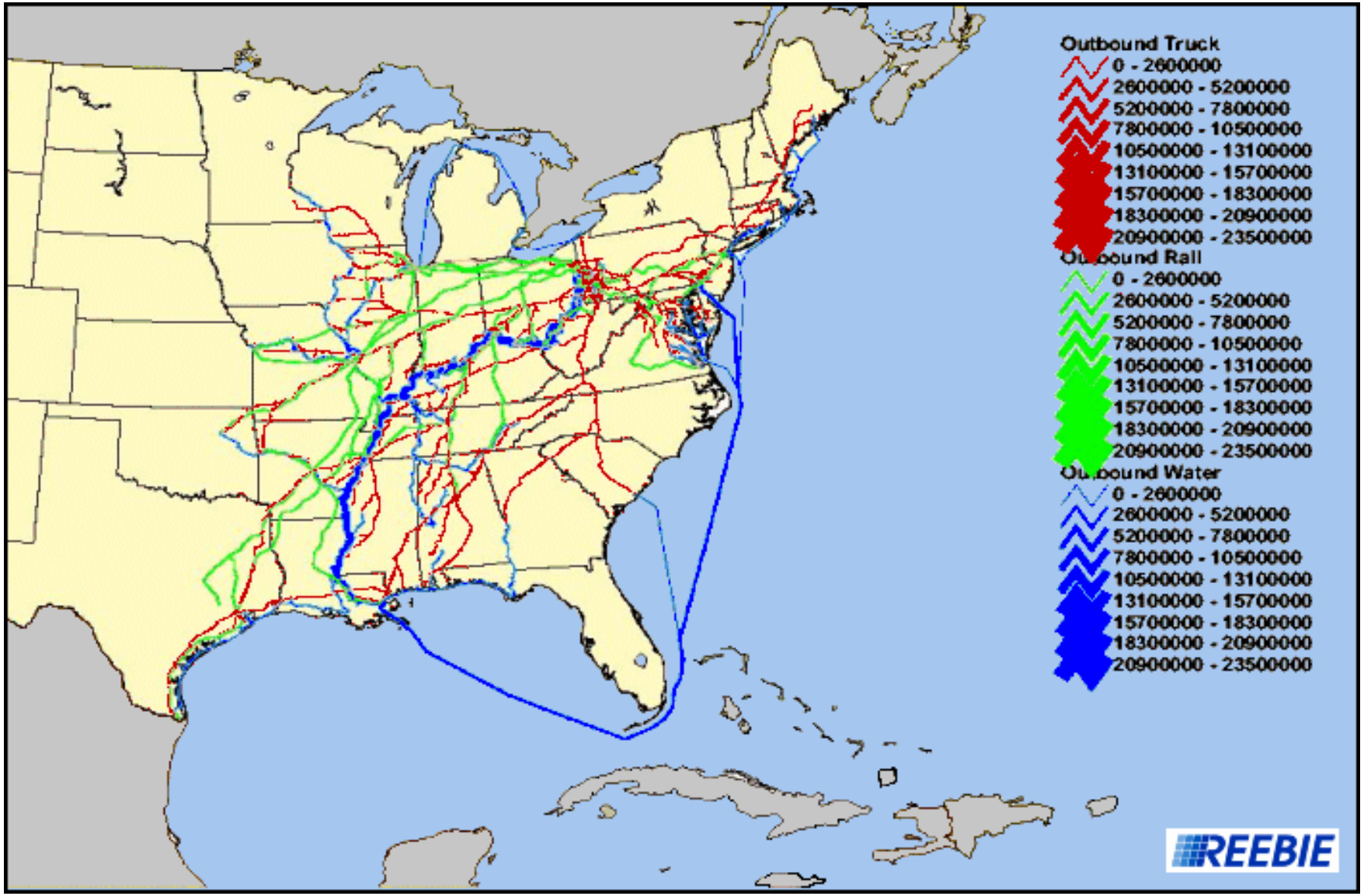


Figure 4: **Pittsburgh Outbound Traffic from Water Markets, by Mode & Geography**

3.1.4 Pittsburgh Market & Modal Benchmark Comparisons

By comparison to national waterborne traffic and to activity at other ports, the Pittsburgh Port has maintained a vigorous market for waterway transportation. The commodity composition of its traffic is appropriate to its economy and did not indicate under-participation in areas where water should be active. It ranks very favorably against other ports on the water system, again allowing for differences in economic base, and does better than some for carriage of local traffic.

Modal benchmarking also revealed favorable results, but consequently limited opportunities. Analysis identified the chief commodities moving by rail and truck in water-served lanes, and compared the traffic captured by barge to that by other modes. Evaluation of Coal traffic demonstrated that water dominates both rail and truck, in both inbound and outbound directions in Pittsburgh. All other commodities combined, whose tonnage total is not as large as Coal, show water as being strong in most bulk commodities with significant volume. Any increase in barge revenue thus is likely to be incremental, from capturing the small remaining part of bulk flow.

Assessment of the modal length of haul profile revealed that Pittsburgh water is equally strong in all strata except the over-1,500 mile category, where the efficient limits of the waterway system are reached. For certain commodities where volume seemed attractive and water under-represented, a closer examination revealed that origins or destinations were well off-water, and lengths-of-haul too short to justify transloading and dray operations. Certain others ultimately explored in Phase II interviews with shippers proved to be high value goods, shipped in consignments too small for barge movement.

The conclusions from this effort confirmed that there were no immediately obvious large or highly leveraged opportunities, as market saturation has already been achieved with water dominating most water lanes. Marketing then would have to consider the consolidation of smaller commodity volumes – or more usefully, ways to penetrate an extended geographical market. For Phase II development from a modal perspective, the chief focus was directed toward traffic currently handled by rail, on the grounds that its volume concentrations and service requirements are closer to what a barge can accommodate – and to the extent that rail also engages in transload during pickup or delivery, it neutralizes a disadvantage to barge transportation. The fragmented volumes, and the far faster, door-to-door service characteristic of traffic moved by truck meant that this was regarded as a secondary prospect, and was considered mainly for shippers or lanes that also had rail activity.

3.1.5 Market Imbalance

Market balances are of particular marketing importance because, while barges are cost-competitive on a head-haul, equivalent empty-return basis with rail and other modes, they can be exceptionally effective against competition if even a partial back-haul can be found. When the head-haul is fully compensatory, back-hauls can allow for an extended drayage range and smaller shipment quantities than otherwise possible. Backhauls, however, are not always possible, since freight in opposing directions may require different equipment types due to the commodities carried – and commodity incompatibility may compel barge cleaning between runs, consuming asset time.

The low incremental costs of the backhaul operation thus can become a significant competitive factor in some cases, and the Pittsburgh water traffic is marked by a significant inbound imbalance. Figure 5 shows the waterborne balance profile in terms of tonnage differential and implied empty movements, and demonstrates that the greatest empty volumes are incurred by the coal shipments from Charleston, West Virginia, but the most significant empty miles are incurred by chemical shipments from Louisiana. Because of the long distance involved, Louisiana can offer attractive opportunities for full or partial backhaul, provided equipment types are suitable.

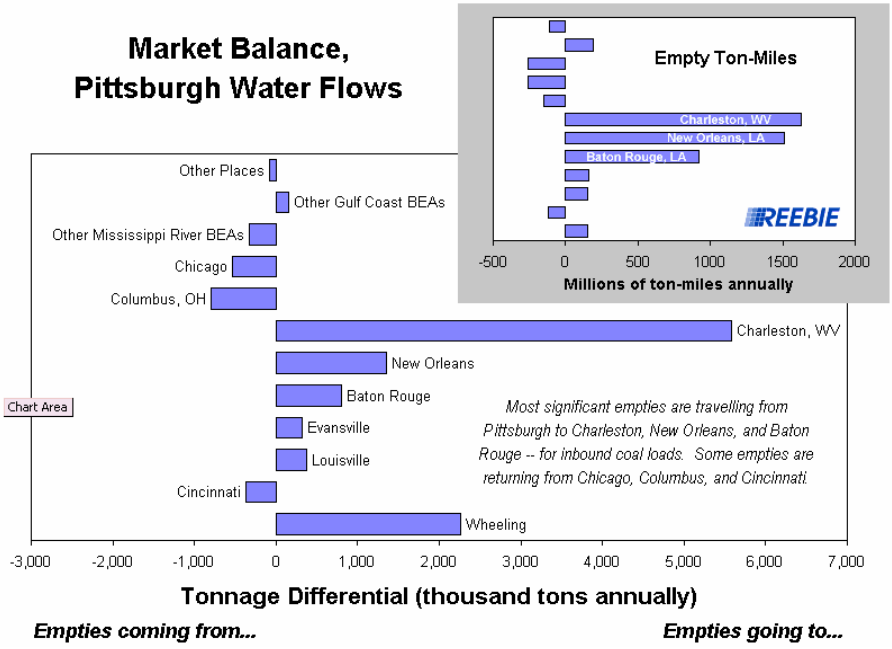


Figure 5: Pittsburgh Barge Imbalances, Implied Empty Movements

For business development purposes, balance analysis was applied in two ways. First, certain commodity prospects in backhaul lanes were identified for Phase II evaluation. Second, and of more systematic significance, backhaul economics as an offset to water access (drayage and transloading) costs have a role in a number of the niche opportunities developed in Phase II, strengthening those opportunities where equipment balance can be brought effectively into play.

3.2 Market Development Opportunities

There are ways to grow the traffic at the port other than head-to-head competition for concentrated local volume. Two strategies are: (1) to enter the "spot" transportation market, where consolidation of fragmented commodity volumes results in loads sufficiently large to operate barge service; and (2) to extend the effective range of the port by providing drayage between Pittsburgh and other markets. Both were evaluated in the initial phase of this study.

There are three different types of dray possible: (a) Pittsburgh toward non-water lanes, where barge service is not active today; (b) Pittsburgh toward its catchment area or 'hinterlands'; and (c) Very long or "extended" drays routed via Pittsburgh. Pittsburgh non-water lanes involve a dray from an inland location to a port on the Mississippi River System, and the load is then barged to Pittsburgh. The Pittsburgh hinterland comprises of the four BEAs adjacent to Pittsburgh, which cannot be served from the Mississippi River System directly (Cleveland, Ohio; Erie, Penn.; Buffalo, N.Y.; State College, Penn.; and the West Virginia portion of the Pittsburgh BEA). Hinterlands will be served by transload to regional truck or rail moves. The Extended Drays aim to capture long-distance ground traffic that parallels the Mississippi River System, coming within 100 highway miles of Pittsburgh en-route to or from northeastern markets. Instead of being railed or trucked all the way, barges could conceivably replace the long-haul ground section as far as the terminus of the waterway system at Pittsburgh, where products then would be offloaded and drayed to or from their ultimate markets.

The analysis suggests that a few opportunities may exist in Pittsburgh non-water lanes, detailed below. As for consolidation, the main volume is in the wrong direction; most fragmented freight flows northward, which is the head-haul direction for Pittsburgh and makes new business development less attractive and unlikely. The main opportunities are the more challenging ones: regional drays for the Upper Mississippi markets, and especially Gulf Coast traffic now moving by rail or truck to the Middle Atlantic markets.

3.2.1 Pittsburgh Spot Market

As shown in Figure 6, the Pittsburgh spot market for low-volume commodities is not only small (combined total of about 1 million tons per year), it is also in the wrong direction, the predominant traffic being northbound. In addition, it is comprised of more than 30 discrete commodities, the management of which is bound to be a challenge. (The size of the pie in the chart is approximately proportional to the amount of traffic available.) Without backhaul economics, the transfer and delay costs associated with barge make this market an improbable prospect.

3.2.2 Pittsburgh Non-Water Lanes

As demonstrated in Figure 7, Pittsburgh non-water lanes offer limited volumes and circuitous routing (via New Orleans to Jacksonville, via Minneapolis and extended dray from Casper, WY). However, certain bulk movements may be developable, and were investigated in the second phase of research.

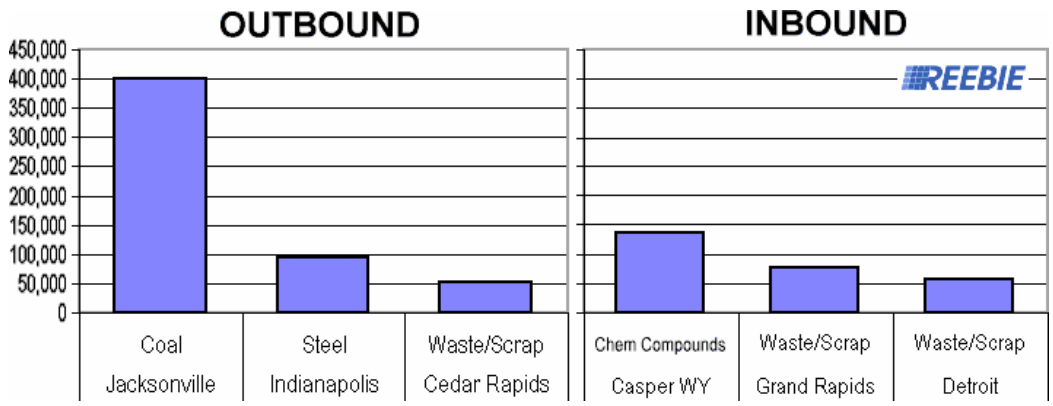
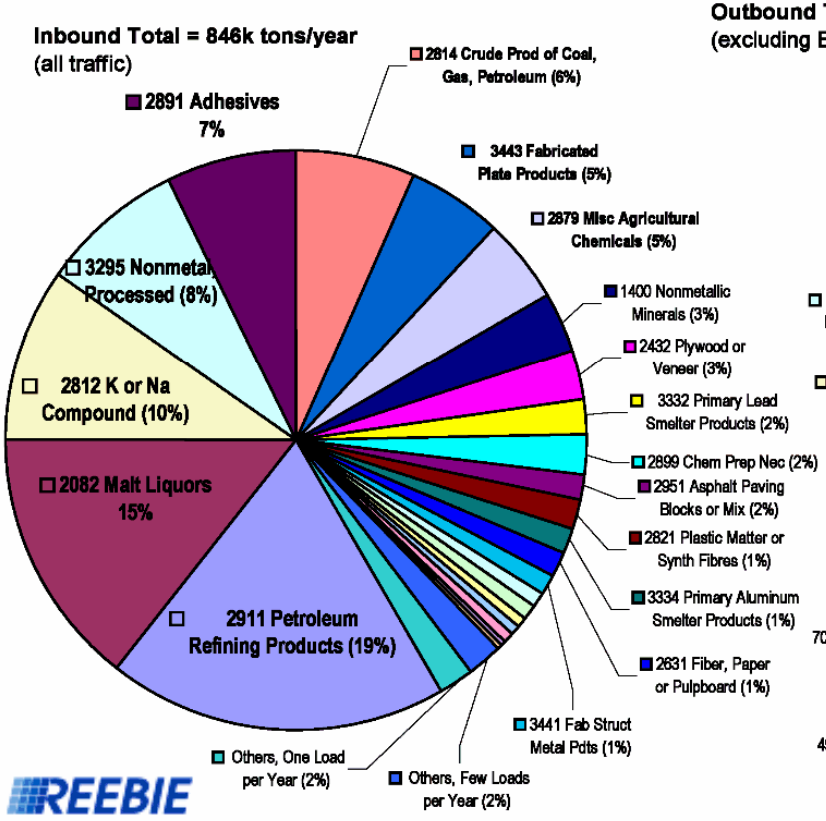
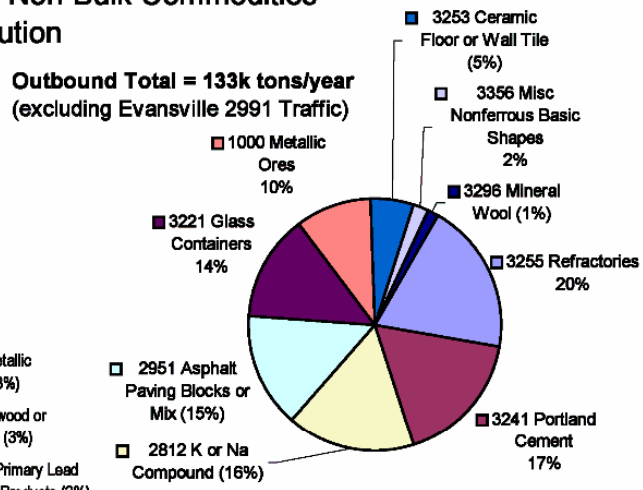
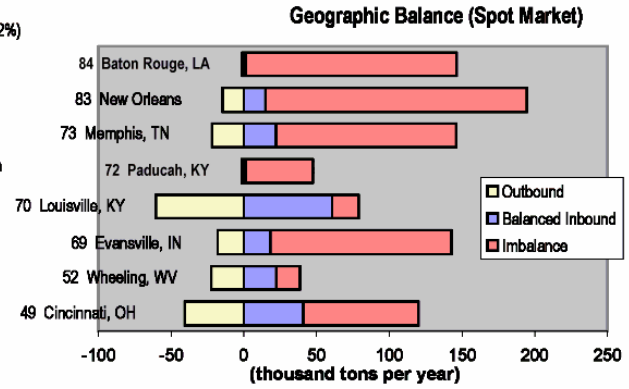


Figure 7: Pittsburgh Non-Water Lanes with >50,000 Annual Tonnages

Consolidation: Spot Bargeable Pittsburgh Non-Bulk Commodities Market Potential Distribution







REEBIE

Figure 6: **Pittsburgh Non-Bulk Commodities, Market Potential Distribution**

3.2.3 Pittsburgh Catchment Area

Most of the traffic moving to or from the Pittsburgh Catchment Area travels by truck, with more than half the inbound originating from the Lower Mississippi River (see Figure 8a). A variety of commodities is carried; the largest inbound volumes are Petroleum Products, Metal Products and Chemicals (See Figure 8b). The water system carries such goods today, so some of them potentially are transload opportunities for barge service.

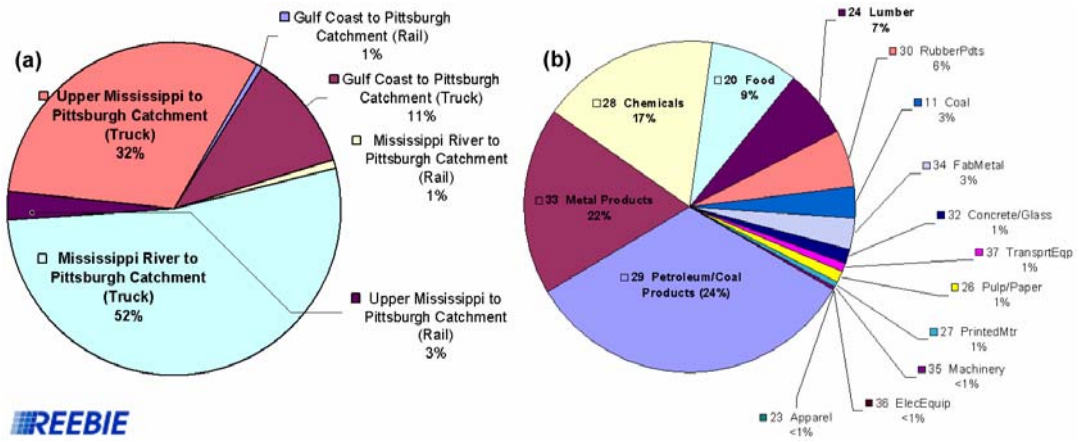


Figure 8: **Pittsburgh Catchment Area Freight Characteristics**

As shown in other analyses, trucks dominate most of this traffic, but there is rail volume in both directions, most notably on the inbound side. Figure 9 is a map showing the northbound rail flows, with volumes for selected commodities from selected origins. In Phase II development, traffic options were explored and prospects identified northbound and south; while the former involved more traffic, the latter introduced a waterborne backhaul that might offset the cost of hinterland handling and drayage.

3.2.4 Extended Dray Markets (Forward Distribution)

Extended drayage, executed logistically as forward distribution, is a way for barges to divert long distance traffic by carrying some of it over water to Pittsburgh, where it is landed, perhaps stored, and then trucked to the final destination in the Middle Atlantic region. The criterion used to qualify traffic for opportunity analysis was that the shortest highway route from origin to destination must pass within 100 miles of the Port of

Pittsburgh, and that the origin must have water access. This screening method produced a list of flows that could potentially be diverted to water with a single transload at Pittsburgh. This operation could result in traffic that is price-competitive with rail carload, and somewhat time-competitive as well.

To assess if the traffic is viable, mileage-based modal average cost factors extracted from Reebie's COSTLINE product were applied to both the incumbent (highway or rail) and the challenger (barge-dray) routings. This further screening technique gave rise to a list of eligible flows that quantified the size of the market. Figure 10 displays the qualifying traffic that is handled today by rail. In Phase II, interviews were held to locate this traffic, and competitive analyses were conducted to determine feasibility for barge transport.

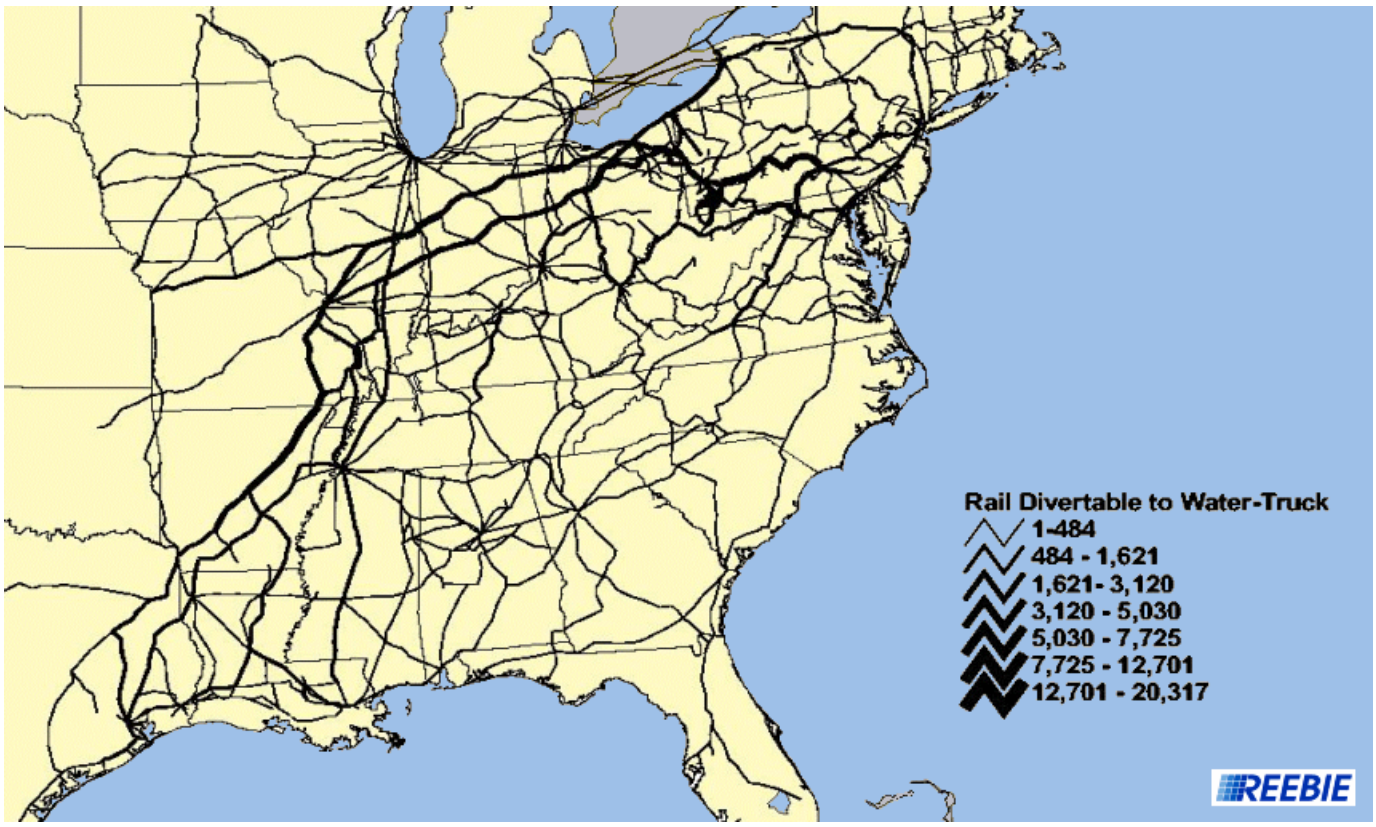


Figure 10: **Potential Rail Market Opportunities for Extended Dray**

In that phase, a number of opportunities were found for forward distribution, including: certain chemicals from the Gulf coast; bulk commodities subject to geographic sourcing; and new market access. These will be discussed further in the subsequent section.

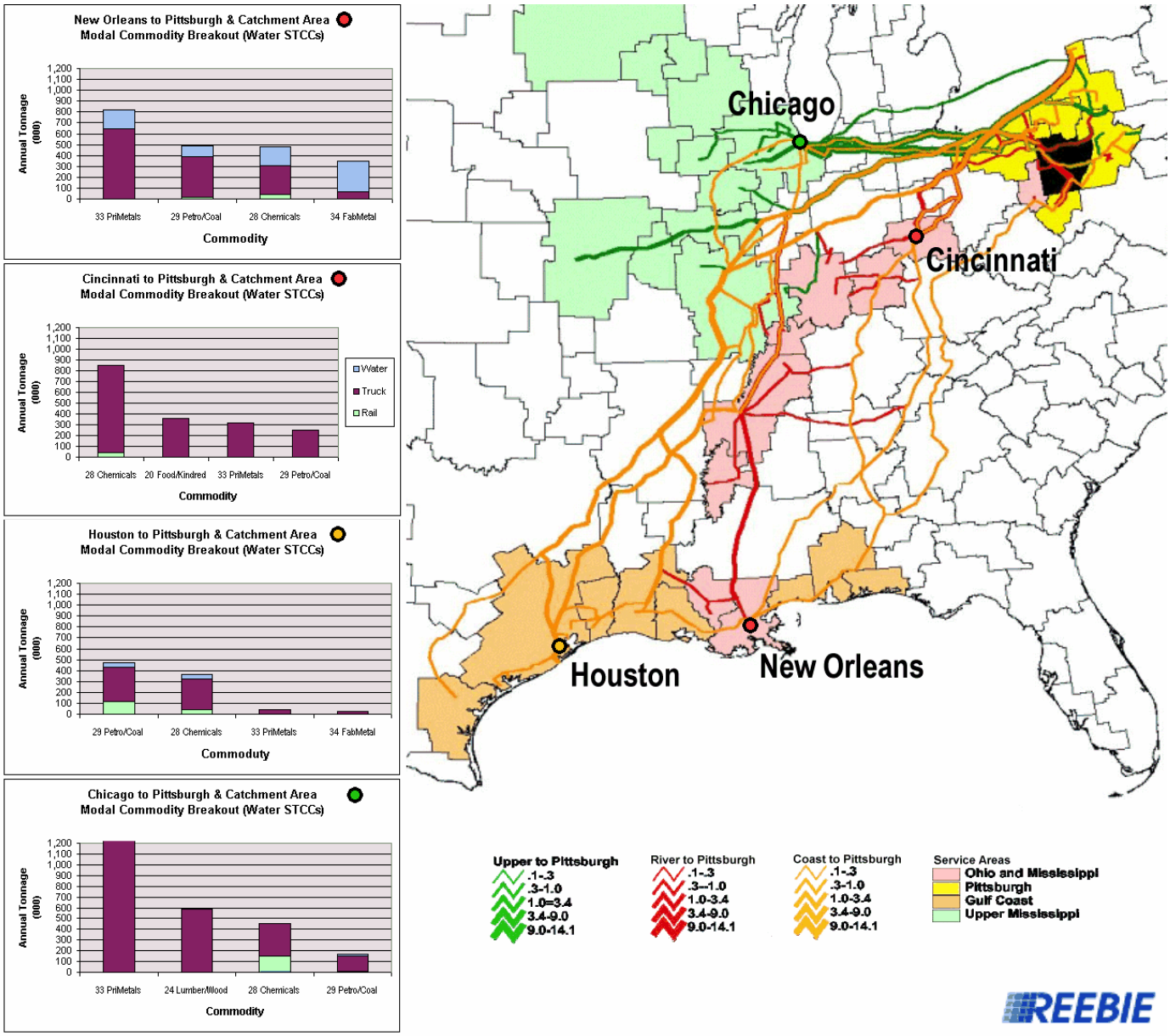


Figure 9: Inbound Rail Commodity Flows to Pittsburgh Catchment Area

3.3 Summary of Phase I (Quantitative Analysis)

In assessing freight market data for the Pittsburgh Port Commission, the research team found that the development effort by the Port and its constituents has been quite successful in traditional markets. Logical water markets both out of and into Pittsburgh are dominated by water, and Pittsburgh is very strong in comparison to its peers. Nevertheless, as the U.S. and the regional economies shift toward new sectors, the Port is seeking ways to participate in a business environment that is less oriented to the waterway. Comparative modal analysis suggests that traffic from the extended area around Pittsburgh is available, and some diversion from direct rail or direct truck to a truck-barge or rail-barge combination would be likely.

Pittsburgh lies at a terminus of the Mississippi River System and represents a port that can serve consuming markets in the northeastern US. For this reason, it is difficult to balance the flows originating from Pittsburgh, as geographic end-points have fewer options than intermediate locations, and national traffic tends to flow from the industrious and productive South and Midwest to the service-oriented consuming markets of the Northeast. On the other hand, the location that gave rise to the City of Pittsburgh to begin with, also makes it a strategic staging point for traffic moving east.

The most promising markets for field exploration in Phase II were those that were located further from the water, and were not traditionally water lanes. This makes them more difficult to develop, requires a higher degree of coordination than individual barge lines or terminal operators are able to muster, and should be seen as underscoring the need for active intermediaries. Intermediation is required in logistics design and execution, and in consolidated negotiating and marketing for the region, suggesting roles that the Port should seek parties to fulfill, or in some ways may undertake or facilitate itself.

4. Phase II: Fieldwork Results

Following consultation with the Port Commission, customer interviews were employed in Phase II to uncover specific avenues for waterborne business, surveying within the range of opportunities established in the opening phase, and applying cost assessments where appropriate for support. A series of 190 interviews was conducted, focusing on the petrochemical and metals industries, bulk motor carriers, and some others. Respondents helped to define market niches and benefits, and were able to confirm a number of traffic development options, discourage others, and suggest elements that were not visible from quantitative analysis. One class of opportunity proved to offer a material volume of new business, although most were less compelling – and in keeping with the first phase finding that the low-hanging fruit had been picked, development mainly required coordination and effort.

Fieldwork was conducted in stages. A first round of interviews explored a large number of shippers identified as having eligible flows through the traffic analyses using FREIGHT LOCATER and TRANSEARCH data; a second round of interviews and site visits allowed the team to 'drill down' with a number of more promising customers who were exemplars of attractive market niches. Finally, an analysis of costs and requirements to serve this customer traffic was conducted, to assess the extent to which the service could be competitive and the traffic compensatory, and the results were reported to the Pittsburgh Port Commission for follow-on action.

The design of this study had envisaged that fieldwork would take place in Pittsburgh with local receivers and operators, to find business opportunities that had previously been underdeveloped. However, the traffic analysis made it clear that useful development opportunities lay further abroad, requiring the survey of customers operating in the catchment or Middle Atlantic markets, and serving these markets in many cases from the Gulf Coast. The Phase I research had indicated a high concentration of industrial bulk shippers in the Gulf region, with good and often direct access to the Mississippi River and Intracoastal System; as a result, the site visits in particular were directed to this region.

Waterborne business opportunities fell into a set of market niches or tactics, each of which will be discussed in the following section. For each category, a general analysis was carried out to define the magnitude of benefits to the shippers, the operators, and the Port of Pittsburgh. The categories, falling mainly into variants of forward distribution and catchment area exploitation, were as follows:

(1) Forward Distribution;

(2) Product & Plant Rationalization;

(3) Rail Backhaul Diversion;

(4) New Market Access;

(5) Rail Gateway Arbitrage;

(6) Regional Rail Diversion;

(7) Awakening/Revisiting Barge Options;

(8) Container Markets.

In cases where concrete development opportunities were found, specific cost modeling and service requirement analyses were carried out to determine feasibility. In terms of market development, Forward Distribution for certain classes of chemicals is by far the most important, while rationalization, geographic competition, and backhaul exploitation contribute to other opportunities. The development prospects hinge on service partnerships with trucking firms, and perhaps short line railroads where they combine industry and water access.

The Port Commission has received confidential strategic analyses featuring a greater level of detail than reported here; however, this section will report on the flavor of opportunities available and suggest relevant approaches for marketing.

4.1 Forward Distribution

Forward distribution is a logistics system in which plant production is transported in consolidated lots to a staging point much closer to end-markets than the point of production, and then either cross-docked or held and distributed in smaller lots to customers. This method substitutes for direct shipments from plant to customers, reducing costs and potentially improving customer service. In the context of waterborne market development, the strategic position of Pittsburgh as the location on the inland river network closest to the industrial and consuming markets of the Middle Atlantic and Northeastern states, acts as a catalyst to this form of distribution. Barge-truck combinations substitute for direct shipments from water-served industrial centers, utilizing the low-cost volume capabilities of barge transportation and the service capabilities of trucking on the well-developed highway routes between Pittsburgh and the east.

The concept also broadly applies to logistics chains that may involve intermediate processing or stockpiling – for example, instead of shipping finished product from a

remote plant, an intermediate product with lower value is shipped via barge to a staging area or a processing facility near Pittsburgh, where it is assembled or further manufactured, and then trucked to a final destination. This can also apply to geographic sourcing, where a high-capacity plant in Pittsburgh can replace smaller plants elsewhere in the country, by supplying local needs with regular inbound barge loads to a distribution center; this takes advantage of low transportation costs since the Pittsburgh plant can send goods downriver in backhaul capacity, and it greatly reduces the cost of production.

4.1.1 Petrochemicals from the Gulf

The largest new market opportunity uncovered in this study exploits Forward Distribution for certain types of petrochemicals currently moving by rail from the Gulf coast to Mid-Atlantic markets, by substituting service by barge via Pittsburgh. Barge is competitive with direct rail on a cost basis, and has an advantage when rail is transloaded for delivery. Some commodity types are better suited to productive truck utilization, and allow efficient drayage for a long enough distance from the staging point at Pittsburgh to reach the Middle Atlantic. The interline rail service to these markets from most Gulf origins can be inconsistent, allowing barge transportation to be a closer competitor to rail in performance quality. The potential market for this service, mapped out and supplied privately to the Port Commission, is a very material volume.

Some customers interviewed are already engaged in this type of process; others are interested in this concept. The storage and transloading arrangements would have to be worked out to demonstrate the concept, and participation of trucking partners is very important to the success of this type of scheme. Because complex coordination between plants, staging facilities, barge lines, and motor carriers is required for implementation, a logistics specialist working for one of the benefiting parties may be the most practical agent to begin development of this market. Examples of appropriate agents have been given to the Commission.

4.1.2 Product and Plant Rationalization

Low cost barging into truck-served storage at Pittsburgh allows production to be consolidated at a water-served plant, either freeing up plants for different production, or permitting plants to be dropped entirely. Distribution centers, or simply direct-to-customer shipping replaces the plant. This form of opportunity works well for commodity types produced at multiple factories, where transportation is a significant component of delivered cost. The service area from Pittsburgh could be regional, or larger via forward distribution. The cost savings from rationalization of product lines and

of plants in particular, can be large enough to diminish the importance of other economic factors. The key requirement in that case is that logistics performance be reliable, in capacity, transport, and staging.

The key parties for production decisions will not be located in transportation departments, nor will the opportunities necessarily be evident to those groups. This poses a pragmatic challenge for market development, and again a logistics intermediary may be more effective at preparing the argument and reaching the right audience than a carrier or the Commission can be. Ultimately, the determination as to whether this arrangement works lies with the customer, and the requirements for execution extend well beyond transportation into facilities contracting, acquisition or construction; production planning and materials management; and product marketing by the shipper.

Rationalization should be a standard part of Pittsburgh marketing to appropriate clientele, because it can overwhelm other arguments to sway the business to water. While it is a two edged sword that competing ports may use against one another, Pittsburgh has the advantage of significant backhaul capacity to offer to plants, and is not exposed to river competitors on its eastern side. This can make it the preferred location for the plant to be retained, all other factors being equal. Use of the strategy was encountered in interviews among large bulk shippers; others brought up the possibility as an infrequent but important option.

4.1.3 Geographic Competition

Low cost barging into truck-served storage at Pittsburgh allows a business or plant to compete in a geographic market for which it otherwise is not viable. This is an effective waterborne niche for goods where transportation is a significant component of delivered cost. Geography is a well-recognized competitive factor in bulk industries; during fieldwork, some forms of chemical manufacturing emerged as specific candidates in the Pittsburgh market. Some of the key development issues are shown below, and indicate how coordination with facility operators and motor carriers can support implementation. The role the Port Commission may play in this is considered in Section 5 – Directions for Development.

- Direct water access on at least one end of the transportation lane, because of the cost effect from drayage;
- Appropriate storage facilities where product can be accumulated and staged – these might be shared use, so as to improve facility utilization and hold down costs, and in some cases special commodity handling may be required;

- Truck delivery rates, because of the necessity of low delivered cost as a requirement for market entry.

4.2 Pittsburgh Catchment Area Penetration

Catchment area penetration is a way for barges to divert freight traffic located off the water at some distance from Pittsburgh, but within its region and requiring only a moderate dray. The tactic is to utilize some form of economic advantage to offset the costs of off-water drayage and transloading, with backhauling being the most obvious type. This means that outbound goods shipped to the west and southwest, where barges can backhaul them down the Ohio and potentially down the Mississippi, are most of interest. The target typically is freight currently handled by rail, because of the better probability of barge offering competitive service performance, especially where rail relies on less-consistent interline operations. Since the market lies outside the normal range of Pittsburgh water service, there are apt to be undeveloped prospects to tap. Three variations of catchment area penetration were explored in Phase II research: straight backhauls, regional rail opportunities, and gateway arbitrage.

4.2.1 Rail Backhaul Diversion

The niche is to substitute backhaul barge/truck combination for direct rail or transloaded rail into Gulf markets. The opportunity arises because of the low cost of barge backhaul economics, accentuated by distance, and facilitated by the weaker rail interline carload service. The reduced linehaul cost is essential to offset the added expense of draying to the river at Pittsburgh and transferring to barge, and the prospect is far stronger when the Gulf consignee is on or close to water – which is not uncommon, however. For customers with sufficient volume to consolidate to barge-load lots, the railroad's difficulty in keeping car lots together during interline transport can be an added advantage for water. Attractive but not substantial new business volumes were uncovered during fieldwork, and were shared with the Commission. Barge lines generally are capable of acting on such prospects with the normal coordination requirements of their business, although the Commission may be useful particularly in common negotiation for the conditions and rates for truck drayage, over the longer distance from the Port.

Development issues included:

- Barge pricing for moderate load volumes, so that the advantage of excess (backhaul) capacity is put into play;

- Turn-around times (the load-to-load cycle) for drayage trucks, because daily utilization has a decisive effect on truck pricing. The Port can assist on the northern end by stressing the importance of fast processing to terminal operators, perhaps helping them benchmark best practices, and to the regional MPO, where street access may be an issue. Facilitation of financing for transload equipment also may be explored;

- Transfer facilities, which must be available and of adequate capacity, and have good proximity to customers on at least the delivery end.

4.2.2 Regional Rail Diversion

The niche is to exploit the relative economies of a barge transload via Pittsburgh versus a direct interline rail service or transloaded rail service from the Pittsburgh Catchment Area. Any transloaded rail is more susceptible, but in some markets direct rail traffic is also available. This is generally an extension of the traditional barge market, thus opportunities hinge on transfer and pickup and delivery costs, and in some cases on volume economics. Prospects in this niche unsurprisingly are few, but the Phase II research indicated one opportunity of magnitude that has been shared with the Commission. The role of the Port is the fairly traditional one of support and coordination, to bring effective waterborne bids to the business.

4.2.3 Rail Gateway Arbitrage

The niche is to substitute barge to a western railroad at a Mississippi gateway, for direct rail in interline service heading to the Pacific Coast. The westbound movement from Pittsburgh again is a backhaul by water, and again the rail interline carload service traditionally is inconsistent. More uniquely, the network structure of Class I railroads is divided between eastern and western systems more or less at the line of the Mississippi River, and there is a relatively short distance for eastern roads to travel from the Pittsburgh market to the interline gateway. Because railways are more cost-effective carriers at longer distances, this means that the leg of the journey west of the Mississippi gateway is relatively efficient, and the eastern leg is relatively inefficient. This is a classic condition for arbitrage, where inefficiencies are turned to advantage.

The target of arbitrage is the comparatively high rail cost on the eastern leg of the shipment, for which barge may be able to substitute. It is important for the barge to do this without harm to the revenues of western railroads, by whom delivery in the west must be accomplished (trucks being too expensive an option), and thus they must be willing parties. In order to preserve the length of haul – and thus the revenue, and interest – of western railroads, barge-to-rail transfer at St. Louis is preferable to other river points.

There is ample precedent for this arbitrage tactic: railroads dray into one another's territories frequently, and customers make use of revenue differentials in rate negotiations. However, the current bulk volume opportunity for water at Pittsburgh is minor. One catchment area customer candidate uncovered in fieldwork did not welcome the extra handling of barge transfer, and the added cost to stage through Pittsburgh proved too high, although a customer closer to water (or reduced drayage and handling costs) might improve the prospects. Factors beyond these that matter to development include:

- The total length of haul for the shipment, so there is sufficient revenue opportunity on the western leg – this implies that Pacific Coast markets offer better possibilities;

- Service must be acceptable, and railcar lots consolidated into barges must be capable of being parceled back into carload shipments for final delivery, without risk to order integrity.

Direct-to-rail transfer at the western gateway also is important for cost reduction; this is available for rail carload service, but not for containers. In an assessment of arbitrage opportunities for container traffic conducted for the Port and supplied confidentially, the cost to connect at the gateway from water to rail proved a sensitive component of the overall economics. Interest in container-on-barge at Mississippi ports, and support of local MPO authorities desiring alternative freight capacity, could lead to lower costs through water-convenient rail access, provided that the rail feed into the intermodal train network is effective. Contact by the Pittsburgh Port Commission with a party such as the East-West Gateway Coordinating Council (the St. Louis MPO) could add support to any initiatives that may be contemplated.

4.3 Awakening or Revisiting the Barge Option

During fieldwork, the team talked to some clients who were not considering barge when the economic case for barge transport could be compelling. This may be due to historical reasons ("we've never used barge"), or due to unfamiliarity with the mode, inexperienced

traffic managers, or a combination of the above. Barge may be an effective option for customers who have not otherwise considered it.

This is especially true in less-obvious applications, or among non-barge users. There may be a great deal of institutional resistance, functional stovepiping, and habits that keep barge from being considered for traffic bids. Unfortunately, customers who use some barge are more susceptible than those who use none. There is even greater risk here of barge becoming a tool to drive down rates without actually getting business. Many normal concerns such as access, lot sizes, rates, would also need to be resolved, when signing on a new customer alien to barge. As a traffic opportunity for the Port, this is a tactic or a rule for doing business, and not a market niche; however, it is clear that customer awareness is a true issue, and one that is susceptible to marketing communications programs and alert sales work.

4.4 Container-on-Barge Market Analysis

Reflecting rising passenger and commercial vehicle traffic, congestion on U.S. highways is steadily climbing, with the effect that the capacity of infrastructure is strained, supply chain logistics performance is compromised, and vehicle emissions (especially freight diesel emissions) are reducing air quality. Due to the projected growth in freight traffic by both highway and rail, there has been renewed emphasis on the movement of general cargo, particularly containerized cargo, by barge and short sea shipping operations. In the past, the container-on-barge has not seen wide success in the United States, in consequence of such factors as the relatively slow service speed on water, the high fixed terminal costs at ports for loading and discharge, the inland dray to and from the river terminal, and the relatively fast transit time associated with truck deliveries. There are notable exceptions, however. Apart from the recognized success of short sea shipping in the European environment, a prominent U.S. example is the container movements of agricultural products along the Columbia/Snake River system into the Port of Portland, for transshipment onto westbound ocean going vessels. This is a dedicated move from inland river ports in Eastern Oregon and Washington, and the terminal operations at the Port of Portland's Terminal 6 have integrated these barge moves into their overall pricing structure. The ability to develop innovative, entrepreneurial pricing and service is essential to the development of such container-on-barge operations.

Recently, container-on-barge service has been introduced between New Orleans and Houston, as well as on the US inland waterway system between Baton Rouge and Memphis. Service to private inland river terminals such as in Ghent, KY has also been established. Osprey Lines has been the leading force in the container-on-barge concept. In addition, several other carriers including MEMCO Barge Lines, Ingram Barge and ACBL have shown interest in the development of container-on-barge operations. Key in

the success of such a service will be the identification of a significant volume of less time-sensitive cargo that currently moves or potentially could move between the Pittsburgh region and other inland river destinations, or deepwater ports like New Orleans for transshipping onto ocean going vessels. It will be necessary to develop a dedicated, regularly scheduled service that can be marketed to local shippers/consignees as an alternative to rail and truck. It is to be emphasized that at the outset, a critical baseload volume of containers must be established in order to "induce" the barge call/service.

The focus of this section is to review container moves potentially divertible to barge, which were identified and evaluated during the second phase of this study, and to assess the competitive surface routing presently used. Several potential markets were analyzed: export lumber and logs, imports of lumber, Middle East and South American opportunities, the shipment and receipt of domestic products such as plastics and resins, and the repositioning and utilization of empty containers. Each market is discussed in the following paragraphs.

4.4.1 Lumber Exports

Pennsylvania leads the nation in export sales of grade hardwood lumber, which is primarily used in the production of furniture. In 2003, Pennsylvania export lumber sales were $300 million, an increase of 13% above the previous year's sales. About 53% of Pennsylvania's export sales are to Canada, followed by exports to Europe, which account for more than 26% of the export sales. China and Hong Kong account for 6% of export sales from Pennsylvania. Interviews with Pennsylvania exporters indicated these overseas markets are served primarily by East Coast ports.

In contrast to the overseas markets, the export market to Mexico, which represents 2% of Pennsylvania export hardwood lumber sales, could potentially be served by barge transportation from Pittsburgh to Brownsville, Texas. The principal markets are near Mexico City, Guadalajara, Nuevo Laredo and Monterey. While this market is relatively small, Martin Associates evaluated the competitive costs of moving the lumber to Mexican destinations by barge, and compared this cost to direct truck moves.

Based on interviews with lumber exporters in Pennsylvania, a container-on-barge service at the Port of Pittsburgh would likely draw from mills within a 200 mile radius. The current cost to truck the lumber into Mexico ranges from $3,000 per container into Monterey, to about $3,800 per container into Guadalajara. These direct trucking costs are the current rates paid by lumber exporters into Mexico. Therefore, the cost of using

barge would need to be less than the current trucking rates, as the barge operation would require a longer transit time, which would need to be reflected in lower shipping costs.

It is to be emphasized that if the containers could be stuffed to a weight in excess of the allowable truck weight, the barge could provide additional economies to the lumber exporters. However, such an overweight container operation would require overweight permitting from Brownsville into Mexico. This permitting process or the need to transload the lumber from overweight containers at the Port of Brownsville into domestic truck trailers could offset cost savings from the overweight operation.

For both a barge/truck and direct truck routing, border crossing operations are in place in Laredo to process lumber into Mexico. These include USDA inspection, working relationships between Mexican brokers and US forwarders, and Mexican trucking operators moving the goods across the border. These relationships have been established over time and have created a streamlined coordinated operation between all parties that permits a smooth movement of lumber across the border into Mexico.

A similar coordinated operation would have to be developed in Brownsville in order to compete with the Laredo operation. Exporters are unlikely to use a routing across the border that may result in transit delays and added costs due to problems in coordinating the movement of lumber across the border at Brownsville. Initially, this market is very limited in volume, and not sufficient to entice a barge operator to make a direct call. However, the lumber market could be a user of an established service, but not a driver of the service.

4.4.2 Log Exports

Pennsylvania hardwood log export sales have grown from $53 million in 2001 to $71 million in 2003. During this period, Germany and Canada were the top two importers of Pennsylvania hardwood logs. Sales to Germany grew from $10 million in 2001, about 19% of the Pennsylvania export log market, to $18 million in 2003, representing 26% share of the market. Exports to Canada increased from nearly $11 million in 2001 to $13 million in 2003. Despite the slight increase in sales, the Canadian market share decreased from 20% in 2001 to 18% in 2003. The third largest export market for Pennsylvania hardwood logs in 2003 is China, accounting for 7% of the Pennsylvania log sales in 2003. Sales to China grew from under $4 million in 2001 to over $5 million in 2003. Ten major Pennsylvania log exporters were surveyed to determine their current shipping needs for this market and the potential to use a barge service from the Port of Pittsburgh to the Gulf of Mexico, and then onto the overseas export markets. The exporters indicated that the most competitive alternative would be to use the river system to move export logs to New Orleans for export to China, rather than an East Coast port for exports

to China. East Coast ports such as Baltimore and Norfolk are now used to serve both European and Asian log export markets. The surveys identified that typically the logs destined for China are being stuffed into containers at the logging facilities, trucked to the ports, fumigated and loaded onto ships for overseas delivery. A majority of the exporters truck their containers to the Port of Baltimore and/or Norfolk. On average, the inland truck rate is $500-$650/box and is received at the port within a day. (This truck rate is a roundtrip rate, which includes dropping off a full container at the port and bringing an empty back.)

A majority of the log exporters indicated they use a freight forwarder to arrange the transportation routings, retrieve the cheapest rates and locate the available equipment. The ocean transit from the East Coast to the Far East and China is approximately 32 days.

Interviews with the exporters indicated the current cost of export using Norfolk and/or Baltimore is about $1,900 per container. The log exporters that were interviewed expressed a strong interest in using the barge service from the Port of Pittsburgh to the Port of New Orleans for overseas transportation to the Far East and China. These shippers' concerns include the overall cost, transit time from the Port of Pittsburgh to the Port of New Orleans, and the adequacy of a fumigation facility at the Port of New Orleans to handle the expected volume. (The Port of New Orleans has an area available for fumigation). A total transit time of less than 50 days would be acceptable. It will be necessary to work with the ocean carriers or a third party logistics provider to develop a door-to-door rate for the log exports.

4.4.3 Potential South American Imports

The ability to import products from South America into the Pittsburgh market for use in local manufacturing was identified by Port staff as a potential opportunity for a container-on-barge service. The scenario analyzed involved a discharge of the imported products at New Orleans and a barge move to Pittsburgh. The alternative routing is a discharge in Baltimore and a truck or rail move to Pittsburgh. Currently the products move via Baltimore at a cost of about $3,400 per container, setting a rate for which the import move using barge must compete.

Overweight containers could also use this barge service, thereby effectively reducing the cost per ton over a rail/truck movement. The overweight move would be most attractive for imports moving to a Pittsburgh customer with a riverfront location. This would minimize the cost of drayage of an overweight container and most likely eliminate the need to transload the container into domestic truck trailers, in order to comply with over the road weight regulations.

In order to participate in this market, it is necessary to establish a total in-bound rate from overseas origins to Pittsburgh. This will require direct discussions with the carriers as well as barge operators, and innovative financing and pricing of the move.

4.4.4 Potential Middle East Exports

The potential of exporting containerized products from Pittsburgh to the Middle East was also identified as a possible market lead to the Port of Pittsburgh Commission. The analysis assumes the products are produced at a riverfront location, which would be ideal for barging the containerized products to New Orleans for export. The alternative would be to export the products via one or more North Atlantic ports. It is estimated that the export of these containerized products from Pittsburgh to the Middle East via Baltimore is about $2,200 per container, based on interviews with steamship lines. This again sets the competitive rate for which a barge move via New Orleans would have to compete.

4.4.5 Domestic Plastics & Resins

Earlier in this report, the potential plastics and resins market produced on the Gulf Coast and destined for the Pittsburgh area was presented. These same products are also produced in the Pittsburgh area and are destined for Gulf Coast markets. The outbound Pittsburgh plastics and resins market to the Gulf Coast presents a potential market opportunity for a container-on-barge service in Pittsburgh and was included for analysis to assess the potential of this market. Plastics/resins and petrochemical companies located in proximity to the Greater Pittsburgh area were surveyed to assess the potential of using a container-on-barge service from the Port of Pittsburgh to the Gulf of Mexico. As part of the interview process, 30 companies were contacted.

Currently, the majority of raw materials and/or finished products in this industry are trucked to their origins/destinations. Approximately 60% of the companies interviewed stated their major concern with the container-on-barge service is the transit time rather than the cost. The products are time-sensitive materials that must be delivered rather quickly and on-time. On average, the typical transit time for a truck trip to Houston from the Greater Pittsburgh area is approximately 2-3 days.

Of the respondents surveyed, 80% identified the container-on-barge service would not benefit their operations due to several factors:

- Shipping/Receipt locations are not relevant to waterborne activity
- Shipping/Receipt locations are not relevant to the Gulf of Mexico
- Barge service would not be quick enough (Time-sensitive materials)

- Barge service would not be cost efficient
- Volume is not large enough to be relevant
- Operate their own terminal
- Has rail access at manufacturing plant

Three companies indicated a potential interest in the container-on-barge service from the Port of Pittsburgh to the Gulf of Mexico if their shipping time requirements can be met and the cost is competitive with their existing truck freight rates. On average, the truck freight rates are approximately $1,250-$1,650/truckload to Texas destinations with a typical transit time of 2-3 days. Barging costs from Pittsburgh to Houston is estimated to be $1,500, including barge freight, stevedoring in Houston and Pittsburgh, pick-up and drop-off of an empty container in Pittsburgh and dray to a river terminal for loading. This rate is based on cost data provided by barge lines, shippers and terminal operators. The potential to move overweight containers on this routing could reduce the barge cost per ton by 20%. Such a reduction due to the movement of an overweight container and working with an aggressive barge company could result in a cost effective routing via barge for these domestic cargoes. However, transit time still remains an issue.

4.4.6 Demurrage Penalties

The demurrage charges by ocean carriers on their import and export containers have the potential of increasing container-on-barge costs significantly. The longer barge transit times on the inland river system to Pittsburgh will exceed the number of free days allowed by the carriers, generally ten days. Within this timeframe, however, containers barged to Memphis, for example, would not incur demurrage charges due to the short transit time on the Mississippi River. Osprey Lines reported carriers are routinely waiving demurrage charges, if incurred, to ensure that their containers will be put into service rather than remaining at inland locations unused. The policies regarding demurrage relating to container-on-barge services vary by carrier – will demurrage be charged, when will it be charged and the amount of the charge is at the discretion of the ocean carrier. Penalties could be waived, or they could be imposed and significant. For example, the demurrage tariff of one carrier out of New Orleans is $14 per FEU per day for the first 4 days after free days and $37 per FEU per day thereafter. Based on this tariff, ten days of demurrage charges would add $278 to the cost of barging the container. Two possible solutions to reduce or eliminate demurrage charges are:

- Establishing door-to-door or port-to-port rates – the ocean carrier would enter into an arrangement with a barge liner service that would determine a time of delivery and an appropriate number of free days and subsequent demurrage charges. Osprey

has such arrangements with ocean carriers who are offering door-to-door rates to inland customers.

- An entity (shipper, consignee, barge line, etc.) would enter one-way leases with container owners (steamship lines, third party lessors) for each movement and set the timing of the lease to ensure there is no demurrage charge.

4.4.7 Repositioning of Empties

There exists a surplus of empty ocean containers stored at the Port of New York and New Jersey due to the imbalance between imports and exports. In contrast, there is also generally a lack of containers in production and exporting regions of the country, such as the Houston area. Key exports from the Houston area are driven by the export of plastics and plastic pellets. Martin Associates evaluated the potential to move the empty containers from New York to Pittsburgh for eventual export loading. This way the ocean carrier could collect some revenue to reposition the container back to Asia. Cost models were used to evaluate railing an empty international container from New York to Pittsburgh. In Pittsburgh, the empty container would be transshipped to barge for the final move to Houston.

To assess this potential market, Martin Associates interviewed steamship carriers located in the New York area who call both the Port of New York/New Jersey and the Port of Houston:

- CMA/CGM
- COSCO
- Hapag Lloyd
- Maersk Sealand
- Mediterranean Shipping
- NYK Line
- OOCL
- P&O Nedlloyd

The carriers interviewed do reposition empty containers overland between coastal ranges to meet equipment shortfalls. However, empty containers from Norfolk, Charleston and Savannah are railed to the Gulf Coast for $300-$600 per container. Empty containers are also repositioned by rail from major inland markets in the Southeast and Midwest. The carriers indicated that Pittsburgh is not a major source of empty containers. One carrier moves empties from Pittsburgh via rail to Los Angeles, loaded with domestic cargo from the Pittsburgh area. The rail rate is $600 per container. Carriers also operate dedicated trains between the East and West Coasts and utilize these trains for repositioning as well. With respect to the empty containers in New York, the majority of the carriers interviewed load empties back onto their vessels in New York for repositioning. The carriers indicated it is not cost effective to reposition empty containers from New York through the Port of Pittsburgh to the Gulf Coast. In fact, the annual storage costs for

empties at New York are not much greater than the cost of local drayage to the railhead if the empties were to be railed westward for repositioning. Moreover, as imports via New York have grown, the traffic lanes westbound from the Port of New York and New Jersey have become a head-haul for rail, eliminating the opportunity for the depressed rates that successful empty repositioning requires. With the cost of new containers from Chinese manufacturers low, and container ship lines able to find additional alternatives for container supply, the business prospect for Pittsburgh does not appear to be strong.

Pittsburgh itself generates a small number of empty containers that would not be a basis for supporting a container-on-barge service to the Gulf Coast. Interviews were conducted with Container Port (CPG), who operates container yards in Cleveland, Columbus and Cincinnati, Ohio to identify whether the empty containers in their yards originated from the Port of Pittsburgh and/or the Greater Pittsburgh area. The container yards in both Columbus and Cincinnati have very few containers coming or going from the Greater Pittsburgh area and less than 0.5% of the containers in the Cleveland yard are from the Pittsburgh market.

However, there is a potential to move empty containers from Pittsburgh to Ghent, KY via the inland waterways. Currently, full containers are loaded onto barges in Ghent for delivery to the Gulf Coast. Empty containers are being delivered to Ghent by truck, rail and barge to meet the demand to serve markets in New Orleans and Houston. The empties are stuffed in Ghent and the loaded containers are barged down the inland river system by Ingram Barge to the Port of New Orleans, where they are transloaded onto barges operated by Osprey Lines for barge transport to the Port of Houston and then further loaded onto vessels for overseas transportation. The typical transit time from Ghent, KY to New Orleans via barge is 14-19 days and approximately an additional week from New Orleans to Houston.

4.4.8 Land Bridge Arbitrage

Options to assemble a baseload of traffic for container-on-barge service could include a variation on rail gateway arbitrage, substituting water service to a St. Louis transfer for direct rail from the Pittsburgh region to the west. Analyses prepared during the second phase of research and provided to the Commission, found that water could be competitive with rail on a backhaul cost basis, but could not produce a compelling cost advantage due to transloading and drayage expenses. As mentioned above, private and public entities at the gateway may be able to change this profile, and the Commission can support any steps they may plan. However, the service deficit by water, compared to the generally good railroad performance in the intermodal sector, remains an obstacle for many shipments.

Even so, customer contacts made by Commission staff and other members of the research team suggest that customers with relatively modest individual volumes and relaxed service needs could find use for a water-based container service, but could not support one by themselves. This points once more to the need for a baseload of traffic with which to introduce an initial service. One of the options for securing such volume is to drive down the delivered cost of waterborne containers to the level of a compelling advantage, by reducing the cost of transfer and drayage. This could be done via temporary subsidy, designed to support a new service long enough for it to establish a viable body of business, and doing so perhaps by funding a public intermodal terminal. Alternately, a group negotiating effort may be effective. Individual container ship lines, or individual barge lines or shippers approaching transload operators, may have inadequate volumes to offer high asset utilization and attract low rate bids. A coordinated negotiating group acting on behalf of a consolidated volume may have more success. Facilitating such steps within its own jurisdiction in the Pittsburgh region makes more practical sense (and gives the Commission more control) than to do so at other entry and exit points on the river system, even though transload and dray costs at those points may affect the competitiveness of the barge product just as much. Of course, the Commission may find port partners willing to take similar steps at other locations on the water system.

4.5 Movement of Oversized (Breakbulk) Cargo

An analysis of the cost to move oversized project cargo manufactured in the Pittsburgh area via barge or truck to markets in West Virginia was conducted. As part of the survey process, seven trucking firms were interviewed, but only one is capable of transporting the oversized project cargo and provided a cost estimate for the service.

A comparison of potential barging and trucking costs identified barging as the least cost transportation alternative for the movement of oversized project cargo from the Pittsburgh area to West Virginia. The Port of Pittsburgh staff provided a barge rate of $4,500 from the Pittsburgh area to West Virginia. Assuming the manufacturing facility is located on riverfront property, this is far less costly than the estimated trucking cost provided by the trucking company of approximately $8,100/load, with potential variations depending upon the exact location in Pittsburgh and/or costs incurred due to detouring, as a result of construction along the intended routing. The truck trip will take approximately three days.

Additional permits and an escort service are required for the transportation of the oversized project cargo; and time of day restrictions, diversion from main highways due to height restrictions, and utility service (lift truck to raise utility lines) might be required.

In addition, a similar assessment was conducted of transporting the same oversized project cargo from the Greater Pittsburgh area to Minnesota either by truck or barge. However, the comparative cost analysis became moot since it was found the transportation laws in both Ohio and Kentucky state that cargo exceeding 13.6' cannot pass through either state unless the cargo was manufactured within that state. Thus, oversized project cargo manufactured in Pennsylvania cannot be trucked from Pittsburgh to Minnesota in a direct routing and would require barge service.

4.6 Summary of Phase II (Fieldwork)

Forward distribution and its variations offer a meaningful new market for waterborne traffic at Pittsburgh, and one that customers already have pioneered. It requires complex steps for development and promises attractive, if not tremendous new tonnage for the river system. Moreover, in an economy that has shifted away from the long-time sources of water traffic, it represents an appropriate response to new industrial realities, it utilizes a genuine strategic strength of the Port, and it creates a logistical capability that suits the intricate supply chain systems of contemporary business.

Development of traffic from the catchment area is a useful step for the Port, yet its prospects are individual, and dependent on a string of favorable costs to balance the disadvantage of distance from water. Container traffic is a different matter: equally challenging to develop, but representing a true growth sector of U.S. business, with interest and initiatives by the private and public sectors, and offering a number of prospects. It is important to note that the logistical capabilities that can build forward distribution, the associated relationships with motor carriers, and the capacity to affect transfer and inland costs, all suit the requirements to build container traffic where it is not today. Thus there is a synergy in opportunities that enable the Port to explore a future beyond its traditional trade base, and that create skills and present alternatives that will take time to develop, but are necessary for building opportunities into long term business.

5. Directions for Development

There are three different classes of traffic broadly available to the Port of Pittsburgh: (1) traditional heavy-bulk business; (2) general commodity traffic involving an extended dray, or service to the larger Pittsburgh catchment area; (3) container-on-barge traffic. The Port of Pittsburgh has already captured most of the traditional heavy-haul traffic available in water lanes, reflecting the effectiveness of its existing marketing strategy. Even so, the Port may develop additional business by encouraging geographic consolidation of bulk manufacturing and processing activities in Pittsburgh, to create jobs and create traffic. The extended dray markets are significant, and while transload and

dray costs are critical to the viability of such traffic, an important segment offers favorable conditions now. Container-on-barge traffic is a nascent market; if a critical baseload volume can be established from a number of prospects, the intermodal opportunities could prove a source of long-term growth for the Port.

Strategically, a number of conclusions can be drawn from the foregoing analysis and its implications.

- *First* is that the geographic position of the Pittsburgh Port as a gateway to the inland water system is a valuable asset that should be developed as such, and therefore a tactical focus should be on ways to extend the waterway's scope of services beyond the local market. In a sense, waterway operators naturally understand this, but the position of Pittsburgh at the end of the system gives it greater significance and greater opportunity. Doing so requires efficient access to eastern markets, and this implies a higher degree of control over access cost factors.

- *Second*, new business opportunities mean adaptation to categorically new logistics systems, with complex coordination and again, control over cost factors. The development of such capabilities in the Pittsburgh region should be a target for the Port Commission, identifying third party logistics firms or other agents with an intrinsic interest in the bulk business where the waterway has particular strength. Such firms professionally oversee multiple functions and contributing parties, and at least as important, perceive how to build business opportunities out of complex requirements, and can market that capability to large shippers. Others exist who can manage container services, although their commitment to water-based options must be scrutinized.

- *Third* and relatedly, is the need for a coordinating function that consolidates waterway volume – not operationally, but institutionally, for the sake of creating bargaining power to drive down pickup and delivery costs. This function would act as a negotiating agent much like freight carriers have bargaining groups to treat with organized labor, and it can also seek to foster efficiency in the pickup, delivery, and transload process. Productivity of that sort can come from arrangement of financing for better equipment, from review of best practices among operators willing to learn from each other, and from landside access improvements pursued with the Southwestern Pennsylvania Regional Planning Commission (the regional MPO). A particular payoff is that the capacity to modify access costs may facilitate the production of baseload volumes for new container services, which would yield a beachhead into one of the major contemporary freight markets.

- *Fourth*, is that while forward distribution and the container market differ in their handling and transport requirements, they demand comparable skill sets in logistics management and access cost control. Thus, pursuit of both can be productive and

mutually supporting to a degree, and make new institutional initiatives more worthwhile.

These points all affect the marketing and coordinating role of the Port Commission, and could lead it to consider new functions.

5.1 The Role of the Pittsburgh Port Commission

The Port of Pittsburgh Commission is a non-operating marketing organization that represents the interest of barge operators, terminal owners, government entities, bulk shippers, and others who have an interest in developing the Pittsburgh area as a water-transportation hub. As it does not directly control any assets, its role is one of facilitation and designing schemes that produce a win-win situation for all parties. It issues advertising, participates in trade shows, and distributes sales leads to members, without directly engaging in transacting business. This role could be likened to a 'business development' or 'strategic planning' department in a large corporation, where business plans are constructed, feasibility explored, and once funding agreement is secured, the plan is passed to project delivery (i.e. the individual private operators) for implementation.

Given the strategic conclusions of this study, three actions are critical to the continued growth of Pittsburgh as a waterway freight port: (1) Facilitate consolidated bargaining and promote cost-reducing practices; (2) Recruit 3rd party logistics providers to organize the complex management of forward distribution; (3) Attract, develop and nurture expertise in container-on-barge operations. The following sections expand on these recommendations, as they influence the role of the Commission.

5.1.1 ***The Commission as Agent***

Reach out to stakeholders and explore their support of an agency function for consolidated bargaining. As shippers have demonstrated with core carrier programs, the ability to consolidate traffic volume for rate negotiation has a pronounced effect on price levels, performance quality, and underlying efficiency. The strategic utility of lower dray costs, supported by improved utilization of truck equipment, has been asserted in this study. To achieve it, a coordinating agent negotiating with motor carriers on behalf of multiple waterway operators, could cut pickup and delivery costs to their mutual benefit, and to the advantage of the region. Portrayed as a core carrier program for the Port, this approach can foster partnerships with better performing truck lines, and raise their asset commitments while boosting their level of service. Waterway operators could

recommend motor carriers to the agency, who would have no direct control of traffic, and they need not surrender sovereignty over their operational decisions.

The Port should explore establishment of an agency function, to be undertaken by a qualified party or conceivably by the Port itself, with appropriate staffing and resources. While this initiative is focused on drayage costs, it could perhaps be extended to fuel, maintenance, and equipment purchases. Either inside the agency or parallel to it, the Port should consider steps that modify access costs in other ways. One is to arrange financing for modern transloading equipment or facility upgrades, another is to institute a best practices benchmarking program with interested operators. A third step is to seek transportation improvement programs (TIPs) with the Regional Planning Commission, aimed at better landside access and approach routes to Port districts; the purpose of this is to accelerate turnaround time for drayage providers, cutting their costs and widening the service range of the waterway.

5.1.2 ***The Commission as Recruiter***

Recruit willing and capable operating parties to handle logistical coordination and marketing for complex supply chains. Management of intermodal container or forward distribution systems can require work with, monitoring of, and precision from pickup and delivery firms, transfer terminals, warehouses, linehaul operators, and equipment suppliers, as well as shippers and consignees. Moreover, the marketing of such services to large organizations must overcome modal stovepiping, appeal to business developers in addition to transportation departments, and perhaps win the support of finance and manufacturing groups. The better third party logistics companies make a business out of this, and can bring such functions together not only in Pittsburgh, but at remote origins and destinations for which Pittsburgh may function only as a hub. They have tracking and control systems, and are able to negotiate input cost factors at every stage of transportation, regardless of its geographic location. The Port Commission should identify and qualify third party firms (some have been suggested by the study team), then nurture such capabilities for the Pittsburgh region, by involving these parties in marketing programs, connecting them to local companies, and aiding their local efforts. The benefits are long term as well as more immediate, because management of complex systems can be a prerequisite not only for winning business in contemporary supply chains, but for identifying the best opportunities to pursue, and for building traffic volumes to maturation.

Third party firms the Port Commission might consider should fulfill the following criteria. A prequalification and bid process might earn the firms some sort of formal certification:

- Have demonstrable capabilities in supply chain logistics;
- Have an intrinsic interest in using the waterway to reduce total shipment costs – asset ownership in bulk transportation would be one sign of this;
- Be committed to developing a Pittsburgh regional expertise for organizing complex logistical undertakings;
- Be financed adequately by the owning company;
- Be national (or international) as well as regional in scope, providing broad coverage of potential opportunities.

5.1.3 ***The Commission as Developer***

Develop and nurture inaugural service and local expertise in container-on-barge operations. Container-on-barge is an infant market, in that it will require groundbreaking marketing efforts to establish a regularly scheduled service at Pittsburgh. Such a service will require fixed sailing schedules and be "induced" into the Pittsburgh area by a sufficient volume of cargo to justify the Pittsburgh call. This may require innovative pricing in order to penetrate the rail/truck market, and as a result the cost based analysis conducted in this report may not be representative of the pricing that will be required in order to grow the business. Furthermore, it is unlikely that one shipper will be the catalyst for such an inducement volume, and as a result, it will be necessary to consolidate multiple shippers/consignees in the Pittsburgh region. The fact that the service will require innovative marketing and pricing opens a role for the Port of Pittsburgh Commission. The Port can engage in the active marketing to key shippers/consignees in the area along with direct marketing to Osprey Lines, MEMCO, Ingram Barge and ACBL. In addition to involvement of the potential barge operators, it is necessary that the Port initiate discussions with ocean carriers regarding intermodal pricing, and potential repositioning of empties into the Gulf. Pittsburgh access costs are important, but so too are the cost absorption policies of containership lines, and aggressive marketing of one element may help to swing the other. The pricing can be divided into its components for analysis, but only the total price will be relevant. A high or low barge component rate, terminal rate or dray rate can be offset by an advantageous component rate in the supply chain. Steps can, and should be undertaken to reduce all component rates.

Barge carriers typically quote barge load rates, usually on a long term contract with an invoice to a single shipper. This method of pricing does not lend itself to the numerous customers that would make up a container-on-barge movement. The service delivery must be regular and predictable with pricing quoted on a per container basis. The barge

needs to sail as scheduled, whether it is full or not. Therefore, the per container rate must anticipate varying load factors.

The Port of Pittsburgh should continue its marketing of the system for traditional cargoes, as well as for the potential container business. Coordination with other ports should be an element of this, especially in new markets where both parties may derive new traffic. It also is useful to note that the new or extended roles for the Port this study has suggested can be mutually reinforcing, so that the agency role, for instance, supports the developer role. To take an example, one key impediment to the success of container shipments via the Port of Pittsburgh is the level of terminal charges quoted by terminal operators along the Mississippi River system. The quoted terminal charges, which include stevedoring as well as truck loading, mounting on chassis, weighing, container inspection and repair, account for a significant share of the total inland river cost of moving a container. These are fixed charges and represent about one-third of the transportation cost (excluding the dray to and from the river terminal).

It is necessary that the proposed terminal rates be reduced significantly, for the river system to be competitive with competing deep-sea ports and inland modes. Investments in equipment with greater productivity would be required. The private sector is unlikely to make major speculative investments, which exacerbates the productivity situation. The Port of Pittsburgh Commission could provide incentive plans/financing assistance for investment in terminal equipment, which lower terminal costs per container, and aid development. And, it could encourage partner ports to provide the same.

Finally, the Port can work on project specific issues brought forward by terminal operators or local shippers/consignees. These could include specific feasibility analyses, funding assistance, and/or working directly with the ocean carriers in developing innovative pricing techniques.

5.2 Conclusions

New business opportunities in traditional waterborne traffic have become fewer in the changing marketplace. However, new business of material magnitude is available that will require creativity and new marketing expertise, as the assessment of container-on-barge, forward distribution, and its variants determined. The steps required to exploit such a market niche, and the concomitant capabilities and cost elements that must be developed, in fact would move the Port toward the complex management of logistics that modern supply chains have adopted and nurtured for competitive advantage. Recognizing that conventional markets are not wholly exhausted, and that some actions should be taken in that direction for prospects identified in this research, the larger steps forward are steps in transition that develop new capabilities for industries that are

themselves in transition into global markets and global-to-local logistics. Whether the role of the Port Commission – or just the capabilities it fosters – should change along with its opportunities, is a subject the Commission must explore.

6. Appendix A: Pittsburgh Market Assessment

6.1 Overview

The purpose of this section is to provide an assessment of the Pittsburgh transportation market, focusing particularly on water markets. According to TRANSEARCH, a total of 249 million tons were carried in to, out of, and within the Pittsburgh Port District in 2001; 22% of tonnage involved a water movement. The goods had a total value of $133 billion, 7% ($9 billion) of which was carried by water.

Water is a strong contender in lanes where it is active – 68% of all available traffic by tonnage is carried by water in water lanes. In this analysis, 'water lanes' is defined as any market with waterborne volume in the base year of 2001. This definition includes some markets that may be too circuitous for general development, although water is effective for some classes of goods; indeed, there is substantial movement by barge of waste & scrap between Pittsburgh and the East Coast using such out-of-the-way routing. Thirty-three percent of total Pittsburgh market freight tonnage occurs in water lanes – reflecting in part the constraint of the Mississippi River System franchise and its ocean connections.

The top water commodities were: Coal (66%), Sand & Gravel, Waste & Scrap – consistent with the relative low valuation of goods compared to the tonnage. The top water markets by tonnage were: movements within the Port District; movement to/from the West Virginia portion of the Pittsburgh business economic area (BEA, see 3.1.1); and movements to/from Charleston and Wheeling market areas in West Virginia. In terms of tonnage, it is clearly evident that the Port of Pittsburgh is dominated by coal traffic from the Western Appalachians.

6.1.1 Freight Distribution by Mode and Direction

As TRANSEARCH data demonstrate in Figure A.1, the Pittsburgh Port Commission service area (refer to 3.1.1) has approximately equal inbound and outbound tonnages. However, because of different commodity values inbound and outbound, the tonnages are not distributed equally amongst the different modes, leading to modal imbalances.

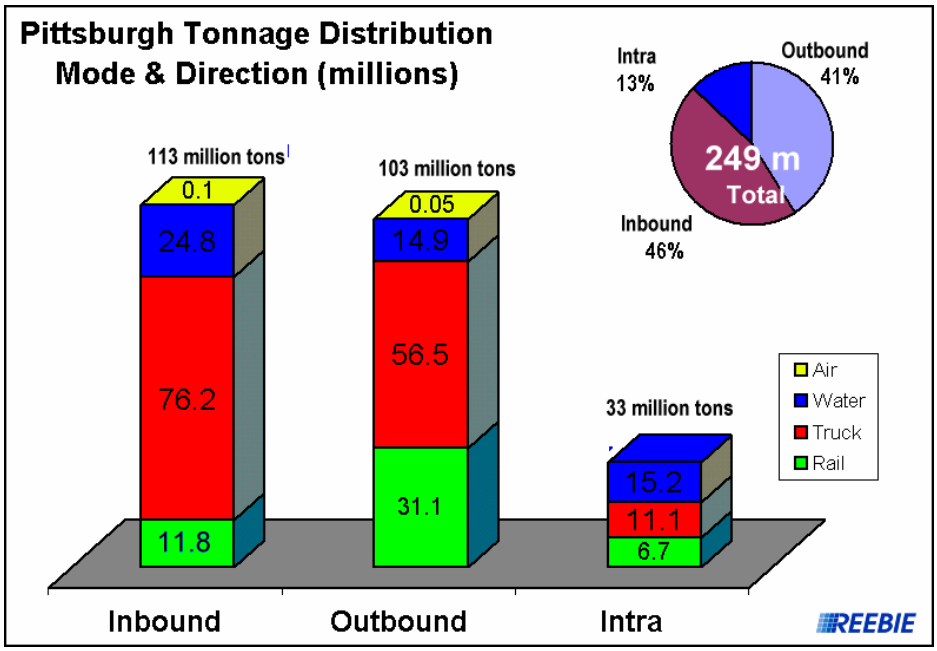


Figure A.1: **Pittsburgh Tonnage Distribution, by Mode & Direction**

In terms of water traffic, barges carry a significant portion of the intra-market service area freight – coal or other bulk commodities moving for short distances within the service area. Trucks are however dominant in both the inbound and outbound in terms of tonnages, exceeding in both cases the total of all other modes combined.

The dominance of trucking in North American freight transportation is clear from a value distribution graph, and Pittsburgh is no exception (Figure A.2). Trucks carry 81% of value in the inbound direction, and 86% of value in the outbound direction, in line with national trends. Despite significant intra-market volume, water achieves only 17% of value, due to the nature of commodities that lends itself to water transportation.

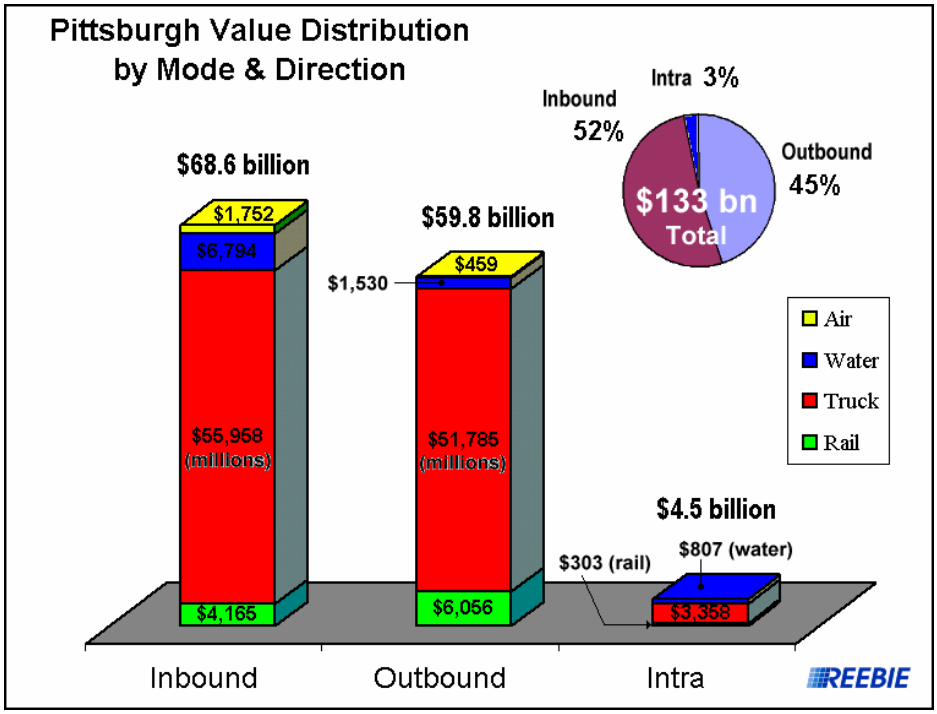


Figure A.2: **Pittsburgh Value Distribution, by Mode & Direction**

6.1.2

Geographic Origin and Destination Rankings for Pittsburgh Traffic

The New York metro market is the top source of Pittsburgh inbound freight by tonnage, as New York is an economic center of national importance and host to several international deepwater ports. In close second place are inbound goods from Charleston, WV – dominated by coal, a logical market for the Port of Pittsburgh. The Pittsburgh, WV area in third place represents local movements between the West Virginia portion and the Pennsylvania portion of the Pittsburgh BEA (the service area). Rail and water divides the available freight there evenly.

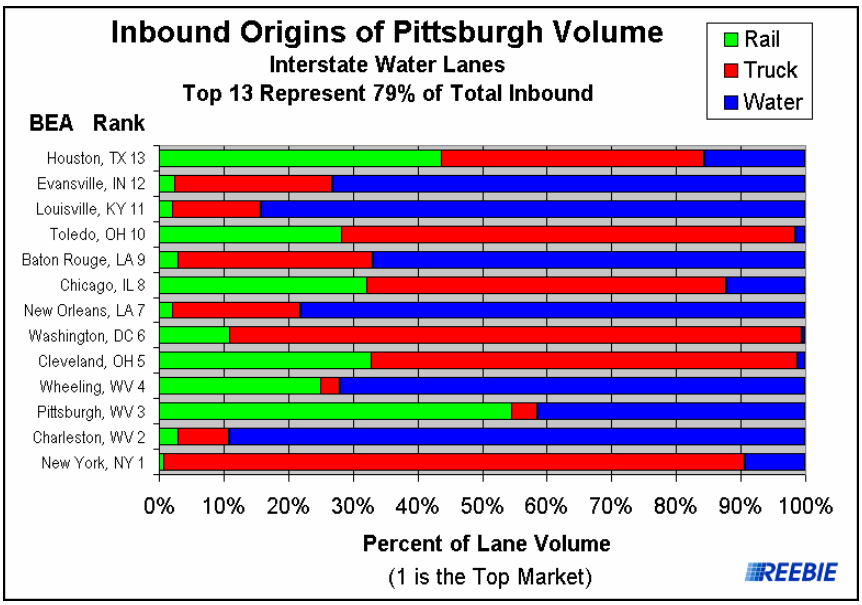


Figure A.3: **Inbound Origins of Pittsburgh Volume**

The geographical constraint of the Mississippi River System is also evident in Figure A.3. Water dominates lanes where convenient river access is available: Charleston, Wheeling, New Orleans, Louisville; trucks dominate in most other markets.

In the outbound direction (Figure A.4), water similarly is strongest around the primary river and Gulf coastal routes. In the Middle Atlantic markets like New York and Washington DC, water access produces a certain amount of waterborne activity, but the time penalty of route circuity leaves the traffic in these areas chiefly on trucks.

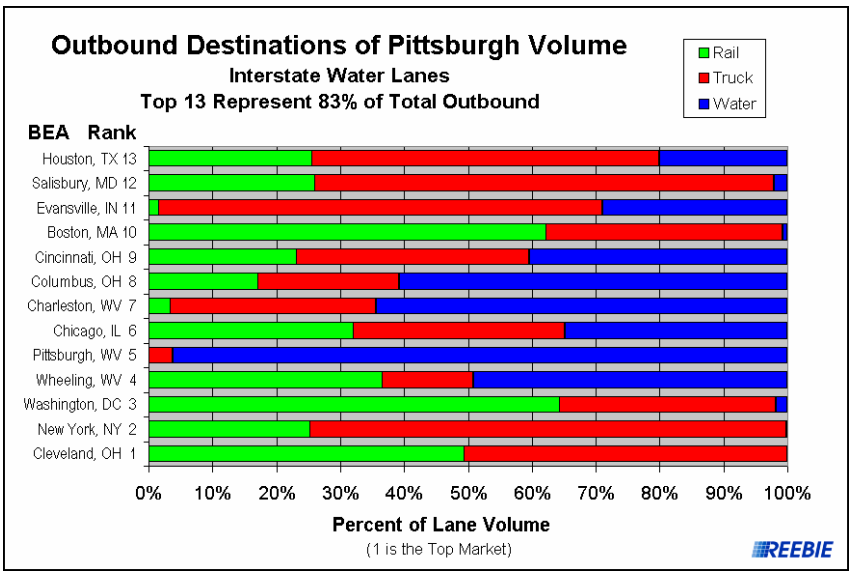


Figure A.4: **Outbound Destinations of Pittsburgh Volume**

6.1.3

Pittsburgh Commodities in Water Lanes

In 2001, water carried 55 million tons in the Pittsburgh market. Coal dominates this profile, accounting for 74% of the top five commodity groups (Figure A.5). Barge mode share is good in coal and excellent in waste/scrap and non-metallic minerals,[2] but is not nearly as dominating in the smaller and higher-value commodities: petroleum products and chemicals.

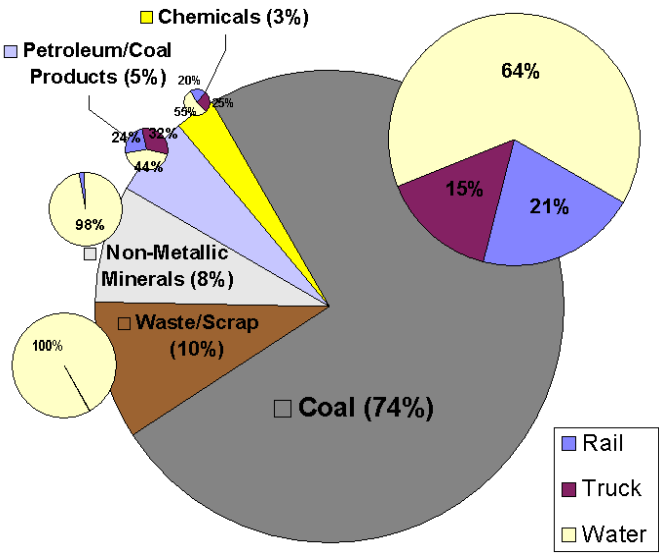


Figure A.5: Top Five Pittsburgh Commodities in Water Lanes

6.1.4

[2] The market share is overstated for waste products, because the underlying market data capture rail but not truck traffic in this commodity; others are captured fully.

Top Pittsburgh Water Commodities

Some commodity shipments are more concentrated in certain geographic origin-destination pairs than others; the transportation of certain ones represents a gathering network where product from many origins is funneled into a central collection point for processing. Figure A.6 shows coal, the primary inbound commodity to Pittsburgh, moving from many points into a central location, with tonnages equally distributed between Charleston, Wheeling, and the West Virginia portion of the Pittsburgh BEA. Pittsburgh serves as a processing and consumption center for coal. However, for waste/scrap, almost all the traffic is moving from Philadelphia.

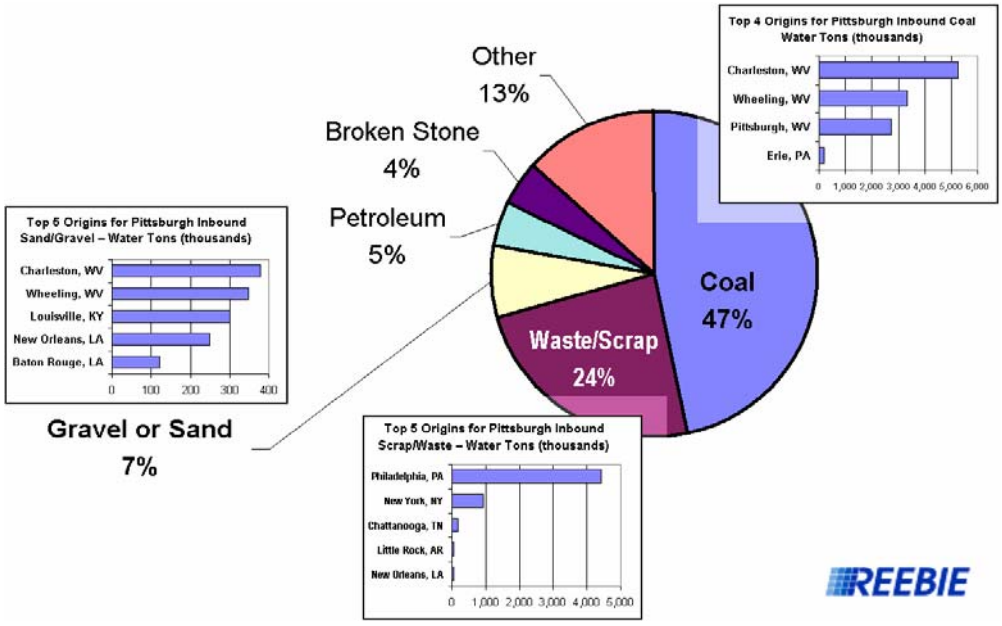


Figure A.6: **Top Pittsburgh Inbound Commodities in Water Lanes**

Most other waterborne commodities show a comparably even distribution by origins and destinations, reflecting centralized networks for many bulk commodity movements. This implies a difficulty for water in entering markets with greater dispersion, because of its clear geographic constraint and its need for volume consolidation – besides the requirement for drays and transloads.

6.2 Pittsburgh Benchmark Comparisons

The purpose of this section is to benchmark Port of Pittsburgh district performance to similar domestic water shipping lanes to assess freight capture performance. Shipping lanes will be identified and port-to-port comparison statistics presented, including average length of haul, modal market share, lane density, commodity mix, and shipment value. Significant traffic imbalances also will be evaluated in the context of their markets.

Pittsburgh proves to be a healthy market for water where it should be one. Its reliance on coal instead of petroleum stands out – coal is 66% of Pittsburgh water traffic versus the national average of 20%, while petroleum crude and products stand at 3% of the mix versus 30% nationally (Table A.1). Waste and scrap (including scrap metal) in Pittsburgh are somewhat above the national figure. These results reflect the traditional Pittsburgh economy – which was heavily based on coal and steel – and the industrial mix of other cities on the waterway system, especially the petroleum centers on the Gulf. The overall conclusion is that Pittsburgh performs well versus other waterway activity, especially given the industries available to feed it.

Commodity	US Waterborne Rank	Percent Of US Water	Pittsburgh Rank	Percent Of Pittsburgh Water
Petroleum Pdts	1	23%	5	3%
Coal	2	20%	1	66%
Waste/Scrap	3	10%	2	13%
Crude Petro	4	7%	N/A	0%
Sand/Gravel	5	7%	3	6%
Grains	6	5%	35	<1%
Ores	7	5%	22	<1%
Stone/Riprap	8	4%	4	4%
Seed/Nut Oils	9	2%	33	<1%
Cyclic Dyes	10	1%	13	<1%

Table A.1: Top Waterborne Commodities, Pittsburgh vs. National

6.2.1

Pittsburgh vs. National Mode Shares

As demonstrated in Figure A.7, Pittsburgh achieves a much higher waterborne share of total freight tonnages than the nation on average, not all of which is water-served. Water is very effective for transportation of heavy tonnages where it is available, economic geographies of the past have been dictated at least partly by access to bodies of water, and water historically fostered the industries that could use it.

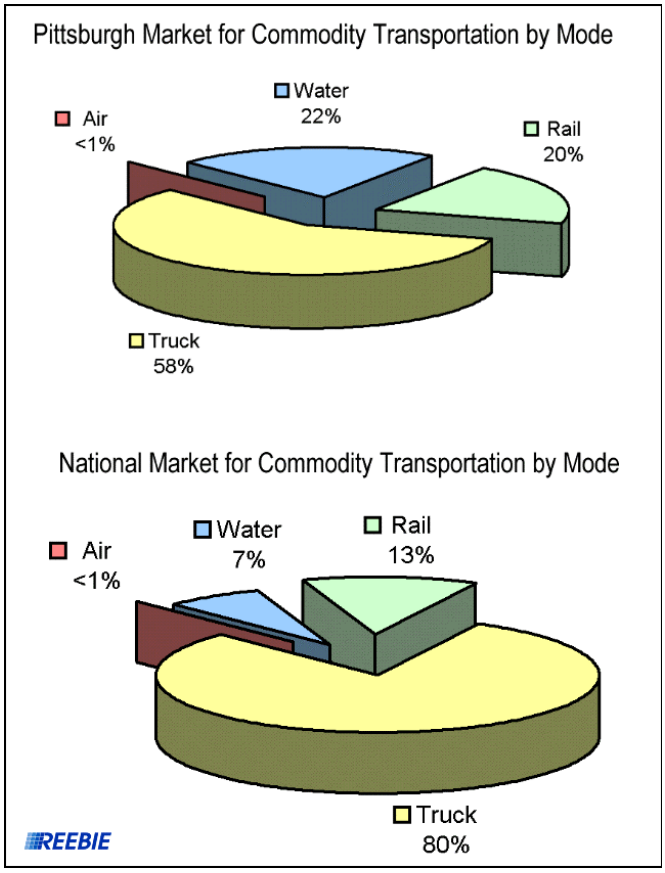


Figure A.7: Pittsburgh vs. National Mode Shares

6.2.2 Length of Haul Distributions, Pittsburgh vs. National

In terms of lengths of haul, Pittsburgh traffic tended to be shorter and longer than the national average (Figure A.8). There is a significant amount of intra-port traffic and coal from neighboring areas, hence the prominence of shorter-haul traffic; the fact that Pittsburgh is the northeastern terminus of the Ohio River means that traffic in general has to travel further before reaching ocean or southern destinations. This produces a length-of-haul profile that has representation from every strata, unlike the national average where medium-haul traffic is more common.

REEBIE	MILEAGE RANGE									
	<250		250 to 499		500 to 1499		1500 and >			
Commodity	National	Pittsburgh	National	Pittsburgh	National	Pittsburgh	National	Pittsburgh	National Volume	Pittsburgh Volume
Farm Products	9.3%	0.0%	12.2%	0.0%	77.9%	100.0%	0.6%	0.0%	76,841,946	39,719
Forest Products	40.8%		55.5%		3.8%		0.0%		19,726	0
Fish & Marine Pdts	11.7%	0.0%	11.8%	0.0%	76.3%	100.0%	0.2%	0.0%	2,166,872	65,814
Metallic Ores	10.8%	0.7%	20.1%	1.8%	69.0%	97.3%	0.1%	0.1%	51,340,885	295,469
Coal	55.7%	81.6%	26.2%	16.4%	18.1%	2.0%	0.0%	0.0%	322,121,058	46,673,746
Crude Petroleum	26.3%		5.7%		1.8%		66.1%		65,406,738	0
Non-Metallic Minerals	60.0%	66.2%	21.4%	17.8%	18.5%	15.9%	0.0%	0.0%	128,116,930	6,186,934
Food	7.7%	0.0%	14.3%	0.0%	77.3%	100.0%	0.8%	0.0%	41,204,011	26,697
Tobacco	2.2%		27.2%		70.3%		0.3%		41,478	0
Textile Pdts	35.9%		5.3%		5.4%		53.4%		166,942	0
Apparel	41.7%		6.7%		6.4%		45.3%		1,151,022	0
Lumber	73.0%	0.0%	18.3%	0.0%	7.2%	100.0%	1.5%	0.0%	40,408,193	23,204
Furniture	38.4%		6.2%		5.8%		49.6%		595,836	0
Pulp/Paper	30.7%	0.0%	35.6%	100.0%	32.6%	0.0%	1.1%	0.0%	1,638,212	0
Printed Matter	40.7%		6.6%		5.1%		47.5%		1,099,761	0
Chemicals	45.5%	37.1%	15.8%	14.7%	33.0%	39.1%	5.6%	9.1%	147,019,320	2,193,520
Petroleum	60.3%	52.8%	14.7%	13.6%	22.7%	33.5%	2.3%	0.0%	583,673,241	3,923,979
Rubber/Plastics	27.2%		4.1%		34.1%		34.5%		1,046,931	0
Leather	38.1%		5.3%		5.3%		51.3%		121,527	0
Clay, Glass, Stone	28.1%	0.0%	45.0%	43.8%	26.1%	56.2%	0.7%	0.0%	22,315,550	580,553
Primary Metal	11.9%	2.0%	17.2%	11.9%	69.9%	84.1%	1.0%	2.0%	26,369,048	3,026,436
Fabricated Metal	11.9%	1.7%	16.0%	3.5%	71.4%	93.0%	0.7%	1.8%	6,875,105	614,968
Machinery	38.9%		11.1%		7.6%		42.3%		2,037,310	0
Electrical Equipment	41.3%		6.8%		5.7%		46.2%		290,093	0
Transportation Equip	42.9%		5.4%		4.1%		47.5%		2,798,320	0
Instr., Photo, Optical Equip	37.7%		4.0%		5.8%		52.4%		213,835	0
Waste/Scrap	40.0%	1.5%	26.4%	82.0%	30.1%	16.3%	3.5%	0.3%	105,792,588	7,258,095
Misc Freight Shipments	50.8%	3.3%	7.5%	36.9%	29.4%	59.8%	12.3%	0.0%	5,353,512	35,495
Shipping Containers	50.7%		4.5%		4.0%		40.8%		82,164	0

Figure A.8: **Length of Haul Distribution for Water Commodities**

6.2.3 ***Port Benchmark Comparisons***

For a number of key port cities on the Mississippi River System, head-to-head benchmarks on the other port's largest commodities were compared with those of Pittsburgh, an example of which was shown in Figure A.9. In the case of local traffic moving within the port district of Cincinnati, the five largest commodity groups were Non-metallic Minerals, Coal, Waste/Scrap, Petroleum or Coal Products, and Clay Concrete Glass or Stone. For the largest category in Cincinnati, Non-metallic Minerals, most of the traffic moves by truck as shown by the mostly maroon-colored stacked bar. In Pittsburgh, the corresponding commodities moving locally within the port shows significantly larger volumes, a substantial slice of which moves by water.

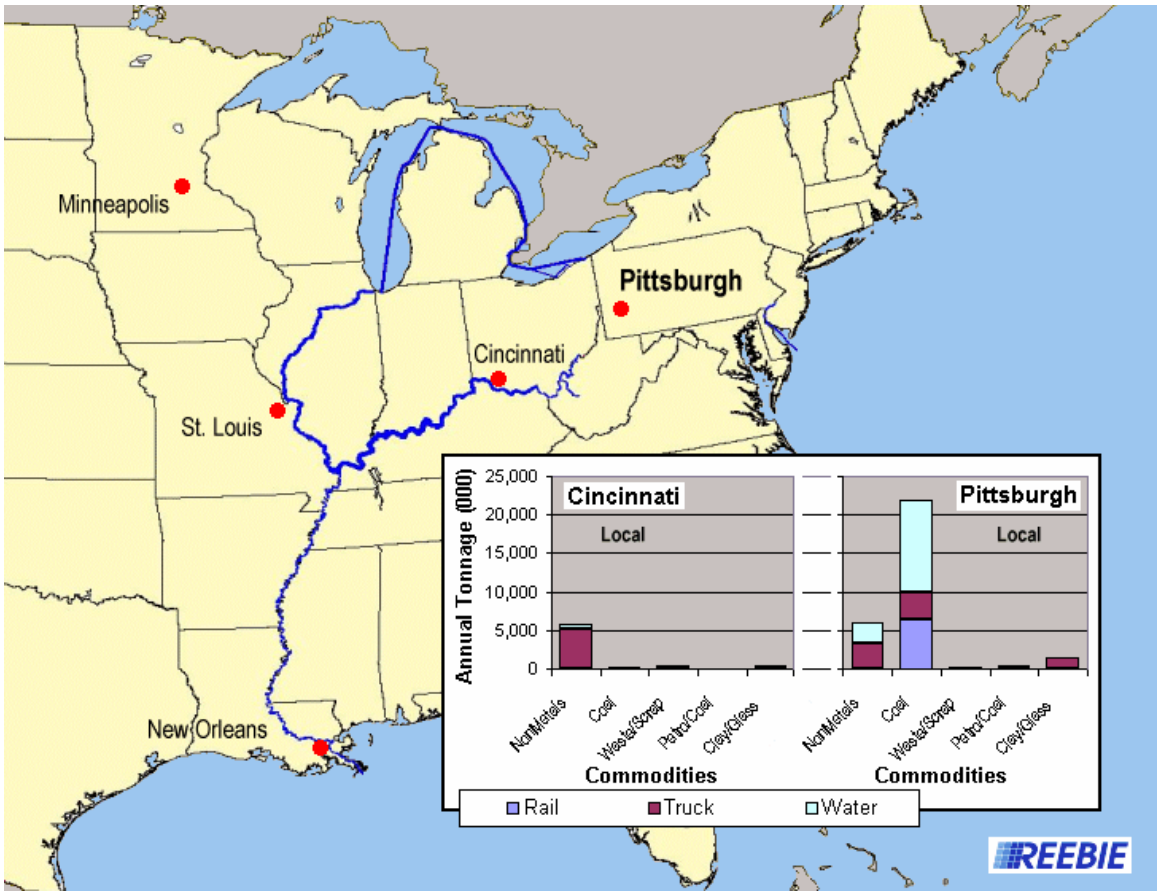


Figure A.9: **Port Benchmarking Analyses for Key Mississippi River Ports (Cincinnati Local Traffic vs. Pittsburgh Local Traffic)**

These charts, all of which were provided privately to the port, demonstrated that Pittsburgh in general ranks very favorably with the ports the team chose to analyze based on their similarity in attributes. The notable exception was Petroleum Products and Chemicals moving out of New Orleans. Water has a substantial presence carrying these commodities out of New Orleans, whereas in Pittsburgh water does not. There is also much less volume of said commodities moving out of Pittsburgh, most of which are trucked. This is an effect of the Petrochemical production centers concentrated on the Gulf, and the traffic densities they generate.

6.3 Modal Competition in Pittsburgh Water Lanes

The purpose of this section is to explore commodity markets in other modes, to reveal traffic that could potentially be water marketing opportunities. Examination by lengths-of-haul revealed a few general opportunities: Petroleum Products and Metal Alloys by truck, in regional and long-haul markets; Coal and metal by rail in regional markets, and local Coal by rail and local Sand & Gravel by truck.

Closer examination of the local Coal and Sand/Gravel flows revealed that although water would be capable of handling these commodities, the origins or destinations were off-water some distance from the river and the length-of-haul was too short to justify any type of transloading or dray operations. The single mode service was found to be more economical. Interviews with shippers in Phase II also revealed that the alloys tended to be shipped in consignments too small for barge movement. Although reported under the same commodity code, most of the alloys being shipped are high-value, highly specific alloys that are ordered by specialist manufacturing firms on a truckload basis. Barge service would be too slow, and the many different type of alloys make consolidation difficult. Petroleum products and chemicals held some promise, as will be discussed in a later section.

In general, the conclusions from this effort confirm the earlier benchmarking analyses. There are no immediately obvious large or highly leveraged opportunities, as market saturation has already been achieved with water dominating most water lanes. Market development would have to consider the consolidation of fragmented commodity volumes, or drayage from an extended geographical market.

6.3.1 Modal Length of Haul Profiles

The Pittsburgh modal length of haul profile is shown in Figure A.10. Pittsburgh water is equally strong in all strata except the >1,500 mile category. Compared to rail and truck, rail has an advantage in intra-Pittsburgh movement, while trucks are important in the 250~499 mile category.

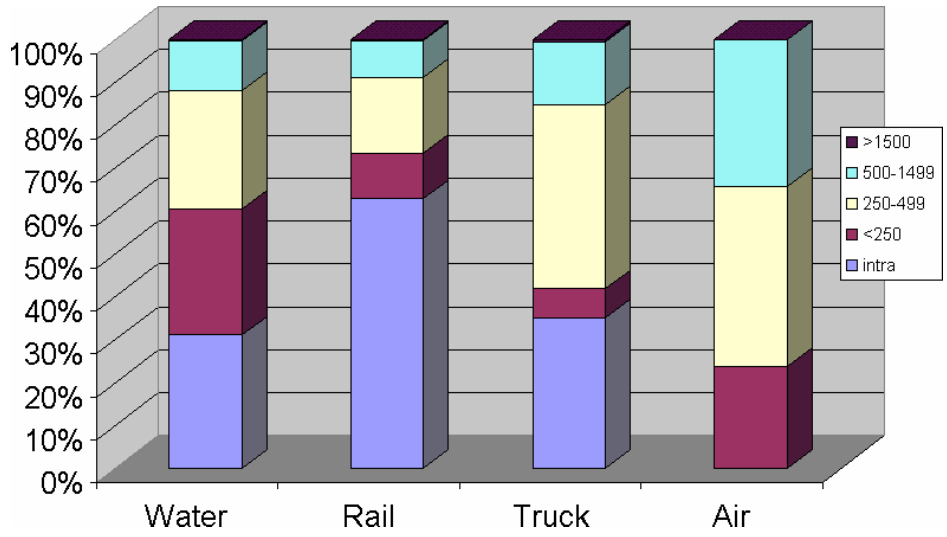


Figure A.10: **Pittsburgh Length of Haul Distribution in Water Lanes**

6.3.2 Commodity Drill Down

Sharpened focus on commodities and modal competitors can reveal telling specifics, thus targeting the Phase II interview process and helping to narrow the search for potential customers. The team analyzed Pittsburgh commodities at a detailed (four-digit STCC commodity code) level, both by tonnage and by value, to home in on important market opportunities. Examples of this type of analysis are shown below (Figure A.11).

In this particular chart, barge is shown to be the predominant mode for many types of commodities, with notable exceptions. Electrometallurgical Alloys, Malt Liquors, and certain classes of Chemicals, shown in yellow, have substantial truck involvement. The volume patterns, and service and handling requirements that brought these goods to highway carriage are not favorable for barge conversion; most were not pursued in the second phase, and for the few that were, these factors proved to be major obstacles.

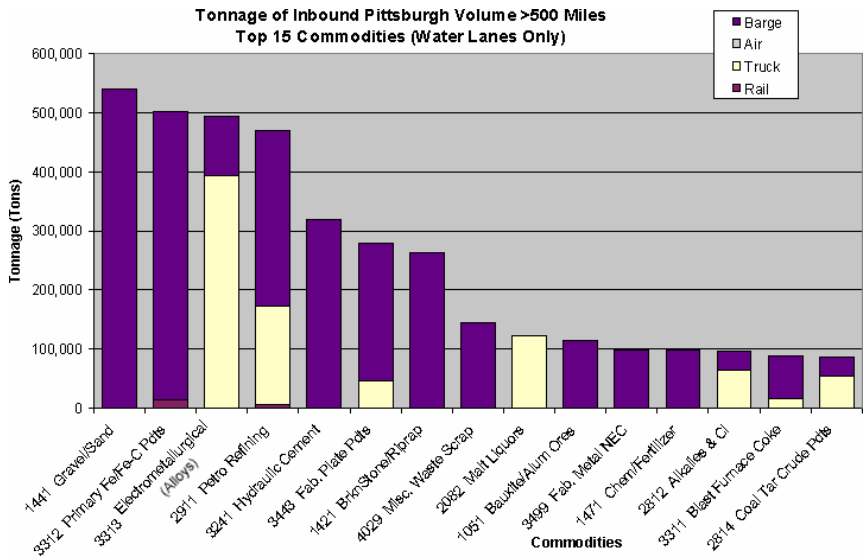


Figure A.11: **Commodity Drill Down Tonnage Analysis**

In Figure A.12, where commodity flows are converted to monetary values, truck is clearly shown to dominate the landscape. The Alloys sector is shown as a high-value item, and an unlikely market for barge. Subsequent second phase interviews confirmed that the customers tended to order alloys by the truckload, and firms could not accept barge load volumes.

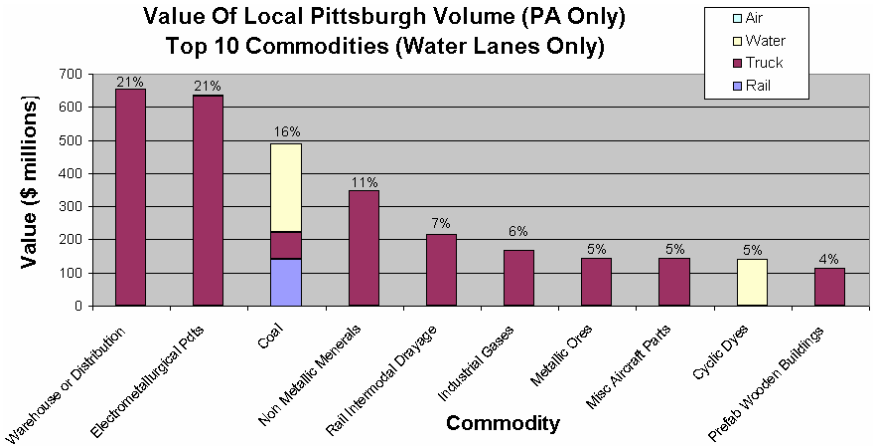


Figure A.12: **Commodity Drill Down by Value**

6.3.3 Modal Benchmarking

Modal benchmarking was undertaken to identify the chief commodities moving by rail and truck in water-served lanes, and to compare the traffic captured by barge to that by other modes. Analysis of Coal traffic shows that water dominates both rail and truck in both inbound and outbound directions in Pittsburgh. All other commodities combined, whose tonnage total is not as large as Coal, show water as being strong in most bulk commodities with significant volume. Any increase in barge revenue is likely to be incremental – from capturing the small remaining part of bulk flow, or from capturing a new type of commodity with higher revenue potential.

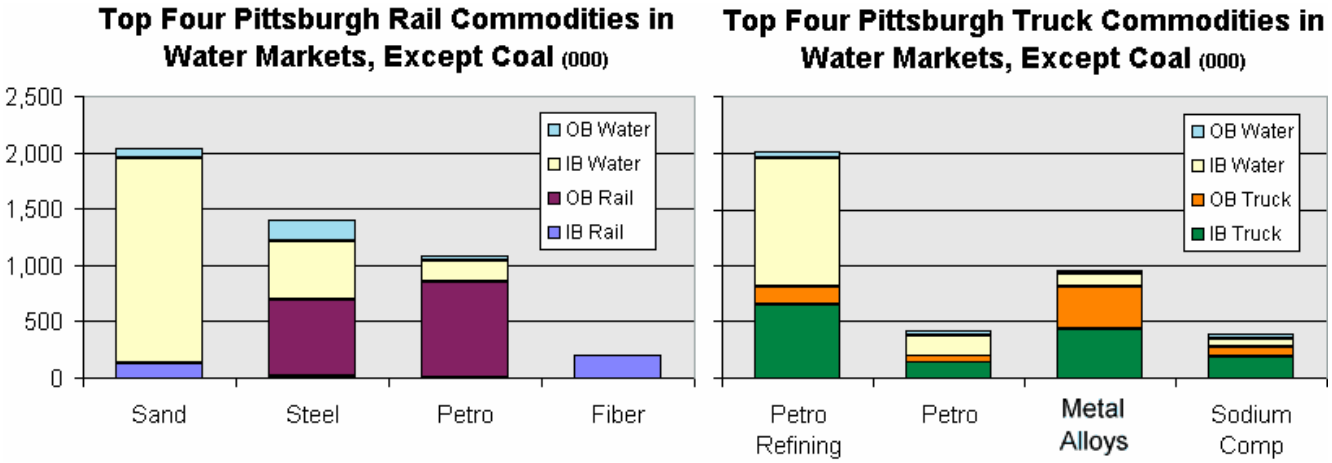


Figure A.13: Modal Benchmarking, Rail and Truck

This analysis clearly demonstrates that barge is superior in Sand, so that while this is a relatively important rail commodity, the rail role in fact is small. On the other hand, there is more substantial traffic in Steel, Petroleum Products, and Petroleum Refining Intermediates that is untapped by water. With the exception of Alloys, volume for other goods is light. For Phase II purposes, this meant that the Petrochemical and Steel, and perhaps the Alloy sectors potentially offered business opportunities worth further evaluation.

To further sharpen the focus on the hunt for traffic, the team further drilled down on the market area lane-commodity level, for water commodities, and the results were ranked by non-barge activity. 'Water commodities' were defined as any that recorded water movements during 2001. Of course, this necessarily included certain one-off movements that do not usually travel by barge (e.g. Refrigeration Assemblies), however, such movements tend to be low in volume and thus did not affect the tonnage-oriented analyses. An example of the analyses conducted is shown in Figure A.14.

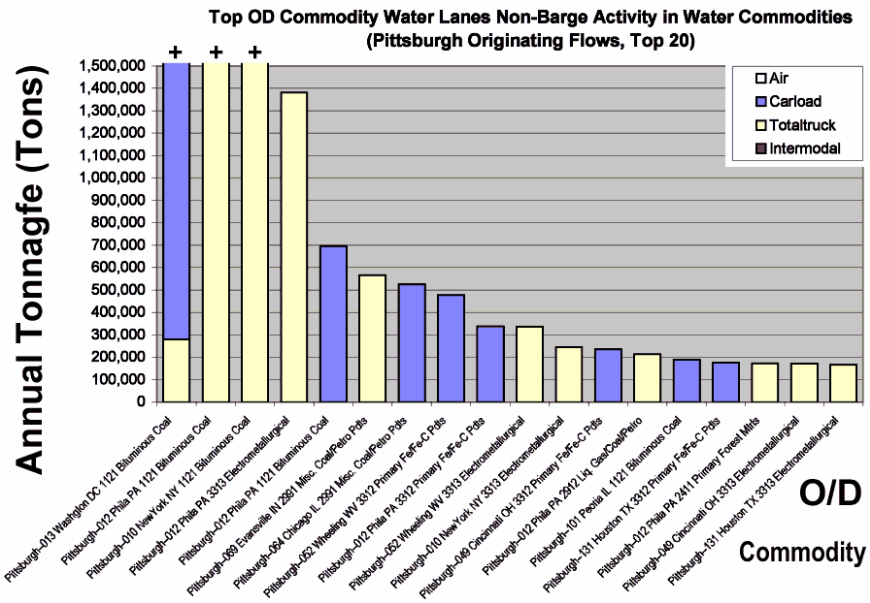


Figure A.14: **Non-Barge Lane-Commodity STCC4 Drill Down, by Tonnage**

This analysis is fairly typical of what the study found. In general, in areas that the team examined, truck was by far the dominant competition although rail also accounts for substantial non-barge activity. In general the lane-commodity combination is likely to yield flows carried by only one mode, although in major flows sometimes rail and truck will split a flow (e.g. Coal going from Pittsburgh to Washington, D.C., see column 1.)

For Phase II development, the chief focus was directed toward traffic currently handled by rail, on the grounds that its volume concentrations and service requirements are closer to what a barge can accommodate – and to the extent that rail also engages in transload during pickup or delivery, it neutralizes a disadvantage to barge transportation. The fragmented volumes, and the far faster, door-to-door service characteristic of traffic moved by truck meant that this was regarded as a secondary prospect, and was considered mainly for shippers or lanes that also had rail activity.

6.4 Market Imbalance

Market balances are of particular interest to the freight marketer because while barges are cost-competitive on a head-haul, equivalent empty-return basis with rail and other modes, barges can be daunting for their competitors if even a partial back-haul could be found. If the head-haul is fully compensatory, back-haul could allow for an extended drayage range and smaller quantities than otherwise possible. Backhauls, however, are not always possible, since the freight may require different equipment types – and the barge may require cleaning between runs due to incompatible freight, which consumes valuable asset time. The low incremental costs of the backhaul operation can become a significant competitive factor in some cases.

Pittsburgh water traffic is marked by significant inbound imbalance. West Virginia and Louisiana markets are the chief sources of goods flowing northbound into Pittsburgh. These barges sometimes return south empty. The imbalance is fairly typical of the market and pattern in Pittsburgh water lanes. This study conducted balance analysis for non-bulk flows and found some back-haul opportunities originating from Cincinnati, Columbia, and Wheeling southbound. In terms of bulk flows, some steel and petrochemicals are moving south from Lower Mississippi, Evansville, and Louisville to destinations in the Deep South and the Gulf Coast. However, these flows will only support the barge's operation part of the way, and operators based in other ports will also be after the same traffic since such northbound imbalance exists also at Cincinnati and Wheeling.

6.4.1 Implied Empty Movements

Traffic or market imbalance analysis could paint a suggestive picture of where the implied empty movements are. If tonnage moving from A to B (head-haul) is greater than that from B to A (back-haul), it is likely that some barges will travel empty from B back to A. However, this is not always an accurate picture, because of the freight incompatibility problem discussed earlier (which will increase the empty return ratio), but also because the same barges may pick up a load at C while en-route from B to A, which will decrease the empty mileage.

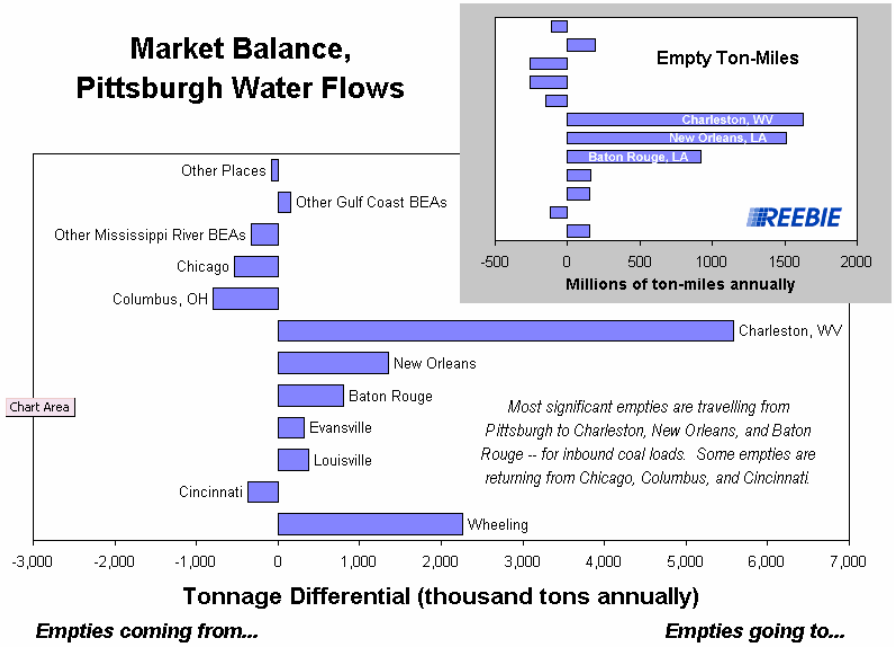


Figure A.15: Pittsburgh Barge Imbalances, Implied Empty Movements

Figure A.15 shows a modal traffic-imbalance analysis, demonstrating that the greatest empty tonnages are incurred by the coal moves from Charleston, West Virginia, but the most significant empty ton-miles are incurred by the chemical moves from Louisiana. Because of the long distance involved, Louisiana offers better opportunities for partial backhaul than the others. However, one clear problem is that chemicals tend to be produced in the south and consumed in the north, so there is limited traffic suited to carriage in tank barges southbound from Pittsburgh and other points on the Ohio River.

6.4.2 Market Balance Analysis

Modal traffic imbalance is a function of both what traffic is moving and the levels of service that the commodities require. In a tonnage-balanced market, modal balance still might not be achievable because goods moving from A to B might be low-value bulk moving by barge while freight moving from B to A might be high-value perishables that are trucked. However, conducting a market balance analysis enables an understanding of what the upper-bound of back-haul utilization is. In other words, if market volumes are fundamentally imbalanced, some vehicles are obliged to return empty regardless of sales development efforts. Thus, from a strategic standpoint, freight carriers attempt to cede the imbalanced (additional head-haul) traffic to another operator or mode, to maintain

optimal utilization for their own equipment. The cost of empty equipment repositioning, and the reduced incremental cost when new traffic can improve fleet balance, are critical considerations for competitive market development.

Figure A.16 shows imbalance in top Pittsburgh bulk markets for all modes in water lanes. Not surprisingly, movements are dominated by Coal from the West Virginia portion of Pittsburgh BEA, and from Wheeling, West Virginia. What is perhaps remarkable is that even in that market, barges have achieved a back-haul ratio of approximately 50%, which would result from the coal-mixing and processing operations that normally occur in mining areas. Raw coal is moved from mines to processors, and the product may then move in an opposite direction, resulting in a convenient backhaul.

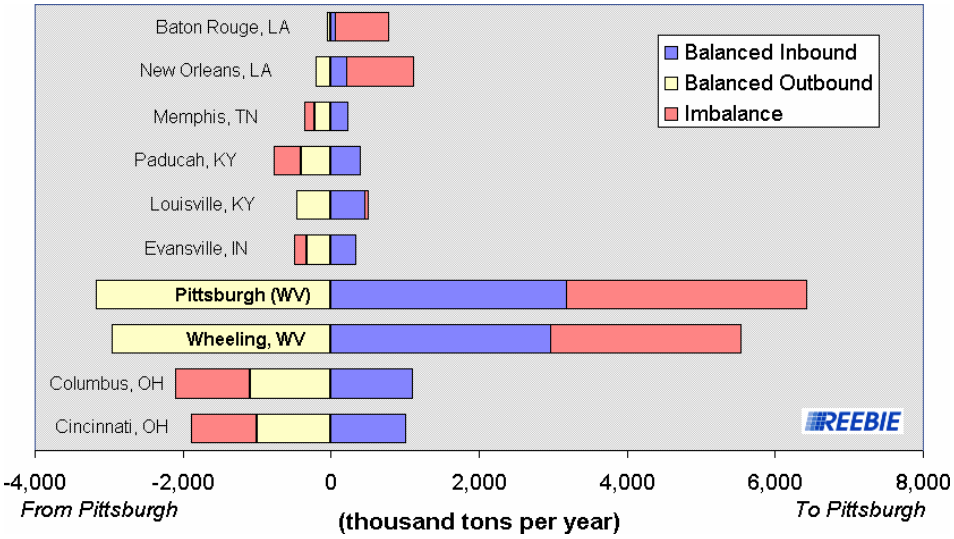


Figure A.16: Pittsburgh Bulk Market Imbalance, All Modes, Water Lanes

Figure A.17 shows the corresponding chart for the Pittsburgh non-bulk markets. Note that the chart is shown on a different scale. From the charts it is clear that some bulk head-hauls are balanced by non-bulk back-hauls, except in the Louisiana markets where the imbalances are in the same direction in both bulk and non-bulk. Due to the differences in tonnages, the bulk market on the whole remains unbalanced.

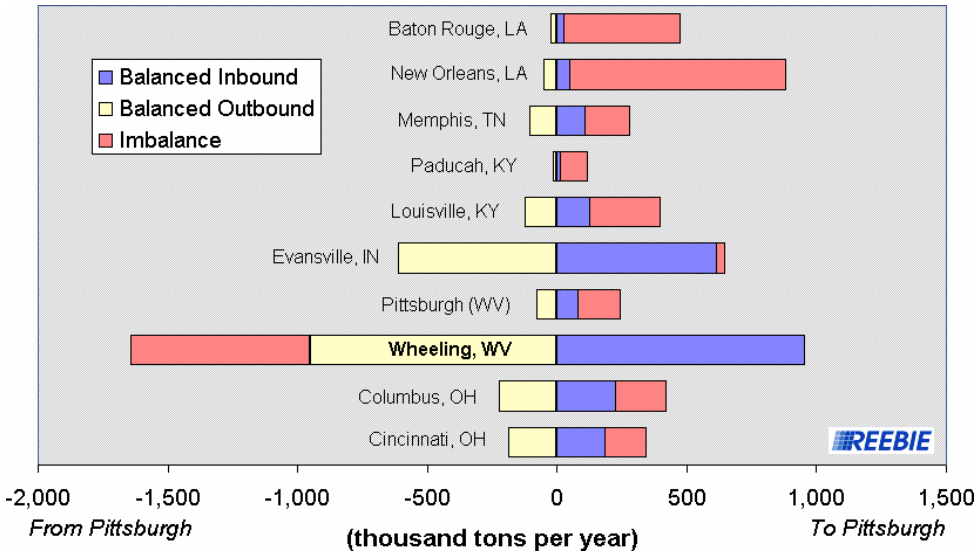


Figure A.17: Pittsburgh Non-Bulk Market Imbalance, All Modes, Water Lanes

7. Appendix B: Analysis Methodology

The Phase I research relied heavily on freight market data, both to make its assessments and to guide the Phase II process. As with the later fieldwork, the initial quantitative analysis was based on a drill-down methodology, a process of examining data at increasingly detailed levels to zero-in on opportunities and generate ways of acting on them. First, TRANSEARCH data at the summary level was examined in multiple dimensions. The data were then refined to show county-level information and commodity detail at the four-digit Standard Transportation Commodity Code (STCC4) level, which produced a list of individual flows that could be targeted. As much information as possible was gathered from the FREIGHT LOCATER database regarding potential customers and economic intelligence as to what traffic might be viable, then efforts were made to contact the shippers to obtain further information.

Martin Associates conducted the market analysis of the specific container repositioning and container-on-barge opportunities as well as the project cargo breakbulk market opportunity. The analysis was based on surveys of shippers and consignees of lumber, logs, plastics and resins, products now containerized that are produced or consumed in the Pittsburgh/Western Pennsylvania markets, barge lines, steamship lines, trucking lines freight brokers and terminal operators. In addition to cost data, the interviews provided insight into the criteria and requirements for shippers/consignees market needs. The findings from these interviews and the results of cost analyses were presented in the previous section.

Because of their importance to the development of this study, some information regarding the data sources, derivations, and definitions follow.

7.1 Definitions

The analysis was broadly conducted by Business Economic Area (BEA), with drill down to county and establishment levels as necessary. The BEA is a geographic definition generated by the Bureau of Economic Analysis (BEA) for the purposes of analyzing the national's economic activity. The BEA is based on market factors such as commuting, residences, proximity, population centers, and pattern of commercial activity, independently of jurisdictional boundaries such as state and county. It is therefore a good approximation for markets where freight is generated, and least likely to fall victim of artifacts generated by arbitrary jurisdictional boundaries.

Traffic were examined for the base year 2001. Where the term "water markets" is used, it implies a selection of BEAs that showed any degree of water activity during the base year. The term "water commodities" implies any four-digit Standard Transportation Commodity Code (STCC) that showed movement by water in the base year.

The "Port of Pittsburgh" is defined as the eleven counties that comprise of the Pittsburgh Port Commission service area (see 3.1.1). Most of the same counties, with the exception of Clarion, also make up the Pennsylvania portion of the Pittsburgh BEA (#53). The counties are: Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Indiana, Lawrence, Washington, and Westmoreland, some of which do not receive direct water service. This definition is distinct from the Census Bureau definition for the Pittsburgh Metropolitan Statistical Area (MSA), which is a subset of the Pittsburgh BEA consisting of six counties only: Allegheny, Beaver, Butler, Fayette, Washington, Westmoreland. The Census Bureau uses the MSA for purposes of producing metropolitan area statistics, relating mainly to commuting and social issues; the BEA is a more appropriate unit of analysis for freight movements.

The "Pittsburgh Catchment Area" is defined as the four BEAs adjacent to Pittsburgh which cannot be served from the Mississippi River System directly, including Cleveland, Ohio (#55); Erie, Penn. (#54); Buffalo, N.Y. (#8); State College, Penn. (#9); and the West Virginia portion of the Pittsburgh BEA consisting of nine counties: Barbour, Doddridge, Harrison, Lewis, Marion, Monongalia, Preston, Taylor, Upshur. For the purpose of this analysis, this nine-county market area is shown as "Pittsburgh, WV", to distinguish it from the service area of "Pittsburgh, PA." Only three of the nine counties fall within the Pittsburgh Consolidated Metropolitan Statistical Area (CMSA): Monongalia, Marion, and Preston.

7.2 Data Sources

Multiple data sources were used in the preparation of this report. The following paragraphs contain a short description on each of the data sources and/or models.

7.2.1 TRANSEARCH

TRANSEARCH® is an integrated, multimodal freight flow database constructed from direct and indirect inputs and modeling techniques. A market research data service of Reebie Associates, it is a proprietary database of freight flows that has been produced annually for two decades. It provides a market-to-market picture of freight traffic movements in the United States, for Canada/U.S., and for Mexico/U.S. TRANSEARCH services are supplied to leading carriers across the U.S. transportation industry as well as to

government agencies at the federal, state, and local levels. The database is the leading commercial source of freight traffic information, with a long record of practical guidance to marketing, operating, investment and policy decisions. The version used in this analysis corresponds to traffic level estimates for the year 2001.

TRANSEARCH is constructed from a large number of separate, partially overlapping sources. A major component in the development of TRANSEARCH is the conversion of many different information sources into a single, common framework. Not all sources are equal. Economic modeling is used to aid in the design where data are lacking or confidential, and to check such factors as spatial patterns and logic. The US database is built from approximately 100 sources; exports and vessel-borne imports are included, and NAFTA trade is captured from foreign and federal information. To supplement these sources Reebie Associates has established a large scale, long-term data exchange program with the motor carrier industry. The program, which was instituted to validate information about spatial patterns of truck traffic, has been an effective way to confirm traffic patterns in TRANSEARCH. Truck information received in the exchange program amounts to over 70 million shipments annually, and is the largest truck data sample of its kind.

Records display annual dollar value and tonnages moved by market pair, by commodity and seven modes of transportation. Thus a record for domestic U.S. contains an origin market area, destination market area, commodity code (Standard Transportation Commodity Code – STCC or Standard Industrial Classification – SIC) and alpha commodity description, volume in each traffic lane, plus volume for for-hire truckload, for-hire less-than-truckload, private truck, rail carload, rail/truck intermodal, air and water. Market definition can be at the county, Business Economic Area (BEA), metropolitan area, state or province level. Volume can be expressed in terms of tons, vehicles, value, or VMT. TRANSEARCH also includes information on secondary traffic; freight re-handled by truck from warehouse and distribution centers.

Figure B.1 shows the basic data sources for TRANSEARCH. THE 2001 database was constructed from the most recent set of freight traffic flow information available through public, commercial, or proprietary channels. The development process draws these disparate sources together, checking their completeness and basic validity, assigning commodity, geography and mode descriptions and then putting them into a uniform format.

7.2.1.1 Constructing TRANSEARCH Dataset for This Study

Development of each annual version of the TRANSEARCH database generally begins by establishing state production volumes by industry or commodity. This information is drawn from the Annual Survey of Manufacturers and the Census of Manufacturers. Once

the production volumes are established, tonnages moving by truck, rail, water, and air are developed. Import volumes are subsequently combined into the data set at the point of importation.

Mode	Traffic Flow	Production & Shipment
Truck	• RA Motor Carrier Industry Data Exchange • Department of Energy Coal Movement Statistics • Department of Agriculture Produce Movement Data • BTS Commodity Flow Survey • RA Prior Year TRANSEARCH Databases	• Department of Commerce Census/Survey of Manufactures • DRI-WEFA Industrial Production Indices • Trade Association Production & Shipment Reports • US Geological Survey Mineral Industry Reports • Motor Carrier Industry Financial & Operating Statistics • InfoUSA Industrial Employment & Activity • Railroad Industry Proprietary Rebill Factors • County Population Data • Inter-Industry Trade Patterns (Input/Output Table)
Water	• Corps of Engineers Waterborne Commerce State-State Data • Corps of Engineers Waterborne Commerce Port Statistics • RA Prior Year TRANSEARCH Databases	• Department of Commerce Census/Survey of Manufactures • DRI-WEFA Industrial Production Indices • Trade Association Production & Shipment Reports • US Geological Survey Mineral Industry Reports • Private Port Directories
Air	• BTS T-100 Domestic Traffic Data • BTS Form 41 T-3 Enplanement Statistics • BTS Commodity Flow Survey • RA Prior Year TRANSEARCH Databases • Statistics Canada International Trade Data • FAA 5010 Airport Database	• Department of Commerce Census/Survey of Manufactures • DRI-WEFA Industrial Production Indices • Trade Association Production & Shipment Reports
Rail	• Surface Transportation Board Railroad Waybill Sample • RA Rail Industry Data Exchange • RA Prior Year TRANSEARCH Databases	• Department of Commerce Census/Survey of Manufactures • DRI-WEFA Industrial Production Indices • Trade Association Production & Shipment Reports

Figure B.1: TRANSEARCH Data Sources at a Glance

Truck: The truck flow information is based primarily on the motor carrier data exchange program, supplemented by commodity production and consumption volumes from a variety of sources. Carriers that participate in the Motor Carrier Data Exchange program submit a summary of their annual traffic flows that includes origin state or zip code, destination state or zip code, commodity indicators, and tonnage. Most of the Motor Carrier Data Exchange information is now collected at the 5-digit zip code level, and all is provided on an origin-to-destination basis. Zip codes are converted to counties as part of the database preparation process. The program samples shipments at all lengths of haul, and includes considerable coverage in the bulk trucking sector.

Rail: For this study, TRANSEARCH rail traffic data is extracted and summarized from the STB Carload Waybill Sample, with appropriate permission from the Surface Transportation Board. The Waybill Sample is a statistically-based stratified sample of all shipments terminated by U.S. rail carriers. The full Waybill Sample file contains extremely detailed information on the origin, destination, commodity and volume of each sampled movement. Throughout the analysis, railroad carload and trailer-on-flat-car/container-on-flat-car (TOFC/COFC) traffic are maintained as separate volumes. The identification of which shipments utilized TOFC/COFC services was based on the combined analysis of the car type, commodity and a series of TOFC/COFC data items in the public use file.

Water: The US Army Corps of Engineers annually collects information on all shipments moving on the nation's waterways to support its management and planning activities. TRANSEARCH uses various components of the data issued by the Corps to develop its waterborne flow data. The primary input is the annual COE file of waterborne commerce. This source provides state-to-state annual volumes of broad commodity groupings. Supplementing this flow data are originating and terminating volumes by port and more specific commodity type, which are also provided by the COE. The less detailed state-to state flow data is disaggregated to the port level using the more detailed origination and termination information, supplemented with port profiles from commercial sources.

Air: Air cargo represents by far the smallest portion, on a tonnage basis, of the TRANSEARCH database. Air activity is constructed using the Federal Aviation Administration's (FAA's) Airport Activity Statistics.

7.2.2

FREIGHT LOCATER Industrial Establishment Data

FREIGHT LOCATER® is a proprietary database of shipping establishments marketed by Reebie Associates, based on information provided by InfoUSA. This data set provides information on the specific locations of manufacturing and distribution facilities, along with descriptions of their industrial output and employment and sales level. It offers market intelligence on who is shipping, what commodities are being shipped, estimates of annual tonnage, equipment needs, and rates of business growth or contraction. The database contains information on over 168,000 U.S. manufacturing and warehousing establishments.

FREIGHT LOCATER is a tool to increase freight volume and revenue, improve sales force productivity, or expand a customer base. Its applications include telemarketing and sales prospecting, customer profile development, sales territory assessment, facility location decision-making, market shift assessment, and equipment allocation planning. It includes coverage of shipping establishments with over 20 employees, covering over 450 industries and 22 vehicle types. It portrays elements such as:

- Market Area
- County
- State
- Zipcode
- Area code
- City
- Business Economic Area
- Annual tons
- Annual sales
- Employees
- Rates of growth/contraction
- Industry activity
- Company profile information

Establishments captured in this data source include current and potential users of the inland waterway system, and shippers by rail, truck, and air.

7.2.3

COSTLINE Family of Cost Models

Reebie's COSTLINE® products are used to calculate the shipment costs of U.S. and Canadian freight carriers. The models are designed to improve and speed rate negotiations by shippers; provide cost analysis capabilities to carriers; and allow for the economic analysis of corridors, policies and investments by public sector users.

COSTLINE analyses typically reveal comparative advantages between modes and carriers, as well as providing informed bargaining and systematic benchmarking of transport profit margins to users. The following mode-specific costing services were relied on for the purposes of this study:

- COSTLINE ***Rail Cost Analysis Model (RCAM)*** – assesses origin-to-destination shipment transportation costs by rail on a carrier-specific basis. As an example, the pie chart below illustrates components of rail carload shipping rates that are developed by the rail cost model. The various components vary with the shipments' parameters, such as weight, distance, routing, and car type.

- COSTLINE ***Truck Cost Analysis Model (TCAM)*** – used to assess shipment profitability and cost components that vary with shipment parameters, such as weight, distance, and trailer type.

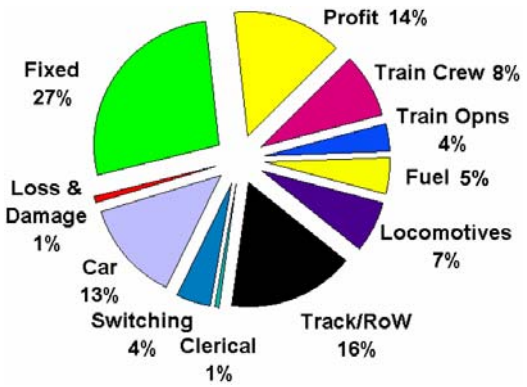


Figure B.2: **Typical Cost Breakdown Report from Reebie's COSTLINE Rail Cost Allocation Model (RCAM)**

- COSTLINE ***Intermodal Cost Analysis Model (ICAM)*** – used to assess cost to the carrier of intermodal shipments and cost components that vary with the shipments' parameters, such as weight, distance, routing, service code, and trailer/container type.

- COSTLINE ***Barge Cost Analysis Model (BCAM)*** – provides detailed and summary insights about the costs of operations on the inland waterway network. The various components vary with the shipments' parameters, such as weight, distance, lock delays and barge type.

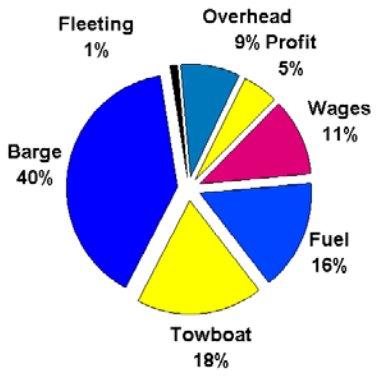


Figure B.3: Sample Cost Breakdown Report Generated Using Reebie's COSTLINE Barge Cost Analysis Model (BCAM)

ENDS