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16. Abstract
The following report chronicles the landside access needs at Texas deepwater seaports. It focuses on how the needs for Landside Access improvements are assessed, planned and financed. Trends in maritime trade in Texas are analyzed. The report also provides guidelines for Metropolitan Planning Organizations and ports in prioritizing their landside access needs.

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Landside Access Needs at Texas Deepwater Ports

Michael Bomba
Diya Mazumder
Nathan Hutson
Rob Harrison

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Center for Transportation Research
The University of Texas at Austin
3208 Red River
Austin, TX 78705

www.utexas.edu/research/ctr

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Products

This report contains one product (P5: Recommendations for Landside Access Improvements) consisting of Chapters 4 and 5.

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Chapter 1. Introduction

Deepwater maritime ports in Texas play an important role in the national economy by facilitating trade while simultaneously generating substantial revenues, taxes, and employment for local economies. Enhanced global trade has increased the variety of products imported and exported, as well as the number of countries that have become active trading partners. As overall trade volumes have grown, so has Texas' role as an international freight gateway. The U.S. customs ports of Houston, Beaumont, Corpus Christi, and Texas City rank in the top ten for movement of foreign maritime trade.

The constantly changing global trade environment creates new challenges for port authorities in the United States to offer flexible and inexpensive shipping options. In 2002, a U.S. Chamber of Commerce research study [A4] argued that North American ports would soon face capacity shortages and would be unable to handle the expected growth in cargo demand over the next decade. Trade patterns are also becoming more dynamic as shippers seek to reduce risks by developing multiple shipping route options. These trends make it likely that Texas ports will experience a growth in cargo value and tonnage handled over the medium and long term. Ultimately, the amount of future trade that will be captured by each port will depend upon its geographic position and the efficiency of its operations, as well as external factors such as the condition of the national and regional economy and technology. Port users will continue to face pressure to lower production and shipping costs to remain competitive.

To maintain the economic viability of their facilities, port authorities must consider improving landside linkages, as well as dockside improvements, and determine the optimal set of investments for ensuring efficiency and preventing bottlenecks. An inefficient transportation system acts as a surcharge on all areas of the economy [A7]. Therefore, transportation investments at ports not only make the ports competitive but also make the state and the nation more competitive [A6].

At the nation's busiest ports, innovative measures have already been taken to address problems of landside congestion. The Port of New York/New Jersey is considering the development of several inland ports on multi-modal corridors that are served in part by container on barge (COB) movements. In the case of the Port of Los Angeles-Long Beach, the Alameda Corridor was constructed to link railheads with port facilities to avoid using already congested urban roadways to carry intermodal freight while the recent PierPass program has provided a monetary incentive for shippers to avoid peak hour congestion.

The primary goal of this study is to assess the current state of landside access at Texas deepwater ports. Landside access is a general term used to describe the multimodal connections used for transferring goods from their unloading station at the port to their next destination. Problems of landside access arise when the capacity or efficiency of ports eclipses that of the land based transportation network servicing the port. This report examines landside access problems and solutions through the lens of a systems approach, which seeks to improve efficiency at the ports, as well as in the state's entire transportation network. Thus, an integrated approach to solving landside access issues at ports requires attention to multiple, crucial aspects of the transportation system.

The remaining chapters of this report will build upon this discussion of landside access issues affecting deepwater ports in Texas. Chapter 2 concentrates on the process of planning landside access improvements with an emphasis on metropolitan planning organizations (MPOs). MPOs are the key actors in the development of landside infrastructure improvements at the local level. Chapter 3 provides a detailed analysis of maritime trade data for each U.S. customs port in Texas. The volume, composition, and patterns of cargo handled at the ports determine the demand placed on the local and state transportation networks. Understanding the characteristics of trade at each port and how these characteristics affect demand is critical for effective long-range planning. Chapter 4 reports the researchers' findings of current landside issues affecting each deepwater port, based upon a series of site visits between 2003 and 2004. Chapter 4 also provides a tool for assessing landside access needs at ports, as well as a discussion of other potentially useful analytical techniques. Finally, Chapter 5 summarizes the findings of the study and provides recommendations for improving landside access at deepwater ports in the state for the Texas Department of Transportation's (TxDOT's) consideration.

In an effort to become globally competitive, shippers have begun streamlining their production and distribution processes. The management of this streamlining process has been termed "supply chain management." Logistics management is defined as the part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from the point of origin to the point of consumption in order to meet customers' requirements. [1]

1.1 Relevant Background Studies

(1) In 1991, the American Association of Port Authorities (AAPA) conducted a nationwide survey of member ports to identify the most crucial landside access issues at U.S. ports. Results were published by the Transportation Research Board in 1993 [A6]. The survey identified infrastructure, land use, environmental, and institutional impediments that prevented efficient movement of freight at landside connectors or prevented enacting solutions that would improve the situation. In 1999, AAPA conducted another survey of its members in the U.S., Canada, Latin America, and the Caribbean. In this study, railroad and highway intermodal access issues were ranked fifth in a list of eighteen issues that ports must address to survive.

(2) In August 1999, the Center for Ports and Waterways (CPW) [A1] surveyed twenty-eight Texas ports to identify port access needs, as well as needs that may arise in the future induced by external factors. All twenty-eight ports responded to the survey. This was followed up with a second survey that required more detailed explanations of each impediment. The ports were encouraged to submit further information to include in the overall findings. The survey indicated that of all the impediments reported, 32 percent related to road and highway access, 20 percent related to rail access, 22 percent related to waterside access, 14 percent related to infrastructure status, and two percent related to regulations. Thus, road access accounted for the majority of all impediments reported, with access to routes and lane widths reported most frequently. Several ports identified rail access impediments, varying from the location of the railway to inadequate amounts of track at the ports. Waterside access impediments included the need for dredging, inadequate widths and depths, channel markings, and vessel navigation. Infrastructure status was addressed, and the most frequent concern involved the repair and replacement of docks and piers.

(3) A study conducted by the National Chamber Foundation of the U.S. Chamber of Commerce in March 2003 [A4] notes that a narrow focus on each of the ports problems gives rise to situations where bottlenecks exist at certain highly-used segments of the country's

[1] Council of Logistics Management, 2001.

network (rail, trucking, and inland freight hubs), with excess capacity existing elsewhere. Thus, reserve capacity exists in the transportation system but is located at the wrong points. The study suggests the creation of a national freight policy to develop a comprehensive, well-coordinated network to allocate scarce resources where they are most needed, resulting in an efficient intermodal system.

(4) A report conducted by the U.S. Department of Transportation (US DOT), U.S. Maritime Administration, and Office of Ports and Domestic Shipping in October 1998 [B10] discusses efforts for including all parties in the decision-making process. The report also examines the industry's adeptness at handling growth in containerized freight in terms of infrastructure required, financing opportunities available, dredging requirements, and current bottlenecks necessitating intermodal developments for improved landside access. The success of these ports lies in resolving these issues, keeping in mind the conflicting interests of the different players impacted, such as the port and businesses that make significant use of waterborne commerce for shipping or receiving goods, as well as local, regional, and national planners.

(5) A report by Michael Bomba and Rob Harrison conducted at the Center for Transportation Research (CTR) in December 2000 presents a port evaluation process that is a useful method for selecting appropriate port improvements based on a scoring system from a selection matrix in the context of deciding the best location for a "megacontainership load center." This process consists of two steps: (1) Establishing a set of eligibility criteria for a port to qualify as a load center, and (2) Creating a port evaluation process that could be useful for Texas ports that have been identified as potential candidates for servicing containerships. Eligibility criteria used to select candidate ports are their infrastructure requirements, level of environmental compliance required, locational advantages offered by the port, landside access issues, and types of port financing available. Methods to determine selectivity in the report are heuristic, selecting matrix parameters, and parameter criteria, all of which involve using an appropriate scoring and weighting scheme. A modified version of this method can be applied when selecting the most appropriate landside access improvements at Texas ports, as well as selecting the best locations for them in the state.

(6) A joint study conducted by the Minnesota Department of Transportation and the SRF Consulting Group, Inc. [A15] describes the performance-based framework set out by the Minnesota Department of Transportation for making future investment decisions. It develops

policies aligned with the department's strategic plan while taking the entire transportation network into account. The method also describes desired outcomes for each policy and develops a set of performance measures for each of the four major modes of transport for passenger and freight movement. A combination of these two studies can be implemented for Texas ports when deciding the optimal combination of transportation investments in transportation modes by setting appropriate goals and using performance measures to decide how each investment ranks in achieving them.

(7) An added aspect of landside access, especially in light of the ongoing war in Iraq, is the ability of ports to transport defense equipment and military personnel swiftly to any domestic or international location. In view of maintaining an added degree of preparedness at marine ports, the Maritime Administration's strategic plan (2003-2008) includes goals to ensure an efficiently-operating waterway system that includes maintaining efficient functioning and coordination of seaports, intermodal connectors, and adequate ship capacity for movement of defense equipment in case of war [A27]. The issues covered in the strategic plan are security, shipbuilding, intermodalism, and trade. Successful implementation of this plan calls for innovative financing, such as public-private partnerships.

Thus, the main points to keep in mind when deciding optimal landside access investments in Texas ports are summarized below:

- Adopt a logistics approach to choosing amongst investments
- Establish a well-defined set of eligibility criteria
- Establish a well-chosen set of performance measures or selection criteria
- Achieve an enhanced level of preparedness for movement of equipment at normal times and during emergencies
- Better coordination among all parties involved

1.2 Increasing Landside Capacity Through Non-Highway Alternatives

Landside access modal problems come in a variety of forms, depending on the type of commodity handled by the deep-water Texas ports. This chapter explores alternative modes of transportation to highways including rail, pipelines, the Gulf Intracoastal Waterway [GIWW] and multimodal corridors. The researchers will further examine the roles each can play in a systems approach to resolving critical landside access issues. The following sections review published work establishing how these modes have been used to mitigate landside congestion problems in an integrated manner in the U.S. and other parts of the world that are appropriate for Texas marine ports. For example, in the European Union, transportation planners have adopted an integrated approach for more than a decade and are therefore more likely to provide a variety of procedures suitable for incorporation into the master plan.

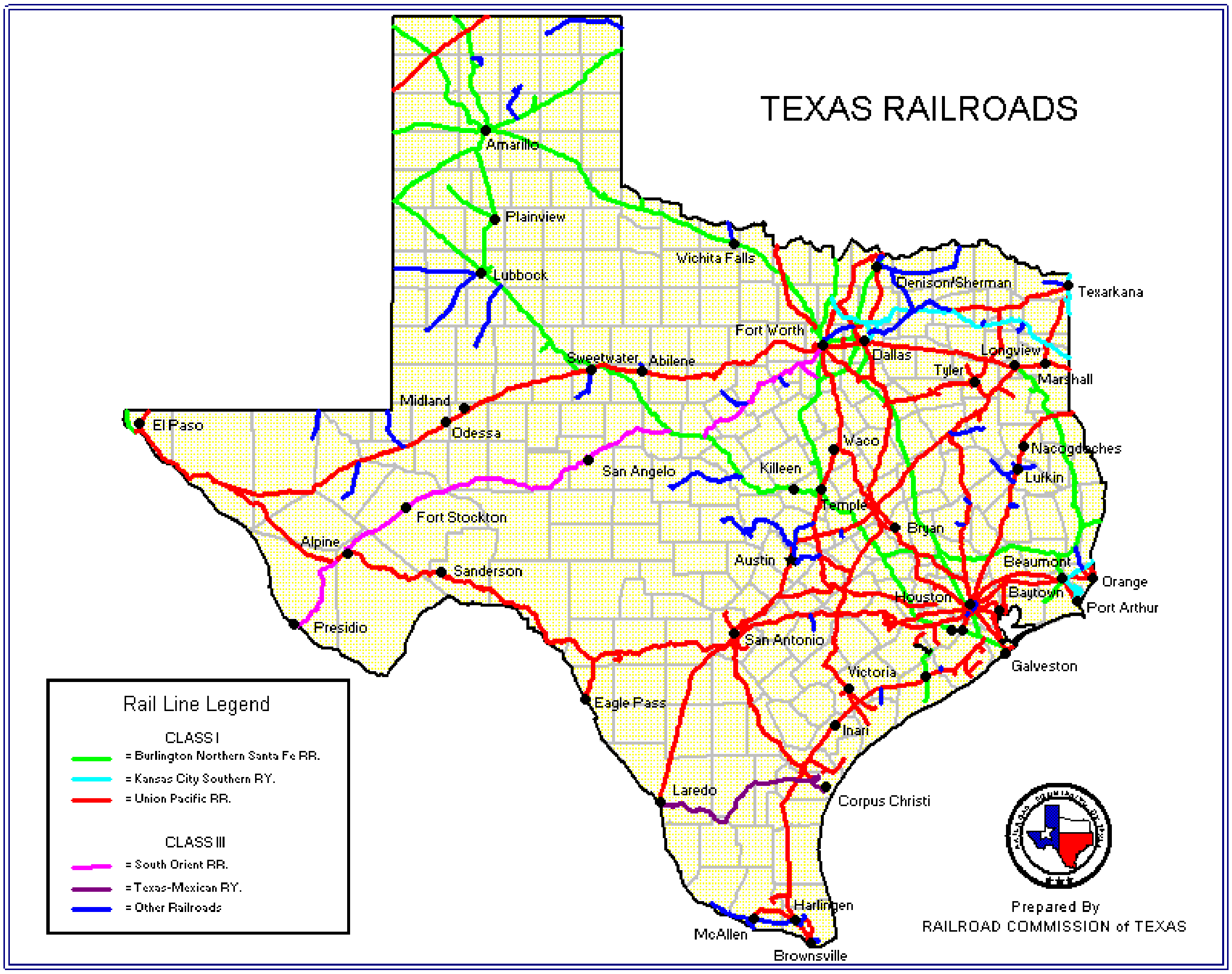
1.2.1 Rail

The decline of railroads and the emergence of trucks significantly altered the design of deepwater ports constructed in the second half of the twentieth century. However, tremendous gains in the energy efficiency of locomotives and the increased use of double-stack rail since the 1980s have provided a revitalization of port-rail operations at specific locations. Current Class I railroads are often unable to offer substantial funding for the capitalization of projects or are unwilling to consider unilateral investment in expensive links into marine port sites.

Texas ports are served by three Class 1 railroads: Union Pacific (UP), Burlington Northern Santa Fe Railway (BNSF), and the Kansas City Southern Railway (KCS). The Texas Mexican Railroad (known as the "Tex-Mex") is a Class III railroad that serves the Port of Corpus Christi and controlled by KCS. At the local level many ports are served by rail switching companies that ensure an equal level of service to all port users. Local short line railroads that serve ports include:

- Galveston Railroad, Port of Galveston
- Texas City Railway Terminal Railroad, Port of Texas City
- Port Terminal Railroad Association (PTRA), Port of Houston
- Point Comfort and Northern Railroad, Port of Point Comfort
- Brownsville and Rio Grande Railroad, Port of Brownsville

Figure 1.1   Major Railroad Operators in Texas

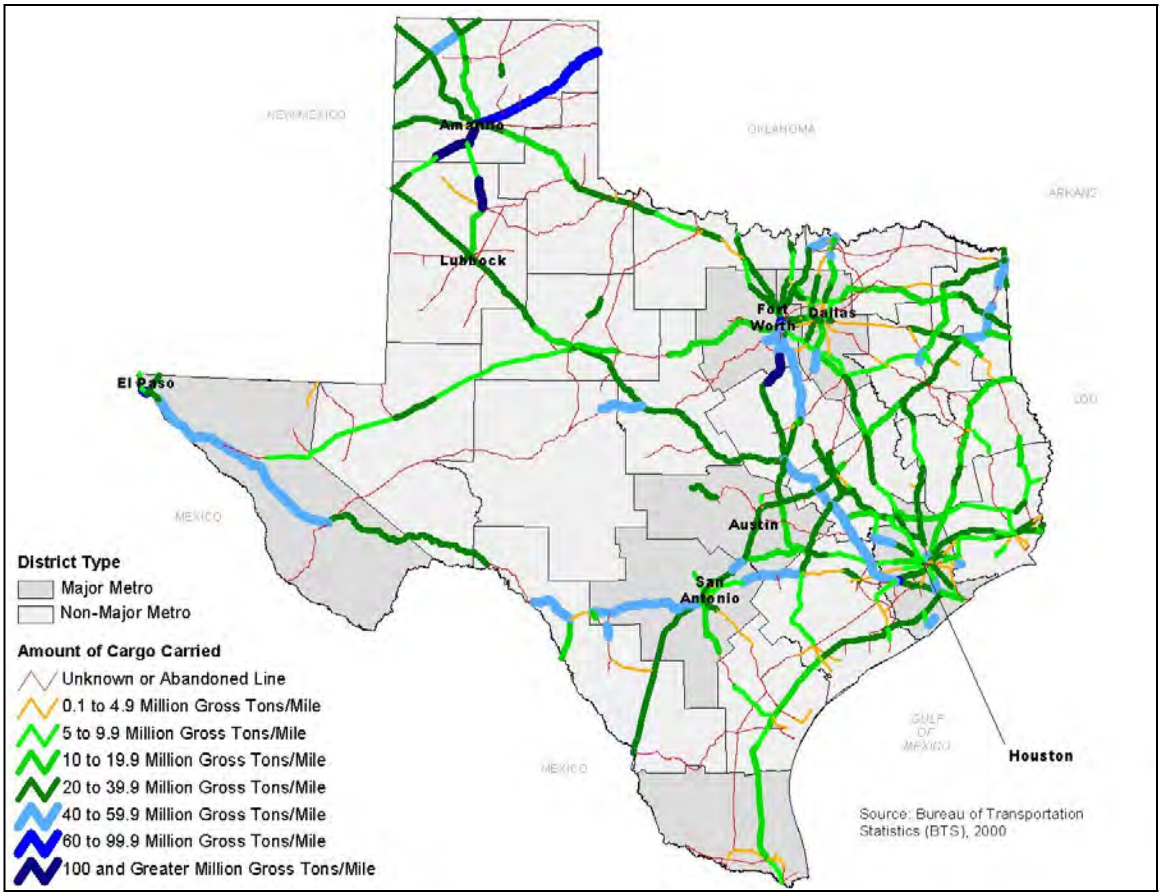


Source: Texas Railroad Commission, 2005.

Rail operations at Texas ports focus predominantly on noncontainerized commodity markets such as agricultural products and chemicals. Double-stack operations have led to increased rail use for containers but have not led to substantial gains in rail's share of containers moving through Texas ports. At the Port of Houston, the container terminal built by UP adjacent to Barbours Cut has surplus capacity, and the current infrastructure would therefore seem to be adequate for the near future. Dockside rail container operations, which greatly speed the clearance of containers, are feasible only at new sites such as Bayport, Texas City, and the proposed La Quinta site.

Figure 1.2 illustrates the heavy volumes of rail cargo that flow along the Texas Gulf Coast. In some cases the ports are significant generators of this cargo, and in other cases they are not. However, even ports that do not generate a large volume of rail cargo can be congested if they feed into an already congested rail line.

Figure 1.2 Statewide Rail Commodity Flows



Source: Texas Department of Transportation, Transportation Planning and Programming Division

In 1998, railroads in Texas moved 83.7 million tons of cargo that originated in the state, with more than a third of these commodities comprised of chemicals and related products. Rail traffic is expected to continue growing in Texas, and future commodity movements on rail are forecasted to increase by 31 percent between 1998 and 2025 (Table 1.1). It is anticipated that the growth in rail freight will be led by an increase in food products and mixed shipments of unspecified goods (those that cannot be categorized by any single commodity). These commodities are forecasted to increase by approximately 68 percent between 1998 and 2025. The volume of rail freight terminating in Texas in 1998 amounted to 149 million tons. Rail freight volumes terminating in Texas are forecasted to increase to 172 million tons in 2010 and 213 million tons in 2025, an increase of almost 44 percent.

Table 1.1 Forecasted Major Railroad Commodity Groups Originating in Texas

	1998		2010		2025		
Commodity Group	**Tonnage**	**Percent of Total**	**Tonnage**	**Percent of Total**	**Tonnage**	**Percent of Total**	**Percent Growth 1998-2025**
Chemicals and allied products	30,215,922	36	32,876,243	34	33,116,363	29	9
Non-metallic minerals	17,316,126	21	20,581,945	21	22,929,955	20	24
Petroleum and coal products	6,586,451	8	6,681,311	7	6,769,516	6	1
Miscellaneous mixed products	5,781,431	7	9,192,641	10	15,494,513	14	63
Food Products	3,931,080	5	5,015,788	5	10,723,289	9	64
All other	19,869,830	23	21,830,278	23	25,878,758	22	25
Total	83,700,840	100	91,178,206	100	114,912,394	100	31

Source: Cambridge Systematics

Significant challenges lie ahead for the rail industry and its prospects for moving a greater share of freight handled at Texas seaports. Class I railroads have insufficient infrastructure to handle the current volumes of freight they are attempting to move. Because their infrastructure is entirely privately owned, they must incur all the costs of improving the system, and the needs are substantially greater than the cash on hand. As a result, railroads tend to make modest improvements that do not require significant borrowing but that also do not result in substantial improvements to the rail network.

From the operations perspective, the problems associated with the rail system in Texas (e.g., rail abandonment, poor track conditions, weight limitations, and single tracks entering and leaving ports) will continue to limit the mileage of operating track and its efficiencies. Some measures that have helped alleviate these problems are mergers (such as that between UP and Southern Pacific Railroad) that implement a form of rail banking to purchase the right-of-way of abandoned railroad for future service, and the establishment of rural rail transportation districts. Much still needs to be done to prepare for the growth in rail freight that is anticipated in the near future, along with improved intermodal connections to loading and offloading centers.

1.2.2 Short Sea Shipping

Short sea shipping (SSS) is defined as the movement of cargo along coastal or inland waterways. In the U.S., domestic shippers have been very successful in developing SSS for bulk cargo such as agricultural products, petroleum, aggregates, and fertilizers. However, when it comes to the movements of containers via SSS, the U.S. record has been disappointing. Currently, proportionately few containers are moved in the U.S. using SSS. However, transportation policymakers are increasingly interested in SSS as a means of reducing highway congestion, improving air quality, and transporting overweight containers.

Wider use of the inland waterways for SSS of containers could significantly reduce levels of traffic congestion on the nation's roadways. A single barge is capable of carrying as much cargo as fifteen jumbo hopper cars or sixty large trailers hauled by a semi-truck (U.S. Army Corp of Engineers, 2002). In addition to reducing highway demand and congestion from trucks, other advantages offered by SSS are fewer airborne emissions [F1], more efficient energy usage [F1], less intensive labor requirements, conduciveness to handling overweight cargo volumes [F2], and higher level of environmental safety. Table 1.2 shows the pounds of emissions released per ton of cargo moved by barge, rail, and truck.

Table 1.2 Comparison of Air Emissions (lbs.) per Ton Carried by Mode

Mode	Hydrocarbon	Carbon Monoxide (CO)	Nitrous Oxide (NOX)
Towboat	0.09	0.20	0.53
Rail	0.46	0.64	1.83
Truck	0.63	1.90	10.17

Source: U.S. Army Corp of Engineers, 2002.

Table 1.3 Comparison of Fuel Consumption (gallons) per Ton Carried by Mode

Mode	Ton-miles per Gallon
Barge	514
Rail	202
Truck	59

Source: U.S. Army Corp of Engineers, 2002.

In addition to the movement of bulk commodities along the nation's inland waterway system, there are several current examples of SSS operating in the U.S. One of the most frequently cited intermodal SSS services is Osprey Line, which is based in Texas and operates in the Gulf of Mexico, on the GIWW, and on the Mississippi River. Osprey Line offers several regularly-scheduled container-on-barge (COB) services: Houston-New Orleans, New Orleans-Baton Rouge, and New Orleans-Memphis.[2] Another successful COB operation is on the Columbia and Snake rivers, which moves approximately 50,000 TEUs per year, primarily agricultural products. The application of a SSS network can also be seen in the Port of New York/New Jersey's Port Inland Distribution Network (PIDN), which moves containerized cargo by barge or rail between marine terminal facilities in the New York-New Jersey area and regional terminals in New York, New Jersey and three other northeastern states. After arriving at regional terminals, local trucks are used to transport cargo to its ultimate destination. Finally, some forms of SSS only cover short distances. One example is the Detroit-Windsor freight truck ferry, which moves hazardous cargo over the U.S.-Canadian border on Lake Erie because trucks carrying it are banned from using the international bridge [F3].

Despite the many advantages of SSS, carriers have struggled to make intermodal services work. One of the most significant challenges to domestic SSS are U.S. cabotage laws that restrict carriers moving goods between domestic ports to using U.S.-manned crews and U.S. - built ships. This restriction is particularly constrictive because U.S. shipbuilders are generally not capable of building vessels that would be conducive to intermodal SSS at a cost that would make the carriers competitive with competing modes.

1.2.3 Conditions Necessary for the Viability of SSS

The countries of Northern Europe have been successful in their implementation of SSS services because they meet the critical conditions necessary to make such operation viable. This involves maintaining a high degree of reliability in terms of time and scheduled service, high frequencies, short transit times, and creating a vibrant infrastructure for multi-modal hubs. The network must optimally combine inland and deepwater coastal ports, expanding their focus from a single city-pair service to multiple port origins and destinations and implementing port infrastructure improvements to deal with the shift from bulk commodities to containerized goods.

Other conditions that would aid the viability of SSS operations include technological developments, such as the construction of bigger and faster ships that can serve multiple ports at

[2] www.ospreyline.com

one time, which have helped to make SSS successful in Europe [F18]. Advances in ship-building technology that use hull designs conducive to high-speed cargo shipping (e.g., catamarans) would increase speeds. [F13].

1.2.4 Viability in Texas

SSS suffers from lack of flexibility with regard to inland access when compared to trucks. A presentation entitled "The Trucking Variable in the Short Sea Equation" by Bill Wanamaker [F14] recognizes the disadvantages of SSS. Wanamaker recommends including the shipping industry in the planning process, increasing the hours for ship-to-barge transfers, and using a wheeled container operation. Another prerequisite for developing SSS was reducing time costs involved its loading operations, particularly when compared with the small time costs for trucks. This cost might be reduced with technological developments in ship construction.

The Merchant Marine Act of 1920 (also known as the Jones Act), which requires American ships to transport goods between American ports, has resulted in a higher cost of capital for constructing new barges and ocean liners that are necessary for SSS to compete with trucks. This was one of the primary reasons for the failure of Matson's Pacific Coast Shuttle that served the coast from California to Canada between 1995 and 2000. The service was discontinued after it was unable to cover the cost of capital. One lesson from the Matson experience is that a viable SSS service in Texas would need a minimum service frequency of two to three times a week., a stevedore-friendly ship (roll-on/roll-off, open top) with big box capacity, lower cost structure (ports-dockage and wharfage, offshore unions such as ILWU, Pacific Maritime Association assessments), and access to lower-cost capital. Other suggestions for improving the success of SSS include tax incentives, government subsidies, modification to the Jones Act, and reducing manpower requirements [Ref. 67].

1.2.5 Public Incentives required for supporting SSS

Because SSS is a nascent industry in the U.S., it may require subsidies justified by the positive externalities SSS could confer on air quality and congestion. Some incentives for making SSS a part of regional planning could be to offer regions or zones running a SSS operation the opportunity to earn environmental credits for air quality improvements that could be traded. Other strategies observed in Europe are mergers and collusions between ports with companies serving niche markets and offering intermodal links, as well as providing reliable and safe transportation of cargo through sharing data with shippers and forwarding agents in electronic data exchange (EDI) compatible formats.

1.2.6 Inland Ports as Distribution Centers

One opportunity for reducing landside congestion at maritime ports is to make use of inland ports. The focus of many industries has shifted to international operations and supply chains, requiring transportation planners to evaluate the importance of multimodal corridors. Transportation corridors are the focus of much of the current interest in the U.S. and are the subject of both federal designation and statewide planning, which carry the likelihood of priority funding requirements. One method of successfully using transportation corridors in a logistically consistent manner requires the establishment of distribution centers called inland ports, which make use of economies of scale to optimize the transportation network. Inland ports have the opportunity to offer a number of attractive attributes to shippers and may complement the transportation corridors they serve by raising service levels and lowering total costs. In this section, the researchers will study a variety of resources that define inland ports, examine the benefits offered by them over traditional ports, and note how they have been used in the U.S. and abroad.

Traditional ports at land, air, and coastal borders are the primary locations where international trade is processed. However, it has been recognized in the past decade that a growing amount of trade is being processed at inland sites. International trade processing involves all types of transactions and inspections that federal agencies require for goods entering or leaving the country. An inland port is a location where the processing of trade can be shifted from national borders and served by multiple modes of transportation that offer a wide variety of services at a common location [H1]. This consolidates a large number of operations and minimizes the fixed costs of investments that different parties would have to pay at different locations to offer the same services. International operations can also be supported at an inland port with the availability of customs clearance and foreign-trade zone capabilities. Inland ports that provide value-added services in addition to trade processing will support industry efforts to create more efficient supply chains.

1.2.7 Definition of an Inland Port

Although there have been many definitions of inland ports, Toby B. Gooley [H6], managing editor of *Logistics Management,* refers to an inland port as a freight hub or freight gateway that "bring(s) together in one location all the modes of transportation, along with warehousing, freight forwarding and customs brokerage, and logistic management services." The success of the hub critically depends on its connectivity to rail, highways, and/or air freight facilities. The financing of the investment could be completely private or accomplished through public-private partnerships.

1.2.8 Benefits of Inland Ports

Leitner and Harrison (2001) [H1] created a classification methodology to help the transportation sector better understand the structure and role of an inland port. Inland ports are crucial as hubs for processing traded goods and can be classified into four categories: inland waterway ports, air cargo ports, maritime feeder inland ports, and trade and transportation center inland ports. With examples borrowed from the U.S. and Europe, a case is made for inland ports as a way to reduce "transportation-related waste that can add cost but no value." Leitner and Harrison claim that truck congestion and safety hazards are among the main problems faced at border clearance points, particularly the Texas-Mexico border. These negative impacts are even more pronounced at maritime ports, particularly since the ability of ports to expand physically is limited due to development in surrounding areas, unavailability of land, and prohibitive real estate cost. Moreover, delays at ports of entry sometimes cause containers to remain at the terminal anywhere from one to four days awaiting pickup for delivery to the port's hinterland. Inland ports developed at the right locations can be enormously useful in alleviating these problems by transferring containers to inland distribution centers as soon as they clear customs.

1.2.9 Pipelines

Pipelines have a significant role in the landside transportation networks of Texas ports handling oil products. The primary impact of such pipelines within the facility affects issues such as channel design and widening. Pipelines also affect landside activities at the facility, impacting railroad expansion and highway connectivity. Pipelines link a variety of elements in the oil and chemical production process, linking storage with production and distillation areas and then carrying products to a variety of markets within Texas and the U.S. Therefore, it is important to include pipelines in this proposal. As of 2002, Texas had 67,801 miles of utility pipelines that serve limited markets and have limited commodities.[3] They may be used for storage or for moving liquid and gas petroleum or chemical products over long distances. The commodities typically moved by pipelines are petroleum, petroleum-related commodities, or natural gas, all of which are critical to the state's economy. The pipeline industry is oligopolistic in nature, with a very small number of very large private carriers dominating the market (ibid). A feature of the pipelines business is that they have high fixed costs with low capital turnover, high economies of scale, and low labor costs.

1.2.10 Intelligent Transportation Systems

In addition to expanding physical infrastructure, the incorporation of intelligent transportation systems (ITS) can create opportunities to improve the efficiency of freight movements. Improving the logistics of the transportation network also requires better communication between modes. Thus, ITS solutions to landside access issues are an important and potentially cost-effective means to obtain large-scale improvements to landside access. This section describes some of the current technology available to ports for improving landside access.

ITS can include a wide collection of applications and can be used to facilitate the safe, efficient, secure, and seamless movement of freight. Freight tracking applications can monitor, detect, and communicate freight status information to ensure that containers remain sealed en route. Additionally, asset-tracking technologies can monitor the location and identity of containers in real time. ITS freight terminal processes can improve the efficiency of freight transfers by activating transponder tags to track cargo containers within the terminal as they are processed and sealed for transfer. These applications can improve security measures at ports in the short term, before more permanent infrastructural security investments are undertaken, as well as in the long term. ITS drayage operations can also promote the efficient loading, unloading, sorting, and transfer of cargo by implementing automated systems and robotics to optimize limited dock and port space. At international border crossings, automating revenue transactions and faster, more efficient confirmation of cargo manifest information can reduce delays associated with customs and tax collection processing. In addition, ITS applications that

[3] Source: Texas Railroad Commission (http://www.rrc.state.tx.us/divisions/gs/documents/Table10.pdf).

optimize traffic control and coordinate transfers near intermodal ports of entry can help reduce the strain of increased freight movement on the nation's freight highway connector system.

The private sector has used several ITS solutions to optimize shipment and asset management. These include the following systems:

- Shipment tracing and information systems: This system optimizes the flow of goods from origin to destination in a logistically consistent manner, keeping in mind the shipper as well as the receiver's needs.
- Inventory stowage management systems: This is a system ideal for tracking the movement of containers and trailers within any facility domestically as well as internationally.
- Asset location and management systems: This system minimizes travel time, optimizes use of equipment and improves reliability of the system.

The public sector has developed ITS solutions to improve traffic and highway management. These include the following:

- Traveler information systems that inform travelers electronically in realtime about highway conditions in advance using dynamic message signs, closed circuit cameras, and internet sites. This system informs truckers and commercial vehicles of congestion in advance, allowing them the choice of an alternative route (if one exists) and minimizing traffic delays.
- Toll collection Systems: These systems allow the collection of user fees electronically, minimizing time spent in queuing, improving fuel consumption, and reducing congestion and the risk of accidents at toll booths. There are already many electronic toll collection systems in place, including the EZ Pass system in New York and along the northeast.
- Traffic management systems: These improve the management, operation, and safety on roads and railroad grade crossings. They also reduce congestion and improve traffic flow by using flow-monitoring systems such as vehicle detection loops and closed circuit television cameras. They also use traffic control devices such as traffic responsive and traffic adaptive signal systems.

1.2.11 Examples of Ports Using ITS

The Port of New York/New Jersey (PNYNJ) has implemented a project called the Freight Information Real-Time System for Transport (FIRST). The technology consists of a website with realtime information on logistics such as ship and rail arrival/departure times and landside road traffic information. The website is linked with EDI systems, CCTV security systems, TMC, equipment tracking systems, etc. FIRST will achieve greater logistics efficiency and enable alternate route or time planning for truckers. It is also an Internet portal providing subscribers with up-to-date information. PNYNJ contracted with a private corporation to develop and implement FIRST, which cost $1.9 million.[4]

Another ITS installed at PNYNJ is the SEA LINK trucker identification system that consists of electronic ID cards issued to truckers and linked to port's automated cargo expediting system (ACES) for verification. The SEA LINK system provides identification cards to truck drivers who have authorized entry to different terminals within the port. The card accesses information from the port's ACES. Truckers can then seamlessly enter terminals without waiting for human confirmation.

Another technology commonly used is an electronic toll collection that reduces highway traffic. It can also help expedite traffic entering and exiting ports. The electronic toll collection methodology bypasses the need for truckers to pull their vehicle to a halt, have it weighed, and pay tolls.

The Port of Long Beach and Los Angeles in California[5] has implemented a project called the Advanced Transportation Management, Information and Security System (ATMIS). The technology in this system consists of CCTV security systems, dynamic message signing (DMS), gate queue detection, links to regional TMCs, advanced warning systems for railroad at-grade crossings, advanced traveler information systems (ATIS) technology for travel and route information, and links to private information providers such as eModal.com. This system incorporates a variety of ITS technologies to enhance efficiency and security for these ports. The project has recently begun and is still under construction. This far, $8 million in expenses have

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[4] See The Port Authority of New York and New Jersey website, www.panynj.com

[5] Port of Long Beach website, www.polb.com

been incurred, a cost that is absorbed by the ports, the metropolitan transportation authority (MTA), the Alameda Corridor Authority, and the federal ITS program.

The Port of Charleston, South Carolina has installed the ORION computer system.[6] This technology helps reduce paperwork processing that slows the movement of goods. By utilizing EDI technology, documentation can be handled electronically, thus saving time. The system is linked with numerous government websites such as AMS, ABI and ACS. This system, which evolved over the past 20 years, was subsequently contracted out to another port. Other private sector services include eModal.com, a website that provides logistical information to subscribers. eModal.com contains information about many of the largest ports in the U.S. The type of information it provides includes container, vessel, and terminal information.

1.3 Financing Landside Access Improvements

Most landside access improvement projects, particularly those improving connectivity throughout the transportation system, involve substantial investments. Many port authorities do not have the financial resources available to make significant improvements to their landside infrastructure. Because railroads and pipelines are privately owned, TxDOT's ability to remedy landside congestion at ports has primarily been limited to providing roadway improvements and other small scale projects in the port vicinity. However, even this limited role is under increasing pressure, as the state has a limited amount of funding to meet the growing need for transportation improvements. Given these restrictions, TxDOT and port authorities must consider innovative methods to finance the much-needed transportation infrastructure projects in order to maintain their competitiveness with other states in capturing the growing share of traded goods.

This section will summarize innovative financing options from a variety of sources that are available to port authorities. These financing programs can be classified into broad categories:

- Federal financing programs
- State programs
- Other financing methods

[6] Port of Charleston website, www.port-of-charleston.com

The importance of innovative financing will be highlighted in the discussion below, and examples will be given where several combinations of available financing sources have been implemented. The clear conclusion resulting from this discussion is that ports must use more than one source for financing landside access investments including the involvement of public and private agencies. However, it is ultimately the particular port authority's choice to select the number of sources required and the most appropriate combination to satisfy its goals.

1.3.1 Federal Financing Options

Federal financing programs available in the U.S. include the following:

- Federal funds for highways
- Transportation Infrastructure Finance and Innovation Act (TIFIA)
- Section 129 loans

1.3.2 Federal Highway Funding

A document titled "Financing Federal-Aid Highways" published by the Office of Legislation and Strategic Planning in August 1999 [B3] provides detailed information concerning other forms of financing of federal-aid highways under various programs. These include:

- The Interstate Maintenance (IM) program,
- The Surface Transportation Program (STP),
- The National Highway System (NHS) Funds, and
- The Congestion Mitigation and Air Quality Improvement Program (CMAQ).

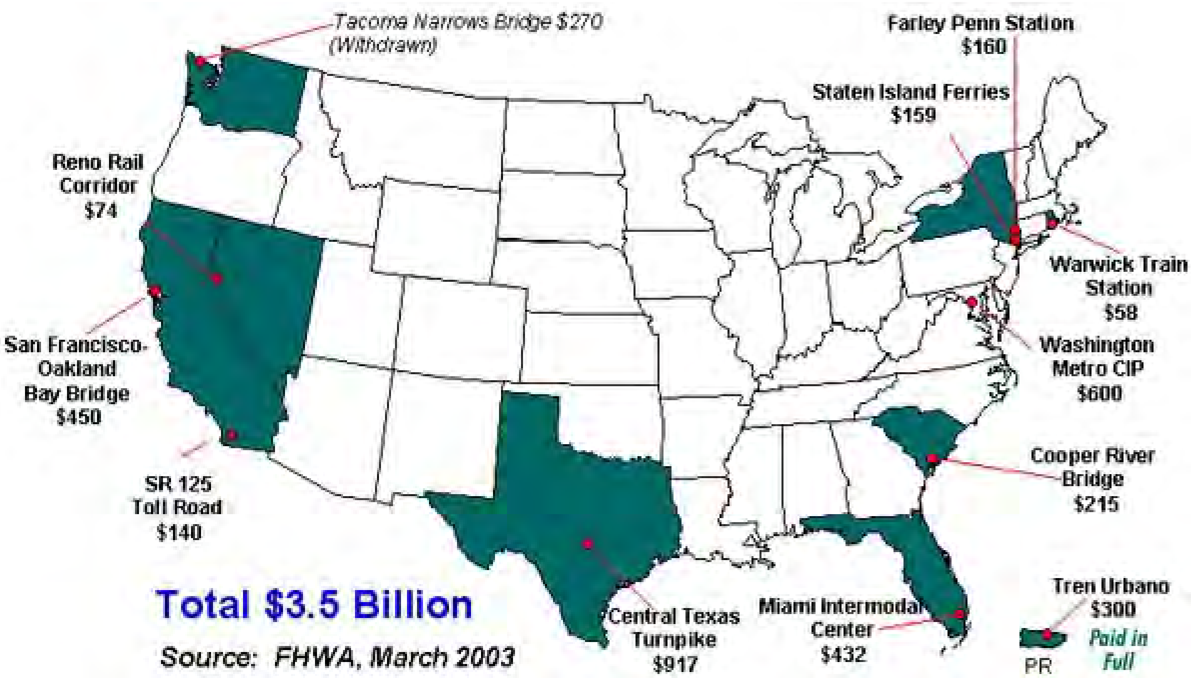
These are sources for the matching requirements of funds. Projects eligible for STP and NHS funding are public intermodal transfer facilities, facilitating access to, from, and within ports, as well as operational improvements necessary for intermodal projects, including ITS. Dedicated funding for such projects will be available from funds apportioned to NHS according to the ratio of "freight/STRAHNET (Strategic Highway Network) connector miles in the state compared to the total NHS miles in the state," with a 90 percent federal share. This reduces the amount of state funds required to match the federal dollars. Projects eligible for NHS funds are STRAHNET connectors to strategic ports used for military purposes [B7].

Useful guidelines regarding the appropriate funding mechanism for projects are highlighted in Reference B3, "Financing Federal-Aid Highways," by the Federal Highway Administration's (FHWA) Office of Legislation and Strategic Planning. Nonrevenue generating projects must depend on funding mechanisms such as traditional grants, municipal bonds, and Grant Anticipation Revenue Vehicle (GARVEE) bonds, all of which are appropriate for large projects. Revenue-generating projects that require subsidies can initially use innovative financing techniques such as credit assistance from Section 129 loans, TIFIA, and state infrastructure banks (SIBs). Self-financing projects can generate sufficient revenue through user fees to cover capital and operating expenses. We will now discuss TIFIA and Section 129 in further detail. SIBs are discussed under the section "State Financial Assistance."

1.3.3 TIFIA

The Transportation Infrastructure Finance and Innovation Act (TIFIA) of 1998 [B4] created a federal credit program under which the U.S. DOT can provide three types of financing for surface transportation projects of national and/or regional importance to public and private sponsors. These are direct loans, loan guarantees, and standby lines of credit. Interest rates for secured loans are equal to or greater than comparable U.S. Treasury securities while rates for loan guarantees are negotiable. The maximum payback period is 35 years, and the principal amount of credit cannot exceed 33 percent of the project cost. This program is meant to act as a financing or a refinancing mechanism of interim eligible project costs. The project cost must be a minimum of $100 million (modified to $50 million under the Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2003 [SAFETEA]), while ITS projects are allowed to have a minimum threshold of $30 million. The project must also be a part of STP and STIP, with a dedicated revenue source such as a fee or tax. Public approval is required in case of private sponsorship. The 2003 legislation altered TIFIA requirements in favor of intermodal projects, such as highway, transit, rail, interstate, state highways, bridges, toll roads, publicly owned intermodal facilities on or adjacent to NHS, and projects providing ground access to airports or seaports. Examples of ports that have participated in TIFIA funding are the Port of Charleston and the Port of Greater Cincinnati Development Authority. TIFIA has also been used for a large number of intermodal projects. The 2005 SAFETEA-LU legislation left the TIFIA funding provisions largely intact. However, some provisions were expanded in scope. For example, the general threshold for eligible projects was lowered from $100 million to $50 million. In addition, the new legislation enables certain rail projects, including private freight rail facilities that provide public benefits, such as congestion mitigation, to be considered for TIFIA funding. [B14]

Figure 1.3   TIFIA loans for financing transportation investments in the United States



1.3.4 Section 129 Loans

Section 129 loans allow states to use regular federal-aid highway apportionments to fund loans to projects with dedicated revenue streams. A state may directly lend apportioned federal-aid highway funds to toll and nontoll projects. A recipient of a Section 129 loan can be a public or private entity that is selected according to each state's specific laws and process. A dedicated repayment source must be identified and a repayment pledge secured. The federal aid loan may be for any amount up to the maximum federal share of 80 percent of the total eligible project cost. A loan can be made for any phase of a project, including engineering and right-of-way acquisition, but cannot include costs prior to loan authorization. A state can obtain immediate reimbursement for the loaned funds up to the federal share of the project cost.

Loans must be repaid to the state beginning five years after construction is completed and the project is open to traffic. Repayment must be completed within 30 years from the date federal funds were authorized for the loan. States have the flexibility to negotiate interest rates and other terms of Section 129 loans. The state is required to spend the repayment funds for a project eligible under Title 23 U.S.C.

There are several advantages to using Section 129lLoans. States can use Section 129 loans to assist public-private partnerships by enhancing start-up financing for toll roads and other privately-sponsored projects. Since loan repayments can be delayed until five years after project completion, this mechanism provides flexibility during the ramp-up period of a new toll facility. Loans can also play an important role in improving the financial feasibility of a project by reducing the amount of debt that must be issued in the capital markets. In addition, if the Section 129 loan repayment is subordinate to debt service payments on revenue bonds, the senior bonds may be able to secure higher ratings and better investor acceptance. If a project meets the test for eligibility, a loan can be made at any time. Federal-aid funds for loans may be authorized in increments through advance construction procedures and are obligated in conjunction with each incremental authorization. The state is considered to have incurred a cost at the time the loan is made. Federal funds will be made available to the state at the time the loan is made.

There are several cases in which these loans have been applied successfully for the construction of important highways in Texas. The George Bush Turnpike Project in Dallas illustrates how a Section 129 loan can play an essential role in the total financing package. This project links four freeways and the Dallas North Tollway to form the northern half of a circumferential route around the city of Dallas. Primary funding for this $940-million project included a low interest, long-term Section 129 loan and revenue bonds. This $135 million loan was critical in ensuring the affordability of the project's senior bonds. Completion of this important beltway extension will be accomplished at least a decade sooner than would have been possible under traditional pay-as-you-go financing.

Significant differences lie in the three types of federal credit assistance (Section 129 loans, SIBs, and TIFIA), and these are highlighted in a report that readers may wish to reference entitled “Innovative Finance Primer” by the Federal Highway Administration (FHWA) [B5]. SIBs are administered by the state while being capitalized with Federal funds. The main difference between Section 129 loans and SIBs is that the former funds an individual project, while the latter operates similar to a mutual fund and can fund several projects simultaneously. TIFIA differs from both of these funding methods in two significant ways. the first, the project sponsors directly negotiate with the U.S. DOT; and second, TIFIA is in addition to funds apportioned to states for grant-assisted projects. Moreover, this document discusses another technique of relevance introduced in the Transportation Equity Act for the 21st Century (TEA-21) enacted in 1998. These allow tolling noninterstate federal highways, reconstructing a maximum of three interstate highways into tolled roads, and implementing value pricing schemes such as congestion and parking pricing to reduce congestion on highways.

1.3.5 State Infrastructure Banks

The National Highway System (NHS) Designation Act of 1995 established the SIB pilot program, which was designed to complement existing funding mechanisms and serve as a useful tool to meet project financing demands, thereby stretching both federal and state dollars. The primary benefits of SIBs to transportation investment include:

- Flexible project financing, such as low interest loans and credit assistance that can be tailored to individual projects
- Accelerated completion of projects
- Incentives for increased state and/or local investment
- Enhanced opportunities for private investment by lowering the financial risk and creating a stronger market condition
- Recycling of funds to provide financing of future transportation projects.

While the authorizing federal legislation establishes the basic requirements and overall operating framework for a SIB, states have customized the structure and focus of their SIB programs to meet state-specific requirements. Various types of financing are offered by a SIB, with loans including subsidized interest rates designed to suit the repayment scheme and credit enhancement schemes such as letters of credit and bond insurance, lines of credit, and loan guarantees being among the most popular forms of SIB assistance. Other forms of assistance include certificates of participation or lease-purchase agreements, GARVEE bonds, grant anticipation notes (GANs), and other debt financing schemes.

As of September 30, 2001, thirty-two states had entered into 245 loan agreements with a dollar value of more than $2.8 billion. Two states, Minnesota and South Carolina, leveraged their SIBs through the issuance of bonds. Since its inception, the South Carolina Transportation Infrastructure Bank has approved financing and begun development of $3 billion in projects for eight applicants. This SIB financing mechanism is helping to condense 27 years of projects into 7 years. Florida has a very active SIB, with thirty-two loan agreements executed through the end of the 2001 fiscal year at a value of $465 million. Because of loan demands, Florida's SIB has been augmented with a phased-in state fund appropriation of $150 million. Ohio and Arizona have also contributed additional state funds to their SIBs [B8].

A 1997 report prepared by the Lyndon B. Johnson School of Public Affairs at the University of Texas at Austin [B9] examined port finance programs in Wisconsin, Minnesota, Oregon, Louisiana, Florida, and California to identify prospective ideas that could be applied to Texas. Nine innovative state port financing programs are detailed in this research report and include grants and loan programs financed through gas taxes, revenue bonds (some involving matching funds requirements), lottery proceeds, state general funds, and creation of a "maritime-specific public investment bank," envisioned as a credit union for ports.

The Wisconsin DOT used a grant program. Generally these programs feature eligibility requirements such as a minimum tonnage per year. They must be public and must satisfy cost-benefit requirements signifying the urgency of the project. Funding for the grant programs is usually taken from state transportation gasoline taxes and revenue bonds and may feature matching funds requirements. For example, the local government may be required to cover 20 percent of the project cost if there is no federal assistance. Texas does not provide funding for port projects, so gasoline tax revenue and state revenue bonds are not options. Furthermore, federal funding is generally provided for dredging activity, so a grant program is not a method applicable to Texas ports. Another financing method is a combination of a grant and loan program used by the Minnesota DOT. Projects are subject to eligibility criteria and cost-benefit analysis. Generally, if a project provides indirect economic benefits, it will be provided grants, and if it generates revenue, it would get a loan, with interest rates varying from project to project. Another type of financing is a loan program used by the Oregon Economic Development Department. The Oregon program targets small to medium sized ports that cannot raise funds on their own due to transaction costs of bond issuance. In this example, the interest rate minimum is five percent for port development and one percent below treasury bills for economic development projects. Projects are selected for feasibility, risk, and prospect for payback among other criteria.

1.3.6 U.S. Army Corps of Engineers

The Resources, Community, and Economic Development Division of the U.S. General Accounting Office prepared a report in March 2000 [B1] that presents an overview of the port financing experience of small and medium sized ports from thirty-two states that received funding from the U.S. Army Corps of Engineers for port improvement projects. The report describes federal funding opportunities for small and medium sized ports and examines the financing experience of these ports outside of the portion derived from the Corps, including any projects that were suspended or terminated due to financing difficulties. The Corps provides a financing plan that involves the port donating its land or rights-of-way as substitute for its share of project cost. Other sources of financing include cash reserves, bonds, and grants from local communities. Some programs use combinations of financing. For example, Humbolt Bay Harbor District financed a project through cash reserves, a grant from the local government, increased fees, imposition of a tariff, and debt restructuring.

1.3.7 Tax-Exempt Bond Issuance

Much port financing does not qualify for tax-exempt status because the law precludes it, particularly if the project results in too much private benefit. However, the authors of a Harvard University study [B11] note that "bonds issued to support the construction and renovation of docks, wharves, and related facilities are considered to be 'exempt facility bonds' and may be financed on a tax-exempt basis, even if the private participation exceeds the standard threshold." Furthermore, aspects of SAFETEA may make it easier to issue private activity tax-exempt bonds for port landside projects. The tax-exempt status of bond issuance is very important, and ports may be more willing to issue bonds for landside access projects if they qualify for tax-exempt status if they previously did not qualify.

Despite the benefits of this financing technique, the authors identify the problems inherent in providing such types of support. The structural changes in the shipping industry require ports to expand their current infrastructure to deepen channels and improve landside access to their facilities require large funds. Because most U.S. ports are publicly owned, they are subsidized by local, state, and federal governments. These vary from direct subsidies to cross subsidies from other projects and tax exemptions on debt issued by ports, even on projects that have significant private participation. There are at least two problems with this system of port financing. First, the subsidized loans do not reflect the true cost of capital. Secondly, subsidies may underestimate the risks inherent in the project. Both issues tend to lead to overinvestment in port infrastructure. This can be corrected by project-driven private sponsorship of port investment. The Intermodal Container Transfer Facility project undertaken in the 1980s by the Ports of Los Angeles and Long Beach is described as a successful example of a private-type finance project.

1.3.8 Other Types of Bonds

Two types of bonds are typically used to finance infrastructure projects in the transportation industry. These are:

- Revenue bonds
- General obligation bonds

A revenue bond is a limited liability bond in which debt service requirements are paid only from the earnings of a public project. Limited liability does not pledge the full faith and credit of a jurisdiction. It instead dedicates a revenue source for repayment of the bond. General obligation (G.O.) bonds are secured by a pledge of the issuer's full faith and credit. This means that obligations have an unlimited claim on the taxes and other revenues of the issuing unit. Full faith and credit bonds typically bear a lower interest rate than limited liability debt because they are seen as less risky. Ports and localities routinely utilize this method of financing.

1.3.9 User Fees

Local user fees on ships to pay for wharfage, docking, and other services offered by waterside facilities are a traditional form of revenue used by ports. There are problems created by this method. Finch and Henry (1985) [B6] discussed anti-competitive distortions created among ports of different sizes with user fees. Due to economies of scale, large ports can charge relatively low user fees based either on tonnage of cargo or value and still be competitive. However, small ports have very few clients to raise sufficient funds and might not be able to benefit from this method of financing. Finch and Henry claim that small ports could apply user fees as a significant method of financing if they could charge user fees to sectors of the regional economy that benefit from a particular port investment both directly as well as indirectly.

1.3.10 Examples of Innovative Financing Techniques

Several examples of innovative finance projects have been implemented in the U.S. and Europe. The Alameda Corridor in Southern California [C1] is a $2.4 billion project. It is supervised by a special joint powers authority, the Alameda Corridor Transportation Authority. The project was financed by the public sector, but private sector companies using the corridor will be charged users fees to pay back some of the debt incurred ($400 million from the U.S. DOT and $1.165 in billion revenue bonds). The ports also contributed $394 million, $347 million of which was obtained from pass-through grants from federal and state sources and sales tax revenues administered by the Los Angeles County Metropolitan Transportation Authority. The remaining $154 million was obtained from other state and federal sources and interest income.

Another example resulting from successful innovative financing is the Port Inland Distribution Network (PIDN) [C2]. The PIDN is a hub-spoke system of rail and barge services moving through the Port of New York/New Jersey that acts as modes of transportation in addition to trucks. The inland terminals or ports are situated at or near customers and distribution centers. Funding for the entire project would require a successful public-private partnership consisting of the port authority, state and local governments, and private users such as ocean carriers, shippers, barge operators, and trucking companies, all of which would indirectly gain from the network. Additionally, federal funding provided through the Congestion and Mitigation Air Quality Program (CMAQ) and TIFIA are possible sources.

2. Landside Planning for Maritime Freight: the Role of Metropolitan Planning Organizations

2.1 Metropolitan Planning Organizations (MPOs)

Although TxDOT bears the responsibility of funding and developing improvements to state-maintained roadways, and construction of new state roadways, Metropolitan Planning Organizations (MPOs) maintain a significant role in the development of improvements to landside infrastructure. This is because MPOs have the sole responsibility of choosing which federally funded projects will be selected for construction and when the construction will be financed. As a result, TxDOT's ability to directly improve landside access at deepwater ports is limited if local MPOs do not place a priority on a needed improvement. This chapter will discuss the role of MPOs in the transportation planning process in greater detail and describe some of the ongoing freight transportation issues that challenge metropolitan areas around ports. This chapter will also provide a general discussion of how the activities at Texas ports affect local congestion, reasons why MPOs have found it difficult to plan for improved landside access, and, finally, offer recommendations for MPOs to improve freight planning processes.

An MPO is a transportation planning agency designated by federal law to operate within metropolitan areas with a population of more than 50,000 people. The MPO plays an important role in the transportation planning process by selecting transportation projects for development and ensuring that local priorities are adequately represented in state transportation plans. The goal of a MPO is to promote a transportation system that maximizes the mobility of people and goods while incurring minimal energy consumption, air and water pollution, and other negative social impacts. US DOT will not approve federal funding for urban transportation projects unless they are listed in the MPO's program. Therefore, it is the MPO's responsibility to develop and maintain the required transportation plan for a metropolitan area and to ensure that federal funds are spent to support these locally-developed plans.

2.1.1 The Origin and Legal Framework of MPOs

The origin of MPOs can be found in the Federal Highway Act of 1962. The act created MPOs and assigned them the primary role of deciding which transportation projects were to be carried out during any given year. The role of the MPOs has evolved with subsequent federal legislation. This has improved the MPO's efforts at community outreach and increased their authority. The primary federal laws that have influenced statewide and metropolitan transportation planning over the past four decades have been:

- Federal-Aid Highway Act of 1962
- Federal-Aid Highway Act of 1973
- Intermodal Surface Transportation Efficiency Act of 1991
- Transportation Equity Act for the 21st Century

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) strongly emphasized the role of MPOs in local transportation planning, as well as identified a significant role for public involvement in the planning process. While ISTEA made federal funding for transportation projects more flexible and gave MPOs more authority to grant those funds, it also required that MPOs develop fiscally-constrained transportation plans and programs. Additionally, ISTEA emphasized the management of travel demand and tied transportation improvements to achieving air quality attainment goals.

ISTEA was strengthened in 1998 by a reauthorization bill called the Transportation Equity Act for the 21st Century (TEA-21). TEA-21 expanded the responsibilities of MPOs to include planning for the needs of the freight industry in urbanized areas while maintaining the goals of ISTEA. TEA-21 maintained much of ISTEA's program structure and decision-making process but stressed simplification and streamlining. Building on its predecessor, TEA-21 extended the responsibility of MPOs to include the needs of the freight industry when planning transportation systems in urbanized areas. Specifically, Section 1203(a) of TEA-21 reads:

> It is in the national interest to encourage and promote the safe and efficient management, operation, and development of surface transportation systems that will serve the mobility needs of people and freight [emphasis added] and foster economic growth and development within and through urbanized areas, while minimizing transportation-related fuel consumption and air pollution.

The act also established seven planning factors for consideration in statewide and metropolitan planning processes for people and freight:

1. Support economic vitality
2. Increase system safety and security
3. Increase accessibility and mobility
4. Protect and enhance the environment

5. Enhance system integration and connectivity
6. Promote efficient system management and operations
7. Emphasize preservation of the existing transportation system (FHWA, 1998).

2.2 Authority and Responsibilities

2.2.1 Metropolitan Transportation Plan

MPOs have three primary goals: to state the transportation needs of a region, to identify and prioritize projects to meet those needs and to match prioritized transportation projects with available funding. To accomplish these goals, an MPO produces several plans that outline its transportation vision for a region and explain how that vision will be achieved. A brief description of these plans is provided below.

The Metropolitan Transportation Plan (MTP) is the MPO's long-range planning guide that identifies the transportation needs of a region for the next 20 years or longer. By law, the MTP must consider the future needs of all transportation modes and must include programs and policies for congestion management, transit, bicycles and pedestrians, roadways, and freight. It also includes plans that specify how these long-range projects will be funded. The funding strategies range from using public and private sources to a variety of innovative techniques such as value capture, tolls, and congestion pricing. The selection of local transportation projects in the MTP is based on their regional and national significance.

The MTP's primary use is as a regional long-range plan for securing federal funds. It also serves as a comprehensive, coordinated transportation plan for all the government jurisdictions within the designated area. The MTP must be revised at least every five years or every three years if an area is designated as a nonattainment zone for federal air quality standards.

2.2.2 Transportation Improvement Plan (TIP) [7]

MPOs are required by legislation to develop a Transportation Improvement Program (TIP) for their area in cooperation with the local community, public interests, and other affected stakeholders, using suitable project selection criteria. This plan lists and prioritizes projects within a metropolitan area that have been proposed for federal funding consistent with the area's long-range transportation plan. The TIP also lists state or locally funded projects that are regionally significant.

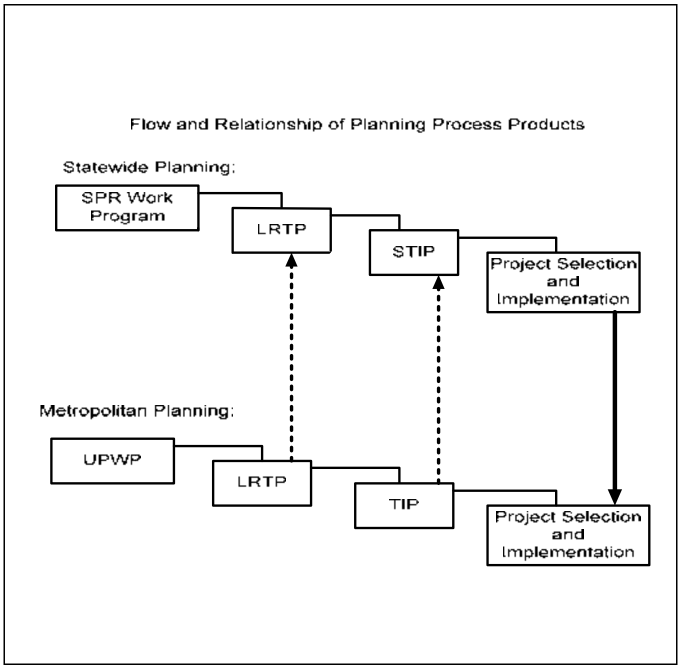
[7] 23 CFR 450.324

2.2.3 Statewide Transportation Planning

The list of transportation projects and/or project segments in the TIP must be implemented within a three-year period, and the TIP must be updated at least once every two years. The TIP must also be approved by the MPO and the state's governor. If local priorities or conditions change, the TIP can be amended at any time subject to the MPO's established public involvement practices. In developing the program, the MPO provides citizens, affected public agencies, representatives of transportation agency employees, private providers of transportation, and other interested parties with a reasonable opportunity to comment on the proposed program.

Parallel to the local MPO's planning process is the statewide transportation planning process performed by each state's department of transportation (DOT) (Figure 2.1). The selection of projects for funding in the state plan is based on the regional and national significance of the proposed list of projects. The primary products of the state planning process are described in Figure 2.1.

Figure 2.1 The Parallel MPO and State DOT Transportation Planning Processes



Source: Smith, 2003

2.2.4 Statewide Long-Range Transportation Plan[8]

This long-range transportation plan lists projects that cover at least a 20-year period and provides for the development and implementation of a statewide intermodal transportation system after coordinating with all the state's MPOs. For non-metropolitan areas, state officials consult with the affected local officials who are responsible for transportation in that region. In some parts of the country, state DOTs must also consult with Native American tribal counsels and the Secretary of Interior. The statewide long-range plan may also include a financial plan that demonstrates the implementation of the enlisted projects.

[8] 23 USC 135(e)

2.2.5 Statewide Transportation Improvement Program[9]

The state DOT also develops a State Transportation Improvement Program (STIP), which is coordinated with funding priorities developed by the MPOs in their TIPs. The STIP groups transportation projects according to function, work type, and geographic area. As the projects in the STIP advance through project selection process and are implemented, it must revised at least every two years. The STIP must also be consistent with the statewide long-range transportation plan, and the state DOT must incorporate public participation into the process. As with the local TIP, the STIP can be amended at any time through the public participation process.

2.2.6 State Planning and Research Programs

The State Planning and Research Program (SPRP) provides planning assistance to each state for comprehensive statewide as well as local transportation planning studies. Funding for the SPRP is allocated to each state by the Federal Highway Administration (FHWA) using a population based formula. The federal share for eligible planning activities is 80 percent, with 20 percent provided by the state or local governments. Eligible activities include feasibility studies, management, operations, innovating financing opportunities, and social and economic impact studies of transportation projects. Applications for funds under this category must be accompanied by unified planning work program (UPWP) documentation. Transportation authorities may undertake studies either with a statewide focus or pass funds through MPOs for planning studies with a local emphasis. Table 2.1 summarizes the federally mandated planning activities at the state and local level.

[9] 23 CFR 450.216

Table 2.1 Summary of the Transportation Planning Products Produced by State DOTs and Local MPOs

PRODUCTS (AND AUTHORITIES)	PLANNING HORIZON	CONTENTS	UPDATE REQUIREMENTS
Work Programs: UPWPs and SPRP Work Programs	1-2 years.	Planning studies and tasks	Updated annually.
Metropolitan and Statewide Long-Range Transportation Plans	20 years (minimum), but often 25 years or more.	Identifies future transportation goals, strategies, and projects for a region.	Metropolitan plans: Updated very three years (if within an air quality non attainment/ maintenance areas) or five years (if within an air quality attainment areas) Statewide plans: No Federally mandated updated cycle
Metropolitan and Statewide Transportation Improvement Programs: TIP	Three years (minimum).	Schedules funding for transportation projects (by phase).	Every two years (minimum).

Source: Smith, 2003.

2.2.7 The MPO's Decision Makers

An MPO's work is typically divided among several committees. The Policy Committee is comprised of local elected officials and state and local transportation agency officials. The local elected officials serving on an MPO's Policy Committee could be city council members, mayors, county commissioners, county judges, state representatives, and state senators. The state and local transportation agency representatives usually include representatives of the state DOT, the director of the MPO's permanent professional staff, and local transit agencies. The Policy Committee generally makes the decisions required to develop a metropolitan area's transportation plans and programs. While doing this, the Policy Committee receives assistance from the Technical Committee, which oversees and supports the technical work needed to develop the transportation plan. Sometimes there is a Citizen's Advisory Committee that provides public input. The Policy Committee receives additional assistance from the MPO's professional staff, which is comprised of planners and engineers who provide expertise and support to the various committees throughout the development of the plans and programming.[10]

[10] See Bureau of Transportation Statistics, "Building new Partnerships – The Freight Railroad Industry and Metropolitan Planning Organizations," http://ntl.bts.gov, accessed 7/11/2003.

Additionally, the MPO's professional staff will often hire consultants for specific technical tasks for which they may not maintain "in-house" expertise, such as traffic model development.

Freight transportation planners currently face a multitude of challenges: insufficient funding for infrastructure improvements, congestion at port connectors, lack of coordination between the public and private sectors, and inadequate attention from planners at the local and state levels. More generally, from the freight industry's standpoint, the overarching issue in transportation programming is improving efficiency. When considering transportation efficiency, there are three interrelated aspects: travel time, reliability, and cost. Depending on the commodity being shipped, the importance of delivery time may vary. However, in the case of "just-in-time" manufacturers, rapid and reliable delivery is absolutely critical. The need for reliability and speed does not mean that firms are willing to pay any price for transporting their goods. Therefore, over the long-term, if a region is to become or remain economically competitive, it must provide a relatively low-cost transportation environment in addition to one that is reliable and fast. The benefits of such a system cut across a variety of economic activities which include manufacturing, value-added services, warehousing, and transportation services.

Although shippers are most concerned about improving the efficiency of the transportation network, the public is usually more interested in improving safety. Few commuters enjoy the experience of driving on busy freeways and local streets alongside heavy trucks or driving over busy at-grade rail crossings. Although commuters are responsible for many accidents that occur with freight shippers, the public often perceives the freight industry as being the problem. Texas ports will continue to be significant and growing generators of freight traffic on the local transportation network.

The public is also concerned about the environmental impact of freight operations on regional air quality and nearby neighborhoods. Since most freight trucks run on diesel fuel, they contribute a disproportionate share of airborne particulates and sulfur dioxide. One possibility for reducing air quality impacts is to shift freight to less polluting modes of transportation such as railways and/or barges. Freight operations can also affect the quality of life in residential areas by generating high volumes of ambient noise. In some instances, resolving these issues only requires a modification of behavior, but there are often limits to which community impacts can be eliminated or diminished. Requiring costly retrofits or relocations and placing greater restrictions upon freight operators often creates higher costs to shippers and consumers. There is a risk that firms will be unable to absorb or pass on these costs.

Finally, it is important for MPOs to promote more efficient land use by planning transportation improvements that maximize access and mobility while reducing the footprint of the infrastructure. The inefficient incorporation of vacant land has contributed to the increasing cost and complexity of expanding maritime, rail, truck, and air terminals at intermodal connectors. The MPO's expertise in identifying and procuring funds from federal, state, and local sources for transportation infrastructure is one of the most valuable ways it can help ports operate more efficiently. In addition to existing funding programs, there may also be innovative solutions to financing freight transportation improvements such as developing public-private partnerships. The Alameda intermodal corridor in California, which transfers containers from the ports of Los Angeles and Long Beach to a downtown rail terminal, is a recent example of this type of partnership. At the same time, although the Alameda Corridor appears to be a success, only a few MPOs in the U.S. may be capable of replicating a project of this scale. For their part, private firms will generally become involved in a freight infrastructure project if they anticipate an adequate return on their investment.

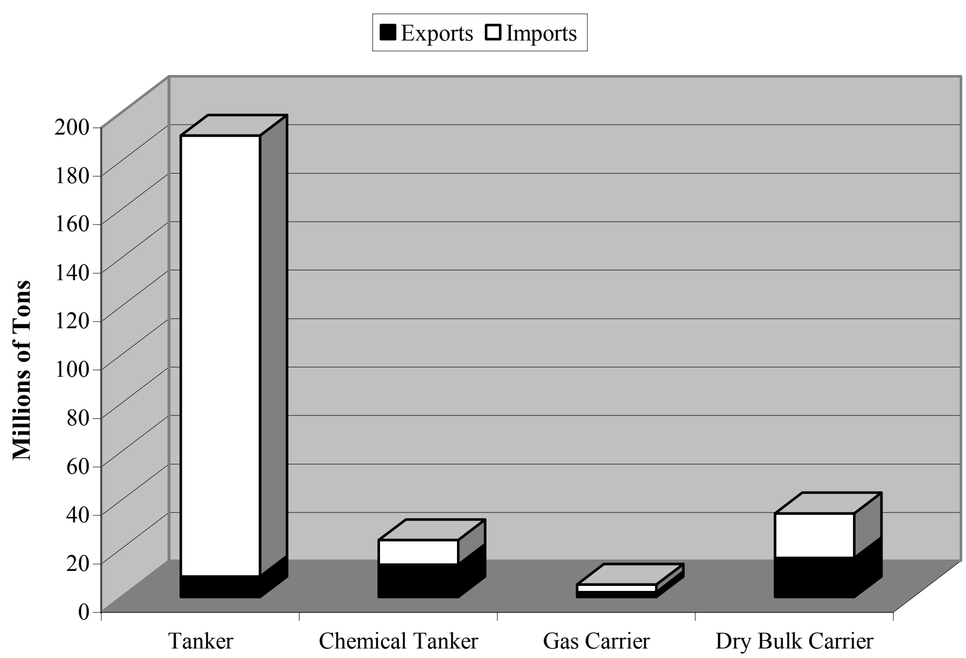
2.2.8 Texas's Maritime Ports as Local Freight Generators

Texas' maritime ports play a significant role in driving the economy of the state and the nation. According to the U.S. Maritime Administration, in 2002, Texas ports moved 283 million metric tons of import and export cargo. The largest share of the state's cargo consisted of bulk liquid imports, but Texas ports also move a variety of other products, including dry bulk, containerized, and roll-on/roll-off (RO/RO) cargos. A key factor in the ability of MPOs to address landside access issues at Texas ports is for their staff to understand how the ports contribute to freight movements in their region. This section discusses the general characteristics of freight that moves through Texas ports (more detailed information will be provided in the next chapter) and how it can affect the local transportation network.

2.2.9 Bulk Cargo

All of Texas' deepwater ports and many of its shallow water ports are capable of accommodating bulk commodities. The majority of the cargoes handled at these ports are liquid (including gas) or dry bulk. Petroleum products account for most of the state's liquid bulk imports (Figure 2.2). After unloading, they are often sent through pipelines to nearby refineries and petrochemical plants for processing. Chemicals are another liquid bulk product that may be fed through pipelines directly to ships for export. Chemicals may also be fed through pipelines to nearby plants for manufacturing or to storage tank farms; they also may be loaded onto barges, rail, or truck tank cars for further shipment. In addition to petroleum and chemicals, liquid bulk cargo may also include edible items (e.g., cooking oil) that are moved by truck or rail to or from the port. Dry bulk cargo includes food, aggregates, wood products, ores, metals, etc. Dry bulk goods often move to and from ports on rail cars, but for nearby origins or destinations, it is often more cost-effective to move these commodities using trucks.

Figure 2.2 2001 Bulk Cargo Tonnages at Texas Ports

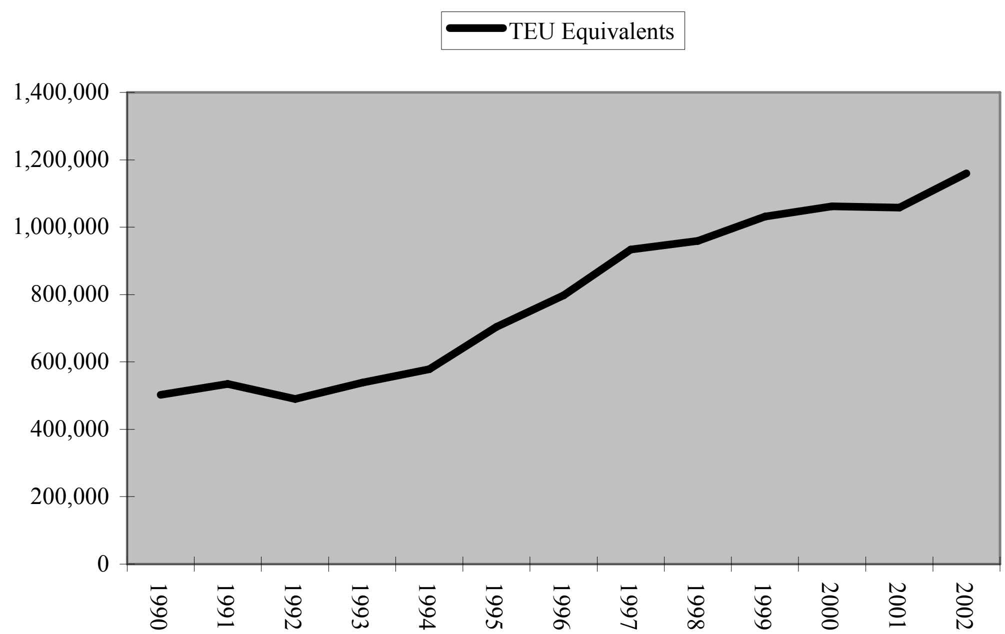


Source: U.S. Maritime Administration, 2004.

2.2.10 Containerized Cargo

One advantage of shipping cargo in containers is that they can be easily moved between modes (e.g., truck to rail to ship and back again). Containers also provide protection against damage and pilferage. With the recent growth of international trade and the expected continuation of this trend into the foreseeable future, more containers are likely to be shipped to and from Texas. MPOs need to be aware of container activity at their local ports because containers contribute disproportionately to roadway congestion. Although most of a container's travel time is spent on a ship, the majority of them will likely travel by truck for a least one segment of their journey. Figure 2.3 illustrates some detail into the growth of containerized traffic in Texas. The Port of Houston is the state's largest container port, handling about 93 percent of the total market. Between 1990 and 2002, the volume of containers at the Port of Houston more than doubled to 1,159,789 TEUs. [11] During this same period, container tonnage more than tripled to 10,858,068 short tons.

Figure 2.3 Container Growth at the Port of Houston Authority, 1990-2002



Source: Port of Houston Authority, 2004.

According to the Port of Houston Authority, roughly two-thirds of the containers they handled stay in the Houston area. Since trucks are the only economically feasible means to move these shipments, the port generated more than 400,000 container-related local truck trips in 2002.

The state's other active container port is the Port of Freeport, which handled 66,000 containers during the 2004 fiscal year. Most of the Port of Freeport's containerized import cargo

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[11] Intermodal containers are measured as "20-foot equivalents," which is abbreviated as a "TEU." A TEU is equal to a container that is 20 feet long. However, not all containers are 20 feet long. There are also 40-foot and 54-foot containers. A 40-foot container is considered to be two TEUs.

consists of fresh fruits (largely bananas), while containerized exports included a variety of items, with most of these destined to Central America and the Caribbean. All of the containers transported to and from the Port of Freeport travel by truck.

Table 2.2 Container Activity at the Port of Freeport, FY 1995-FY 2004[12]

Year	Inbound	Outbound	Total	Percent Change
1995	15,268	15,248	30,516	-10.41
1996	18,350	17,630	35,980	17.91
1997	26,250	22,947	49,197	36.73
1998	26,438	26,564	53,002	7.73
1999	29,956	30,870	60,826	14.76
2000	29,672	29,976	59,648	-1.94
2001	37,086	37,180	74,266	24.51
2002	37,100	37,436	74,536	0.36
2003	34,816	34,916	69,732	-6.45
2004	32,910	33,240	66,150	-5.14

In 2004, the Ports of Houston and Freeport were the only Texas ports that regularly handled containers. The state's third container terminal, the Port of Galveston, was inactive. Container movements in Texas are expected to grow as the national economy grows and as a result of shifting logistical patterns, such as expanding U.S. trade with China and shipper efforts to reduce dependence upon West Coast ports after a port workers strike in 2002. To meet the new demand, several Texas ports are planning to add new container capacity. The earliest expected projects are the Bayport container facility, which is currently being constructed by the Port of Houston Authority. The first phase of this facility slated to open in late 2006. Construction of Texas City's Shoal Point container port is not imminent, but the project does have all necessary environmental clearance required for construction. The Port of Corpus Christi is also proposing to construct a container terminal called "La Quinta" at some future date. As each of these sites move closer to construction, MPOs and local transportation planners will need to coordinate with the ports to plan for their impact to the local transportation network.

2.2.11 Roll-On/Roll-Off

Roll-on/roll-off (RO/RO) cargos are vehicles that can be wheeled on and off of a ship. This category can include construction equipment, passenger vehicles, commercial vehicles, and

[12] http://www.portfreeport.com/pdf/2004AnnualReport.pdf

various military vehicles. Many state ports have the capacity to handle RO/RO cargo, although they may only provide this service on an infrequent basis. In 2001, Texas ports exported 201,000 metric tons of RO/RO cargo and imported 469,000 metric tons. Various Texas ports serve as the point of entry for foreign-built vehicles and the point of departure for used vehicles exported to developing countries and large-scale military deployments, including the two wars in Iraq. Texas ports are also used to ship construction and commercial vehicles to project sites around the world. MPOs should query their local ports to identify any special impacts RO/RO cargo might have to mobility on area roadways or local rail networks.

2.3 Challenges to Planning for Freight

For a number of years, many MPOs have paid insufficient attention to freight issues when developing their long-range transportation plans. This neglect has not been the result of completely omitting freight transportation from their long-range transportation plans. Instead, the neglect has occurred by only giving the topic a cursory treatment. Many MPO documents, even for the largest cities, demonstrate only a superficial understanding of freight issues both in the context of global logistics and the patterns of freight movements in their local communities. The reasons why this occurs often vary, but MPO staff members frequently cite one or more of a few common responses. [13]

1. *The local freight industry does not participate in the transportation planning process*. Even though MPOs routinely make important decisions that directly affect the operations of freight transportation firms, most firms avoid opportunities for involvement during the public participation process. In addition to time constraints, many in the private sector have reported frustration with the complex and extensive public transportation planning process, which can require years to implement even relatively small projects with broad public support. This situation is in direct contrast to their ability as company executives to make decisions and act promptly.
2. *Advocates for commuter transportation projects and alternative modes of transportation are often more active in the MPO's public participation process and make their preferences more widely known.* The freight industry's ambivalence about attending

[13] The results of a 2003 study by the Association of Metropolitan Planning Organizations supports these assertions.

MPO meetings often compounds the Policy Committee's perception that those projects with the most vocal support are the best for the local transportation network. Additionally, because many Policy Committee members are elected public officials, they know that commuters represent voters. Therefore, it is in their interest to be viewed as supporters of popular projects.

3. *Commuter transportation needs are easy for Policy Committee members to grasp because they experience these same problems themselves everyday.* A freight transportation need, on the other hand, may only be obvious if you are a member of the freight industry. Again, the lack of participation by the freight industry in the public participation process means there are few opportunities for educating the members of the Policy Committee or the MPO's professional staff.

4. *Many MPOs and/or their consultants do not have the expertise or manpower to adequately consider local freight transportation issues in addition to their more visible efforts of planning for commuters.* Because many MPOs are understaffed, they often provide a superficial treatment to freight transportation in their long-range plan simply to satisfy federal requirements. Many consultants hired to produce local transportation plans are well-qualified to create transportation models that reflect commuter behavior, but they frequently do not have an adequate background or understanding of freight issues to plan effectively. While significant fault lies with the freight industry for reasons outlined above, MPOs do bear the legal responsibility to adequately address freight transportation. Fulfilling this legal obligation may require that MPO staff take on the responsibility of educating themselves about the topic.

2.4 Recommendations for Texas MPOs

As this chapter has described, freight transportation issues are complex and dynamic. To truly understand and address local freight transportation, MPO planners need to inform themselves of current issues and become proactive collectors of information. In the case of ports, it is even important for MPO staff to be aware of events outside of the community, because it is often those events in other parts of the U.S. or even the world that can have direct impacts on local transportation conditions. To illustrate this point, consider the following example: In 2003, a hurricane strike along the U.S. East Coast created such a strong demand for plywood that domestic plywood production was insufficient to meet national demand. In response lumber retailers began to dramatically increase their import of plywood from producers in Brazil, which was brought into the U.S. through a Texas port. The port's expanding trade, in turn, led to a growing number of trains generated by the cargo, which further congested local traffic at the many at-grade rail crossings surrounding the port. Thus, the stimulus for the increased demand was not in Texas nor was the source of the remedy. However, a Texas port did play a critical role in the adjustment to the international supply chain to meet domestic demand. However, in doing so, local commuters near the port experienced indirect effect of traffic congestion. Although this example may seem unique, it is surprisingly typical and just one of many situations where landside issues related to local ports are the product of external situations.

To better situate themselves to address the changing needs of ports, MPO staff should regularly meet with port officials to inquire about recent trade patterns (e.g., volumes, imports versus exports, etc.), the composition of landside movements (e.g., truck versus rail versus barges versus pipelines), and recent domestic and global events that may affect trade volumes. MPO staff should also be aware that the volumes and types of cargos that ports handle can and do fluctuate dramatically depending upon the value of currencies; international trading agreements; local, national, and international economic conditions; regional supply and demand; and the decisions of individual firms. To stay on top of these issues, biannual or quarterly meetings between the port and MPO staff members would keep all parties apprised of potential landside access problems. These meetings would also give ports the opportunity to identify local bottlenecks and to suggest projects for the MPO's long-range transportation plan and the TIP. Finally, such meetings would develop stronger relationships between the staff of ports and the MPO beyond the typical port representative serving on the MPO's Policy Committee.

MPOs can also improve their freight planning by identifying a "freight" person or persons and/or identify a point of contact for the freight industry. This person should not only lead the study of freight issues during the development of the long-range transportation plan but should also actively develop relationships with members of the freight community. Because members of the freight transportation community are intensely preoccupied with their survival in a highly competitive industry, the freight community will likely always be somewhat underrepresented in the public participation process. This means that MPOs should take on the responsibility of initiating the contact if they are to effectively deal with local freight issues.

2.5 Summary

Although commuter transportation problems will always occupy an important part of an MPO's efforts, MPOs should make a conscious effort to give freight transportation issues a similar level of attention. In addition to satisfying the regulatory and legal requirements that mandate planning for freight transportation issues in the local network, MPO planners may find that alleviating freight congestion may also lead to less commuter congestion. MPO staff should also be aware that maritime ports in Texas create unique conditions that require knowledge of current trends. Finally, MPOs should recognize that freight issues do not revolve solely around improving commuter safety, although this is a very important goal. Other issues, such as air quality, noise, socioeconomic and land use impacts are also important considerations, but MPOs must address the overall efficiency of the local transportation network. By becoming a proactive partner with local ports and the transportation firms that serve them, MPOs can lead the effort to alleviate local traffic congestion, improve the environment, increase the local quality of life, promote a more efficient movement of goods, and increase the competitiveness of their local economy.

3. Current Maritime Trade Trends in Texas

Texas deepwater ports play a critical role in driving our state and national economy by providing the infrastructure necessary to fuel our economy and to obtain the many items we use in our daily lives. The purpose of this chapter is to provide the readers with information on the extent of maritime trade in Texas, as well as to describe which commodities are being shipped and which countries are our major trading partners.

3.1 Increase in Global Trade

As global trade has grown, so has the volume of goods transported by ships. In 2003, the United Nations estimated that more than 12.6 billion tons of goods were handled at maritime ports nationwide up from 11.5 billion tons in 1999.

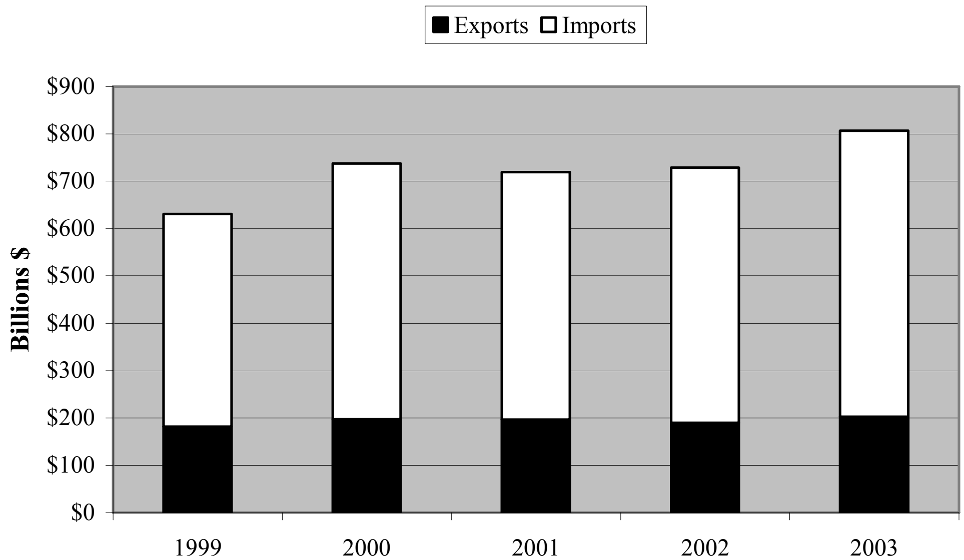
Table 3.1 Global Maritime Trade Flows in Millions of Tons, 1999-2003

Year	Total Goods Loaded	Total Goods Unloaded
1999	5,666	5,860
2000	5,872	6,249
2001	5,891	6,167
2002	5,948	6,276
2003	6,168	6,460

Source: UNCTAD, 2004.

In terms of value, the U.S. total maritime trade grew from $630.2 billion in 1999 to $807.1 billion in 2003, an increase of approximately 28 percent. Imports accounted for the majority of the total trade throughout this period. In fact, the nation's maritime imports grew significantly at 34.7 percent while the value of maritime exports grew more slowly at 11.6 percent.

Figure 3.1 Total U.S. Maritime Trade by Value, 1999-2003

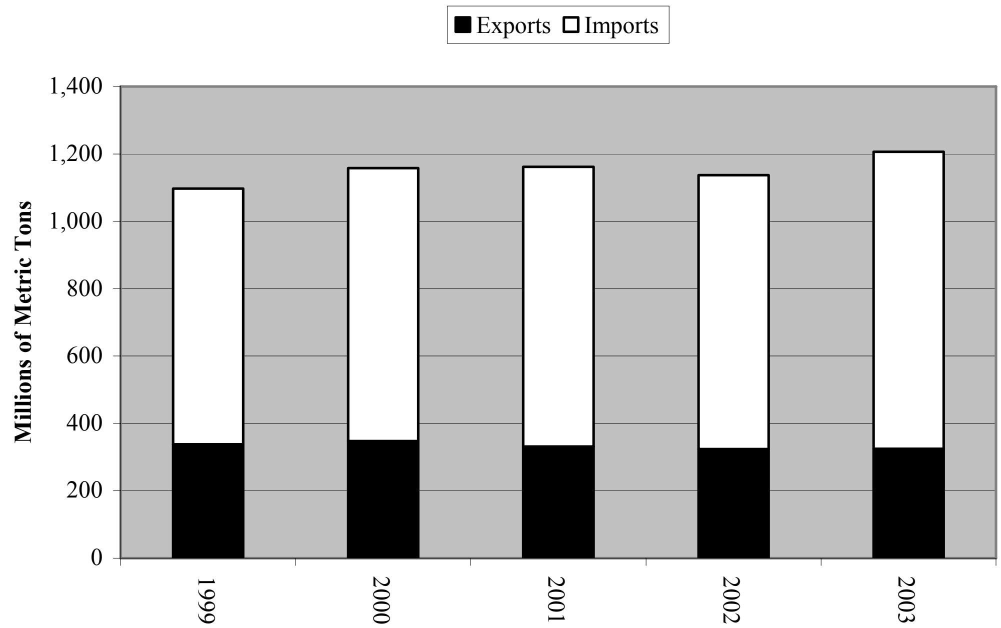


Note: 2003 data are preliminary

Source: U.S. Maritime Administration, 2005.

In terms of tonnage, total U.S. maritime trade has grown, but at a slower rate than the increase in value. Between 1999 and 2003, the total weight of U.S. maritime trade increased from approximately 1.1 billion metric tons to slightly more than 1.2 billion metric tons (Figure 3.2). The tonnage of U.S. maritime exports actually declined during this period from 337.8 million metric tons in 1999 to 324.8 million metric tons in 2003. However, U.S. import tonnage grew from 759.5 million metric tons to 881.4 million metric tons during this same period. The weight of maritime imports into the U.S. has likely grown more slowly than the increase in value because more of the goods imported into the U.S. have been manufactured products, which tend to have a higher overall value by weight than other products.

Figure 3.2   Total U.S. Maritime Trade by Weight, 1999-2003



Note: 2003 data are preliminary

Source: U.S. Maritime Administration, 2005.

Almost 60 percent of all U.S. waterborne foreign trade came from its top ten maritime trading partners shown (Table 3.2). In 2003, China was the U.S.' largest maritime trading partner, with total waterborne trade exceeding $138 billion dollars. Japan ranked second at $108 billion, and South Korea and Taiwan ranked fourth and seventh, respectively. Combined, these four Asian countries account for more than one-third of our nation's total maritime trade. This fact is even more impressive when taking into account that maritime trade with major oil-producing nations like Mexico, Saudi Arabia, and Venezuela only accounted for 8.4 percent of the total.

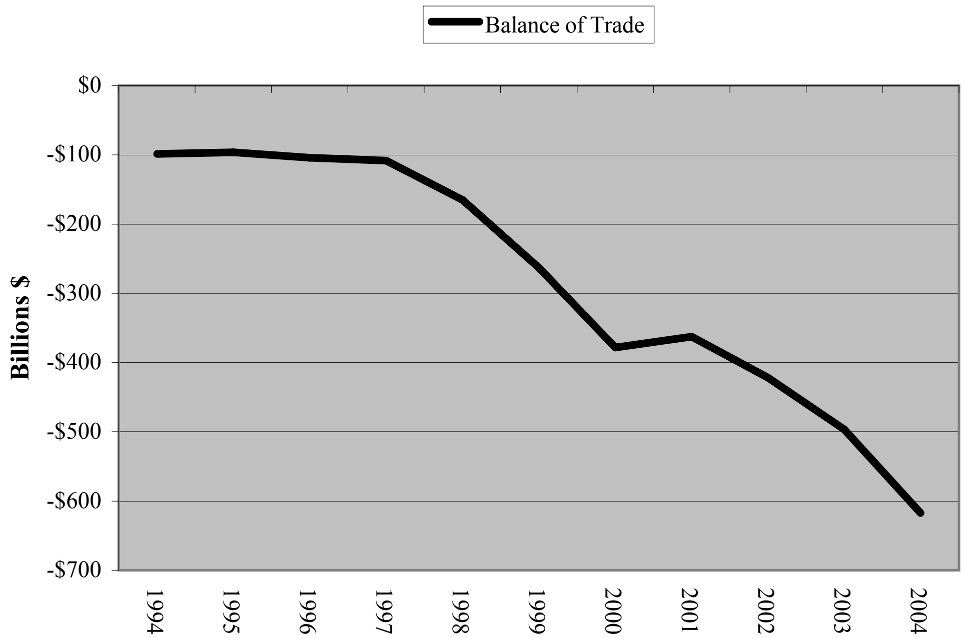
Table 3.2 2003 U.S. Waterborne Foreign Trade—Top 10 Trading Partners (millions $)

Rank	Trading Partner	Value	Percent of Total
1	China	$138,064	17.1%
2	Japan	108,401	13.4%
3	Germany	50,859	6.3%
4	South Korea	32,291	4.0%
5	United Kingdom	29,172	3.6%
6	Mexico	27,062	3.4%
7	Taiwan	24,917	3.1%
8	Saudi Arabia	21,237	2.6%
9	Venezuela	18,986	2.4%
10	Brazil	18,703	2.3%
Remainder of World		$337,420	41.8%
Total		**$807,112**	**100.0%**

Source: U.S. Maritime Administration, 2004.

The increasing volume of maritime trade is not surprising considering the nation's growing trade imbalance (Figure 3.3). Domestic manufacturers are intensifying rapid relocation of facilities to countries with lower labor costs. Initially, many of these manufacturers moved their facilities to Mexico and transported products to the U.S. by truck. However, more and more manufacturers are now relocating their facilities to China and other Asian countries to take advantage of even lower labor costs. This has resulted in more products entering the U.S. market through ships.

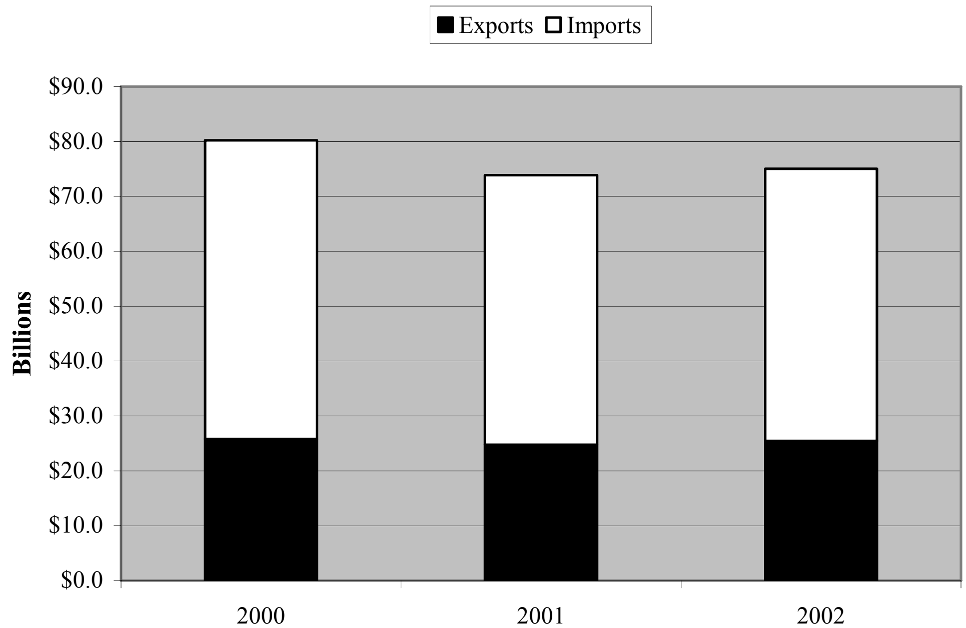
Figure 3.3 United States' Balance of Trade with the World, 1994-2004



Source: U.S. Census Bureau, 2005.

More than 10 percent of the national total maritime trade by value moved through Texas ports in 2002, despite the fact that the total value of maritime trade handled at Texas ports fell between 2000 and 2002 from $80.2 billion to $75.0 billion (Figure 3.4). Maritime exports declined only modestly during this period from $25.8 billion in 2000 to $25.5 billion in 2002, while import trade decreased from $54.4 billion in 2000 to $49.5 billion in 2002.

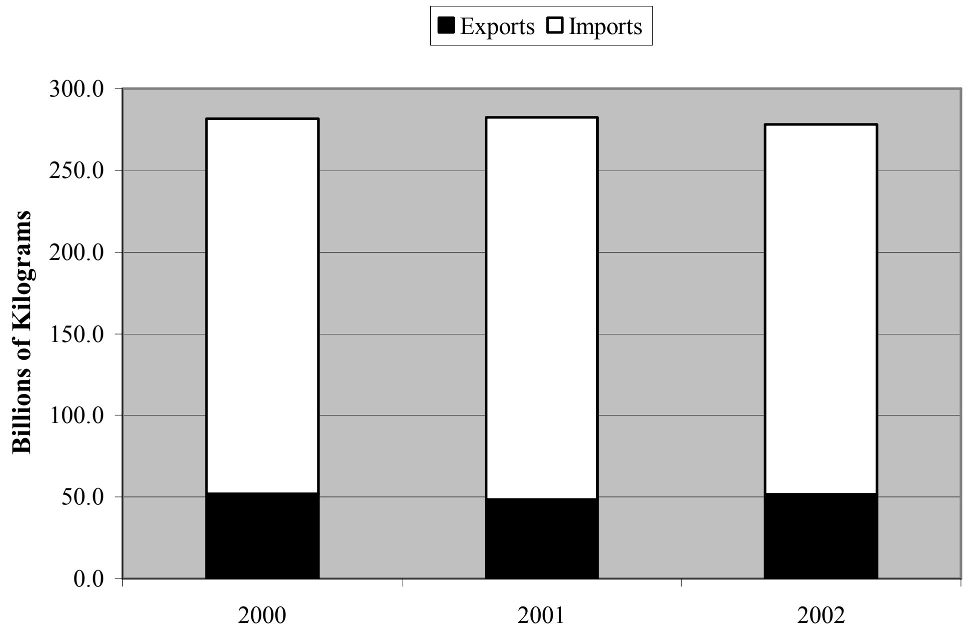
Figure 3.4 Total Texas Maritime Trade by Value, 2000-2002



Source: U.S. Maritime Administration, 2001-2003.

In terms of weight, Texas ports handled almost one-quarter of total U.S. maritime trade. The total weight of Texas maritime trade was 278 billion kilograms in 2002, down slightly from 281.7 billion kilograms in 2000 (Figure 3.5). As would be expected, most of the trade in 2002 was imported goods, which weighed roughly four times more than exports or 226.3 million kilograms. Export trade declined modestly between 2000 and 2002, from 52.1 billion kilograms to 51.6 billion kilograms.

Figure 3.5 Total Texas Maritime Trade by Weight, 2000-2002



Source: U.S. Maritime Administration, 2001-2003.

Table 3.3 shows the ten most important commodities exported from Texas ports during 2002, which accounted for more than three-quarters of total export trade. Organic chemicals were the most important commodity export with a total value of more than $6 billion or 23.9 percent of the total. Other important export commodities were various types of machinery, petroleum, chemical, and agricultural products.

Table 3.3 10 Top Exports from Texas Maritime Ports by Value, 2002

Rank	SITC	Description	Value	Share of Total
1	51	Organic chemicals	$6,078,981,462	23.9%
2	72	Machinery specialized for particular industries	3,137,313,090	12.3%
3	33	Petroleum, petroleum products, and related material	3,094,704,238	12.1%
4	74	General industrial machinery and equipment and parts	1,767,725,338	6.9%
5	57	Explosives and pyrotechnic products	1,675,349,197	6.6%
6	04	Cereals and cereal preparations	1,293,566,105	5.1%
7	59	Chemical materials and products, n.e.s.	986,137,444	3.9%
8	71	Power generating machinery and equipment	789,812,140	3.1%
9	78	Road vehicles (including air cushion vehicles)	504,916,307	2.0%
10	77	Electrical machinery, apparatus, and appliances n.e.s.	384,110,027	1.5%
		Remainder of Commodities	5,769,751,817	22.6%
Total			**$25,482,367,165**	**100.0%**

Source: U.S. Maritime Administration, 2003.

Petroleum products, primarily crude oil, were undoubtedly the important maritime imports at Texas ports and accounted for two-thirds of total imports (Table 4.4). Different types of machinery, road vehicles, iron and steel, organic chemicals and beverages were other important commodities unloaded at the state's ports.

Table 3.4 Top 10 Total Imports from Texas Maritime Ports by Value, 2002

Rank	SITC	Description	Value	Share of Total
1	33	Petroleum, petroleum products, and related material	$33,188,816,474	67.0%
2	78	Road vehicles (including air cushion vehicles)	2,636,519,102	5.3%
3	67	Iron and steel	1,679,058,500	3.4%
4	71	Power generating machinery and equipment	1,617,716,445	3.3%
5	51	Organic chemicals	1,337,661,851	2.7%
6	72	Machinery specialized for particular industries	961,404,416	1.9%
7	74	General industrial machinery and equipment and parts	858,547,860	1.7%
8	11	Beverages	538,952,381	1.1%
9	66	Non-metallic mineral manufactures, n.e.s.	482,326,949	1.0%
10	77	Electrical machinery, apparatus & appliances n.e.s.	446,932,192	0.9%
Remainder of Commodities			5,780,009,053	11.7%
Total			**$49,527,945,223**	**100.0%**

Source: U.S. Maritime Administration, 2003.

Table 3.5 Texas' Top Maritime Trading Partners, 2002

Rank	Trading Partner	Value	Percent of Total
1	Mexico	$11,685,592,093	15.6%
2	Venezuela	6,014,495,224	8.0%
3	Saudi Arabia	5,309,183,302	7.1%
4	Germany	4,432,718,894	5.9%
5	United Kingdom	3,600,913,195	4.8%
6	Brazil	3,083,030,258	4.1%
7	Nigeria	2,513,675,610	3.4%
8	Netherlands	1,986,481,494	2.6%
9	Belgium	1,875,083,250	2.5%
10	Iraq	1,862,557,291	2.5%
Remainder of World		32,646,581,777	43.5%
World		**$75,010,312,388**	**100.0%**

Source: U.S. Maritime Administration, 2003.

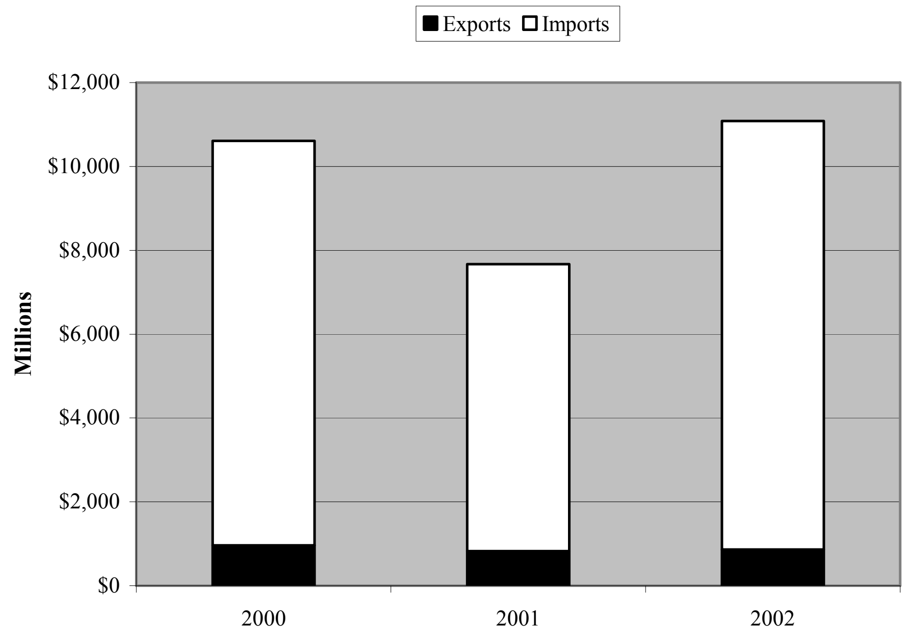
3.2 Maritime Trade by U.S. Customs District

This section provides summary statistics on maritime trade activity at each of Texas customs districts with a deepwater port. The U.S. Maritime Administration, in conjunction with the U.S. Army Corp of Engineers, provides detailed maritime trade data for individual customs districts across the nation. This dataset, called the Waterborne Databank, contains detailed information about commodities exported from and imported to the U.S. and identifies countries that are the destination or origin of these goods. Despite the detailed information they supply, readers should be warned that these data do have some limitations when analyzing port activity. First, the data in the Waterborne Databank are reported by U.S. customs districts. Therefore, they typically do not follow the boundaries of individual ports and frequently contain a number of other private and sometimes public terminals. For example, the Houston Customs District contains the facilities owned by the Port of Houston Authority, but it also includes the many private terminals located along the Houston ship channel. As a result, the Waterborne Databank does not provide any specific information that would allow a user to separate the trade activity that occurs at the Port of Houston Authority terminals. Another factor to consider is that the trade figures produced by the U.S. Maritime Administration and the U.S. Army Corp of Engineers are released as draft or even final figures and may continue to go through multiple iterations to improve accuracy and correct mistakes. As a result, some of the official figures purchased by the Center for Transportation Research from the U.S. Maritime Administration and provided in this chapter may not reconcile with official figures released at a later date. Despite these limitations, the Waterborne Databank still provides an excellent resource for TxDOT and other research institutions to develop a better understanding of maritime trade patterns at Texas ports.

3.2.1 Beaumont Customs District

The overall volume of maritime trade increased modestly at the Beaumont Customs District between 2000 and 2002, from $10.6 billion to $11.1 billion. This includes a decline of more than 25 percent between 2000 and 2001 (Figure 4.6). Imports strongly outpaced exports during this period, with import values rising from $9.6 billion to $10.2 billion and export values falling from $960.1 million to $866.7 million.

Figure 3.6 Export and Import Maritime Trade at the Beaumont Customs District, 2000-2002



Source: U.S. Maritime Administration, 2001-2003.

In addition to the Port of Beaumont, the Beaumont Customs District also includes a segment of the Neches River on which lies a number of oil refineries and petrochemical plants. These private facilities generate a large volume of foreign ships which bring feedstock and deliver final or refined products. In 2002, these facilities imported more than $9 billion of crude oil and other petroleum products, which accounted for almost 90 percent of all imports (Table 4.6). Road vehicles were another important commodity imported in this district at $911 million. Power generating machinery and equipment was the third most important category of imports, which totaled $80 million. The largest volume of goods exported from Beaumont consists of petroleum, petroleum products, and organic chemicals. However, agricultural products are also important, and more than $100 million of cereals and cereal preparations were exported in 2002.

Table 3.6 Top Three Export and Import Commodities at the Beaumont Customs District, 2002

Rank	SITC	Description	Value	Share of Total
EXPORTS				
1	33	Petroleum, petroleum products and related material	$351,835,179	40.6%
2	51	Organic chemicals	216,189,150	24.9%
3	04	Cereals and cereal preparations	106,552,981	12.3%
Remainder of Commodities			192,101,785	22.2%
Total			**$866,679,095**	**100.0%**
IMPORTS				
Rank	**SITC**	**Description**	**Value**	**Share of Total**
1	33	Petroleum, petroleum products and related material	$9,068,990,441	88.8%
2	78	Road vehicles (including air cushion vehicles)	910,670,748	8.9%
3	71	Power generating machinery and equipment	80,057,089	0.8%
Remainder of Commodities			153,466,596	1.5%
Total			**$10,213,184,874**	**100.0%**

Source: U.S. Maritime Administration, 2003.

The most important export markets for the Beaumont Customs District were Mexico, South Korea, and Venezuela, with approximately 47 percent of all exports going to Mexico (Table 4.7). These three countries account for more than 60 percent of the customs district's total exports. Mexico was the Beaumont Customs District's largest importer in 2002, accounting for almost 25 percent of imports, while Saudi Arabia shipped 22.2 percent of the import cargo handled at its ports and terminals. Germany ranked as the third largest importer at 8.2 percent.

Table 3.7 Top Three Trading Partners at the Beaumont Customs District, 2002

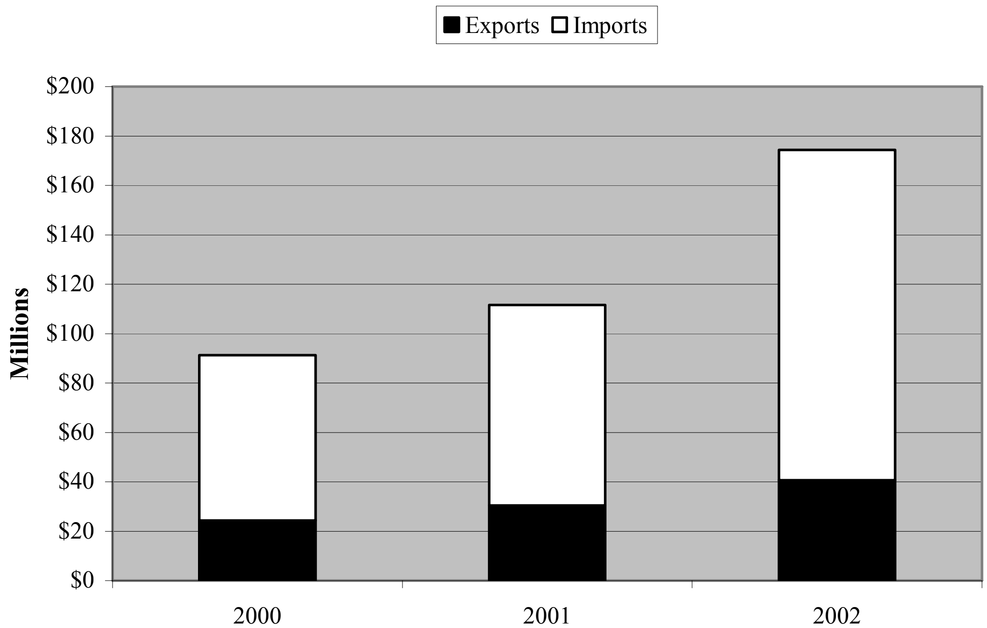
Rank	Country	Value	Share of Total
		EXPORTS	
Rank	**Country**	**Value**	**Share of Total**
1	Mexico	$406,813,936	46.9%
2	South Korea	70,954,502	8.2%
3	Venezuela	62,811,210	7.2%
Remainder of World		326,099,447	37.6%
Total		**$866,679,095**	**100.0%**
		IMPORTS	
Rank	**Country**	**Value**	**Share of Total**
1	Mexico	2,512,369,257	24.6%
2	Saudi Arabia	2,270,499,983	22.2%
3	Germany	840,054,351	8.2%
Remainder of World		4,590,261,283	44.9%
Total		**10,213,184,874**	**100.0%**

Source: U.S. Maritime Administration, 2003.

3.2.2 Brownsville Customs District

The Brownsville Customs District consists of the deepwater ports of Brownsville and Port Isabel, along with two shallow water ports, Harlingen and Port Mansfield. Unlike the maritime trade volumes at other Texas customs ports, total maritime trade volumes at the Brownsville customs district increased every year between 2000 and 2002 from $91.3 million to $174.4 million (Figure 3.7). Imports made up the largest share of the total trade, growing from $67 million to 133.7 million during this period, while export trade grew from $24.3 million to $40.7 million.

Figure 3.7 Export and Import Trade at the Brownsville Customs District, 2000-2002



Source: U.S. Maritime Administration, 2001-2003.

Petroleum products were the most important maritime exports from the Brownsville Customs District, totaling $27.3 million in 2002 or 67 percent of total exports (Table 3.8). They were also the most important import commodity in 2002 at $72.8 million or 54.5 percent of total imports. Industrial machinery and parts and textiles were the second and third most important export commodities, respectively. Together these commodities accounted for 89 percent of the cargo handled at the port. Iron and steel were other important import commodities and were frequently shipped to maquiladoras in Mexico to be used in manufacturing.

Table 3.8 Top Three Export and Import Commodities at the Brownsville Customs District, 2002

EXPORTS

Rank	SITC	Description	Value	Share of Total
1	33	Petroleum, petroleum products, and related material	$27,264,624	67.0%
2	74	General industrial machinery equipment and parts	7,416,716	18.2%
3	65	Textile yarn, fabrics, related products	1,535,937	3.8%
Remainder of Commodities			4,493,694	11.0%
Total			**$40,710,971**	**100.0%**

IMPORTS

Rank	SITC	Description	Value	Share of Total
1	33	Petroleum, petroleum products, and related material	$72,820,388	54.5%
2	67	Iron and steel	17,753,321	13.3%
3	76	Telecommunications and sound recording apparatus	14,436,213	10.8%
Remainder of Commodities			28,708,671	21.5%
Total			**$133,718,593**	**100.0%**

Source: U.S. Maritime Administration, 2003.

Singapore was the Brownsville Custom District's largest export trading partner in 2002, receiving $10.3 million of goods or approximately one-quarter of the district's total exports (Table 3.9). Combined with the Netherlands ($9.3 million or 22.8 percent share) and Spain ($7.4 million or 18.1 percent share), these three countries accounted for two-thirds of the total maritime exports. China was the custom districts largest importer, sending $37 million of goods or 27.6 percent of the total maritime imports. Mexico, surprisingly, was second with $30.1 million of imports and Germany third with $13.4 million.

Table 3.9 Top Three Trading Partners at the Brownsville Customs District, 2002

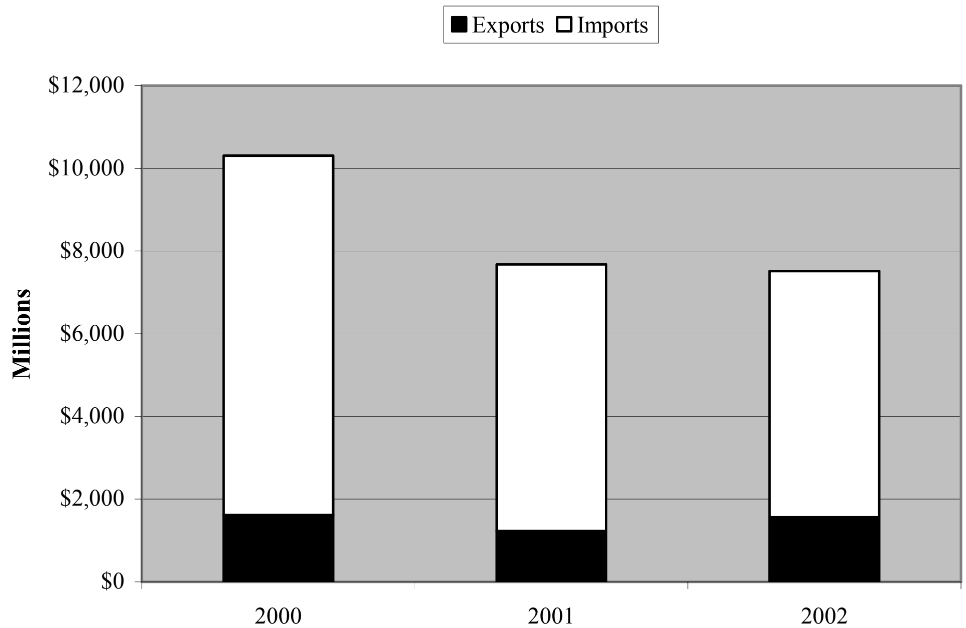
Rank	Country	Value	Share of Total
		EXPORTS	
Rank	**Country**	**Value**	**Share of Total**
1	Singapore	$10,332,066	25.4%
2	Netherlands	9,272,174	22.8%
3	Spain	7,363,813	18.1%
Remainder of World		13,742,918	33.8%
Total		**$40,710,971**	**100.0%**
		IMPORTS	
Rank	**Country**	**Value**	**Share of Total**
1	China (Mainland)	$36,955,248	27.6%
2	Mexico	30,073,162	22.5%
3	Germany	13,436,980	10.0%
Remainder of World		53,253,203	39.8%
Total		**$133,718,593**	**100.0%**

Source: U.S. Maritime Administration, 2003.

3.2.3 Corpus Christi Customs District

The Corpus Christi Customs District contains the Port of Corpus Christi, as well as a number of private terminals serving the large industrial complexes in the surrounding region. The Corpus Christi Customs District experienced a substantial decline in volume between 2000 and 2002 from more than $10.3 billion of total maritime trade to $7.5 billion or a decrease of 27 percent (Table 3.8). Imports declined more rapidly than exports, with imports falling from $8.7 billion in 2000 to $6 billion in 2002. Exports diminished modestly from $1.62 billion in 2000 to $1.56 billion in 2002.

Figure 3.8   Export and Import Trade at the Corpus Christi Customs District, 2000-2002



Source: U.S. Maritime Administration, 2001-2003.

Petroleum and petroleum products were the most important imports and exports in the Corpus Christi Customs District (Table 3.10). Almost 95 percent ($5.6 billion) of the imported goods were petroleum or petroleum products, which also accounted for 31.5 percent ($491 million) of the total exports. Other important export products were organic chemicals ($385 million or 24.7 percent share) and cereals ($220.8 million or 14.1 percent). Scrap metal and metal ore imports totaled $210.3 million (a 3.5 percent share of total imports), ranking second, and power generating machinery and equipment, which accounted for less than one percent of total imports, ranked third.

Table 3.10 Top Three Export and Import Commodities at the Corpus Christi Customs District, 2002

Rank	SITC	Description	Value	Share of Total
		EXPORTS		
1	33	Petroleum, petroleum products, and related material	$491,025,107	31.5%
2	51	Organic chemicals	385,049,315	24.7%
3	04	Cereals and cereal preparations	220,750,736	14.1%
Remainder of Commodities			463,870,223	29.7%
Total			**$1,560,695,381**	**100.0%**

Rank	SITC	Description	Value	Share of Total
		IMPORTS		
1	33	Petroleum, petroleum products and related material	$5,633,468,807	94.6%
2	28	Metalliferous ores and metal scrap	210,267,064	3.5%
3	71	Power generating machinery and equipment	26,247,159	0.4%
Remainder of Commodities			84,379,698	1.4%
Total			**$5,954,362,728**	**100.0%**

Source: U.S. Maritime Administration, 2003.

Mexico was the Corpus Christi Custom District's most important trading partner, accounting for almost one-third of total exports, with a value of more than one-half billion dollars (Table 3.11). Israel and Canada were ranked as the second and third top markets, receiving $224.9 million and $193.8 million dollars worth of goods, respectively. As would be expected, oil producing countries were the largest import trading partners. Venezuela sent the most goods in 2002, at approximately $1.7 billion, with Nigeria and Mexico placing second and third with $629.5 million and $425.7 million, respectively.

Table 3.11 Top Three Trading Partners at the Corpus Christi Customs District, 2002

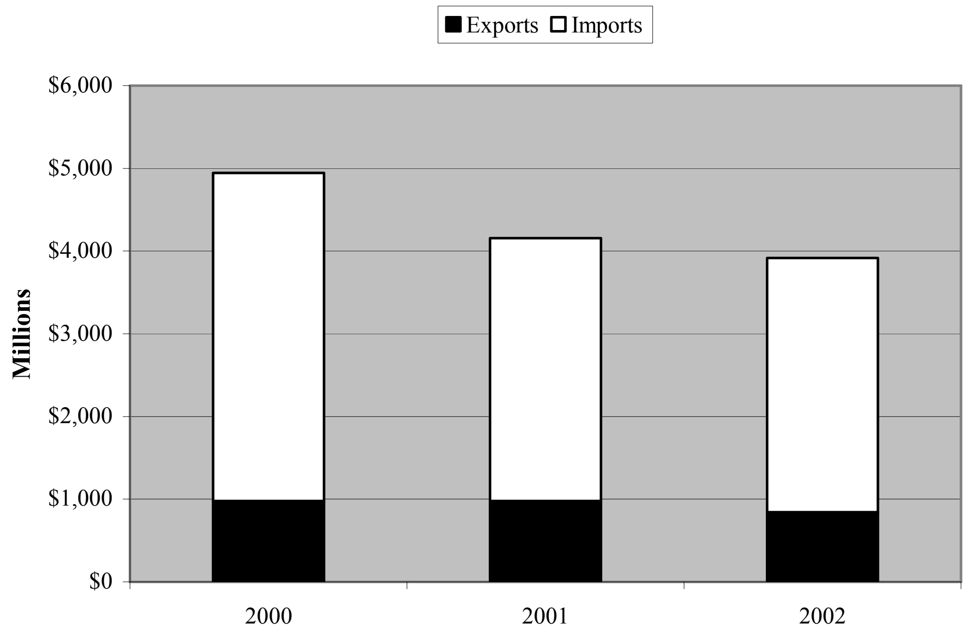
Rank	Country	Value	Share of Total
		EXPORTS	
Rank	**Country**	**Value**	**Share of Total**
1	Mexico	$513,276,261	32.9%
2	Israel	224,905,170	14.4%
3	Canada	193,798,870	12.4%
Remainder of World		628,715,080	40.3%
Total		**$1,560,695,381**	**100.0%**
		IMPORTS	
Rank	**Country**	**Value**	**Share of Total**
1	Venezuela	$1,700,007,158	28.6%
2	Nigeria	629,473,055	10.6%
3	Mexico	425,666,021	7.1%
Remainder of World		3,199,216,494	53.7%
Total		**$5,954,362,728**	**100.0%**

Source: U.S. Maritime Administration, 2003.

3.2.4 Freeport Customs District

The Freeport Customs District contains the Port of Freeport, along with terminals at a number of very large oil refinery and petrochemical plants. Total trade at the Freeport Customs District fell by one-fifth between 2000 and 2002, from $4.9 billion to $3.9 billion (Figure 3.9). During this period, exports declined from $977.0 million to $843.9 million, while import trade fell by almost one-quarter from $3.9 billion to $3.0 billion.

Figure 3.9 Export and Import Trade at the Freeport Customs District, 2000-2002



Source: U.S. Maritime Administration, 2001-2003.

Organic chemicals were the largest export commodity from the Freeport Customs District, totaling $354.4 million in 2002 or 42 percent of total exports (Table 3.12). Other important products were explosive and pyrotechnic products ($239.8 million) and inorganic chemicals ($55.6 million). Petroleum made up 87.6 percent of the district's imports, with organic chemicals and vegetables and fruits ranking second and third, respectively, but neither comprised more than three percent of the total import trade.

Table 3.12 Top Three Export and Import Commodities at the Freeport Customs District, 2002

		EXPORTS		
Rank	**SITC**	**Description**	**Value**	**Share of Total**
1	51	Organic chemicals	$354,376,864	42.0%
2	57	Explosives and pyrotechnic products	239,835,522	28.4%
3	52	Inorganic chemicals	55,564,693	6.6%
Remainder of Commodities			194,084,220	23.0%
Total			**$843,861,299**	**100.0%**

		IMPORTS		
Rank	**SITC**	**Description**	**Value**	**Share of Total**
1	33	Petroleum, petroleum products, and related material	$2,690,226,081	87.6%
2	51	Organic chemicals	86,310,845	2.8%
3	05	Vegetables and fruit	78,080,882	2.5%
Remainder of Commodities			217,906,341	7.1%
Total			**$3,072,524,149**	**100.0%**

Source: U.S. Maritime Administration, 2003.

The Freeport Customs District served a large number of trading partners. South Korea, Honduras, and Guatemala were its three most important export markets in 2002 (Table 3.13). Given that most of the customs district's imports were petroleum-based, it is not surprising to find that the top three importers were oil-producing nations: Venezuela, the United Kingdom, and Nigeria.

Table 3.13 Top Three Trading Partners at the Freeport Customs District, 2002

EXPORTS			
Rank	**Country**	**Value**	**Share of Total**
1	South Korea	$82,369,692	9.8%
2	Honduras	70,888,239	8.4%
3	Guatemala	69,077,271	8.2%
Remainder of World		621,526,097	73.7%
Total		**$843,861,299**	**100.0%**

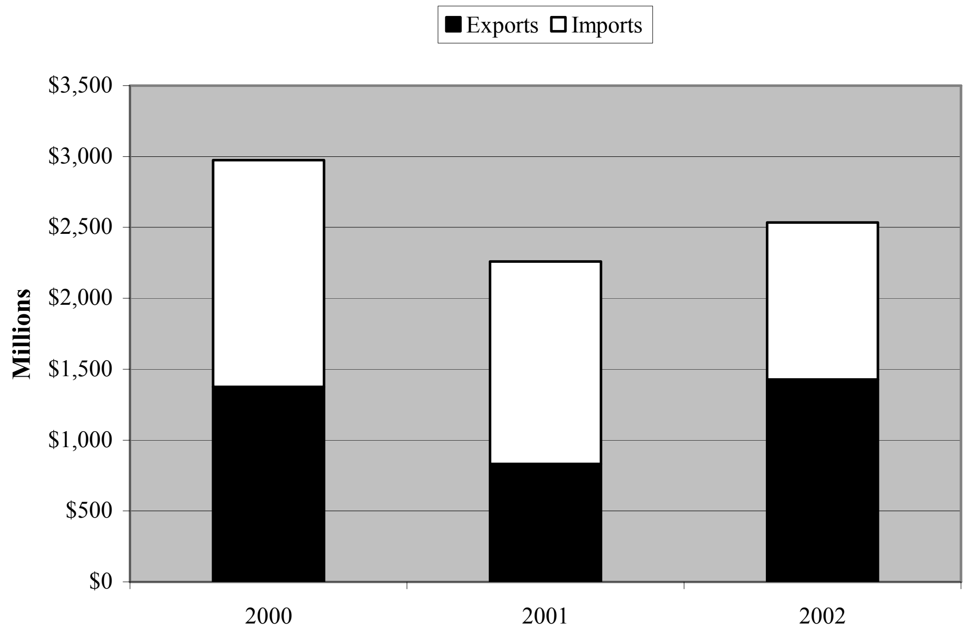
IMPORTS			
Rank	**Country**	**Value**	**Share of Total**
1	Venezuela	$1,201,937,329	39.1%
2	United Kingdom	367,490,566	12.0%
3	Nigeria	348,720,681	11.3%
Remainder of World		1,154,375,573	37.6%
Total		**$3,072,524,149**	**100.0%**

Source: U.S. Maritime Administration, 2003.

3.2.5 Galveston Customs District

The Galveston Customs District contains the Port of Galveston and nearby oil refineries and petrochemical plants. Overall trade values fell at the Galveston Customs District between 2000 and 2002, from just under $3.0 billion in 2000 to slightly more than $2.5 billion during 2002 (Figure 3.11). Export volumes increased modestly from $1.37 billion to $1.43 billion, while the total value of imported goods fell from $1.6 billion to $1.1 billion during this period.

Figure 3.10 Export and Import Trade at the Galveston Customs District, 2000-2002



Source: U.S. Maritime Administration, 2001-2003.

Organic chemicals were also the largest export commodity for the Galveston Customs District, totaling $211.1 million in 2002 (Table 3.16). The value of exported cereals and cereal products was $193.7 million, and the value of exported petroleum products was $111.8 million. Unlike all the previous customs districts discussed, petroleum was not the most important import (ranking third at $132.9 million). Machinery and road vehicles were the two most valuable import commodities at $292.7 and $141.7 million, respectively.

Table 3.14 Top Three Export and Import Commodities at the Galveston Customs District, 2002

		EXPORTS		
Rank	**SITC**	**Description**	**Value**	**Share of Total**
1	51	Organic chemicals	$211,164,424	21.6%
2	04	Cereals and cereal preparations	193,724,981	19.8%
3	33	Petroleum, petroleum products, and related material	111,797,265	11.4%
Remainder of Commodities			460,969,603	47.2%
Total			**$977,656,273**	**100.0%**

		IMPORTS		
Rank	**SITC**	**Description**	**Value**	**Share of Total**
1	72	Machinery specialized for particular industries	$292,738,371	26.4%
2	78	Road vehicles (including air cushion vehicles)	141,734,804	12.8%
3	33	Petroleum, petroleum products, and related material	132,903,615	12.0%
Remainder of Commodities			540,832,357	48.8
Total			**$1,108,209,147**	**100.0%**

Source: U.S. Maritime Administration, 2003.

The Galveston Customs District also had a large number of trading partners. Its largest export market was Mexico, which received $120.3 million of goods, followed by Israel ($65.3 million) and Belgium ($59.2 million) (Table 4.17). Roughly one-quarter of its imports arrived from the United Kingdom, followed by Germany (19.3 percent) and France (9.8 percent).

Table 3.15 Top Three Trading Partners at the Galveston Customs District, 2002

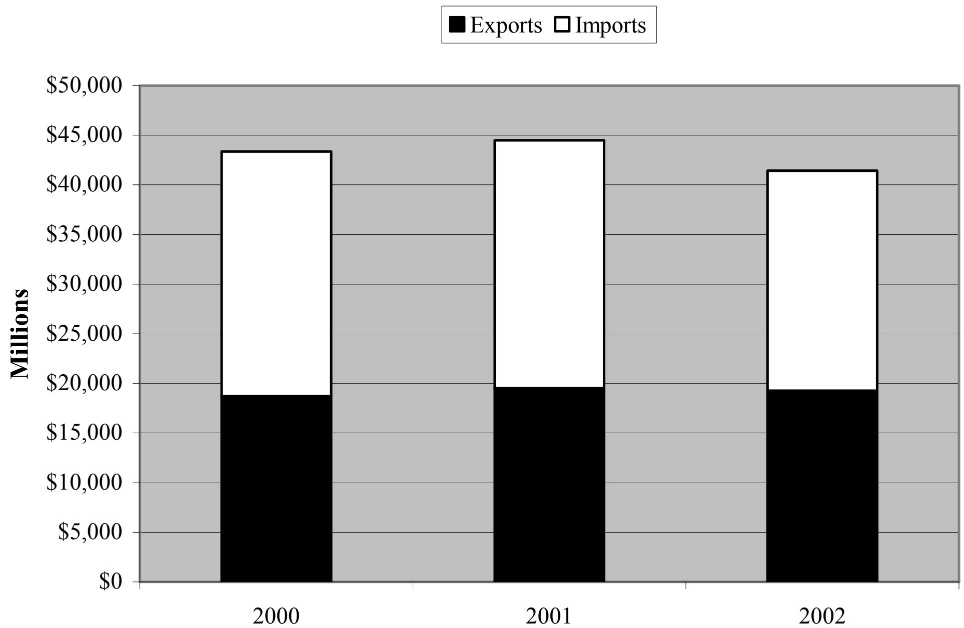
Rank	Country	Value	Share of Total
	EXPORTS		
Rank	**Country**	**Value**	**Share of Total**
1	Mexico	$120,329,816	12.3%
2	Israel	65,336,031	6.7%
3	Belgium	59,198,290	6.1%
Remainder of World		732,792,136	74.9%
Total		**$977,656,273**	**100.0%**
	IMPORTS		
Rank	**Country**	**Value**	**Share of Total**
1	United Kingdom	$258,949,750	23.4%
2	Germany	214,391,422	19.3%
3	France	108,321,884	9.8%
Remainder of World		526,546,091	47.5%
Total		$1,108,209,147	**100.0%**

Source: U.S. Maritime Administration, 2003.

3.2.6 Houston Customs District

The Houston Customs District contains the various facilities that make up the Port of Houston Authority, which handles container and bulk cargoes. It also includes dozens of private terminals along the Houston ship channel that handle petroleum products, liquid and dry bulk cargo, heavy machinery, automobiles, and agricultural products. In terms of total weight, the Houston Customs District is one of the busiest in the nation and is the largest in Texas with a total foreign trade volume of $41.4 billion in 2002 (Figure 3.10). Unlike many other customs ports in Texas, the Houston Customs District increased its total trade volume during 2001 before falling in 2002. Although the volume of imports exceeded the volume of exports during this period, they were closer to parity than at most other Texas customs ports. Between 2000 and 2002, exports rose from $18.7 billion to $19.3 billion, while imports fell from $24.6 billion to $22.2 billion.

Figure 3.11 Export and Import Trade at the Houston Customs District, 2000-2002



Source: U.S. Maritime Administration, 2001-2003.

The Houston Customs District handled a wider variety of commodities than most other districts in Texas. Organic chemicals were the most important export commodity at $3.7 billion, followed by various types of machinery which totaled $4.6 billion (Table 3.14). Petroleum and petroleum products were the largest import commodities at $9.1 billion in 2002 and accounted for more than 40 percent of all imported goods. Road vehicles and steel were other important imports at $1.6 and $1.5 billion, respectively.

Table 3.16 Top Three Export and Import Commodities at the Houston Customs District, 2002

Rank	SITC	Description	Value	Share of Total
		EXPORTS		
Rank	**SITC**	**Description**	**Value**	**Share of Total**
1	51	Organic chemicals	$3,677,115,299	19.1%
2	72	Machinery specialized for particular industries	2,919,643,637	15.2%
3	74	General industrial machinery and equipment and parts	1,683,104,319	8.7%
Remainder of Commodities			10,982,804,945	57.0%
Total			**$19,262,668,200**	**100.0%**
		IMPORTS		
Rank	**SITC**	**Description**	**Value**	**Share of Total**
1	33	Petroleum, petroleum products, and related material	9,113,221,920	41.1%
2	78	Road vehicles (including air cushion vehicles)	1,583,001,702	7.1%
3	67	Iron and steel	1,510,771,261	6.8%
Remainder of Commodities			9,961,570,144	44.9%
Total			**$22,168,565,027**	**100.0%**

Source: U.S. Maritime Administration, 2003.

Facilities within the Houston Customs District traded with a large number of countries, with the three most important export markets in 2002 being Mexico, Brazil, and Belgium, respectively (Table 3.15). Mexico was also the Houston Custom District's largest import trade partner in 2002, with $3.6 billion worth of goods or 16.3 percent of total imports. Germany and Italy were the second and third largest import partners at $2.5 billion and $1.2 billion, respectively.

Table 3.17 Top Three Trading Partners at the Houston Customs District, 2002

Rank	Country	Value	Share of Total
	EXPORTS		
1	Mexico	$1,693,396,243	8.8%
2	Brazil	1,415,304,109	7.3%
3	Belgium	1,200,559,245	6.2%
Remainder of World		14,953,408,603	77.6%
Total		**$19,262,668,200**	**100.0%**

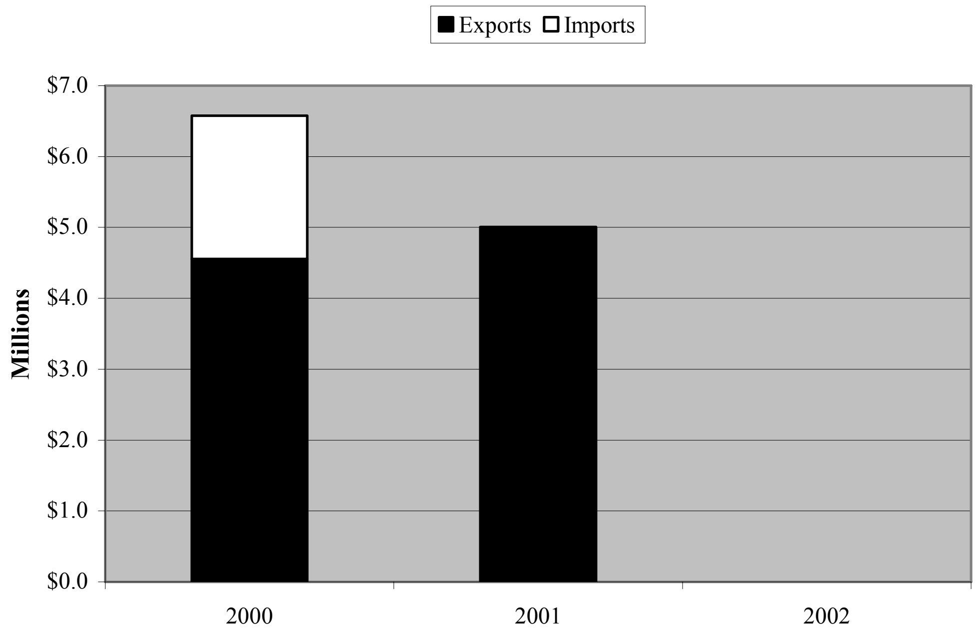
Rank	Country	Value	Share of Total
	IMPORTS		
1	Mexico	$3,612,586,442	16.3%
2	Germany	2,499,196,978	11.3%
3	Italy	1,230,712,697	5.6%
Remainder of World		14,826,068,910	66.9%
Total		**22,168,565,027**	**100.0%**

Source: U.S. Maritime Administration, 2003.

3.2.7 Orange Customs District

Trade volumes at the Orange Customs District fluctuated significantly between 2000 and 2002, primarily because the Port of Orange is its dominant facility and the port's cargo volumes shifted from year to year. In 2000, the Orange Customs District handled $6.6 million worth of goods, consisting of approximately $4.6 million worth of exports and $2.0 million imports (Figure 3.12). During 2001, the district handled only exported goods, which rose slightly from 2000 to $5.0 million. No commodities were handled in the customs district during 2002.

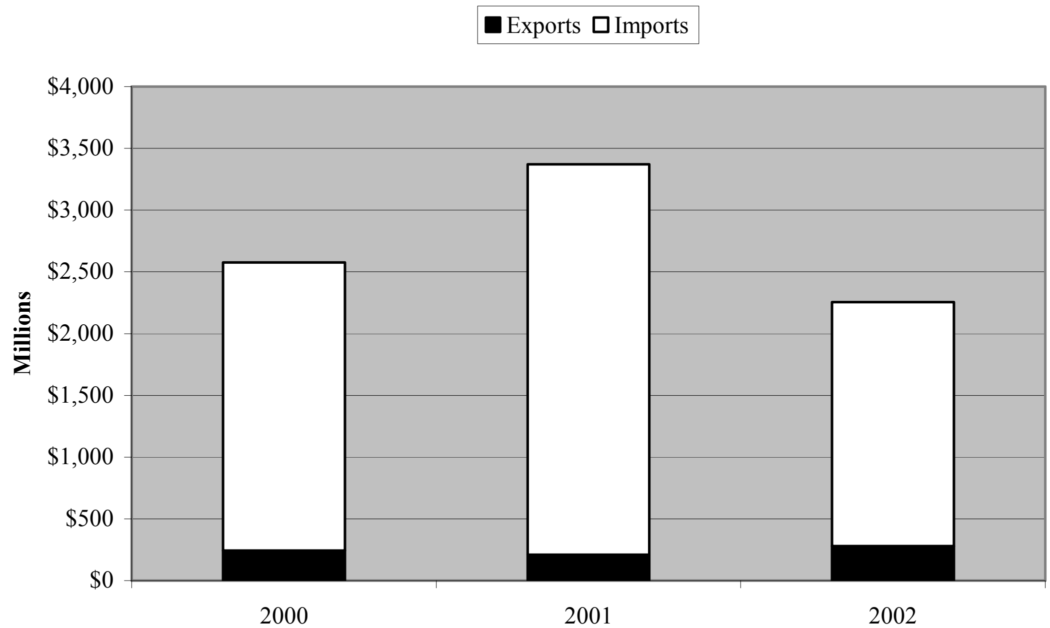
Figure 3.12 Export and Import Trade at the Orange Customs District, 2000-2002



3.2.8 Source: U.S. Maritime Administration, 2001-2003.Port Arthur Customs District

The Port Arthur Customs District consists of the Port of Port Arthur, as well as terminals at large oil refineries and petrochemical plants in the surrounding area. The overall volume of trade at the Port Arthur Customs District fell between 2000 and 2002 from $2.5 billion to $2.2 billion, although it did rise substantially in 2001 to almost $3.4 billion (Figure 3.13). Most of the trade handled at the customs ports were imports, which fell from $2.3 billion to approximately $2.0 billion. Export volumes, comparably, increased modestly from $243.4 million to $280.5 million.

Figure 3.13   Export and Import Trade at the Port Arthur Customs District, 2000-2002



Source: U.S. Maritime Administration, 2001-2003.

Petroleum products made up more than two-thirds of the exports from the Port Arthur Customs District, while paper products and organic chemicals accounted for 20.2 percent and 6.9 percent of exports, respectively (Table 3.18). More than 90 percent of its imports were petroleum products, with iron and steel comprising of 5.2 percent of total imports and cork and wood accounting for just over one percent.

Table 3.18 Top Three Export and Import Commodities at the Port Arthur Customs District, 2002

Rank	SITC	Description	Value	Share of Total
		EXPORTS		
1	33	Petroleum, petroleum products and related material	$191,936,835	68.4%
2	64	Paper, paperboard, articles of paper, paper-pulp/board	56,761,202	20.2%
3	51	Organic chemicals	19,383,932	6.9%
Remainder of Commodities			12,442,418	4.4%
Total			**$280,524,387**	**100.0%**

Rank	SITC	Description	Value	Share of Total
		IMPORTS		
1	33	Petroleum, petroleum products, and related material	$1,784,901,349	90.5%
2	67	Iron and steel	103,124,171	5.2%
3	24	Cork and wood	21,820,831	1.1%
Remainder of Commodities			63,418,053	3.2%
Total			**$1,973,264,404**	**100.0%**

Source: U.S. Maritime Administration, 2003.

The top three export markets for goods sent from the Port Arthur Customs District were the Netherlands (15.4 percent), Italy (10.8 percent), and Venezuela (8.6 percent) (Table 3.19). Almost one-half of the imports came from Mexico, followed by Iraq (16.7 percent) and Saudi Arabia (9.0 percent).

Table 3.19 Top Three Trading Partners at the Port Arthur Customs District, 2002

Rank	Country	Value	Share of Total
	EXPORTS		
1	Netherlands	$43,215,654	15.4%
2	Italy	30,314,878	10.8%
3	Venezuela	24,131,573	8.6%
Remainder of World		182,862,282	65.2%
Total		**$280,524,387**	**100.0%**

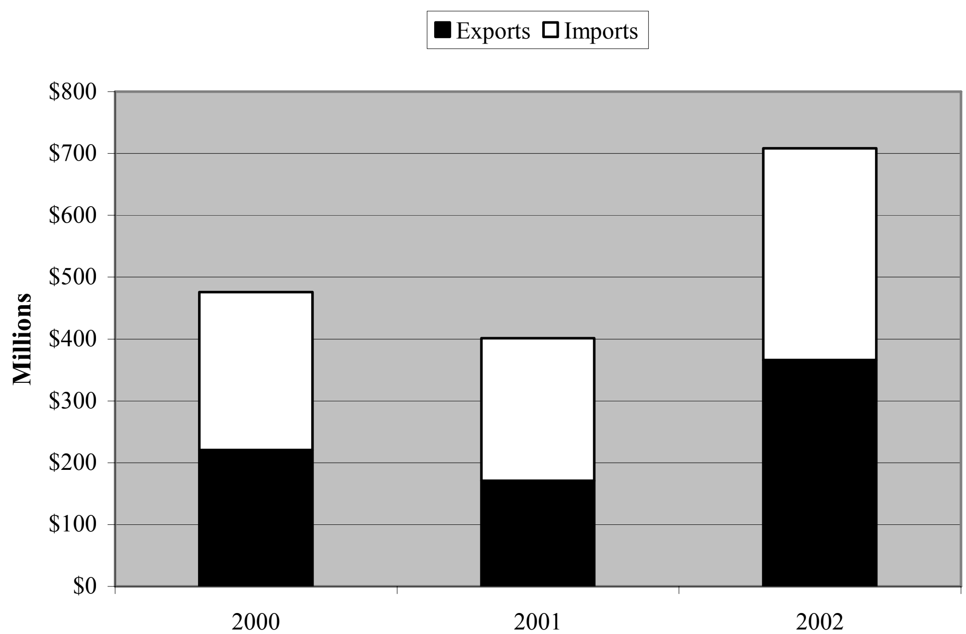
Rank	Country	Value	Share of Total
	IMPORTS		
1	Mexico	$958,076,414	48.6%
2	Iraq	328,893,421	16.7%
3	Saudi Arabia	178,520,765	9.0%
Remainder of World		507,773,804	25.7%
Total		**$1,973,264,404**	**100.0%**

Source: U.S. Maritime Administration, 2003.

3.2.9 Port Lavaca Customs District

The Port Lavaca Customs District contains the Port of Port Lavaca/Point Comfort, which primarily handles chemicals and fertilizers, along with nearby private terminals that handle crude oil and bauxite (aluminum ore). Total trade at the Port Lavaca Customs District increased by almost 50 percent or by $232.4 million between 2000 and 2002 (Figure 3.14). Both import and export trade grew, with exports rising from $220.6 million to $366.3 million and imports increasing from $255.2 million to $341.9 million.

Figure 3.14 Export and Import Trade at the Port Lavaca Customs District, 2000-2002



Source: U.S. Maritime Administration, 2001-2003.

Most of the commodities exported from the Port Lavaca Customs District were organic chemicals, which accounted for almost 95 percent of the total (Table 3.20). Inorganic chemicals were the second most important export at 4.4 percent of the total. Petroleum and petroleum products were the most important imports, representing more than 70 percent of the total. Scrap metal and metal ores accounted for almost 16 percent of total imports and inorganic chemicals for 9 percent.

Table 3.20 Top Three Export and Import Commodities at the Port Lavaca Customs District, 2002

EXPORTS				
Rank	**SITC**	**Description**	**Value**	**Share of Total**
1	51	Organic chemicals	$345,728,364	94.4%
2	52	Inorganic chemicals	16,044,888	4.4%
3	33	Petroleum, petroleum products and related material	1,819,790	0.5%
Remainder of Commodities			2,700,214	0.7%
Total			**$366,293,256**	**100.0%**

IMPORTS				
Rank	**SITC**	**Description**	**Value**	**Share of Total**
1	33	Petroleum, petroleum products and related material	$241,465,116	70.6%
2	28	Metalliferous ores and metal scrap	54,470,190	15.9%
3	52	Inorganic chemicals	30,858,178	9.0%
Remainder of Commodities			15,057,172	4.4%
Total			**$341,850,656**	**100.0%**

Source: U.S. Maritime Administration, 2003.

Three Asian countries were the top destination for commodities exported from the Port Lavaca Customs District. In order of importance they were South Korea (46.6 percent), Taiwan (19.3 percent), and Japan (15.5 percent) (Table 4.21). Mexico provided approximately 45 percent of the district's imports, followed by Guinea at 14.5 percent and Venezuela at 10.5 percent.

Table 3.21 Top Three Trading Partners at the Port Lavaca Customs District, 2002

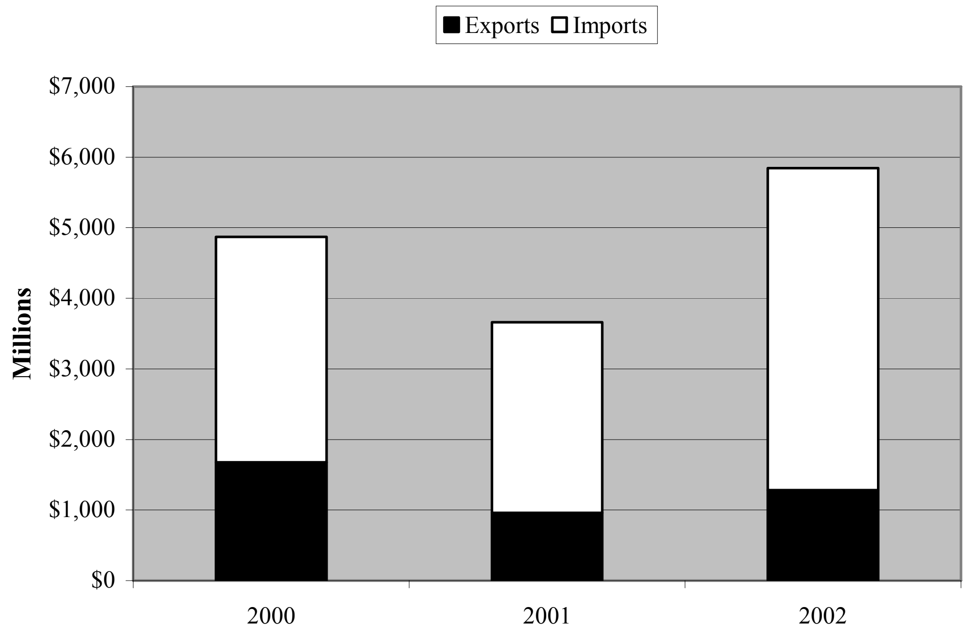
Rank	Country	Value	Share of Total
	EXPORTS		
1	South Korea	$170,646,234	46.6%
2	China (Taiwan)	70,876,022	19.3%
3	Japan	56,788,295	15.5%
Remainder of World		67,982,705	18.6%
Total		**$366,293,256**	**100.0%**
	IMPORTS		
Rank	**Country**	**Value**	**Share of Total**
1	Mexico	$153,565,763	44.9%
2	Guinea	49,453,084	14.5%
3	Venezuela	35,764,071	10.5%
Remainder of World		103,067,738	30.1%
Total		**$341,850,656**	**100.0%**

Source: U.S. Maritime Administration, 2003.

3.2.10 Texas City Customs District

In addition to the privately-owned Port of Texas City, the Texas City Customs District also contains a number oil refinery and petrochemical terminals located along the Texas City ship channel. Total trade volumes fluctuated substantially at the Texas City Customs District between 2000 and 2002. In 2000, the customs district handled approximately $4.9 billion of goods, falling to $3.7 billion in 2001, before growing to $5.8 billion in 2002 (Table 3.15). The overall pattern of exports showed a downward trend, declining from $1.7 billion to $1.3 billion between 2000 and 2002. However, during this same period, import trade increased from $3.2 billion to $4.6 billion.

Figure 3.15 Export and Import Trade at the Texas City Customs District, 2000-2002



Source: U.S. Maritime Administration, 2001-2003.

Given that the Texas City Customs District is home to a large number of oil refineries and petrochemical plants, it is not surprising that 97 percent of its imports were petroleum products and more than two-thirds of the exports were organic chemicals (Table 4.22). Other important exports were closely related petroleum and chemical products.

Table 3.22 Top Three Export and Import Commodities at the Texas City Customs District, 2002

Rank	SITC	Description	Value	Share of Total
		EXPORTS		
1	51	Organic chemicals	$868,450,307	67.7%
2	33	Petroleum, petroleum products and related material	280,977,694	21.9%
3	59	Chemical materials and products, n.e.s.	54,828,666	4.3%
Remainder of Commodities			78,639,043	6.1%
Total			**$1,282,895,710**	**100.0%**

Rank	SITC	Description	Value	Share of Total
		IMPORTS		
1	33	Petroleum, petroleum products and related material	$4,450,818,757	97.6%
2	51	Organic chemicals	90,848,857	2.0%
3	34	Gas, natural and manufactured	5,604,456	0.1%
Remainder of Commodities			14,993,575	0.3%
Total			**$4,562,265,645**	**100.0%**

Source: U.S. Maritime Administration, 2003.

Mexico was the Texas City Custom District's largest export market in 2002, receiving 43 percent of outgoing goods (Table 3.23). Brazil and Belgium were ranked second and third at 6.5 percent and 6 percent, respectively. Saudi Arabia, Venezuela, and Trinidad and Tobago, which are all oil-producing nations, were the three top importing countries.

Table 3.23 Top Three Trading Partners at the Texas City Customs District, 2002

		EXPORTS	
Rank	**Country**	**Value**	**Share of Total**
1	Mexico	$551,450,987	43.0%
2	Brazil	83,315,812	6.5%
3	Belgium	76,907,188	6.0%
Remainder of World		571,221,723	44.5%
Total		**$1,282,895,710**	**100.0%**
		IMPORTS	
Rank	**Country**	**Value**	**Share of Total**
1	Saudi Arabia	$952,159,818	20.9%
2	Venezuela	594,765,110	13.0%
3	Trinidad And Tobago	592,195,922	13.0%
Remainder of World		2,423,144,795	53.1%
Total		**$4,562,265,645**	**100.0%**

Source: U.S. Maritime Administration, 2003.

3.3 Summary

Although this chapter has provided the reader with a large volume of detailed information to digest, several key facts emerge. First, the volume of imported goods handled at Texas ports outweighs the volume of exports by a more than five-to-one ratio. Second, more than two-thirds of imports are petroleum and petroleum products, which fuel the state's oil refinery and petrochemical industries along the Gulf Coast. Almost one-quarter of Texas' maritime exports are organic chemicals, which are also produced at many of these facilities. However, despite the emphasis on serving the petrochemical industry, Texas ports also handle a wide variety of cargoes from bulk to containerized goods that serve industrial and consumer markets. Third, trade volumes can fluctuate greatly at the ports depending upon regional, national, and/or global economic conditions, port competitiveness, and the market prices of various commodities. Despite the downward trends shown for some of these customs districts, which captured a period of hypergrowth in the national economy that was immediately followed by recession, the future development of the state's economy will ensure that there will be an ongoing demand for well-developed and well-connected deepwater ports.

4. Landside Access Issues at Deepwater Ports in Texas

An efficient maritime transportation system relies on connecting different segments and modes in an integrated manner in order to build a seamless network. For freight movement this involves transporting cargo from vessels through terminals, as well as to and from inland destinations. Ports are a critical intermodal link of this system and are important for sustaining the system's well being. During the study period of this project, CTR researchers made two field visits to each port to meet with port officials to discuss current landside issues. The paragraphs below provide a brief description of the findings from these interviews.

4.1 Port of Orange

The Port of Orange has handled cargo on an intermittent basis for the past few years but has primarily operated as a layberth port during this period. As a result, the port has not developed any substantial landside congestion problems. The primary arterial serving the Port of Orange is IH 10, which traverses the U.S. from Florida to California. From IH 10, north-south interstate and major U.S. highways can be accessed in Houston (IH 45 and US 59), which is about a two-hour drive from the Port of Orange. Locally, the port is served by FM 1006, which connects to BR 90 and ultimately to IH 10. Other northbound arterials near the Port of Orange are SH 62 and SH 87.

UP owns the track that enters into the Port of Orange and traverses alongside its dock. Although the port's rail connection is to UP track, users can also access the services of the BNSF and Sabine River & Northern Railroads (Port of Orange, 2005). The Sabine River & Northern Railroad is a short line railroad operated by the Temple-Inland Corporation to move wood pulp and paper products (UP, 2005). From the Port of Orange, rail traffic can move east and west on the UP's "Sunset Route" or north on either BNSF or UP tracks.

Although the port handles traffic intermittently, truck back up can occur when cargo is handled along Alabama Street as trucks wait to be cleared by the new security gate at the port's entrance. Cargo is moved primarily by truck and the connecting arterial to the port (FM 1006), which typically has light traffic. According to Port of Orange personnel, approximately 80 percent of cargo handled by the port travels by truck and 20 percent travels by rail. Any rail traffic produced by the port could contribute to the rail congestion problems in the Beaumont area. As a result, these activities could have some effect on the Port of Orange's level of service and could contribute to the region's overall rail congestion.

The Port of Orange, which is located along the Gulf Intercoastal Waterway, could benefit from development of a container-on-barge (COB) service to support the local plastics and petrochemical industry. However, at the time of this study, no COB service was in operation.

4.2 Port of Beaumont

The Port of Beaumont is located along the Neches River at a point approximately 20 miles inland from the Gulf of Mexico. The port primarily handles wood products, pot ash, grain, and similar bulk commodities that are "cross-docked" from ship to rail car or from rail car to ship. Military and "project" (large and bulky) shipments constitute an important and growing source of business for the port. Most of the port's military cargo enters by rail and includes a substantial number of RO/RO shipments of military vehicles (e.g., tanks, armored vehicles, heavy trucks, etc.). The port handles a few containers each year, but personnel indicate an interest in developing a container on barge service to expand this capability.

The Port of Beaumont maintains good landside connections that include roadway and rail. The port's primary roadway connection is IH 10, which crosses the nation from east to west starting in Jacksonville, Florida and ending in Santa Monica, California. IH 10 provides the Port of Beaumont with access to the cities of Houston and New Orleans, and roadway interchanges with IH 10 are located within a few miles of the port. Various highways provide the port with north-south access, including US 69/287 and US 96. The port is also served by three Class I railroads: UP, BNSF, and KCS. Each of these railroads delivers rail cars to the port, which in turn are handled within the port's perimeter by a contract switching operator called Trans-Global Solutions, Inc. According to statistics provided by the Port of Beaumont, the port handled almost 48,000 rail cars in 2003.

In terms of truck traffic, the Port of Beaumont does not appear to be experiencing any substantial roadway congestion problems on the local network at the current time. However there is congestion along the segment of IH 10 that passes through Beaumont. Prior improvements to MLK Boulevard (SH 380), which is connected to the port by Franklin Street to IH 10, have reduced past congestion. However, at-grade rail crossings near the port contribute to local roadway congestion, including trucks serving the port. The rail traffic which contributes to local congestion is in part caused by a poor connection between the port and mainline of the "Sunset Limited" track. This causes trains to be backed up and to operate at very slow speeds. The Sunset Limited is a major east-west rail corridor in the U.S., regionally connecting Houston and New Orleans, and is primarily owned by UP.

The local configuration of tracks in the Beaumont area requires that multiple rail lines converge into a single line of track that crosses the Neches River over a lift bridge. To further complicate matters, the short segment of the Sunset Limited that crosses the Neches River is owned by KCS. Because several tracks must funnel into a single line of KCS track at the Neches River in Beaumont, it quickly becomes apparent that this segment of single track restricts rail capacity between New Orleans, Houston, and the West Coast. Additionally, this capacity constraint complicates rail access to the Port of Beaumont because to enter the port from the mainline, trains must block the mainline while interchanging cars to and from the port. Approximately 800 trains per year (averaging roughly two per day) travel in and out of the port. Traffic volume on the Sunset Limited route is heavy and appears to consist of about 40 to 50 trains per day.

Although there is rail access to both the north and south sides of the port property, all trains enter through the exchange yard with the exception of KCS trains, which serve the port's grain elevator. Before rail cars can enter or leave the port using the north entrance, they must be marshaled in the port's interchange yard, which lies north of the Sunset Limited route mainline and along the Neches River. The interchange yard consists of four short tracks that have a total capacity of about 120 cars (approximately 30 rail cars apiece). This requires BNSF, UP, and KCS to split up inbound trains so that a single train can be made to fit. When a train is being dispatched to the port, the train operator must approach the port turnout from the west and then "run around" the cars to shove them into the interchange yard, thereby briefly blocking *both* main tracks. Trains coming from the east pull past the turnout and reverse into the yard. In either case, one of the two main tracks is blocked for an extended period, effectively lengthening the single-track portion of the route.

4.3 Port of Port Arthur

The Port of Port Arthur is a break bulk port at the mouth of Neches River. The primary commodities handled at the Port of Port Arthur include steel, lumber, and newsprint, with most of these products arriving from Latin America and Europe. Most of the cargoes handled at the

Port of Port Arthur are import commodities. Port personnel reported that approximately 60 percent of cargo handled enters or leaves the port by rail and 40 percent by truck, but these percentages change depending upon the type of cargo handled and the preferences of the shipper. Most of the steel and paper products leave the port by rail, along with some lumber, while most of the lumber leaves by truck. Many products handled by the port have final destinations outside of the state, requiring trucks serving the port to make significant use of the state's roadway transportation network.

For trucks with origins or destinations east or west of the Port of Port Arthur, the primary route is IH 10, but there are two links for connecting it with the port: SH 73 and US 96. Northbound and southbound truck traffic would most likely travel on US 69 or US 96. Locally, the port is located in downtown Port Arthur, and trucks must travel on city streets and arterials to reach major roadways. The Port of Port Arthur is served exclusively by the KCS Railroad. Despite the port's historic links to KCS, personnel indicate the need to build a connecting spur to the nearby UP line so that the port could benefit from the competition between the railroads. However, the piece of land needed to connect the port to the UP line is owned by KCS railroad, so it is uncertain if construction of this spur is possible.

Because of the Port's location in downtown Port Arthur, trucks serving the port must use local streets to enter and leave the facility. The port would support a direct connection to the state highway system that would allow trucks to bypass local streets and connect directly with port facilities.

Like most other Texas ports, the Port of Port Arthur is interested in moving commodities by barges that are presently carried by trucks. Rising fuel prices and the reclassification of the number of hours that truckers can drive have increased trucking charges. Barge service would offer a cost-effective alternative to trucks when it is an appropriate option.

4.4 Port of Galveston

The Port of Galveston is Texas' oldest port and dominated cargo handling for the state prior to the devastating hurricane of 1900 and the subsequent construction of the Houston Ship Channel. The business profile of the Port of Galveston is changing as it places increasing emphasis on its growing cruise industry. On the freight side, the port continues to handle a variety of bulk and project cargoes, which include cement, fertilizers, heavy equipment, and windmill blades. Container business at the Port of Galveston has dropped significantly since the port signed a 20-year lease with Port of Houston for use of its cargo facility. Although the Port of Houston leased the container facility as a reliever facility for its Barbours Cut facility, most of the Port of Houston's customers prefer to continue using Barbours Cut, which has meant little container traffic at the Port of Galveston.

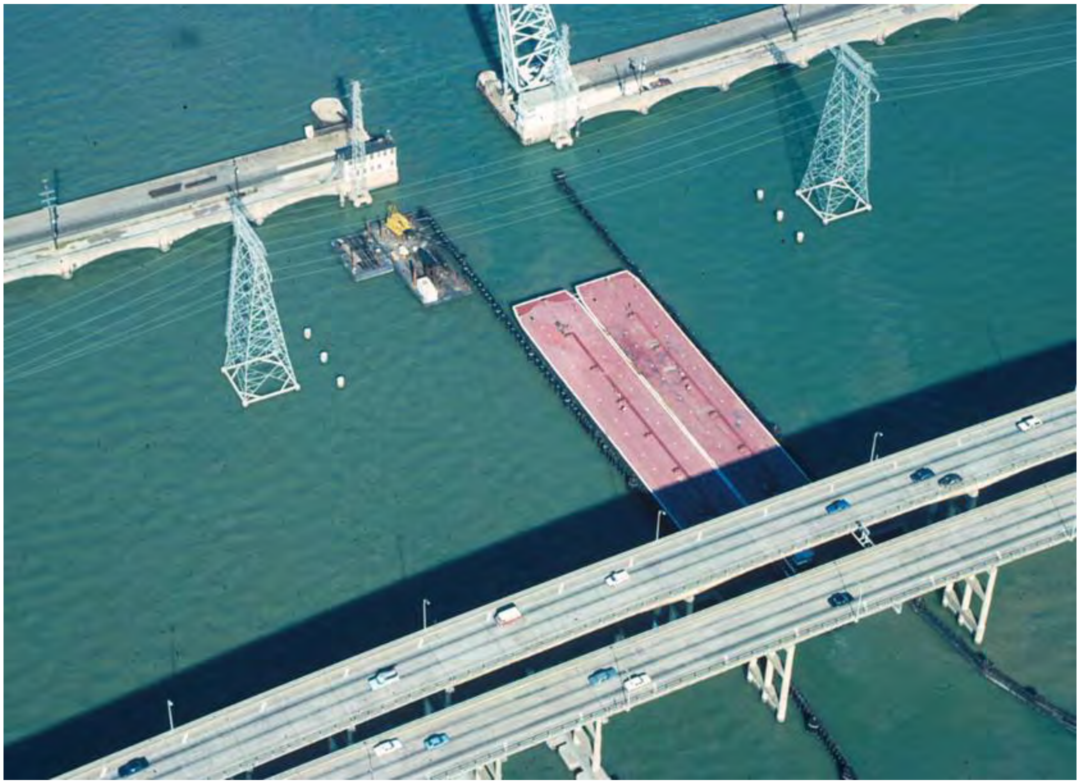
Over the medium to long-term, the Port of Galveston will continue to support and expand its cruise ship industry, because this strategy receives strong support from current City of Galveston officials (the City of Galveston owns the Port of Galveston). The port will also concentrate its cargo activities on its west end while leaving the possibility of redeveloping property on the east side for non-port use.

The Port of Galveston has good landside connections, with direct access to the U.S. interstate system via IH 45, which terminates in Galveston. Using IH 45's connections in Houston, freight trucks can access IH 10 or US 290 for points east and west or US 59 for points north and south, in addition to IH 45 for points north. Locally, the Port of Galveston connects to IH 45 by using Loop 275 (Harborside Drive). The Port of Galveston's rail connections are good considering its offshore location. The port is serviced by rail, and the terminal operator at the port is the Galveston Railroad, which provides switching services to BNSF and UP. There are several rail interchange yards within the port, although some of the tracks were being planned for removal to improve access to the port's cruise terminal. According to port personnel, the minority of cargo moves to and from the port by rail, but the port uses its interchange yards to generate income as a railcar storage facility, primarily for rail hopper cars holding plastic resins.

When CTR researchers interviewed the port officials, they did not report any roadway congestion problems due to the movement of freight. However, they did report significant congestion from passenger trips during days when cruise ships were docked. This congestion is concentrated in downtown Galveston, especially along Loop 275 (Harborside Drive). During the second port visit, a study was underway that would identify techniques for improved port access and reducing congestion, which might include traffic light signalization, grade-separated crossings, and the use of ITS technologies. Port officials have also requested that TxDOT provide improved signage along US 87 (Broadway Street) so that ship passengers can find the cruise terminal more easily. Additionally, widening or adding curb cuts at port entrances would improve truck mobility.

One rail-related landside access issue near the Port of Galveston is the desired replacement of the UP rail bridge over the Gulf Intracoastal Waterway (GIWW) in Galveston Bay. Although the bridge has been designated a hazard to navigation by the U.S. Army Corp of Engineers, barge operators are even more concerned about the future safety of this bridge due to expected changes to its fender system. As it operates now, the bridge's fender system is maintained by TxDOT to protect the IH 45 causeway (Figure 4.1). However, a replacement to the current IH 45 causeway is currently being constructed. When completed, the new causeway will have piers that are outside of the GIWW channel, which will eliminate TxDOT's responsibility to maintain the fendering system. Currently, barge operators use the fendering system to guide their barges through the opening of the rail bridge and to avoid damaging the rail bridge structure. Occasionally, the fendering system is damaged by barge operators (who are required to pay for the repairs). However, without TxDOT's required involvement, it is likely that no entity will take responsibility for repairing the fendering system when it is damaged. Therefore, after the new causeway is completed and TxDOT ends its maintenance of the fendering system, barge operators will eventually have to guide their barge tows through the narrow rail bridge opening without the assistance of the fenders and without the ability to back up if they approach it poorly or the possibility of encountering the effects of water currents. Under these conditions, it will only be a matter of time before a barge tow collides with the rail bridge. If serious structural damage occurred to the bridge, it could close the rail line for an extended period of time and interrupt rail service to the port.

Figure 4.1 Barge Crossing through the Opening of the Galveston Railroad Bridge on the GIWW



Source: Gulf Intercoastal Canal Association, 2004. Used with permission.

4.5 Port of Texas City

While there are numerous private maritime terminals along the Texas coast, the Port of Texas City is the state's only privately-owned port and is jointly owned and managed by the UP and BNSF railroads. This port handles a very significant volume of petroleum and chemical imports that primarily feed into processes performed at nearby oil refineries and petrochemical plants. The port also exports refined and final products to domestic and international markets. The majority of products that enter the port are transferred to their final destination through pipelines or local rail movements to nearby customers.

The Port of Texas City is served by IH 45, which provides direct access to the Houston market and connects to other parts of the region and state. In Houston, trucked freight can use IH 10 for east-west travel, in addition to US 290 to the west and US 90 to the east. Along with IH 45, US 59 provides port users with a major north-south roadway. At the local level, the port can be accessed from IH 45 by Loop 197, which is an uncongested arterial. At the terminal, rail movements are the responsibility of the Texas City Railway Terminal Company, which handles approximately 25,000 rail cars per year on thirty-two miles of track. Connections between the port and the railroad's mainlines occur at two junctions approximately six miles away (Port of Texas City, 2005).

Unlike other Texas ports, the Port of Texas city generates surprising little truck or rail traffic in relation to the volume of cargo handled by the port. Port officials estimate that about two percent of cargo is moved by trucks and three percent by rail. On the other hand, a significant volume of cargo flowing to or from the port travels by barge or coastwise ships. Port of Texas City officials estimated that 75 percent of all cargo handled at the port is transferred to or from a barge or ship. The remaining cargo, approximately 20 percent, moves to or from the port by pipeline. Because the port generates relatively little truck traffic, traffic congestion has not been a problem. However, from a safety perspective, port officials support any improvements by TxDOT that would reduce or eliminate the possibility of an accident at an at-grade rail crossing around the port's periphery. Specifically, it was suggested that TxDOT build a grade separation at Loop 197 south and close SH 3's at-grade crossing after tying it into the parallel SH 146, which has a grade separation. Port officials also identified the need for more rail car storage capacity in the area to keep the BNSF tracks serving Galveston flowing smoothly.

A longstanding project that is moving towards development is the container terminal in Texas City. It is important to clarify that the proposed container terminal is not an expansion of the Port of Texas City's facilities; rather it is a separate endeavor pursued by the City of Texas City and Stevedoring Services of America, Inc. (SSA). As proposed, the container terminal would be constructed as a phased development, ultimately reaching full capacity of approximately two million TEUs. The initial plans do not include immediate rail access, which means that all containers will enter and leave the port by truck. At present, the proposed Shoal Point container terminal has cleared mandatory federal environmental requirements for construction. SSA had initially planned to begin full construction during the fall of 2005, with the first phase of the terminal to be completed in late 2007 or early 2008 with a capacity of about 500,000 TEUs per year. This estimated date was later pushed back to the first quarter of 2009.

4.6 Port of Houston

The Houston ship channel is the location of one of the most concentrated centers of maritime activities in the U.S., ranking first in the nation in overall foreign tonnage handled.

Approximately 85 percent of channel activities occur at its many private maritime terminals, which serve both ships and barges. The remaining activity occurs at docks owned by the Port of Houston Authority, which operates the largest deepwater port in Texas and one of the nation's largest container ports, handling almost 1.2 million TEUs in 2003. In addition to containers, the Port of Houston Authority handles a large volume of bulk and RO/RO cargoes, which include petroleum and petroleum products, chemicals, fertilizers, plastics, iron and steel, and food products.

According to Port of Houston personnel, the Barbours Cut container terminal is presently operating at capacity, and traffic congestion is a major problem in the Houston region. A significant increase in traffic congestion has resulted from Houston's population growth during the 1990s, an increase in the number of jobs in the region, and a growing level of international trade. Growing port-related traffic has led to an increased number of trucks on local roadways. These problems have been exacerbated by inadequate turning lanes, insufficient turning radii, and lack of proper signaling on local and state roadways. The development of the port's new Bayport container terminal will bring online a facility with almost twice the current capacity of Barbours Cut, as well as a cruise ship terminal. A significant share of the containers entering the new terminal will be bound to local distribution centers, resulting in few (if any) options to shift the containers to rail, which means they must travel by truck.

The Port of Houston is served by various roadways, depending upon the terminal being used. The Houston metropolitan area is served by IH 10 and IH 45. Major U.S. highways are US 59 (which will be upgraded to interstate status), US 290, and US 90. Most local truck traffic from the Port of Houston is generated by the Barbours Cut facility. More than 400 trucking companies use the Barbours Cut terminal and make hundreds of thousands of trips per year using the local and state roadway network.

The port is also served by several rail carriers, which include UP, BNSF and the Tex-Mex. Switching service at the Port of Houston and along the Houston ship channel is handled by the Port Terminal Railroad Association (PTRA), which has the responsibility of providing impartial switching services between port facilities and the UP and BNSF railroads (http://www.trainweb.org). The PTRA was formed in 1924 and operates 177 miles of trackage (including 46 miles of mainline track along the ship channel) with a staff of 300. The PTRA moves approximately 500,000 rail cars a year (http://www.trainweb.org and UP, 2005). The

PTRA is managed by a board of directors that consists of two voting members and two non-voting members. The board's voting members are represented by UP and BNSF, and the nonvoting members are represented by PTRA and the Port of Houston. UP also operates an intermodal rail terminal within Barbours Cut, which consists of four working tracks and five storage tracks. The terminal offers direct port-to-port service, even to the West Coast, three days a week. On average, nine trains go in and out of the facility per week.

At the regional level, port officials believe that insufficient capacity and poor pavement conditions are a hindrance to the smooth flow of goods. In particular, US 59 does not have sufficient capacity between Houston and Mexico. It should be upgraded outside of the immediate region to provide better access to Mexico. Port officials also believe that congestion on SH 146 and IH 10 affects the efficiency of landside movements. Additionally, during or following inclement weather, there is flooding around the region that makes important roadways impassable.

The most significant problems with the region's rail network involve numerous grade crossings, which currently number 1,100 in Harris County, 800 of which are in the city of Houston. Vehicular delays at the grade crossings can be significant, and port officials are hoping to improve this situation by consolidating rail corridors to improve conditions for the local community to reduce the waiting times of trucks and automobiles at train crossings.

During the CTR researchers' visit to the Port of Houston, officials identified several priority projects:

1. Construct direct connectors from southbound SH 146 to eastbound Port Road and from westbound Port Road to northbound SH 146.

2. Grade separate Choate Road north of the Bayport Channel where it crosses SH 146 and the UP corridor at-grade. This UP corridor is a heavily-used chemical tanker route for the Bayport Loop, a railroad corridor serving the large Bayport Chemical complex. Choate Road is major arterial road for the city of Shoreacres and provides access to S H 146, as well as points west of the railroad corridor.

3. Grade separate SH 146 over Red Bluff Road and the PTRA Railroad. SH 146 is currently intersected at-grade by Red Bluff Road and in the future by the PTRA rail from the Bayport container and cruise terminal.

4. Construct a new rail line alongside the UP railroad on the west side of SH 146 North to the Strang Yard near the Barbours Cut container terminal.

4.7 Port Freeport

The Port of Freeport is a deepwater port serving the Houston metropolitan area and various petrochemical and agricultural customers along the Texas coast. The port is Texas' second major container port, and it also handles a substantial volume of bulk materials. Most inbound containerized cargoes handled at the Port of Freeport are fruits and vegetables from Central America and the Caribbean. These containers are usually refrigerated and require special facilities that the port is equipped to provide. Interestingly, outbound cargoes must travel in the refrigerated containers so they can bring more perishable items, but they typically carry goods that do not require refrigeration. Most containers hold a wide array of dry goods that are being exported to Central America and the Caribbean. By providing the reefer cargoes to carry these commodities to various parties, the shipper is able to reduce the cost of relocating the containers. The types of bulk cargoes handled by the port vary, but the most important commodities are rice, project cargo, and chemicals.

The Port of Freeport relies upon the state's roadway and rail network for most of its landside access, but almost all cargo is presently handled by truck. All trucks entering or leaving the port must do so using FM 1495, which provides connections to US 288 (to Houston) and SH 36 to US 59 (which also connects to Houston and points south to Laredo), which are primarily used to serve the port's hinterland. Rail service at port is provided by UP.

The Port of Freeport generates between 200 and 300 (or more) trucks and vehicles a day, all of which must enter or leave using FM 1495. With regard to desired roadway improvements, port officials support widening SH 36 to four lanes up to its intersection with US 59 because this is the route used by the majority of the trucks serving the port. Port officials also support the development of SH 288 to freeway standards and improvements to FM 1495 and FM 523, which have been designated as hazardous material routes.

During the first visit to the port, officials expressed concerns about the condition of the UP track serving the port. CTR researchers visited a section of the track with port personnel, and the track was visibly worn. Port officials were concerned that the track's condition would diminish the port's competitiveness. By the second visit to the port, UP had made some improvements to the track, and the port was pursuing contracts with shippers that would be using rail service. However, one of the remaining issues on the port's agenda is a swing bridge over the Old Brazos River (Figure 4.2), which port personnel believe needs to be replaced. Alternately, a new rail right-of-way could be secured that does not require a bridge.

Figure 4.2 Swing Bridge on Rail Line Serving the Port of Freeport

The Port of Freeport is expected to generate a growing volume of truck traffic in the foreseeable future. The Port is currently in the process of developing a new container facility, the first phase of which is expected to be operative by 2007. Port officials believe that due to the port's proximity to the Houston metropolitan area, the state's growing population, the planned expansion of its container facilities, and the relatively low level of port congestion, the port will be a strong competitor with other container handling ports along the Gulf of Mexico.

4.8 Port of Port Lavaca-Point Comfort

The Port of Port Lavaca-Point Comfort serves the middle Texas Gulf Coast and primarily handles petroleum products, chemicals, fertilizers, and metal ores. Commodities enter and leave this port through a variety of modes which include trucks, rail, barges, and pipelines. Most of the import cargo handled by the port is petroleum products for nearby industries. Most of the exports are chemicals. The market area for the port has been expanding during the past few years, and port officials expect this trend to continue.

The port is served by FM 1593, which connects to various roadways to points beyond. The port can serve the Houston and Laredo markets by US 59 via SH 172. The port also serves Victoria and San Antonio using US 87 (that is reached by SH 35), which intersects with FM 1593. The port's rail service is provided by the Point Comfort and Northern Railroad, which interchanges with UP on its "Macaroni" line at Lolita and with BNSF through trackage rights on the UP line. The Point Comfort and Northern Railroad is wholly-owned by the Aluminum Company of America (ALCOA) and operates on a total trackage of seventeen miles (Union Pacific, 2005).

Truck traffic at the Port of Port Lavaca-Point Comfort is seasonal, and during peak periods the port can generate up to 100 trucks a day. As mentioned, trucks serving the port must use FM 1593, and those trucks traveling to US 59 must also use FM 616 and SH 172 to reach it. The roadways on a portion of this route do not have shoulders, and port officials support the addition of shoulders and other improvements along the roadways to improve safety and capacity. Over the longer-term, port officials support the development of a direct connection to US 59 using existing roadways and/or new right-of-way.

4.9 Port of Victoria

The Port of Victoria is a shallow water port located along the middle Texas Gulf Coast and is served by the Victoria Barge Canal. The Port is located approximately 35 miles inland from the GIWW. The Port of Victoria handles dry and liquid bulk commodities, which are primarily aggregates, chemicals, agricultural products, and fertilizers (Port of Victoria, 2005).

The Port's connection to the state's roadway network is FM 1432, which intersects with SH 185 and US 87. From US 87, trucks can serve the San Antonio market or access US 59, which serves the Houston market to the north and Laredo and Mexico to south. US 77 can also be reached by US 87, and it provides access to Corpus Christi and the Rio Grande Valley to the south. Rail linkages to the port are provided through a rail spur which connects directly into UP's rail network, but the port is exploring opportunities to improve rail access. The BNSF, KCS, and Tex-Mex railroads can serve the port through trackage agreements with UP. Although it is not currently experiencing roadway congestion, the Port of Victoria is seeking a widening of FM

1432 and segments of SH 185 to increase the roadway's capacity and to improve its safety and efficiency.

Port of Victoria officials are also aggressively pursuing a strategy to develop it into an intermodal facility, transporting containers on barges. The port has signed a Memorandum of Understanding (MOU) with the Port of Houston to provide COB service and is actively pursuing clients and infrastructure improvements to the port

4.10 Port of Corpus Christi

The Port of Corpus Christi is Texas' second largest port. It handles a large volume of liquid and dry bulk cargo, which includes petroleum products, chemicals, metal ores, grains, and aggregates. The Port of Corpus Christi also handles a significant volume of military cargo bound for the war in Iraq and other military deployments around the world. Most military cargoes are RO/RO, such as heavy trucks, tanks, and smaller combat vehicles. Although the port does not handle containers at the present time, it is in the process of developing its La Quinta terminal, which will be located on the northern shore of Corpus Christi Bay outside of the existing port boundaries. The port has already received necessary federal environmental clearances for the La Quinta facility and will rely upon a third party to construct and operate the facility on port property.

The highest volume commodity handled by the Port of Corpus Christi is oil, and this is typically transported using pipelines to nearby refineries and petrochemical plants. Some of the gasoline and other refined petroleum products produced in the area leave through the port in tanker barges.

The Port of Corpus Christi is directly connected to the national interstate system by IH 37, which traverses to San Antonio. From San Antonio, trucks can continue northward on IH-35 or in an east-west direction on IH 10. Major crossing points along the Mexican border can be reached by several U.S. highways: Brownsville-Matamoros by US 77; McAllen-Reynosa by US 281 via SH 44; and Laredo by US 59 via SH 44. Markets to the north can be reached by a variety of state and U.S. highways, with US 77 being the primary northern route (in addition to IH 37).

The port has excellent connections to the interstate and state highway roadway system, so most of its roadway needs are at the local level. Several county roads within the port's boundaries are in poor condition or have overhead restrictions, but improvements to these roads have been slow to occur. Although these roadways are not technically TxDOT's responsibilities, the inefficiencies they create can make the port's operations more difficult. Port officials also support the replacement of the Harbor Bridge, which TxDOT is currently pursing, and are moving forward with the development of the Joe Fulton Trade Corridor, a $55 million project, on the north side of the port.

Approximately thirty-eight trains a day operate on the Port of Corpus Christi's rail network. Customers have access to three Class I railroads: UP, BNSF, and the Tex-Mex. As trains leave the port, they travel on northbound tracks owned by UP, but BNSF and KCS maintain trackage rights. For trains moving south or west or to and from Mexico there are two possible routes. The Tex-Mex serves areas west of the Port of Corpus Christi to Laredo. For southern origins or destinations, UP continues to Brownsville. At the border, both railroads connect to the Transportacion Ferroviaria Mexicana (TFM) Railroad in Mexico, of which KCS owns a controlling interest. In Mexico, TFM provides customers with direct access to Monterrey, San Luis Potosi, Mexico City, and the Pacific Coast port of Lázaro Cárdenas.

The Port of Corpus Christi initially experienced significant rail congestion during military deployments for the war in Iraq. As the deployments continued, many initial problems were resolved. However, in 2005, the Office of the Governor, through TxDOT, provided a grant of $5.2 million for improvements of rail connections to the port and cargo handling during military deployments. Prior to this, the port completed a master plan rail study that provided a long-term plan for addressing rail needs at exiting port terminals and the planned La Quinta container facility. Of particular interest to port officials is ensuring that at least two rail carriers have access to the La Quinta container terminal, because at present only UP has access to the site. Port officials are also interested in a variety of improvements being made to regional connections to the main UP line that traverses the region south to Brownsville, which has become congested and less efficient over time. Interchange agreements between the railroads serving the port are also creating delays.

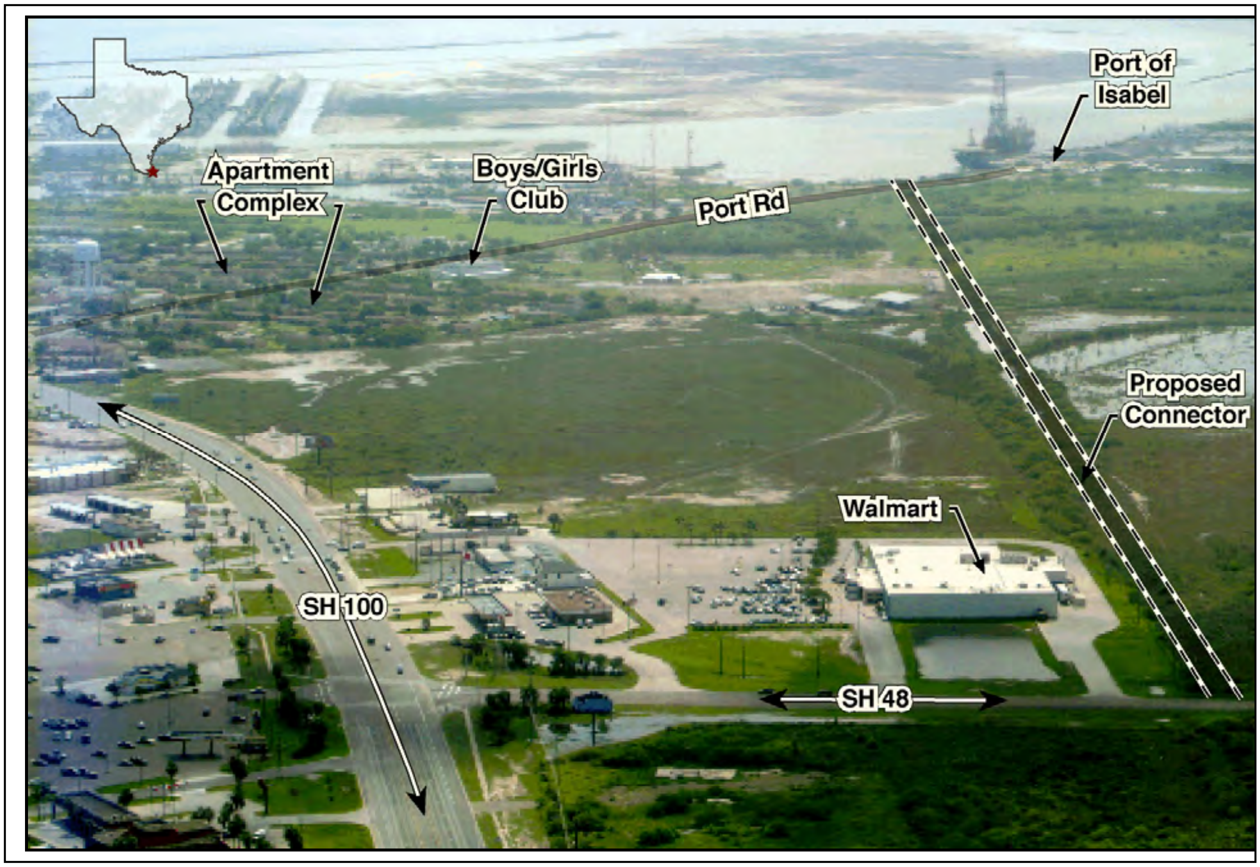
4.11 Port of Port Isabel

The Port of Port Isabel is located at the far southern tip of the Texas Coast and can be accessed from the north by shallow-water craft and from the south by deepwater ships from the Brownsville ship channel. The port's infrastructure is within the Laguna Madre and protected from open water by several small dredge islands, as well as South Padre Island. The port has not handled a large volume of cargo during the past few years. Instead, it has served as a hub for recreational craft, cruise ships, and international ferry service, and has acted as a layberth port. Most cargo handled by the port in the recent past has been RO/RO, specifically used vehicles bound to Central America.

The Port of Port Isabel is connected to SH 100 by a two-lane access road called Port Road. From SH 100, carriers can access US 83, which serves the Rio Grande Valley, or US 77, which connects to the U.S. interstate system in Corpus Christi (via IH 37). Cargo bound to or from Mexico can use FM 1792 to connect to roadways in Brownsville, which lead to an international bridge. The Port of Port Isabel does not have direct rail service.

Although the port does not currently experience substantial roadway congestion, officials are concerned about pedestrian safety along Port Road. More specifically, a boys/girls club is located along Port Road between the port and SH 100 on the west side of the road (Figure 4.3). The port's management, port's users, prospective users, and some local residents are concerned that an accident could occur between a truck serving the port and one or more of the children walking or riding a bicycle to the club. A proposed solution to this problem is to build a new roadway approximately a mile in length to connect the port to S.H. 48, which would allow all port traffic to bypass the Boys/Girls Club on Port Road and the nearby residential development. The Port proposes that the right-of-way of an abandoned rail line be used for this roadway, which would minimize harm to the natural and human environment. According to the Port's management, the safety concerns along Port Road have been a deciding factor for some potential cargo clients, who have chosen to operate elsewhere. The Port believes that the current conditions are also an impediment to expanding its cruise business. The Port has expressed a willingness to assist TxDOT with the purchase of right-of-way, if TxDOT will construct the spur.

Figure 4.3 Port of Port Isabel and Proposed Connector to SH 48



Source of Base Photo: Port of Port Isabel, 2004.

4.12 Port of Brownsville

The Port of Brownsville is the southernmost port in Texas and the U.S., handling cargo for the Lower Rio Grande Valley and northern Mexico. The port handles a variety of bulk cargoes, which include steel, petroleum, fertilizers, and agricultural products. The port has also handled containers on barge and has the equipment and infrastructure to handle small container ships.

Trucks leaving the Port of Brownsville can connect to the statewide roadway network by taking FM 511, which bypasses Brownsville and connects to US 83 and US 77. At its intersection with FM 511, US 83 serves the Rio Grande Valley region, while US 77 connects Brownsville to points north. Trucks can also travel on SH 48 to US 83/77, but this route requires trucks to enter central Brownsville, which is typically congested and has many traffic signals.

The Port of Brownsville is served by a short line railroad called the Brownsville & Rio Grande International Railroad, which has interchange connections to UP and BNSF. The northbound rail is owned by UP, but BNSF has trackage rights. For trains moving to and from Mexico, the Brownsville & Rio Grande provides a connection to UP, which then connects to the TFM (the KCS Railroad owns a controlling interest in the TFM) in Mexico. In Mexico, TFM provides its customers with access to Monterrey, San Luis Potosi, Mexico City, and the Pacific port of Lázaro Cárdenas.

Port of Brownsville officials are currently proposing two major roadway improvements. The first is the construction of a new international bridge on port property. This bridge would allow overweight trucks to be served by the port without using state and local roads with stricter weight limits. Planning for the bridge has been extensive and ongoing for a number of years. The second improvement is truck-only lanes between the port and the future IH 69 interchange along the FM 511 right-of-way. Officials from the port and the Pharr District have been working on this project for a number of years.

The Port of Brownsville is in the process of completing a major rail relocation program, which removed more than 80 at-grade crossings on the UP line. The next phase of the project will include the relocation of the rail that crosses the U.S.-Mexico border from the center of Brownsville and Matamoros to the west side of both cities. It is anticipated that the west side rail relocation will produce significant safety benefits on both sides of the border. Port of Brownsville officials also seek to develop direct rail linkages to the Mexican rail network, crossing at the proposed international bridge that will be built within the port's property.

4.13 Summary

As demonstrated in Chapter 4, Texas ports efficiently handle enormous volumes of foreign and domestic trade. However, the continued efficiency and competitiveness of Texas ports and the state economy as a whole depends on the smooth transition of these commodities from their origins to the ports and from the ports to their final destinations. Most non-petroleum products handled at Texas ports must be moved by trucks or on rail. The development, improvement, and maintenance of this landside infrastructure is a critical responsibility that is shared by TxDOT, local governments, the ports, and the state's private railroads. To assist TxDOT with its role in planning future landside access improvements, Table 4.1 provides a summary of landside issues at each of the studied ports.

Table 4.1 Summary of Roadway and Rail Landside Access Issues in Texas

Port	Roadway Issues	Rail Issues
Port of Orange	Minor congestion at truck entrance gate due to new Department of Homeland Security requirements.	
Port of Port Arthur	Direct connection between the port and a state highway to eliminate the need for trucks to travel through downtown Port Arthur.	Lack of rail competition. The port is seeking to create access for an additional rail carrier.
Port of Beaumont		Rail congestion at the port's entrance. The port is seeking to construct a southbound turnout into the port to reduce congestion along the Sunset Limited route caused by switching activity. Reduced capacity due to funneling several mainline tracks into a single track on an antiquated lift bridge that crosses the Neches River. Potential need for bridge replacement or construction of a second bridge.
Port of Galveston	Improved signage that directs cruise ship passengers to the port and cruise terminal. Improvements to Harborside Drive (Loop 275) to reduce congestion during peak periods of loading and unloading cruise ship passengers. These may include signalization, grade-separation, and/or ITS. Add or widen curb cuts around the port to improve truck mobility.	Replacement of the Galveston rail bridge over the GIWW.
Port of Texas City	Eliminate at-grade rail crossings near the port to reduce the risk of vehicular collision with a train, especially on SH 3 and Loop 197.	Need additional interchange yard capacity along the BNSF line serving Galveston.
Port of Houston	Ensure that the proposed Bolivar Bridge provides adequate vertical clearance for ships serving Barbours Cut. Direct connectors from the port to SH 146. Grade separate Choate Road and SH 146. Grade separate Red Bluff Road and SH 146.	Grade separate Choate Road from the intersecting UP line at SH 146. Grade separate PTRA line from SH 146 near Red Bluff. Construct rail along existing UP track from the Strang Yard to Barbours Cut.
Port of Freeport	Improve roadway access to the port by: widening SH 36 to four lanes between the port and US 59; raise US 288 to freeway standards, make improvements to FM 1495 and FM 523.	Need maintenance improvements to the track serving the port. Replace or eliminate swing bridge on track serving the port.
Port of Port Lavaca/Point Comfort	Improve roadway access to US 59 along FM 1593, FM 616, and SH 172.	
Port of Victoria	Improve the intersection between FM 1432 and SH 185	
Port of Corpus Christi	Continue support of Harbor Bridge	Improve rail connections to the port and

Port	Roadway Issues	Rail Issues
	replacement. Need improvements to county roads within the port's boundaries. Continue working on the Joe Fulton Trade Corridor.	handling capabilities for military cargo. Build rail access to La Quinta terminal for second carrier. General improvements to the local rail network to improve accessibility and efficiency. Improvements to the UP line serving Brownsville.
Port of Port Isabel	Build a one mile connector route between the Port of Port Isabel and SH 48 to improve neighborhood safety.	
Port of Brownsville	Construct truck only lanes between the Port and the future IH 69 along FM 511.	Major rail relocation project recently completed. Port seeks to acquire rail access to Mexico through the Port of Brownsville's proposed International Bridge.

5. Conclusions and Recommendations

5.1 Port Planning Policy and Strategies

During the past two decades, the strategic focus of deepwater marine ports along the Texas Gulf Coast centered on design, operations, and efficiency. Accordingly, these factors dominated the process of determining both port budgets and landside access needs. This approach could be regarded as introspective, focusing on the elements lying within the port boundaries that could be changed to generate the efficiencies sought by regional and global shippers. The term "last mile" also came into vogue in the 1990s, highlighting the emphasis in strategic thinking on the port itself plus that small area beyond the port boundaries constituting the connection between the port and its landside transportation modal networks [A28]. The drive for cost reduction during this period was relentless, driven by demands for seamless transfers with the lowest possible interventions, both human and institutional.

Demand for efficient cargo processing at all levels of the supply chain has soared in recent years. Texas ports faced a need to process a greater variety of cargo and were required to juggle a growing imbalance of import volumes that were rising faster than exports. The port system was therefore already in a state of flux when September 11, 2001 brought about major changes in federal security thinking and the role of maritime gateways. In order to ensure accuracy, the concept of "port security" must be separated into two distinct ideas. The first relates to the security of the port itself as an economic asset. The second relates to the port's role as a line of defense against malicious cargo whose intended destination lies inland. From the perspective of a smuggler, the primary selection criteria for determining which port to use involves choosing the softest target—a criteria that would seem to favor a small port that does not have elaborate security screening protocols. Alternatively, from the perspective a of a terrorist intent on damaging the national economy by disabling transportation infrastructure, there is a strong incentive to choose one of the ten US seaports that handle roughly 80 percent of international trade.

The role of security in port planning is an ongoing issue, with a substantial amount of maritime security planning still in the early stages of development and implementation. Adequate processing of international containers for security remains in its infancy, and there are likely to be substantial changes in the way containers are processed at U.S. ports in the near future that must be addressed in the ports' strategic plans. Some investments in new security technologies may restrict the ability of ports to utilize multi-modal solutions. For example, the development of inland ports may be retarded if security protocols require more intensive screening of cargo prior to unloading. Other security-based investments may carry residual benefits for the development of landside access. For example, in the near future, the Department of Homeland Security will be introducing Advanced Container Security Device (ACSD) technology to international containers bound for the U.S. When equipped with an ACSD, "a container could be sealed in Karachi and stripped in Kalamazoo, and shippers would be assured that the contents have been undisturbed in between [A30]." Such a system, if proven reliable, could enable ports to shift final security clearance of containers from the dockside to inland ports.

Like other transportation elements in the global system, U.S. ports are heavily capitalized and generate relatively low rates of return. Investments in new facilities, whether it be warehousing for paper products, facilities to improve the transfer of crude oil, or new locations to effectively deal with the growth of international containers, all require substantial financial investments. These investments cover initial planning (which is often funded wholly by the port), much of which is extremely expensive. Approximately 150 Post-Panamax vessels with capacities over 8000 TEUs will enter service within the next three years. These vessels will make the overall industry more efficient but also threaten to drive ports in some states into obsolescence if they cannot afford to make the improvements needed to adequately handle such vessels [A29]. Due to the state's geography, Texas ports are not as vulnerable to increased ship size as are ports on the West Coast. However, they will still face the threat of bottlenecks unless landside improvements accompany port expansions. In the words of Joseph Bonney, editor of the *Journal of Commerce*, "Trade volume and ship sizes have gotten ahead of the capacity of marine terminals, railroads, trucking and other landside infrastructure. Until landside improvements catch up, problems are inevitable [A31]."

Projects of this magnitude, be they the construction of new facilities or the reconstitution of existing ones, require that ports seek partners within the private sector (e.g., terminal operators) or from public agencies (e.g., metropolitan planning organizations [MPOs]) or the federal government. The real challenge is in moving from lofty ideas to concrete actions. One of the first maritime consequences of September 11, 2001 was the order to undertake a comprehensive security audit at all U.S. deepwater ports to establish clear grounds for seeking federal assistance on a range of issues, most of which would turn out to be port property related [A32]. This became a multi-year program, and as of this date, a number of Texas ports have not completed the audit process. The need for a full and comprehensive inventory was made clear by a recent report by the Inspector General of the Department of Homeland Security, who concluded that the distribution of federal grants aid since 2002 did not correspond to national needs, and since awards given were based on the volume of applications submitted, these tended to bias small low volume ports [A33].

Port authorities have identified state agencies such as TxDOT as partners that can sharpen the strategic relevance of Texas deepwater ports in this general area. As shown in the remaining parts of this chapter, state ports have substantially changed their strategic policies. It appears that the disparate needs of the port operations has somewhat weakened the development of a single "Texas policy" supported by all and has been replaced by a variety of individual port strategies on landside access planning issues that can be considered by TxDOT as part of its multimodal mission. Because TxDOT has shown greater willingness to provide tangible support to Texas ports, port officials have been more willing to make their individual needs known.

5.1.1 Supply Chains: Vulnerability versus Opportunity

In the 1990s, planners engaged in international trade increasingly incorporated the growing importance of logistics in shaping trade corridors along. Dr. John McCray at the University of Texas at San Antonio developed a procedure for calculating and visually displaying NAFTA-related flows between Mexico and the US. In corridor analysis, many considered the terms "trade" and "transportation" as synonymous, although an alternative view, first developed by Stephen Bender, was later expanded on by Dr. Leigh Boske at the LBJ School of Public Affairs, who argued that *transportation* corridors were significantly different from *trade* corridors in terms of planning [A34].

Why is this important? Principally because international trade now accounts for a substantial part of both Texas and the US economies, and differentiating between the two terms allows planners to focus on which corridors should be supported strategically. Those responsible for moving the freight and planning the corridors over which the trade moves—whether they be in-house or third party logistical companies—are constantly examining alternative ways of moving more efficiently from origin to destination. Freight moves along "supply chains" that have been identified and examined over the last decade and are now part of the normal planning duties for logistics specialists. One of the changes that this study identified is the recognition by port managers that Texas deepwater ports lie on a variety of global supply chains that provide both opportunities and vulnerabilities. The opportunities are the efficiencies offered to shippers help maintain their use of that particular supply chain. The vulnerabilities center on cost and time issues associated with a specific supply chain that deters users and causes them to seek alternative chains. Both seaside and landside access problems tend to drive up the transportation costs through that particular location (such as Los Angeles/Long Beach in 2004). This can give rise to vulnerability when those responsible for establishing global trading patterns are making decisions about alternative routes and modes, such as the growth in U.S. East Coast all-water services for Asian trade.

Texas deepwater ports have addressed vulnerability in a variety of ways, particularly through careful cost analysis and attempts to review and improve connectivity on the landside part of their operations. For example, rail access has been problematic for many ports either because of cost considerations or for competitive reasons. Improving rail access has proved to be a slow and time-consuming challenge to port management. Several port managers have expressed a desire to ensure competitive access by more than one rail company. This standard has often been proven to be difficult to achieve. There may be future opportunities to encourage competition through adopting public-private partnerships to address key access issues that would otherwise go unfunded.

When this study began, the Maritime Administration (MARAD) had concluded a review of landside access issues at U.S. deepwater ports, and the authors of the study stated that it was unlikely U.S. ports would agree to a system that used levels of performance or service as an investment metric. In one important respect, such an opinion seemed odd. After all, shippers who maintain a cost-based review of their supply chains (which most do) are going to include some form of performance rating as part of their deliberations. This is certainly the case with recent congestion in ports in southern California. Moreover, it is supported by developments in Europe, where levels of service are now recognized as important measure in logistical decision-making. Perhaps the opinion expressed was related to using levels of service for federal aid. However, service levels must again play an important role in determining whether ports are recognized as "strategic" or "vital" and therefore deserving of aid from various federal sources.

Recognition that ports are integrated components of global supply chains gives rise to a variety of opportunities for port strategic planning in general and specifically how certain elements such as these might impact TxDOT's mission to support multimodal opportunities. These vary from (1) making basic improvements to the design of facilities, such as building new cross-dock warehouse facilities, (2) developing entirely new container facilities, such as BayPort at the Port of Houston, and (3) attempting to induce logistics companies to move some product from rival supply chains, such as those going through ports in southern California. The growth of all-water (and possibly) land-based services through Mexico for Asian trade to and through Texas was also an area of intense interest at the time of this report. In the future, Mexico may be able to add value to Texas-bound Asia trade by performing processing and stripping services. The precise nature of such a relationship is a topic that deserves further study.

5.1.2 The Importance of Key Customers

At the majority of Texas deepwater ports, a small number of key customers influence and underpin both the planning and the financing of port strategy. Their current and future needs are carefully evaluated by port management, and modifications to strategy on both the seaside and landside aspects of the port are frequently driven by changes in key customer needs. This can take a variety of forms from building a terminal and leaving the management to a third party, which acts as a landlord, to responding specifically to the needs of major customers such as Valero, Exxon, and Wal-Mart.

In addition to long-established key customers, there is the opportunity to develop a new customer base that could have important strategic consequences for port operations. Two examples of this are the change in the logistical operations of large retailers and the importance of military cargo following changes in the national defense policy. In the case of Wal-Mart, the company is now specifying a variety of conditions that must be met by those shipping its products. For example, radio frequency identification (RFID) are now required on all shipments for Wal-Mart. This carries with it at least two benefits, not withstanding the fact that it will increase a certain group of costs associated with transportation needs. First, it allows tracking of the product as it moves along the supply chain, thereby providing Wal-Mart with a more accurate input to its warehousing and distribution operations. In so doing, it creates the second benefit by enhancing the security of the consignment, because tracking will show delays in the supply chain where product can be tampered with. It is also possible to embody a greater level of detail on the type of tampering depending on the sophistication of the RFID tag. This will require substantial changes in landside access strategies, possibly impacting both the port and the arterial system linking the port to the new facility. If volumes are significant and create congestion on the arterials, a need for a dedicated corridor or lanes on an exiting corridor could be established.

Both the Ports of Beaumont and Corpus Christi are strategic military ports that move a substantial amount of military cargo on regular schedules [A35]. If this demand continues to grow in the next four years, substantial changes in terminal design and access at their deepwater maritime facilities could become necessary. The state is interested in remaining an important military stronghold, so good access to the sea is an important factor in choosing which bases should be supported and which should be closed. The benefits from improving specific port operations (such as landside access) support a wide variety of economic activities in the rest of the state, thus fulfilling TxDOT's mission. Finally, an important challenge associated with meeting the needs of key customers at maritime locations is the impact on the communities in which the port is sited. These impacts are important elements of the environmental and planning process which now precedes many of the changes to transportation services at marine ports and is the subject of the next section.

5.1.3 Accommodating Future Demographic Changes

Many Texas Gulf Coast ports have been impacted by steady metropolitan growth in the last two decades, a trend that is unlikely to slow in future years. TxDOT has estimated that the population of Texas could more than double to more than 40 million between 2000 and 2030, and that a substantial percentage of that growth will occur within the Texas Triangle [A36]. As these boundaries grow to include the landside access systems of the various deepwater ports, it will become more important to balance the needs of key customers and new sectors with those living near the port both in terms of space, safety, and environment.

A variety of strategies can address space needs at maritime ports and the landside access consequences of continued growth. These include:

(a) Revise operations within current port boundaries. Raising demurrage costs for late container pick-ups and extending gate hours are two operational examples. Infrastructural changes can also be made. One example would be the recent move away from grain to passenger cruise ship operations at the Port of Galveston, where silos were removed to create space and a more pleasing environment for vacationers. Changes in this category do not usually generate negative public feedback, with extended operational hours being a possible exception depending on location.

(b) Build on adjacent land, such as the Bayport facility at the Port of Houston. Experience shows that those objecting to a new facility can use the planning and approval process to delay progress in all areas, thereby creating additional costs and more time delays.

(c) Use other modes such as the GIWW to move certain product, be it chemical or containers, from the traditional port locations to other sites.

(d) Develop unconventional solutions such as moving product from traditional port facilities to new distribution sites like inland ports. This is being contemplated at several sites along the eastern seaboard and southern coast of California.

One landside access solution to increase maritime port throughput is to consider the potential to grow rail traffic. This is particularly difficult for several reasons, but remains an important objective of many major port transportation planning programs. Typically, port rail systems are rarely able to provide direct rail links into port property and thus require an additional move or “dray” to make the process work. Moreover, changing rail systems is expensive, even when railroads do not object to such improvements. Railroad companies, unlike most ports, are publicly-held corporations with stockholders who expect profitability and growth. However, like ports, they are heavily capitalized, and their financial rates of return are generally modest. Hence, any strategy to improve railroad connectivity with ports, be linking into the port facilities themselves or improving the metropolitan corridors on which the rail subsequently passes, could bring some form of public-private partnership to fruition.

Ports have often developed effective partnerships with the metropolitan planning agency in which they are located. In this study, the team collected information on successes in partnering between ports and metropolitan agencies at Beaumont, Houston, Corpus Christi, and Brownsville. However, all Texas ports located within metropolitan areas now accept this as part of their normal operations and responsibility of port management. Port staff members are sensitive to social responsibilities, particularly since they and their families are part of the same communities. Programs to control the external (social) costs of transportation (particularly air quality) both on the sea and landside remain crucial elements of port strategic planning and will remain so in the coming decade.

5.1.4 Intermodal Partners

As previously noted, not all Texas ports have direct rail connections that can be enhanced to offer true intermodal landside choices for shippers. The petroleum industry is an exception because much of its product is either re-exported or moved by barge or rail or most often by pipeline to different parts of the state and the Southwest. Where ports have rail connections, the challenge is two-fold. First, they must improve system efficiency and then attempt to control or reduce the costs of draying to local rail yards. Second, in terms of rate structure, two rail companies are needed to maintain a competitive edge. Again, this can be complex because it may involve trackage rights.

Two potential water-based options for intermodal moves are the intercoastal waterway for small barge movements and short sea shipping for larger commodities. The movement of chemicals and oil-derived products on barge is an important component of total demand on the Texas intercoastal waterway. In addition, Osprey Lines has grown its container business reasonably successfully over the last five years to include a short sea link with Florida. The research team believes that these strategies will receive further scrutiny and support in the strategies developed by some ports in the coming decade.

The petroleum industry is particularly dependent on its landside area on barges, rail, and pipelines. The pipeline network could be enhanced as the second leg of the Trans-Texas Corridor (TTC 69) is developed. This will provide real opportunities for adding pipeline capacity through certain sections of the metropolitan area and will also provide another modal choice for key customers at Texas ports.

One of the critical elements in seeking new intermodal partners is the ongoing change in both origin and destination of commodities passing through Texas ports. Traditionally, the ports have served mostly the state, especially in the case of international merchandise to Harris County and the "Texas Triangle." However, changes in the supply chain and commodity mix for retailers may cause landside destinations to develop outside the state. When this occurs, rail has a comparative cost advantage that could be used to support the choice of Texas deepwater ports as elements of the emerging supply chains. This in turn strengthens the need for ports to have more efficient rail services. As currently structured, the ports often must connect with rail at a variety of terminals near port sites. This move is often undertaken by a dray vehicle, which imposes a substantial cost on the total shipment cost. A recent paper in the Transportation Research Record suggested that over 80 percent of the cost of moving a container 500 miles by train is accounted for by the cost of trucking at both ends of the move [A37]. Under the current highway cost structure, there is both a degree of cross-subsidization favoring trucking and an inability to internalize external costs (e.g., air quality) into the prices charged for modal services, thus making it more difficult to switch from highway to rail on full cost grounds. Efforts in Europe to address this issue may provide future opportunities to promote rail services and connectivity to ports, and this could be an important development to be recognized in port and state planning in future.

5.2 Relationship with TxDOT

(a) In the period of this research, there has been a strategic shift in Texas deepwater port landside policies and strategies. In the past, ports would come together to develop proposed joint legislation, which could then "trickle down" to impact TxDOT operations. This type of strategy has been largely replaced by one in which TxDOT is incorporated into the all port planning processes (at least where landside access is concerned) and assists in developing programs which are consistent with the agencies mission and strengths.

(b) It is likely that under this process, emphasis will change from state port strategic programs to individual port needs. For example, specific changes to rail access to the Port of Beaumont are critical to accommodate product growth, military security, and rail efficiencies without compromising metropolitan standards of living. So there are likely to be specific programs proposed to TxDOT, such as alternative highway links, new rail corridors, and raising or removing bridges, all representing specific needs of that port.

(c) The TxDOT statewide transportation plan should clearly integrate ports into the overall vision, and TxDOT needs to provide leadership on certain issues (e.g., corridor performance) where they are the most appropriate institution to offer unbiased leadership.

(d) The federal viewpoint is changing. Currently, the U.S. transportation infrastructure in its various forms—ports, highways, rail, and airports—is under great stress and is generating a variety of strategic needs with specific solutions (some are user-cost funded, while others are financed through partnerships with the federal and state government to keep freight moving). This study confirms that a major change has taken place in the Texas maritime sector that provides an opportunity for developing enhanced and efficient transportation solutions to some of the most pressing problems. The new TxDOT 2005-2007 Strategic Plan recognizes these opportunities to some degree, and this research team believes there has never been a better time to integrate key aspects of port performance into statewide transportation planning.

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Appendix A—Resources for Improving Landside Access at Texas Ports: Contact Information for Public Agencies and Private Organizations

Texas Department of Transportation (TxDOT) Offices

The Multimodal Section of TxDOT's Transportation Planning and Programming Division is responsible for supporting statewide freight transportation planning. If you have questions or need information about proposed or ongoing roadway improvements in your area and they involve a state or federal highway, contact your local TxDOT District office. If you have questions about roadway projects on city or county maintained roadways, please contact your local public works department, since the TxDOT District Office may be unable to provide you with information.

Multimodal Section – Transportation Planning and Programming Division

Mailing Address:	Physical Address:
125 East 11th Street	118 E. Riverside Drive
Austin, TX 78701-2483	Austin, TX 78704

Phone: (512) 486-5000
Internet: www.dot.state.tx.us/tpp/default.htm

Beaumont District Office

Mailing Address:	Physical Address:
8350 Eastex Freeway	8350 Eastex Freeway
Beaumont, TX 77708-1701	Beaumont, TX 77708-1701

Phone: (409) 892-7311
Internet: http://www.dot.state.tx.us/bmt/
Chambers, Hardin, Jasper, Jefferson, Liberty, Newton, Orange, and Tyler Counties

Houston District Office

Mailing Address:	Physical Address:
P.O. Box 1386	7721 Washington Avenue
Houston, TX 77251	Houston, Texas 77007

Phone: (713) 802-5000
Internet: http://www.dot.state.tx.us/hou/
Brazoria, Fort Bend, Galveston, Harris, Montgomery, and Waller Counties

Yoakum District Office

Mailing Address:	Physical Address:
403 Huck Street	403 Huck Street
Yoakum, Texas 77995	Yoakum, Texas 77995

Phone: (361) 293-4300
Internet: http://www.dot.state.tx.us/ykm/
Austin, Calhoun, Colorado, DeWitt, Fayette, Gonzales, Jackson, Lavaca, Matagorda, Victoria, and Wharton Counties

Corpus Christi District Office
Mailing Address:
P.O. Box 9907
Corpus Christi, TX 78469-9907
Phone: (361) 808-2300
Internet: http://www.dot.state.tx.us/crp/
Aransas, Bee, Goliad, Jim Wells, Karnes, Kleberg, Live Oak, Nueces, Refugio, and San Patricio Counties

Physical Address:
1701 S Padre Island Drive
Corpus Christi, TX 78416-1324

Pharr District Office
Mailing Address:
P.O. Box 1717
Pharr, TX 78577-1717
Phone: (956) 702-6100
Internet: http://www.dot.state.tx.us/phr/
Brooks, Cameron, Hidalgo, Jim Hogg, Kenedy, Starr, Willacy, and Zapata Counties

Physical Address:
600 W US 83 Expressway
Pharr, TX 78577-1231

MPO Contact Information

Metropolitan Planning Organizations are responsible for local freight transportation planning activities. Port personnel, port users, and residents who want to learn more about local freight planning or who are aware of a freight-related transportation problem should contact them using the information below. Not all Texas ports are located within an MPO area. If this is the case for your local port, contact your TxDOT District Office or your local city or county government.

South East Texas Regional Planning Commission
Mailing Address:
2210 Eastex Freeway
Beaumont, TX 77703-4929
Phone: (409) 724-6295
Internet: www.setrpc.org
Ports of Beaumont, Port Arthur, and Orange

Physical Address:
2210 Eastex Freeway
Beaumont, TX 77703-4929

Houston-Galveston Area Council (HGAC)
Mailing Address:
P.O. Box 22777
Houston, TX 77227-2777
Phone: (713) 627-3200
Internet: www.h-gac.com
Ports of Houston, Galveston, Texas City, and Freeport.

Physical Address:
3555 Timmons, Suite 120
Houston, TX 77027

Victoria Metropolitan Planning Organization
Mailing Address:
Planning Department
700 Main Center, Suite 201
Victoria, TX 77901
Phone: (361) 485-3360
Internet: http://www.ci.victoria.tx.us/planning/mpo/mpo.htm
Port of Victoria

Physical Address:
700 Main Center, Suite 201
Victoria, TX 77901

Corpus Christi Metropolitan Planning Organization

Mailing Address:
5151 Flynn Parkway, Suite 404
Corpus Christi, TX 78411
Phone: (361) 884-0687
Internet: **http://www.corpuschristi-mpo.org**
Port of Corpus Christi

Physical Address:
5151 Flynn Parkway, Suite 404
Corpus Christi, TX 78411

Harlingen-San Benito Metropolitan Planning Organization

Mailing Address:
Planning & Development
502 E. Tyler
Harlingen, Texas 78550
Phone: (956) 427-8727
Internet: http://enterprise.ci.harlingen.tx.us/planning.htm
Port of Harlingen

Physical Address:
502 E. Tyler
Harlingen, TX 78550

Brownsville Metropolitan Planning Organization

Mailing Address:
City of Brownsville
P. O. Box 911
Brownsville TX 78520
Phone: (956) 548-6150
Internet: http://planning.cob.us/tp.asp
Ports of Brownsville and Port Isabel

Physical Address:
1150 East Adam
Brownsville, TX 78520

Texas Port Contact Information

Contact information for each Texas port (deepwater and shallow draft) is provided in the list below. Contact information for the Port of Ingleside and the Port of Sweeney were not available.

Port of Anahuac

Mailing Address:
Chambers/Liberty Counties Navigational District
P.O. Box 518
Anahuac, TX 77514
Phone: (409) 267-3541
Internet: http://www.clcnd.com/

Physical Address:
207 Miller Street
Anahuac, TX 77514

Port of Aransas Pass

Mailing Address:
City of Aransas Pass
P.O. Box 2000
Aransas Pass, TX 78335
Phone: (361) 758-5301
City Secretary: Karen Mayer

Port of Bay City Authority

Mailing Address:
P.O. Box 1426
Bay City, TX 77404
Phone: (979) 245-5831
Internet: http://www.portofbaycity.com

Physical Address:
1305 Seventh Street
Bay City, TX 77414

Port of Beaumont

Mailing Address:
P.O. Drawer 2297
Beaumont, TX 77704
Phone: (409) 835-5367
Internet: http://www.portofbeaumont.com

Physical Address:
1225 Main Street
Beaumont, TX 77704

Port of Bay City Authority

Mailing Address:
P.O. Box 1426
Bay City, TX 77404
Phone: (979) 245-5831
Internet: http://www.portofbaycity.com

Physical Address:
1305 Seventh Street
Bay City, TX 77414

Port of Brownsville

Mailing Address:
1000 Foust Road
Brownsville, TX 78523
Phone: (956) 831-4592
Internet: http://www.portofbrownsville.com

Physical Address:
1000 Foust Road
Brownsville, TX 78523

Port of Corpus Christi

Mailing Address:
P.O. Box 1541
Corpus Christi, TX 78403
Phone: (512) 882-5633
Internet: http://www.portofcorpuschristi.com

Physical Address:
1305 N. Shoreline Blvd.
Corpus Christi, TX 78401

Port of Freeport

Mailing Address:
P.O. Box 615
Freeport, TX 77541
Phone: 979) 233-2667
Internet: http://www.portfreeport.com

Physical Address
200 W. Second St., 3rd Floor
Freeport, TX 77541

Port of Fulton

Mailing Address:
Aransas County Navigational District #1
911 Navigation Circle
Rockport, TX 78382
Phone: (361) 729-8037

Physical Address:
911 Navigational Circle
Rockport TX, 78382

Port of Galveston

Mailing Address:
P.O. Box 328
Galveston, TX 77553
Phone: (409) 765-9321
Internet: http://portofgalveston.com

Physical Address:
123 25th Street
Galveston, TX 77550

Port of Harlingen

Mailing Address:
P.O. Box 2646
Harlingen, TX 78551-2646
Phone: (956) 423-0283
Internet: http://www.portofharlingen.com

Physical Address:
F.M. 106 – 4.0 miles east of Harlingen
Harlingen, TX 78550

Port of Houston Authority

Mailing Address:
P.O. Box 2562
Houston, TX 77252-2562
Phone: (713) 670-2480
Internet: http://www.poha.com

Physical Address:
111 East Loop North
Houston, TX 77029

Port of Liberty[14]

Mailing Address:
Chambers/Liberty Counties Navigational District
P.O. Box 518
Anahuac, TX 77514
Phone: (409) 267-3541
Internet: http://www.clcnd.com/

Physical Address:
207 Miller Street
Anahuac, TX 77514

Port of Port Isabel – San Benito Navigational District

Mailing Address:
P O Box 218
Port Isabel, TX 78578
Phone: (956) 943-7826
Internet: http://www.portofportisabel.com

Physical Address:
250 Industrial Drive
Port Isabel, TX 78578

Port of Port Lavaca/Point Comfort

Mailing Address:
P.O. Box 397
Point Comfort, TX 77978
Phone: (512) 987-2813
Internet: http://www.portofplpc.com

Physical Address:
1002 F.M. Road 1593 S.
Point Comfort, TX 77978

Port of Port Mansfield/Willacy County Navigational District

Mailing Address:
295 E. Hidalgo
Raymondville, TX 78580
Phone: (956) 689-3332

Physical Address:
400 W. Hidalgo, Suite 200
Raymondville, TX 78580

Port of Palacios

Mailing Address:
P.O. Box 551
Palacios, TX 77465
Phone: (361) 972-5556
Internet: http://www.portofpalacios.com

Physical Address:
1407 Main Street
Palacios, TX 77465

(Texas Port Contact Information Continued)

Port of Orange

Mailing Address:
P.O. Box 2410
Orange, TX 77632
Phone: (409) 883-4363
Internet: http://www.portoforange.com

Physical Address:
1201 Childers Road
Orange, TX 77632

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[14] The Chambers/Liberty Counties Navigational District and a separate Port of Liberty Commission share jurisdictional authority over the port.

Port of Port Arthur Navigation District

Mailing Address:
P.O. Box 1428
Port Arthur, TX 77641
Phone: (409) 981-2011
Internet: http://www.portofportarthur.com

Physical Address:
221 Houston Avenue
Port Arthur, TX 77641

Port of Port O'Connor

Mailing Address:
West Side Calhoun County Navigation District
6348 Highway 185 N
Long Mott, Texas 77979-7211
Phone: (361) 785-6492

Physical Address:
6348 Highway 185 N
Long Mott, TX 77979-7211

Port of Rockport

Mailing Address:
Aransas County Navigational District #1
911 Navigation Circle
Rockport, TX 78382
Phone: (361) 729-8037

Physical Address:
911 Navigational Circle
Rockport TX, 78382

Port of Sabine Pass

Mailing Address:
Sabine Pass Port Authority
P.O. Box 1067
Sabine Pass, TX 77855
Phone (409) 971-2411
Internet: http://www.sabineppa.com/

Physical Address:
5960 S. First Avenue
Sabine Pass, TX 77855

Port of Seadrift

Mailing Address:
P.O. Box 159
Seadrift, TX 77983
Phone: (361)785-2251

Physical Address:
501 South Main
Seadrift, TX 77983
Fax: (361) 785-2208

Port of Texas City

Mailing Address:
P.O. Box 591
Texas City, TX 77592
Phone: (409) 945-4461
Internet: http://www.railporttc.com

Physical Address:
2425 S.H. 146 North
Texas City, TX 77590

Port of Victoria

Mailing Address:
1934 FM 1432
Victoria, Texas 77905
Phone: (361) 570-8855
Internet: http://www.portofvictoria.com

Physical Address:
1934 FM 1432
Victoria, Texas 77905

Other Sources of Information

In addition to TxDOT's Multimodal Office, your local MPO, and TxDOT District Offices, there are numerous other resources that can be accessed to assist your understanding of freight transportation issues. These resources include agencies in the federal government and a number of professional organizations that are actively involved in the political process of supporting transportation infrastructure for the freight industry. A list of these government agencies and professional associations is provided below.

Federal Highway Administration (FHWA) – Office of Freight Management

Mailing Address:
Federal Highway Administration Operations Unit
U.S. Department of Transportation
400 7th Street, S.W., HOP
Washington, D.C. 20590
Phone: (866)367-7487 – Toll Free "Help Line"
Internet: http://www.ops.fhwa.dot.gov/freight/

Physical Address:
400 7th Street, S.W. HOP
Washington, D.C. 20590

U.S. Maritime Administration (MARAD)

Mailing Address:
Maritime Administration
U.S. Department of Transportation
400 7th Street, SW
Washington, D.C. 20590
Phone: (800) 996-2723
Internet: http://www.marad.dot.gov/

Physical Address:
400 7th Street, S.W.
Washington, D.C. 20590

American Trucking Associations (ATA)

Mailing Address:
2200 Mill Road
Alexandria, VA 22314-4677
Phone: (888) 333-1759
Internet: http://www.truckline.com/

Physical Address:
2200 Mill Road
Alexandria, VA 22314-4677

Texas Motor Transportation Association (TMTA)

Mailing Address:
700 East 11th Street
Austin, TX 78701-2673
Phone: (800) 727-7135
Internet: http://www.tmta.com/contact/index.asp

Physical Address:
700 East 11th Street
Austin, TX 78701-2673

Association of American Railroads

Mailing Address:
50 F Street NW
Washington, DC 20001-1564
Phone: (202) 639-2100
Internet: http://www.aar.org/

Physical Address:
50 F Street NW
Washington, DC 20001-1564

American Association of Port Authorities (AAPA)

Mailing Address:
1010 Duke Street
Alexandria, VA (703) 684-5700
Phone: (703) 684-7100
Internet: http://www.aapa-ports.org/

Physical Address:
1010 Duke Street
Alexandria, VA (703) 684-5700

Texas Ports Association

Mailing Address:
P.O. Drawer 2297
Beaumont, TX 77704
Phone: (409) 835-5367

Physical Address:
1225 Main Street
Beaumont, TX 77704

Association of Metropolitan Planning Organizations (AMPO)

Mailing Address:
1730 Rhode Island Avenue, NW Suite 608
Washington, DC 20036
Phone: (202) 296-7051
Internet: www.ampo.org

Physical Address:
1730 Rhode Island Avenue, NW Suite 608
Washington, DC 20036

Association of Texas Metropolitan Planning Organizations (TEMPO)

Mailing Address:
Attn: Michael Aulick
P.O. Box 1088
Austin, TX 78767
Phone: (512) 974-2275
Internet: http://www.texasmpos.org/

Physical Address:
505 Barton Springs Road, Suite 700
Austin, TX 78704