CAMBRIDGE SYSTEMATICS

TxDOT Waterborne Freight Corridor Study

Phase II

final

report

prepared for

Texas Department of Transportation

prepared by

Cambridge Systematics, Inc.

with

HNTB Corporation
Moffatt and Nichol Engineers
Mr. Robert Harrison

November 30, 2011

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1.0 Introduction and Goals

1.1 INTRODUCTION

Texas's waterborne transportation and trade system is crucial to supporting its economic output. Texas's port and transportation system has helped the State to become the Nation's largest exporter (in terms of revenue) – exporting $206.6 billion of product in 2010.[1] In terms of overall size, the Texas economy is the 12th largest economy in the world, with a gross state product (GSP) of $1.2 trillion in 2010.[2] In fact, Texas is a key driver of the entire U.S. economy and in 2008 was responsible for a full one-sixth of the U.S. Domestic Product (GDP) growth.[3]

The State's port and waterway system functions as a national and international gateway for trade, linking key Texas industries, particularly its chemical, petroleum, and agriculture industries, with markets and suppliers located throughout the world. While chemicals and petroleum are responsible for making Texas' ports among the largest in the nation (as measured by total tonnage), the Texas waterway system's importance in supporting the flow of containerized goods, grains, cement, and other commodities continues to grow. As a result, Texas ports and waterways contribute to the overall health and competitiveness of the State economy, providing a cost-efficient means to move goods into and out of the State, fostering international trade, and creating and supporting high-paying, attractive jobs for Texans.

The Texas Department of Transportation (TxDOT) commissioned a Waterborne Freight Corridor Study to help the DOT develop an understanding of the trends driving freight demand at Texas ports and waterways; identify key chokepoints impacting the efficiency of the State's waterborne and surface freight system; describe the key mobility, economic, and community/environmental impacts being caused (or exacerbated) by these growth patterns and chokepoints; and identify infrastructure, operational, and institutional recommendations to help the DOT and its local partners better address these issues. The study was conducted in two Phases, as shown in Figure 1.1:

- **Phase I** (completed in July 2010) described current and future conditions at the State's marine terminals, navigable waterways, and inland highway and rail connections; and identified critical bottlenecks and needs across the entire system.

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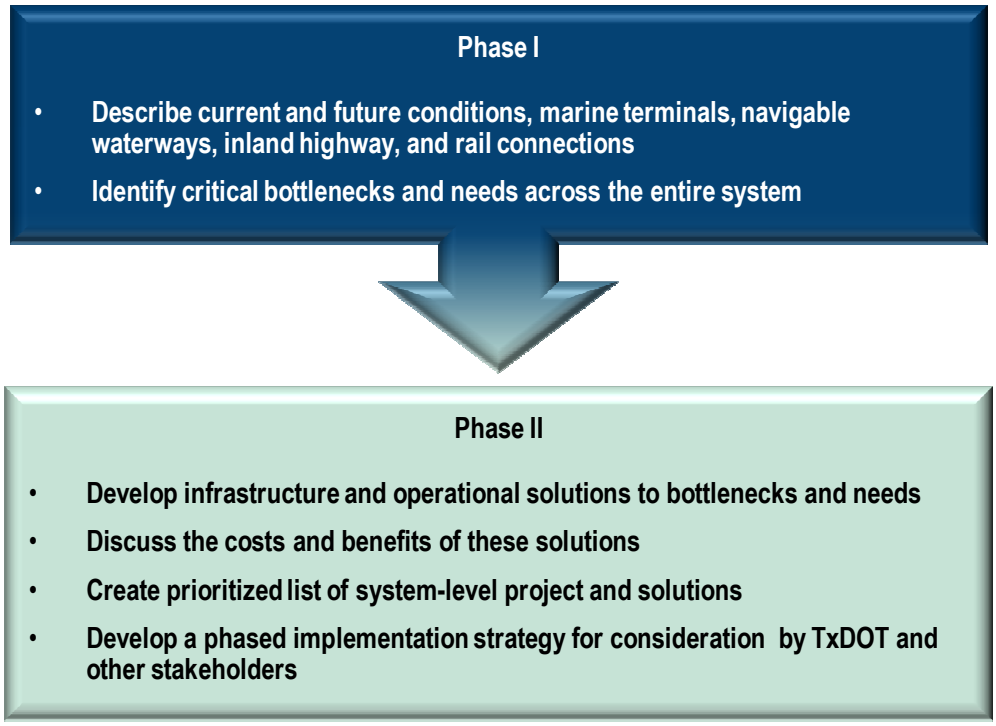
[1] United States Department of Commerce.

[2] United States Bureau of Economic Analysis.

[3] Ibid.

- **Phase II** (summarized in this report) developed infrastructure, operational, and policy solutions to these bottlenecks and needs, described the costs and benefits of these solutions, and developed a phased implementation strategy for consideration by TxDOT and other port/waterway stakeholders.

Figure 1.1 TxDOT Waterborne Freight Corridor Study Phases



Taken together, the two phases of the Waterborne Freight Corridor Study allow TxDOT to identify and address port and waterway-related issues by introducing a structured process for evaluating the benefits of potential investments. This process, which is described in subsequent sections, provides a foundation for TxDOT to develop system-level, multimodal solutions to address statewide waterborne freight needs and issues through the identification of key trade, infrastructure, operational, and policy concerns affecting Texas ports and waterways at the system level. Just as important, it provides a vehicle for TxDOT, along with national and statewide transportation policy-makers, port and waterway operators, the private sector freight community, and local partners, to begin addressing specific systemwide issues and chokepoints that cross jurisdictional interest and financial boundaries.

1.2 TxDOT Waterborne Freight Corridor Study Goals and Process

Goals

Several goals guided the development of Phase I and Phase II of this TxDOT Waterborne Freight Corridor Study, including:

- **Provide a better understanding of the port and waterway system** and the issues (bottlenecks, deficiencies, etc.) that are impacting efficiency, capacity, or safety of the State's waterborne issues;
- **Quantify the benefits of the State's key industries** (in terms of Jobs and Gross Domestic Product (GDP)) and how they use, and are dependent, on the State's waterborne system;
- **Recommend specific infrastructure, operational, and policy projects and strategies** to improve the condition and performance of the intermodal system;
- **Define goals for TxDOT's participation into the waterborne freight system**, and create packages of projects, strategies, and policies that work together to reach these goals;
- **Develop long-term strategy and framework** to allow TxDOT to more effectively include intermodal connectivity issues within its planning and investment activities; and
- **Identify ongoing and future actions** that TxDOT can take to further integrate the State's waterborne freight system into its multimodal planning efforts.

These goals articulate the relationship among economic growth, freight system efficiency, industry competitiveness, and environmental sustainability, and grow from an understanding of the needs of a broad range of public and private freight stakeholders.

Plan Development and Technical Documents

This Phase II report is the culmination of a series of technical papers developed in coordination with a Stakeholder Advisory Committee[4] throughout 2009-2011. Each technical paper dealt with a distinct aspect of the waterborne freight system in Texas, including documents summarized in Table 1.1. This report represents a summary of key findings from each of these efforts, as well as a series of recommendations developed from them.

[4] A list of the Stakeholder Advisory Committee is provided as Appendix B to this document.

Table 1.1 Technical Documents Produced in this TxDOT Waterborne Freight Corridor Study

Document	Content
TxDOT Waterborne Freight Corridor Study Phase I Final Report	Developed throughout late 2009 and 2010, this report focused on an analysis of transportation, socioeconomic, and domestic and international trade trends impacting the demand for waterborne commerce in Texas. It also identified key chokepoints, constraints, and issues that affect the Texas port and waterway system.
Evaluation Criteria and Solution Packages	Developed in Phase II, this document introduces the five-step project evaluation process. It also includes detailed information about the formation of the master projects list (Step I) and the Tier I evaluation criteria used to refine this master project list (Step II).
Waterborne Freight Performance Metrics	Developed in Phase II, this document reviews efforts from Federal, state, and international entities to develop waterborne performance measures. It also introduces the preliminary list of waterborne performance measures suggested for further study in Texas.
Port and Waterway Funding and Finance Options	Developed in Phase II, this document reviews all Federal and state funding and finance programs that are appropriate sources for waterborne freight system projects (or the multimodal truck/rail connectors included in this effort). It also determines which funding sources are the most appropriate to suggest for the different multimodal strategy packages.
Potential Effects of the Panama Canal System Expansion on the Texas	Developed in Phase II, this document introduces some of the potential impacts on the Texas transportation system of the new Panama Canal. It also reviews existing capacity enhancement projects at Texas ports, and discusses implications for Texas stakeholders.

Source: Cambridge Systematics, Inc.

2.0 The State's Waterborne System and Its Users

2.1 THE TEXAS WATERBORNE FREIGHT SYSTEM

The Texas Waterborne Freight System is comprised of 16 key deepwater and shallow draft ports, as well as the Gulf Intracoastal Waterway (GIWW) and other channel facilities. Intermodal connector facilities – including rail mainlines, yards, spurs and grade crossings, as well as highways, bridges, and other roadway infrastructure, provide important linkages and connectivity to these waterborne assets. The dominant features of the Texas waterborne freight system – the GIWW and the ports – are summarized briefly below. A more detailed discussion of the system, and its users, are included in the Phase I Final Report.

Gulf Intracoastal Waterway (GIWW)

The GIWW is a 1,300-mile manmade navigable inland canal that runs along the Gulf of Mexico coastline from the southernmost tip of Texas at Brownsville to St. Marks, Florida (Figure 2.1). Texas' portion of the GIWW begins 270 miles west of the Harvey Locks in Louisiana at the Sabine River border with Louisiana and extends approximately 423 miles south-southwest to the Brownsville Channel, just north of the Rio Grande River, Texas' border with Mexico. The waterway provides a channel with a controlling depth of up to 12 feet, and is designated primarily as a protected channel for barges carrying freight, commercial fishing boats, and recreational watercraft.

Of the five major internal waterways in the United States, the GIWW has consistently carried the third-highest tonnage over the past decade, approximately 110 to 125 million tons of goods per year, equivalent to approximately 20 percent of total U.S. inland waterway traffic.[5] In addition, the GIWW also provides access to the State's deep- and shallow-draft seaports, which contain more than 1,000 individual port and terminal facilities. Almost every port in the State connects to the GIWW.

[5] U.S. Army Corps of Engineers.

Figure 2.1 Texas Portion of the Gulf Intracoastal Waterway System

Source: Guide to the Economic Value of Texas Ports, TxDOT Report 0-5538-P1, Center for Transportation Research, University of Texas-Austin, February 2008 (revised December 2008).

Texas Ports

The Texas Port Association identifies 16 key deepwater and shallow draft ports, (Figure 2.2), that drive the State's waterborne economy. These include the Ports of Beaumont, Brownsville, Corpus Christi, Freeport, Galveston, Harlingen, Houston, Bay City, Cedar Bayou, Orange, Palacios, Port Arthur, Port Isabel, Port Mansfield, Texas City, and Victoria, along with the Calhoun Port Authority (previously known as the Port of Lavaca-Point Comfort), and the West Side Calhoun Navigation District.

Two of these ports – Beaumont and Corpus Christi – have been defined as strategic installations by the United States Department of Defense (DOD) for use in moving surge military cargoes in times of crisis. All of the ports represent critical gateways for domestic and international freight, and connect the Gulf of Mexico, one of the great oil and gas production and refining regions in the world, to regional, statewide, and national markets.

Figure 2.2 Texas Ports

2.2 KEY USERS OF THE STATE'S WATERBORNE FREIGHT SYSTEM

Key Texas Industries

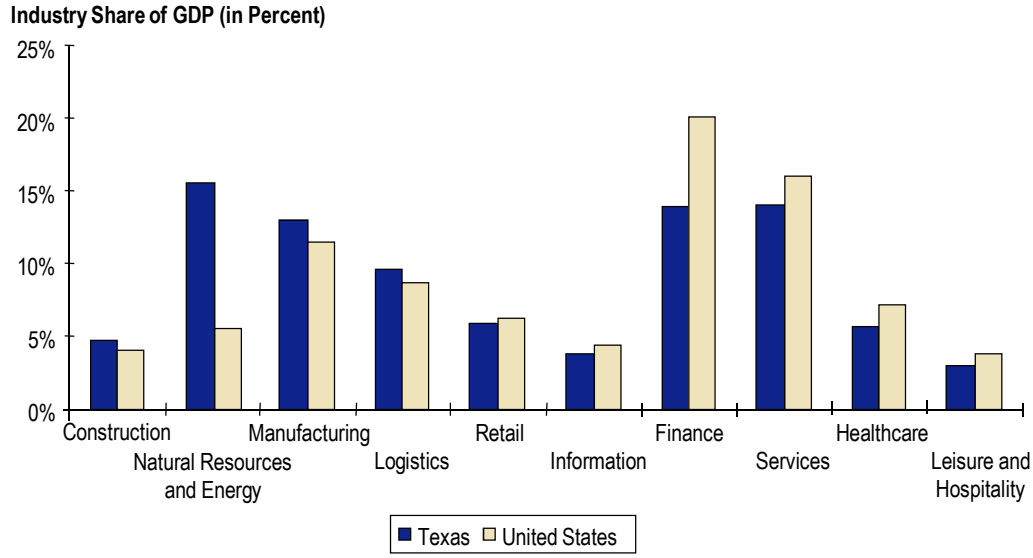
As noted earlier, the Texas economy is the 12th largest economy in the world, with a gross state product (GSP) of $1.2 trillion in 2010.[6] Much of this is driven by the State's key industries, including energy, agriculture, manufacturing, construction, and logistics services.

This mixture of strong resource-, manufacturing-, and logistics-oriented industries means that Texas's economic structure is sustained by industries that rely on the efficient movement of goods for their day-to-day functioning. In fact, Texas has a much higher share of its GSP derived from natural resources and energy, construction, and manufacturing than the U.S. economy as a whole (Figure 2.3). This means that the Texas economy is more dependent than many

[6] United States Bureau of Economic Analysis.

other states on maintaining an effective transportation system. Understanding how these industries gain a competitive edge by using the state waterborne freight system is of key importance when evaluating the impacts of the range of potential improvement projects.

Figure 2.3 Texas Economic Structure Compared to the United States
2008



Source: U.S. Bureau of Economic Analysis, 2009.

How Key Industries Use the Waterborne System

Industries differ in the ways they utilize Texas seaports and the GIWW. In general, distance and landside accessibility is an effective predictor in determining which firms will be able to effectively utilize Texas ports. Yet, within each industry there are exceptions. Some firms located within Texas rely primarily on seaports outside of Texas to handle their products, whether these comprise imports or exports. Reasons may include the location of fixed distribution infrastructure, or access to international markets that are not well served by carriers calling at Texas ports. Conversely, some firms that are located geographically closer to an out of state port will rely on a Texas port if it offers more favorable conditions when the total supply chain is considered.

Due to this variability, the discussion of industry supply chain considerations below is general and will not apply to every individual firm. However, general supply chain needs are provided for key state industries, including petrochemical, agriculture, retail/containerized, project and break bulk cargoes, and specialized commodities, including steel and military movements.

The industries included in this profile were drawn from the discussion of critical industries within the Phase I Final Report. This section reiterates their importance to the Texas economy, and also includes some description about how each industry

Petrochemical

The petrochemical industry remains the single largest user and beneficiary of the Texas port and waterway system. Texas's 27 petroleum refineries can process more than 4.7 million barrels of crude oil per day, and they account for more than one-fourth of total U.S. refining capacity.[7] Most of the State's refineries are clustered near major ports along the Gulf Coast, including the Ports of Houston, Beaumont, Freeport, Texas City, Port Arthur, Victoria, Corpus Christi, and the Calhoun County Port Authority. These coastal refineries have access to local Texas production, foreign imports, and oil produced offshore in the Gulf of Mexico, as well as the U.S. Government's Strategic Petroleum Reserve, which operates two large storage facilities in Bryan Mound and Big Hill.

The petroleum, petrochemical, and manufacturing industries are more dependent on transportation than most other industry sectors. These industries rely on the State's ports, but also on the State's multimodal transportation system comprised of the GIWW and statewide rail, air, pipeline, and road networks to reliably produce and deliver products.

Texas ports and waterways are a crucial link in the petroleum product supply chain, bringing in intermediate goods like petroleum which are converted into much higher value-added chemicals and plastics in Texas manufacturing plants and then shipped from the ports to overseas export destinations. Barge transportation also is heavily utilized, for movements such as transporting commodities – many hazardous – within ship channel and along the Texas Coast. In addition, barging is utilized by deepwater ports to shuttle product between manufacturing facilities. The GIWW plays an important and growing role in facilitating efficient and safe movement of a range of bulk petrochemical products unsuited to highways.

[7] Texas Waterborne Freight Corridor Study Phase I Report.

Supply Chain Characteristics of the Texas Petrochemical Industry
Key Supply Chain Characteristics – Petrochemical

- The petrochemical industry remains the single largest user and beneficiary of the Texas port and waterway system.
- Many petroleum refineries are clustered on the Gulf Coast, in Ports of Houston, Beaumont, Freeport, Texas City, Port Arthur, Victoria, Corpus Christi, and the Calhoun County Port Authority.
- The petroleum, petrochemical, and manufacturing industries are more dependent on transportation than most other industry sectors and these industries rely on the State's ports, as well as the GIWW and statewide rail, air, pipeline, and road networks, to produce and deliver products reliably.
- Barges are heavily utilized to transport materials in this industry – in particular between manufacturing facilities or along the Texas Gulf Coast utilizing the GIWW.

Agriculture

Texas's agriculture industry is the second largest in the country following California. Total Texas farm output was measured at $24 billion in 2010, and included $6.1 billion in agricultural exports.[8] Texas ranks second in total cotton exports, is the third-ranked exporter of live animals and meat, the second ranked exporter of feed and fodders, and the fourth ranked exporter of grain.

In addition to providing a gateway for its own agricultural products, Texas ports also facilitate export of agricultural products from the heartland. For this reason, the top commodity agricultural commodity by value exported through Texas ports is cereals. Corpus Christi, Houston, and Galveston are all major cereal grain export centers. Texas also has unique assets for agricultural exports, such as the 100,000 square-foot cold storage facility at Corpus Christi, that attract exporters from out of state.

In addition to exports, Texas farmers and ranchers also rely on a number of waterborne imports for inputs to production. Imports of fertilizers, farm equipment, pesticides, diesel fuel, enzymes used in feed and for processing waste material, and packaging materials are some of the key inputs that are supplied to agricultural users through Texas ports and waterways. Farmers and ranchers along the coast rely on GIWW for low-cost and reliable shipments of fertilizer and fuel.

Most agricultural shippers also rely heavily on truck and rail linkages. For those with nonperishable products, access to the Class I and shortline rail network is

[8] http://www.ers.usda.gov/StateFacts/TX.htm.

critical. Most agricultural commodities have elastic demand, meaning a small increase in total cost leads to a significant drop off in demand for the commodity. Efficient truck connections to ports and rural agricultural regions, as well as rail linkages, are essential for holding down cost, particularly for low value per ton commodities like cereal grains that originate far from the port of departure. Grains are now typically moved by multicar unit trains, serving efficient rail and port terminals which have displaced many of the smaller cooperative silos on short lines.[9]

Supply Chain Characteristics of the Texas Agriculture Industry
Key Supply Chain Characteristics – Agriculture

- Texas is the leading producer and exporter of cotton, and exports $6.1 billion of agricultural product – both nationally and internationally.
- Several Texas ports (such as Corpus Christi, Houston, and Galveston) serve as gateways for Midwest Grain Exports.
- Texas farmers and ranchers also rely on the port network for imports of agricultural inputs.
- Truck provides a crucial link to agricultural shippers, in particular to carry goods from rural and dispersed farms to markets.
- For those commodities that are not perishable, rail is the preferred modal alternative for agricultural shippers of exports and imports.

Project Cargo/Breakbulk

Breakbulk is sometimes defined as noncontainerized general cargo where the smaller items are stored in pallets, bales, boxes or specially formed cradles, together with machinery or heavy metal components. Though breakbulk was once the dominant method to move goods, the advent of containerization has reduced its significance. Now, it tends to only be used for hard-to-handle, oversized, and at times overweight cargo critical to various sectors of the global economy.

Texas breakbulk trade is relatively small but it has important implications for both the State economy and TxDOT highways for several reasons:

- Breakbulk cargo is carried in smaller ships that are not dependent on terminal cranes, so it can serve smaller ports with sufficient channel depth – typically 35 feet.
- Breakbulk includes large, oversized overweight (OS/OW) commodity shipments that need to travel on Texas highways to their destination – often requiring a permit from TxDOT to do so.
- Growth in both traditional industries, like petrochemicals, as well as emerging industries, like wind power generation, has resulted in the movement of

[9] An earlier TxDOT sponsored study found that unit train costs from the Texas Panhandle to Mexico reduced per bushel costs relative to single cars by 30 percent.

super-heavy loads which have accelerated pavement consumption. The Texas Legislature recently required that TxDOT review the OS/OW permit system, including fees and cost recovery and this could change the current supply chains and port selection.

There are several unique supply chain considerations for handling project cargo and breakbulk. The energy industry makes imports and exports of project cargoes and breakbulk particularly important to the Texas economy. Drilling equipment, wind turbines and blades, platforms and other out of gauge equipment are challenging for ports to handle and are equally challenging to move overland. For this reason, the supply chains for many project cargoes are based upon designated corridors for handling overweight shipments. Due to the potential for damage to the road network, shifting these cargoes to rail or the GIWW[10] whenever feasible is a key priority.

Supply Chain Characteristics of Project Cargo and Breakbulk
Key Supply Chain Characteristics – Project Cargo and Breakbulk

- Many project cargo and breakbulk shipments are tied to energy production or petro-chemical plant.
- Heavy lift and odd-shaped cargoes require specialized equipment and docks.
- Cargoes are difficult to move overland and often require special permits that designate corridors.
- Oversized/overweight permits are not covering the consumption of highway infrastructure, creating an explicit subsidy using TxDOT funds.
- Mode shift to rail is viewed as a strategy to avoid excess pavement damage.

Retail/Containerized Products

Container supply chains are driven primarily by population density with the largest, most densely populated areas of the state requiring the highest number of containerized shipments. However much of the remainder of the state population including Dallas/Fort Worth (DFW), Austin, San Antonio and South Texas also relies on shipments of consumer products arriving through the Port of Houston. El Paso is almost as far from Houston as it is from Los Angeles. With so many residents located far inland away from any maritime port, efficient landside connections for containerized goods become particularly important.

Diversion of supply chains originating in Asia from the West Coast to Texas ports has been an established trend for several years. The Panama Canal expansion is expected to expand and consolidate these trends and will likely shift the

[10] Caterpillar recently selected an assembly site near the Port of Victoria and the site choice was influenced by its location on the GIWW and the ability to transport heavy subcomponents over the entire GIWW-Mississippi systems without highway permits.

inflexion point at which shippers choose to utilize Texas ports for delivery to the interior of Texas as opposed to West Coast gateways.

While consumer goods play a prominent role in containerized imports, most containerized exports from Texas ports are tied to heavy industry and include products such as plastic pellets, machinery parts, organic chemicals, and other chemical products.[11] As opposed to the import dominated terminals in Southern California, the supply chain for containers through Texas ports is characterized by balanced trade.

The demand for maritime containers for export from the Port of Houston has helped to drive the trend to transload containers near the Port of Houston rather than trucking them directly to their destination. For this reason, a high percentage of containers arriving at Houston will first be opened at a Houston area warehouse or distribution center.

Finally, Texas container flows are concentrated through Houston and Freeport which raises the question of strategic redundancy when considering potentially severe disruptions created by weather (hurricanes) or terrorism.

Supply Chain Characteristics of Containerized Cargo
Key Supply Chain Characteristics – Containerized Cargo

- Container supply chains are driven primarily by population patterns, since they tend to carry consumer products and items to support industries and businesses.
- Efficient surface transportation systems are essentially to carry goods from port to inland markets, or to connect industries to the ports for export.
- The demand for maritime containers for export from the Port of Houston has helped to drive the trends to transload containers near the Port of Houston rather than trucking them directly to their destination. For this reason, a high percentage of containers arriving at Houston will have a first stop at a Houston area warehouse or distribution center.
- The supply chain for containers through Texas ports may be impacted by the opening of the new Panama Canal in 2014. Though any change is likely to be incremental, Texas ports may find themselves as part of the supply chain for new cargo diverted from the west coast ports.
- Containerized imports are led by consumer goods and inputs for light manufacturing while exports are driven by heavy industry.

Military

As described earlier, the Ports of Beaumont and Corpus Christi have been defined as strategic installations by the United States Department of Defense

[11] U.S. Census Trade Data.

(DOD) for use in moving surge military cargoes in times of crisis. Beaumont and Corpus Christi both saw consistent utilization by the military during Operation Iraqi Freedom and handled a diverse array of cargo essential to the military effort. Rail connections were an essential feature for these ports selection by the military. In addition, much of the cargo associated with military movements is extremely heavy, and is often oversized or overweight. Therefore, it is necessary to preserve OS/OW corridors near these ports to allow for efficient truck access. With the current military deployments in Iraq and Afghanistan winding down, and frequency of military shipments through these ports has significantly declined, however ports are also important for demobilization activities.

Supply Chain Characteristics of Military Movements
Key Supply Chain Characteristics – Military

- Corpus Christi and Beaumont are designated as key military deployment ports with Beaumont currently handling most of the cargo.
- Rail is essential for military movements and rail connections are given priority by the DOD.
- Truck movements associated with military movements can often include oversize/overweight moves. This means that OS/OW corridors need to be preserved in port access regions and beyond.
- Military shipments are diverse in nature and involve roll on / roll off (RO/RO), project and containerized cargoes.
- Ports play a role not only in initial deployment but also in de-mobilization.

Steel

Texas currently has 181 steel establishments and ranks 6th, nationally, in steel production related employment.[12] The Port of Houston plays the largest role in importation and exportation of articles or iron and steel, and also handles a significant amount of raw steel. Corpus Christi, Freeport, Galveston, and Brownsville also play a role in steel importation and exportation. The Port of Brownsville is particularly strong in the export of raw steel, most of which originates in Mexico. Like agricultural goods, steel is a commodity that is subject to rapid changes in demand. This variability complicates long-term capital planning for improving the efficiency of steel movements. With careful planning there is a potential improved use of the rail network and the GIWW for steel shipments, particularly between Brownsville and Houston. Developing economies, including Turkey, India, Mexico, and China make up some of the key recipients of raw steel exports through Texas ports.[13]

[12] http://www.governor.state.tx.us/files/ecodev/profileironandsteel.pdf.

[13] U.S. Census Trade Data.

Supply Chain Characteristics of the Texas Steel Industry
Key Supply Chain Characteristics – Steel

- Port of Houston plays the largest role in steel movements, though other ports including Corpus Christi and Brownsville are playing an increasing role.
- Mexico utilizes Port of Brownsville for steel exports.
- Steel tends to be subject to boom and bust cycles – Houston reported record growth in steel products in 2011.
- There is the potential to make better use of the Gulf Intracoastal Waterway for steel-related moves, in particular between the Port of Brownsville and the Port of Houston.

2.3 TRENDS AND ISSUES IMPACTING WATERBORNE SYSTEM USERS

Trends Impacting Waterborne Demand

The drivers of freight volumes in Texas are trending upwards, including population, industrial output, and export markets. Though these trends are reported in more detail in the Phase I report, they are included here since they impact waterborne freight volumes, which may exacerbate existing issues and chokepoints on the waterborne system, and will ultimately drive the selection of project and strategies. Briefly, the trends driving the demand for waterborne freight include:

- **Texas' population growth rate** has been exceptional over the last few decades, and continues to outstrip that of the nation as a whole. In net population growth terms, Texas ranked first in the nation between 2000 and 2008, adding about 3.4 million people to reach 24.3 million in total population.[14] By 2040, the State is expected to have nearly 36 million people, making it about the same size as present day California.[15] This will translate into a much larger market for imported consumer goods moving through Texas seaports. It will also create more passenger movements and congestion on critical freight corridors.
- **The State's key industries are thriving and anticipated to grow significantly in future.** In contrast to many other states with service-oriented economies, Texas' economy is particularly strong in resource extraction, agriculture, manufacturing, and logistics – all industries that are especially

[14] *TxDOT Waterborne Freight Corridor Study: Phase I Final Report.*

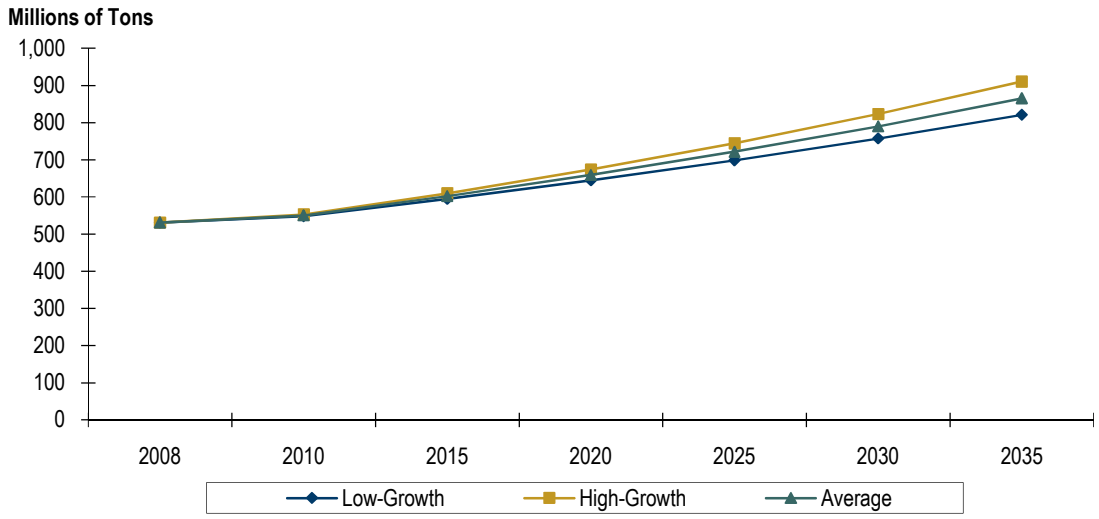
[15] Texas State Data Center Population Projections, Scenario 0.5.

dependent on an efficient multimodal transport network. Natural resources and energy alone accounted for 16 percent of Texas' economic output in 2008, compared to about six percent for the nation as a whole. Chemical production in Texas was a $42 billion industry in 2007, accounting for 17 percent of the U.S. total. At $20 billion in 2007, the Texas agricultural sector is the second largest in the nation after California, and Texas ports are a critical export point for U.S. exports of grain, cotton, and other commodities.[16]

- **High oil prices** (which benefits the Texas petrochemical sector) combined with **rapid economic growth in the developing world** (which increases demand for basic commodities like oil, minerals, and grains) will continue to fuel growth in key Texas industries over the next few decades.

All of this means that Texas waterborne freight demand will grow substantially in the coming years. As shown in Figure 2.4, total tonnage through Texas ports is expected to grow from about 531 million tons in 2008 to nearly 866 million tons in 2035 (using average assumptions about cargo growth rates). Container volumes will grow much faster, nearly tripling to 8.6 million 20-foot equivalent units (TEU) by 2035. This growth will partially be driven the expansion of the Panama Canal in 2014, which will allow much larger cargo ships to use an all-water route to access Gulf Coast ports from Asia.

Figure 2.4 Texas Waterborne Tonnage Forecasts
2008-2035



Source: TxDOT Waterborne Freight Corridor Study Phase I Final Report.

[16] United States Bureau of Economic Analysis.

Issues Facing Port and Waterway System Users

Various infrastructure, operational, and institutional issues are impacting the ability of Texas' waterborne transportation system to absorb this growth in demand. Table 2.1 summarizes the physical and institutional challenges facing Texas port authorities – summarized from work generated through Phase I of this study. Though there were numerous individual chokepoints, constraints, and issues identified during the Phase I effort, they can generally be grouped into six categories:

- **Waterside capacity issues -** lack of adequate harbor or "inside the gates" port terminal capacity is hampering the ability of some ports to accommodate growing cargo volumes. Although several ports have embarked on major terminal expansions to meet growing demand, there is still a need for channel deepening and dredging at various facilities around the State, especially once the expanded Panama Canal begins operations in 2014.
- **Landside connectivity issues** - many ports do not have adequate rail and/or highway connections, which threatens their ability to remain competitive in the market for discretionary cargo.
- **GIWW and Harbor channel issues –** including low bridge clearances at locations including Port Arthur and Corpus Christi limit the air draft of ships that can access these ports. Meanwhile, several points along the GIWW in Texas suffer from aging locks, channel width limitations, and sedimentation problems which limit the size and/or weight of vessels utilizing the channel. Finally, there are growing issues with encroachment into dredged material placement areas, and sections of the GIWW- which threatens the use and capacity of this vital resource.
- **Landside capacity constraints –** including capacity and condition issues on major trade corridors, port access routes, and rail lines, which may prevent the system from effectively absorbing future growth in freight volumes.
- **Policy and institutional constraints** – including the lack of adequate and reliable funding and various security and environmental mandates that increase costs – affect all waterways and ports in the State and lengthen timeframes for project delivery.

Table 2.1 Texas Waterborne Transportation Issues and Challenges

Issues	Description	Ports and Facilities Impacted
Waterside Capacity	Port terminal or harbor capacity limitations	Port of Freeport, Port of Houston, Port of Galveston, Port of Corpus Christi
Landside Connectivity	Lack of adequate rail or highway connectivity to ports	Port of Port Arthur, Port of Freeport, Port of Texas City, Port of Galveston, Calhoun Port Authority, Port of Corpus Christi, Port of Brownsville

GIWW and Harbor Channel Issues	Aging locks, channel width and depth limitations, encroachment into dredged material placement areas and GIWW sections, and bridge clearance issues	Bridges at Port Arthur, Galveston, Corpus Christi, and Freeport; GIWW at High Island Wiggles, Freeport Wiggles, Brazos Floodgates, Colorado River Locks, Caney Creek Wiggles, Matagorda Ship Channel, "Hole in the Wall," and Laguna Madre
Landside Capacity Constraints	Physical or operational constraints on highways or railways connecting to ports	Port of Beaumont, Port of Houston, Port of Texas City, Port of Freeport, Port of Corpus Christi, Port of Brownsville
Policy and Institutional Constraints	Lack of reliable funding sources, policy mandates that increase costs, development and land use conflicts with GIWW needs, and no consid-eration for waterway needs in TxDOT planning process	All ports and waterways

Source: TxDOT Waterborne Freight Corridor Study Phase I report.

In all, and as discussed in more detail in the Phase I report, Texas's waterborne freight system supports many industries that are vital to the State's economy and quality of life. Trends – including growing employment and population – indicate that demand on the waterborne freight system will rise substantially in the coming years. However, there are issues, bottlenecks, and capacity concerns on the State's waterborne freight system that – if not addressed – may limit its it efficiency and its ability to serve key industries. The purpose of Phase II was to create a framework by which potential solutions can be identified, assessed, and evaluated. Our recommended process to do so is described in subsequent sections.

3.0 Identification of Solutions

Phase II of this TxDOT Waterborne Freight Corridor Study was tasked with developing a set of infrastructure, operational, and policy solutions to address the needs identified in Phase I in a way that is transparent, flexible, and reproducible.

This process recognizes that many of the individual ports and terminals already are addressing these needs on their own, and some of these efforts are highlighted in Phase I. However, there are transportation, community, and economic ramifications to these investments that reverberate well beyond the gates of individual ports. As a result, there is a need to consider the collection of ports, waterways, and multimodal connectors as an entire system. The State (via TxDOT) has an interest not only in understanding what those impacts are, but how they can be structured in a way that makes the most sense from a system perspective. Therefore, this entire process was designed to help the State determine what improvement projects exist, what their system impacts and benefits may be, and how the State could/should participate. This helps lay the foundation for a more formal role of the State in investing in its port and waterway infrastructure.

In order to respond to these mandates, the following five-step evaluation process was developed. This process is meant to provide a framework by which projects and strategies can be selected, evaluated against each other, and ultimately moved into a prioritized investment plan for the State's waterborne freight system. Though Section 4.0 of this report includes preliminary results from the first application of this five-step process, it is anticipated that this process will continue to be refined by TxDOT and its partners. Eventually, this five-step methodology could be included in TxDOT's toolbox to better integrate waterborne freight system needs into the planning process.

This five-step evaluation process is summarized in Figure 3.1 and below:

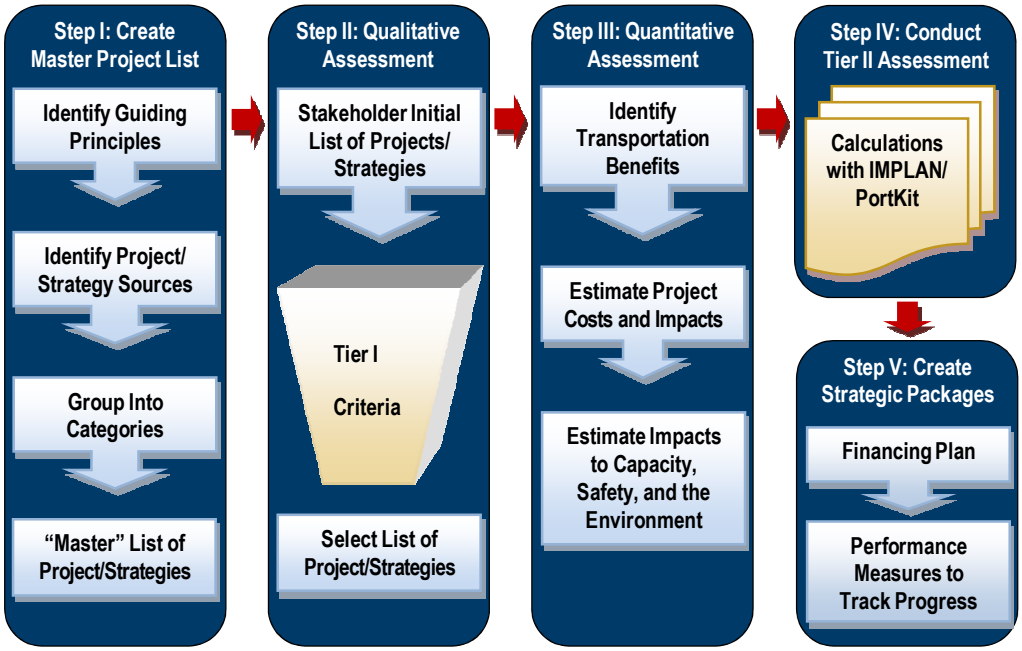
- **Step I –** Create Master Project List;
- **Step II –** Conduct a Tier I (qualitative) screening assessment on the "master"[17] list of multimodal projects and strategies to narrow the list of projects/ strategies to a group of solution packages;
- **Step III –** Conduct a Tier II (quantitative) benefit screening assessment on those projects that satisfy the Tier I criteria;

[17] The "master" list refers to the more than 200 project and strategy list prepared in coordination with TxDOT and the stakeholder group. It is provided as Appendix A to this document.

- **Step IV –** Perform an impact assessment of select projects that satisfy the Tier II screening using the IMPLAN economic assessment tool; and
- **Step V –** Create strategic, multimodal packages of projects and strategies designed to address specific TxDOT goals for participation in the waterborne freight system.

Each step of this five-step process also is discussed in more detail in Sections 3.1 to 3.4 following Figure 3.1.

Figure 3.1 Five-Step Project Evaluation Process



3.1 STEP I – CREATE MASTER PROJECT LIST

The goal of *Step I – Create Master Project List* was to work with Texas waterborne system stakeholders to create a multimodal project list that contains the full suite of projects under consideration for waterborne freight system improvements. It included several steps, including project identification, project categorization, and additional data gathering.

Project Identification

The first step of the process was to create a master project list that includes the full suite of multimodal projects under consideration by TxDOT, individual ports, the U.S. Army Corps of Engineers (USACE), and other stakeholders. Some of the projects were identified throughout the TxDOT's Waterborne Phase I effort, which culminated in a final report in July 2010. Additional methods used to identify projects and strategies included:

- One-on-one interviews with waterborne freight system stakeholders, including individual ports, some key shippers, pilot groups, academics specializing in the State's waterways, regional governments and economic development agencies, and other local and regional organizations and governments;
- Discussions with our Stakeholder Advisory Committee – which is comprised of representatives from Texas seaports, economic development agencies, regional and MPOs, the USACE, Class I railroads, TxDOT districts, and other stakeholders;[18]
- Recommendations from other ongoing port capacity, maintenance, and mobility projects relevant to the statewide waterborne freight system; and
- Other recent studies, including work completed by the USACE, specific ports, and the TxDOT's Waterborne Freight Study Phase I report.

These discussions and research efforts resulted in a list of about 200 multimodal projects, strategies, and policies.[19] The projects and strategies vary tremendously in terms of estimated project cost, project size and timeline, and geographic location. However, they are similar in that each one has been chosen by the Stakeholder Advisory Committee for its contribution to the efficiency and capacity of the Texas waterborne freight system.

Project Categorization

The projects were then grouped into one of three categories:

- **Maintenance projects** – those required to elevate the system to an acceptable, national standard (such as 12-foot channel depth or 286,000 - pound rail capacity), and/or allow the system to maintain existing market share and natural growth.
- **Capacity enhancement projects –** those designed to enhance current market share, or allow the system to capture additional traffic in the near-term. This may include new highway capacity or connectors, channel deepening and rail grade separations.
- **Strategic investment –** those designed to respond to long-term freight, population, and trade trends – such as new terminals, new rail mainlines or highways, or major bridge replacements.

These are broad categories that are defined primarily by the intent of the project, but may also be defined by project readiness, availability, or presence of funding sources, infrastructure or capital needs, technology needs, and estimated timeframe from start to completion of project. We used modal knowledge and

[18] A list of the Stakeholder Advisory Committee is provided as Appendix B.

[19] This list is available as Appendix A.

expertise to determine which of the criteria are actually driving the categorization of any of the projects. The performance definitions, as well as the criteria used to evaluate them, are described in more detail in Table 3.1.

Table 3.1 Performance Definitions Used to Categorize Projects, Strategies, and Policies

Title	Definition	Criteria
Maintenance	Projects that are required to elevate the system to an acceptable, national standard (e.g., 286,000 - pound rail capacity, 12-foot channel depth), maintain and preserve the existing system elements at those standards, and/or allow the system to maintain existing market share and keep up with natural growth in traffic in the short-term (1 to 5 years).	**Intent:** Project will contribute to maintaining the current waterborne system "as is," be currently underway, or assumed to be necessary to support the port's current operational strategy.
		Funding: Likely to be fully or partially funded, or at least have likely funding sources identified.
		Project Readiness: Is fairly "shovel-ready," it has passed one or more of its major environmental review periods, may have some permits authorized. No barriers in sight to moving towards project implementation.
		Implementation Timeline: Can vary, but tend to be short-term and can be completed within 5 years.
		Technology: Will likely not need any specialized, rare, or "under-development" technology.
		Infrastructure/Capital Needs: Can vary considerably in this category, though tend to have zero-to-minor infrastructure needs.
Capacity Enhancement	Projects that are designed to enhance current market share, or allow the system to capture additional traffic in the midterm (10-15 years).	**Intent:** Project adds capacity or operational improvements to fully maximize the current (and projected) cargo levels at Texas ports.
		Funding: Likely to have some funding sources identified, may have taken steps to apply for certain funding sources.
		Project Readiness: Project has some specificity, though may not be "shovel-ready."
		Implementation Timeline: Can vary, but likely on a slightly longer timeframe (5-10 years) than maintenance projects.
		Technology: May require some specialized or rare technology that may add time to the project planning and implementation timeline.
		Infrastructure/Capital Needs: Tends to have minor to substantial infrastructure or capital investment needs.

Table 3.1 Performance Definitions Used to Categorize Projects, Strategies, and Policies (continued)

Title	Definition	Criteria
Strategic Investment	Projects that are designed to respond to long-term (10-20 years) freight, population, and trade trends and keep Texas competitive.	**Intent:** Project responds to local, national, or global trends; and works to increase the global competitiveness of Texas ports.
		Funding: Likely does not have funding sources identified or secured.
		Project Readiness: Project is generally conceptual or at the sketch-planning level.
		Implementation Timeline: Project will likely be on a longer timeframe (10-20 years) to complete.
		Technology: May require technology that currently is either under development, not available, or conceptual in nature.
		Infrastructure/Capital Needs: Can vary, but may require significant infrastructure or capital investment needs.

Additional Data Gathering

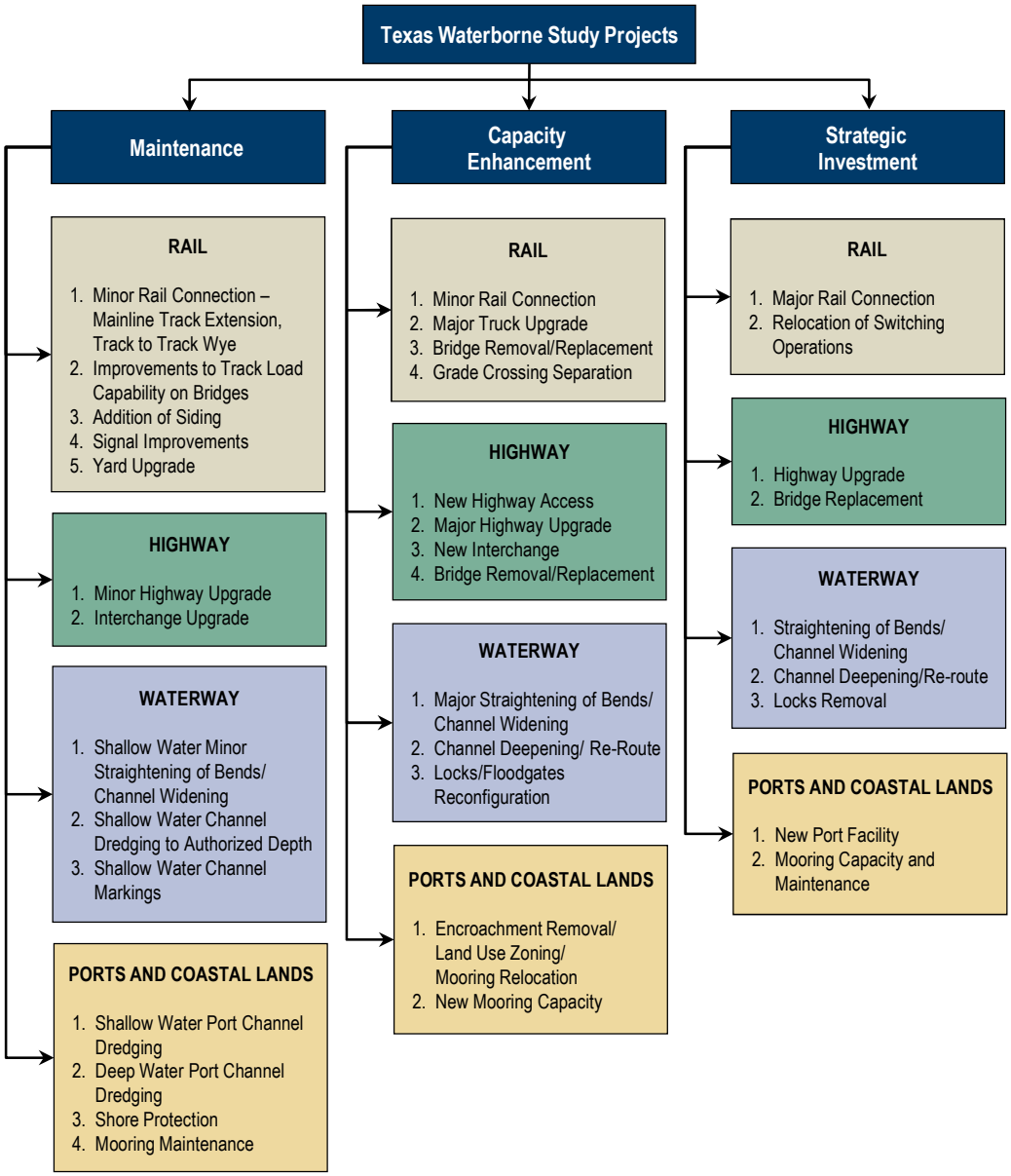
In order to gain a broader understanding of each project and its role in the Texas waterborne freight system, several other types of information were gathered for each project, including:

- **Affected Port** – The primary beneficiary port(s) of each improvement project, strategy, or policy. If the project/strategy will benefit all ports, it is noted as such.
- **Anticipated Cost –** In many cases, the project/strategy has a published cost estimate, which was listed here. Other project costs were calculated by application of engineering unit costs to known project specifics.
- **Status of Project/Solution –** The stage of the project at time of matrix creation (i.e., early 2011).[20] Potential categories include conceptual, under study, partially funded, fully funded, underway, or completed.
- **District –** The affected TxDOT District.
- **Region** – The affected TxDOT Region.

[20] This column is continuously updated as the project assessment proceeded. Several projects changed categories throughout this study timeline.

Almost 200 projects/strategies were included in this master matrix. Though the master matrix is included as Appendix A to this report, a summary of the types of projects in each category is shown as Figure 3.2.

Figure 3.2 Type of Projects in Each Category of the Master Matrix



3.2 STEP II – QUALITATIVE ASSESSMENT

The goal of *Step II – Qualitative Assessment* was to refine the master project list to include only those projects that work towards fulfilling statewide, system-level goals. It included several steps, including development of qualitative screening criteria, creation of assumptions to guide the process, and finally the Tier I assessment of projects.

Develop Tier I Qualitative Screening Criteria

One of TxDOT's goals for this project was to assess individual port and water-way projects from a system-level and statewide perspective, focusing on overall freight mobility and capacity goals.

To this end, a set of **Tier I screening metrics** were developed in order to screen out those projects and strategies that are underway, conceptual, or local, and therefore do not belong in a statewide, system-level plan. Tier I Screening Metrics included all qualitative measures of project performance. For each of the three Tier I screening metrics, simple "Yes" or "No" answers were used to allow for relative comparison against other projects:

Yes	No
Project/strategy addresses or satisfies the screening metric.	Project/strategy does not satisfy or address the screening metric.

Screening Metric No. 1a: Maintain or Create New Capacity

Definition

The purpose of this metric was to assess the contribution of the project/strategy to the capacity of the freight system. Maintenance projects were evaluated for their potential to maintain existing system capacity. Capacity projects were evaluated for their ability to enhance or increase system capacity.

Rating System Description

The rating system for this metric utilized the "yes" and "no" scale, as shown in Table 3.2 below.

Table 3.2 Relative Rating Guidelines
Maintain or Create New Capacity

Relative Rating	General Guidelines
Yes	The project/strategy preserves (for maintenance projects) or enhances (for capacity and strategic projects) existing throughput of the freight system (marine terminal, rail terminal, intermodal terminal, etc.).
No	The project/strategy will not have any measurable impact on existing throughput.

Source: Cambridge Systematics, Inc., 2010.

Screening Metric No. 1b: Maintain or Improve System Mobility

Definition

The purpose of this metric was to assess the contribution of the project/strategy to overall freight system mobility (compared to a no-build scenario). Maintenance projects were evaluated for their potential to maintain existing system mobility. Capacity and strategic projects were evaluated for their ability to enhance system mobility.

Projects that satisfied this metric included those that add connectivity to the freight system (rail spurs, highway connections, or new/enhanced channels), as well as those that reduce potential for conflict (i.e., at rail highway crossings or between freight and recreational vessels).

Rating System Description

The rating system for this metric utilized the "yes" and "no" scale, as shown in Table 3.3.

Table 3.3 Relative Rating Guidelines
Maintain or Improve System Mobility

Relative Rating	General Guidelines
Yes	The project/strategy preserves (for maintenance projects) or enhances (for capacity projects) existing freight system mobility by maintaining or enhancing connectivity, reducing conflict between modes or uses, or other actions that enhance system mobility.
No	The project/strategy will not have any measurable impact on freight system mobility.

Source: Cambridge Systematics, Inc., 2010.

Screening Metric No. 1c: Meets Strategic Statewide Goals

Definition

Freight is a derived demand, and therefore responds to changes in the global economy, as well as to global trade, transportation, and logistics trends.

Fluctuating demand and supply in container shipping, the increased capacity and lower cost of the Panama Canal, the changing role of air cargo – all have implications for what is shipped to and from the Texas ports and waterborne freight system. In addition, statewide budget concerns, projected freight growth, and other localized issues will all impact the amount and types of freight moving on the waterborne system. The consideration of these trends within the strategic planning process is essential to the creation of a strategic waterborne freight system – one that is ready to adapt and respond to key statewide, national, and international trends.

The purpose of this metric was to assess the ability of the project/strategy to meet strategic statewide goals, as described above. For all categories of project (maintenance, capacity, and strategic), this was determined by satisfying two key points:

1. There is regional or statewide demand and need for the project/strategy based on current and/or future logistics and trade forecasts; and
2. The project/strategy will support businesses that support the State's economy or quality of life.

Rating System Description

The rating system for this metric utilized the "yes" and "no" scale, as shown in Table 3.4.

Table 3.4 Relative Rating Guidelines
Meets Strategic Statewide Goals

Relative Rating	General Guidelines
Yes	The project/strategy has potential for statewide- or system-level benefits, and the impacts are felt at the statewide level (or at least in multiple regions).
No	The project/strategy does not appear to meet the strategic goals of the State.

Source: Cambridge Systematics, Inc., 2010.

Screening Metric No. 1d: Potential to Implement

Definition

There are several different indicators that comprise the potential to implement a project:

- Does the project have more than one beneficiary? This will help to determine the level of support that a project has among stakeholders, elected officials, the public, transportation agencies, and other key stakeholders. It also helps to gauge the potential of funding a project from multiple sources (for example, a Public Private Partnership).

- Is the project part of an existing Federal, statewide, or local plan? Is it consistent with long-range planning goals?
- Has the project already passed through a key planning phase? For example, has it received record of decision or categorical exclusion? Or has a preliminary funding availability assessment been performed?

Rating System Description

The rating system for this metric used a "Yes" or "No" answer shown in Table 3.5. The ratings were focused on determining how "real" a project is by identifying beneficiaries, completed planning assessment work, and consistency of the project/strategy with long-term planning goals.

Table 3.5 Relative Rating Guidelines
Potential to Implement

Relative Rating	General Guidelines
Yes	The project/strategy satisfies one or more of the "implementable" indicators. This may be due to a wide range of beneficiaries/stakeholders, or existing planning work (environmental review or financial assessment), as well as the compatibility of the project/strategy with long-range planning goals.
No	The project/strategy does not satisfy any of the "implementable indicators."

Source: Cambridge Systematics, Inc., 2010.

Assumptions Guiding this Process

Several assumptions guided the work of the project team to assess projects and strategies in the Tier I assessment process:

- Grade separation projects included in the list were drawn primarily from the 2010 Texas Rail Plan list of prioritized improvements.[21] Therefore, determination whether to advance a project or not was based on the Benefit/Cost (B/C) ratio calculated in the 2010 Texas Rail Plan.[22]
- USACE maintenance dredging projects are primarily funded and promoted by the USACE. Since they already have been through a process (by the USACE) to prioritize and plan, they are automatically advanced through our process. They were re-introduced in Step 5, to create strategic packages of projects and strategies.

[21] Work performed during the Texas Rail Plan, performed by the TxDOT Department of Transportation in November 2010.

[22] TxDOT Rail Plan, Chapter 7: Short- and Long-Term Rail Program, retrieved from http://www.txdot.gov/public_involvement/rail_plan/trp.htm.

- Policies were automatically advanced through our process. They were reintroduced in Step 5, to create strategic packages of projects and strategies.
- Projects that are already underway, strictly a local issue, fail one or more of the Tier I criteria, or are purely conceptual in nature were dropped from consideration.

Summary of Tier I Evaluation

A summary of the Tier I assessment is included in Table 3.6. The detailed spreadsheet is provided as Appendix C to this document. In total:

- **Forty-nine (49) projects** satisfied the Tier I (qualitative) assessment. These projects were identified as "solution packages" and will be forwarded to the Tier II (quantitative) assessment.
- **Thirty-eight (38) projects** are either policies or USACE projects and are advanced directly to the project-packaging phase.
- **Seventy-five (75) projects** did not satisfy the Tier I assessment. These projects are either underway, conceptual, or do not belong in a statewide, systems-level analysis. It is recommended that these projects be included in localized or port-specific planning processes.
- **Thirty (30) projects** were either overlapping, duplicates, or included in other projects so were dropped from consideration to prevent double counting.

Table 3.6 Summary of Tier I Qualitative Assessment[23]

Tier I Recommendation	South Region Projects	East Region Projects	Total
Projects Forwarded to Tier II Evaluation (Solution Packages)	13	36	49
Projects forwarded to packaging phase (Policies and USACE projects)	20	18	38
Projects dropped from consideration – did not satisfy Tier I criteria	24	51	75
Duplicates, overlapping, etc. – dropped from consideration	15	15	30
Total Projects	**72**	**120**	**192**

[23] The Tier I Assessment spreadsheets are provided as Appendix C.

3.3 STEP III – QUANTITATIVE ASSESSMENT

The goal of *Step III – Quantitative Assessment* was to gather relevant data for each project/strategy to support the economic assessment of benefits in Step IV. Several different types of data were gathered in this effort, including:

- **Cargo and throughput data** were needed to describe the freight handled at these ports by direction (import, export), by type (dry bulk, liquid bulk, breakbulk, or container), and to identify its inland destinations and originations. Sources for this data included discussions with the Ports, pre-existing reports that included this data (TIGER grant applications or others), the USACE, the FHWA's Freight Analysis Framework (FAF3) commodity flow datasets, and proprietary throughput and volume estimation models owned by Moffat and Nichol. A sample map that was prepared using the FAF3 data is shown as Figure 3.3.
- **Impacts of project on throughput were** important in order to estimate what economic impact, if any, the ongoing operations would have on the local economy.
- **Project lifespan data and starting year of operations** were needed to understand what the true cost of the project is over its lifespan, and to provide a timeline for the discounting of benefits in the economic assessment step. Industry and TxDOT standards were used for all project types.

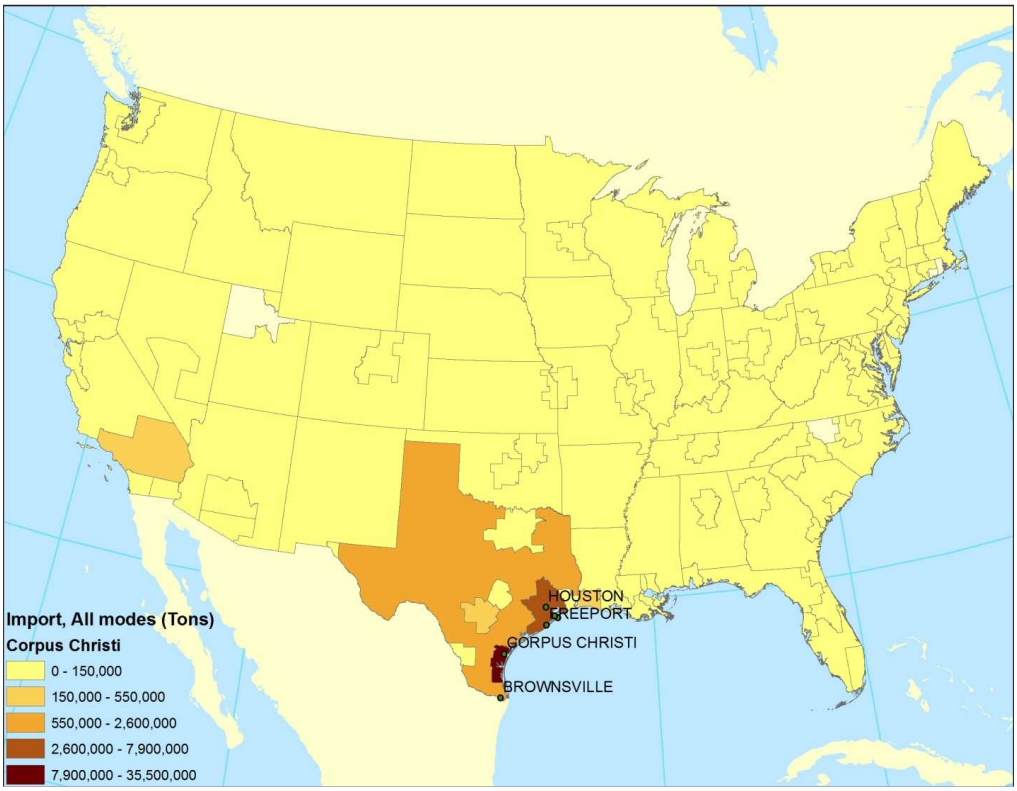
Discussion about how these inputs were used to calculate economic impacts and benefits is included in Section 3.4.

Table 3.7 Data Type and Sources to Support the Step III Data Assessment

Data/Information Type	Sources
Cargo type	U.S. Army Corps of Engineers Data
Cargo direction (import or export)	U.S. Army Corps of Engineers Data
Inland destinations and origin	FHWA Freight Analysis Framework (FAF3) U.S. Army Corps of Engineers Data
Volume forecast	FHWA Freight Analysis Framework (FAF3) Discussions with Ports Published figures Moffat and Nichol Engineers – models
Impact of project on project throughput (estimated growth constraint without completion of project)	Discussions with Ports Published figures Moffat and Nichol Engineers – models

Project lifespan	TxDOT Highway Safety Improvement Program Manual U.S. Army Corps of Engineers Data Industry standards
Starting year of operations	Discussions with Ports Published figures

Figure 3.3 Calculations to Determine Destinations of Imported Cargo
Corpus Christi Example



3.4 STEP IV – TIER II ASSESSMENT

The goal of *Step IV – Tier II Assessment* was to use the data gathered in Step III of the process to translate the benefits of each waterborne project[24] into overall

[24] Rail and Highway projects, though vital to the packages, were not evaluated with such vigor, because 1) Data was limited/confidential for some of the rail/highway projects; and 2) The mixture of passenger and commercial traffic using rail lines/highways makes it difficult to determine the portion of costs, or benefits, that are the responsibility of, or accrue to, the waterborne freight system.

regional economic benefits. The best tool available to make this economic assessment is an input-output based macroeconomic assessment tool. Input-output models provide a set of economic multipliers to trace the impacts of individual actions (such as an improvement project) to the economic activity of a region. Though there are several options of economic assessment tools available, IMPLAN and PortKit were chosen for this analysis. A summary of all the available tools that were considered and the reasons for selecting IMPLAN and PortKit is provided in Appendix D.

Evaluation of Projects and Strategies

Marine cargo projects were evaluated in two stages. The construction impacts were measured with IMPLAN, while the impacts from ongoing operations were estimated using the MARAD PortKit model.

Construction Activity

IMPLAN was used to measure the indirect and induced multiplier impacts resulting from construction expenditure for all projects. Indirect impacts are jobs and output generated as part of business to business transactions (for example purchasing cement for construction), while induced impacts relate to jobs and output generated from local personal spending on goods and services (for example rent/mortgage payments, groceries, clothing, etc.).

The expenditure amount was entered into either the New Construction or Maintenance Construction sectors based on each project and results were extracted in terms of jobs, GDP, economic output, and labor income. These impacts last only through the duration of the construction period.

Ongoing Operations

The MARAD PortKit model serves as a front interface for an underlying Input-Output model, which works like IMPLAN. PortKit allows the user to enter increases in traffic in terms of containers, break bulk, dry bulk, liquid bulk, auto, and project cargo tons. The model uses a series of parameters to monetize the direct expenditure in the local economy that is going to be generated as a result of this traffic. The expenditure is then run through the corresponding input-output (I-O) model and, as with IMPLAN, the total impacts (direct, indirect, and induced) are presented in terms of jobs, GDP, economic output, and labor income.

The PortKit parameters, which can be adjusted by the end user, include costs per ton or TEU for the following:

- Services: tugs, pilots, line handling, dockage, lighterage, etc.;
- Bunkers: oil and water;
- Loading/Discharging: stevedoring, clerking and checking, equipment rental, etc.;

- Supplies: chandler/provisions, laundry, medical, waste, and security;
- Inland Movements: long- and short-distance trucking, barge, air, rail, and pipeline;
- Government Requirements: customs, entrance/clearance, immigration, quarantine, etc.;
- In-Transit Storage: wharfage, yard handling, warehousing, etc.; and
- Cargo Packing: export packing, container stuffing/stripping, and cargo manipulation.

The cargo associated with each project was run through a Texas-specific version of PortKit while adjusting the landside mode split to obtain more accurate results.

Landside Transportation Impacts

In addition to the IMPLAN and Portkit multiplier impacts discussed above, the landside impacts of additional traffic were also evaluated to create a more comprehensive picture of each project's effect. A similar methodology to the US DOT's Transportation Investment Generating Economic Recovery (TIGER) grant program was used, taking into account pavement repair, congestion, air pollution, and crashers. The parameters used for each category are highlighted in Table 3.8. As illustrated, each truck-mile traveled generates approximately $0.76 in externalities for the surrounding communities.

Table 3.8 Quantification of Livability, Sustainability, and Safety Impacts

Category	Metric	Factor	Source
State of Good Repair	Value of pavement damage per truck VMT	$0.21	FHWA
Livability	Travel hours of delay per truck VMT	$0.02	HERS
	Cost per hour of delay	$26.74	NHTSA
	Delay cost per truck VMT	$0.48	CS
Sustainability	CO_2 $/Ton-Mile	$0.002	EPA
	NO_X $/Ton-Mile	$0.001	TTI
	PM $/Ton-Mile	$0.001	TTI
	Total $/Ton-Mile	$0.004	EPA/TTI
	Total $/Truck-Mile	$0.060	CS
Safety	Value of crashes per truck VMT	$0.01	HERS
Total	**Dollars per Truck VMT**	$0.76	CS

FHWA = Federal Highway Administration.

HERS = Highway Economic Requirements System.

NHTSA = National Highway Traffic Safety Administration.

CS = Cambridge Systematics.

EPA = Environmental Protection Agency.

TTI = Texas Transportation Institute.

Evaluation of Waterborne Projects and Strategies

Using the data collected in Step III of the process (Section 3.3), in coordination with the multipliers discussed above (Table 3.9), economic benefits of various waterborne system projects were calculated using IMPLAN and PortKit. A sample matrix of results in included as Table 3.9. Benefits calculated include the increased tons or TEUs per year of increased throughput due to the project, as well as the contribution to each project in terms of Gross State Product (GSP), jobs, and other externalities (sustainability, safety, etc.).

Waterborne projects were the only projects that were evaluated for all of the benefits shown in Table 3.9. Highway and rail projects impacts were estimated for certain variables depending on data availability. Data fields included: increased/maintained cargo volumes, travel time savings in hours and dollars, increased VMT and associated negative externalities of pavement wear and tear and increased air emissions. Though these benefits and disbenefits were not rolled up and reported as "package" benefits (similar to the waterborne system projects); the data were used to influence the allocation of each highway and rail projects to different packages.[25]

In addition to providing a better understanding of the impacts of individual projects, this approach allowed for "strategic packages" of multimodal projects to be assembled. Discussing these packages is the focus of the next section.

[25] These detailed "Tier II" data spreadsheets are included as Appendix E.

Table 3.9 Calculating Economic Benefits of Different Waterborne Improvement Projects

Project	Cost (Millions)	Tons per Year	Traffic Type	GSP/Year (Millions)	Jobs per Year	Externalities (Millions)
Port O'Connor – Encroachment Removal and Mooring relocation	$2.00	287,418	Bulk Tons	$6.28	129	$1.30
Lydia Ann Channel mooring capacity and maintenance	$3.00	76,600	Bulk Tons	$1.67	34	$0.35
Corpus Christi Ship Channel Capacity Dredging	$450.00	823,992	Bulk Tons	$17.99	369	$3.72
Widening and Deepening of Brownsville Ship Channel	$250.00	14,991	Bulk Tons	$0.33	7	$0.07
Freeport Wiggles – Widening and Straightening	$5.00	1,437,090	DB/LB/C Tons	$46.47	1,008	$4.93
Brazos River Floodgates – Removal/Reconfiguration	$7.00	2,874,180	DB/LB/C	$92.94	2,016	$9.87
Brazos River Intersection – Mooring Capacity	$3.00	431,127	DB/LB/C	$13.94	302	$1.48
Rollover Bay – Channel Widening	$4.00	1,377,105	DB/LB/C	$46.56	1,010	$4.73
Port Bolivar – Channel Widening	$2.00	1,377,105	DB/LB/C	$46.56	1,010	$4.73
Pelican Island Mooring Capacity and Basin Widening	$4.00	431,127	DB/LB/C	$13.94	302	$1.48
High Island Wiggles – Straightening of the Bends	$5.00	1,377,105	DB/LB/C	$46.56	1,010	$4.73
Velasco Terminal Construction	$380.00	5,905,411	DB/LB/C	$222.19	4,820	$20.27
Freeport Channel Widening/Deepening	$330.00	656,157	DB/LB/C	$24.69	536	$2.25

Source: Economic assessment using IMPLAN and PortKit by Cambridge Systematics, Inc., 2011.

3.5 STEP V – CREATE STRATEGIC PACKAGES

The last step of the five-step project evaluation process was to create groups of projects/strategies and policies that, together, work towards the realization of one of TxDOT's goals for the waterborne freight system. Each strategic package is driven by a particular goal for the waterborne system and will highlight the projects/ strategies that would most directly advance this goal. For example, *Strategic Package No. 2: Maximize Texas's Cargo Capacity* highlights projects that best equip the waterborne system to accommodate surges in cargo throughput (regardless of cost or geographic diversity). On the other hand, *Strategic Package No. 4: Focus Resources on Key Texas Industries* will instead provide a set of projects/strategies that TxDOT might consider its top priority is to support the State's key industries.

In short, these packages are meant to be multimodal in nature, and combine related transportation infrastructure-, operational-, and policy-level improvements in a manner that addresses systemwide concerns on the TxDOT waterborne freight system.

The six strategic packages are included in Table 3.10. Each package is discussed in more detail in the sections following. A spreadsheet summarizing the allocation of projects to packages is included as Appendix F.

Table 3.10 Summary of Six Strategy Packages

Strategic Package	Name	Number of Projects	Cost (in Millions)	Sample Projects in Package	Relative Benefits of Package
No. 1a	Improve Ports and Waterway Access	17	$1,432	• Channel dredging, widening, and straightening • New terminal construction	• Separates out waterborne system improvements only • Estimated average annual economic and jobs impacts
No. 1b	Improve GIWW	34	$439	• Maintenance dredging of all sections	• Separates GIWW improvements into one package
No. 2	Maximize Texas' Cargo Capacity	58	$3,511	• Channel dredging, widening, and straightening • Upgrades to rail yards, mainlines (including doubletrack), and bridges	• Package that most directly contributes to the system's ability to handle increased throughput
No. 3	Create System Redundancy	40	$1,864	• Channel dredging, widening, and straightening • New terminal construction • Upgrades to rail and highway facilities	• Package that most contributes to the diversification of the system – in terms of port size, cargo type, or geography • Includes ports that are tied to developing or new types of business and industry
No. 4	Focus Resources on Key Industries	58	$3,266	• Channel dredging, widening, and straightening • New terminal construction • Upgrades to rail and highway facilities	• Includes projects that are tied to supporting the supply chains of key Texas industries[a]
No. 5	Positioning for Economic Growth	33	$2,889	• Channel dredging, widening, and straightening • New terminal construction • Upgrades to rail and highway facilities	• Most directly enhances Texas's global competitiveness • Allows Texas to take advantage of emerging opportunities

[a] Increased knowledge of the supply chain of each industry would allow for this package to be broken into different packages that each support separate industries – for example one for petrochemicals, one for steel, etc.

Strategic Package No. 1a and 1b: Improve Ports and Waterway Access / GIWW

Description

These two packages (Nos. 1a and 1b) work to strengthen the waterborne system for delivering freight on the seaside by focusing entirely on improvements to ports, inland waterways, channels, and other components of the marine transportation system without including landside improvements.

- **Package No. 1a – Improve Port and Waterway Access** includes all deepwater and inland port projects except for maintenance dredging of the Gulf Intracoastal Waterway.
- **Package No. 1b – Improve GIWW** includes only those projects that target safety, efficiency, or throughput of the GIWW.

Both packages include those projects and strategies designed to maintain or improve the capacity, safety, and efficiency of Texas's ports and inland waterway system.

Package Definition

- These two packages focus only on those projects that are associated directly with a marine port or the GIWW. They do not include projects from the highway, rail, or air cargo transportation modes.
- These two packages include a geographically diverse set of projects/ strategies, in order to achieve maximum reach and market penetration of the waterborne freight delivery system.
- These two packages include projects from all categories – maintenance, capacity enhancement, and strategic investment.

The projects included in this package, their costs, and estimated benefits are included in Table 3.11.

Table 3.11 Strategic Package Nos. 1a and 1b: Projects, Costs, and Estimated Benefits

Strategic Package	Name	Cost (in Millions)	Projects in Package	Estimated Benefits of Package
No. 1a	Improve Ports and Waterway Access	$1,432	• Cedar Bayou Channel – Markings • USACE Maintenance Dredging – Port Lavaca • Freeport Wiggles – Widening and Straightening • Brazos River Floodgates – Removal/Reconfiguration • Brazos River Intersection – Mooring Capacity • Rollover Bay – Channel Widening • Port Bolivar – Channel Widening • Pelican Island Mooring Capacity and Basin Widening • Velasco Terminal Construction • Freeport Channel Widening/Deepening • High Island Wiggles – Straightening of the Bends • Port O'Connor – Encroachment Removal and Mooring relocation • Lydia Ann Channel Mooring Capacity and Maintenance • Matagorda Bay Re-Route • Corpus Christi Ship Channel Capacity Dredging • Widening and Deepening of Brownsville Ship Channel • Calhoun Port Area – Land Use Zoning	• Separates out waterborne system improvements only – fulfills mandate of TxDOT waterborne planning efforts • Estimated average annual economic impact of $580 million if all projects are completed • Estimated average annual employment of 12,500 jobs if all projects are completed • Increased throughput estimated at 17 million tons/year.
No. 1b	Improve GIWW	$439	• All USACE Identified Maintenance Dredging on Segments of the GIWW (34 in All) • Port-Specific GIWW Segment Dredging – Including the Brownsville Ship Channel, The Port Isabel Ship Channel, The Channel to Port Harlingen, and The Channel to Victoria	• Separates GIWW improvements into one package

Strategic Package No. 2: Maximize Texas's Cargo Capacity

Description

This package focuses on investments that maximize the total cargo handling capacity of the Texas port system to accommodate any potential surge in demand. As such, it is primarily focused on ensuring that the State does not experience capacity constraints, and is therefore less contingent on other factors such as cost or geographic dispersion of investments. In addition, this package is intended to respond to the anticipated impact on Texas's port of national and international shipping trends and events, such as the widening of the Panama Canal and potential diversion from West coast ports.

Package Definition

- This package includes multimodal projects/strategies from the waterborne, highway, rail, air cargo, or intermodal systems.
- This package is not as limited by cost (relative to other packages), and includes some large-scale, capital-intensive projects.
- This package focuses on the larger Texas ports that have greater existing cargo carrying capacity or other existing advantages.
- This package includes projects from all categories – maintenance, capacity enhancement, and strategic investment. However, capacity enhancement projects appear prominently as the focus of this strategic package.

The projects included in this package, their costs and relative benefits are included in Table 3.12.

Table 3.12 Strategic Package No. 2: Projects, Costs, and Relative Benefits

Strategic Package	Name	Cost (in Millions)	Projects in Package	Relative Benefits of Package
No. 2	Maximize Texas' Cargo Capacity	$3,511	• 26 USACE Maintenance Dredging Segments • SH 36 – Upgrade • FM 523 – Upgrade • SH 146 – Upgrade • Spencer Hwy and Redbluff Road – Upgrade • SH 288 – Upgrade • Belt Junction – Double Track Extension • Settegast Yard – Sidings • Pierce Yard – Upgrade • Additional Track Between Englewood Yard and Sheldon • Jacintoport Boulevard – Upgrade • West Belt Sub Capacity – Additional Track Between Tower 81 and Double Track Junction • Rail Capacity Between Galena Junction and Manchester Junction – Doubletracking • Rail Bridge Crossings at Angelton and Placedo • UPRR Brownsville Sub Capacity – Sidings and Signal Improvement • Rail Bridge 5A – PTRA Sub – Doubletrack • Rail Bridge 16 – East Belt Sub – Doubletrack • West Belt Sub Improvement – Grade Separations and/or Crossing Closure	• Package that most directly contributes to the system's ability to handle increased throughput • Benefits accrue to passenger and freight traffic • Benefits include safety and emissions benefits (in particular from rail grade crossing projects) • Mixture of upgraded facilities, new and enhanced facilities, and policies • Includes multimodal projects and a mixture of public and private participation – could prove useful for funding purposes

Table 3.12 Strategic Package No. 2: Projects, Costs, and Relative Benefits (continued)

Strategic Package	Name	Cost (in Millions)	Projects in Package	Relative Benefits of Package
			• SH 225 – Connectivity to Other Roads • Velasco Terminal Construction • Freeport Channel Widening/Deepening • KCS Bridge Across Port of Beaumont Ship Channel (Neches River) – Upgrade • High Island Wiggles – Straightening of the Bends • Nueces River Rail Yard • Grade Separation – Shepherd/Durham – Terminal • Grade Separation – San Felipe – Terminal • UPRR Brownsville and Angleton Subs Rail Capacity – Load Capabilities of Bridges • Corpus Christi Ship Channel Capacity Dredging • Widening and Deepening of Brownsville Ship Channel • East Houston Rail Bypass – New Line Between Dayton and Cleveland • Extend heavy haul permits for FM 1405 to Cedar Bayou • Authorization of Permits for Overweight Trucks on Roadways Near the Port of Houston	

Strategic Package No. 3: Create System Redundancy

Description

This package recognizes that each individual port in the Texas ports system is vulnerable to disruptions caused by natural disasters, labor disputes, security breaches, or other potential events. It strives to strengthen the resiliency of the Texas ports system as a whole by ensuring that multiple facilities are capable of handling different cargo types and thereby improve the options available to shippers. As such, this package is more geographically dispersed than others, and favors projects that preserve and maintain existing capacity and efficiency.

Package Definition

- This package includes multimodal projects/strategies from the waterborne, highway, rail, air cargo, or intermodal systems.
- This package focuses on projects and strategies that maintain and upgrade existing infrastructure rather than invest in new cargo handling capacity.
- This package focuses on a geographically diverse set of projects/strategies, to ensure that multiple Texas ports are able to provide redundancy in the event of disruptions to normal operations.

The projects included in this package, their costs and relative benefits are included in Table 3.13.

Table 3.13 Strategic Package No. 3: Projects, Costs, and Relative Benefits

Strategic Package	Name	Cost (in Millions)	Sample Projects in Package	Relative Benefits of Package
No. 3	Create System Redundancy	$1,864	• 21 USACE Maintenance Dredging Segments • Dow Chemical Plant Near Freeport Harbor – Rail Siding • SH 36 – Upgrade • FM 523 – Upgrade • Spencer Highway and Redbluff Road – Upgrade • SH 288 – Upgrade • Rail Bridge Crossings at Angelton and Placedo • UPRR Brownsville Sub Capacity – Sidings and Signal Improvement • Colorado Structures – Mooring Maintenance • SH 225 – Connectivity to Other Roads • Velasco Terminal Construction • La Quinta Terminal Road Access to U.S. 181 • Port O'Connor – Encroachment Removal and Mooring Relocation • UPRR Brownsville and Angleton Subs Rail Capacity – Load Capabilities of Bridges • Corpus Christi Ship Channel Capacity Dredging • Widening and Deepening of Brownsville Ship Channel • Extend Heavy Haul Permits for FM 1405 to Cedar Bayou • Authorization of Permits for Overweight Trucks on Roadways Near the Port of Houston	• Package that most contributes to the diversification of the waterborne freight system – in terms of port size, cargo type, or geographic dispersion • Includes ports that are tied to developing or new types of business and industry • Benefits include safety and emissions benefits (in particular from rail grade crossing projects) • Develops capacity at other ports to absorb cargo diverted from other ports by disruptions caused by natural disaster, labor disputes, security breaches or other shutdowns • Includes multimodal projects and a mixture of public and private participation – could prove useful for funding purposes

Strategic Package No. 4: Focus Resources on Key Texas Industries

Description

Phase I of the TxDOT Waterborne Freight Corridor Study identified several industries that are critical to sustaining Texas's economy and quality of life, including petroleum, manufacturing production, chemical production, cotton production, and retail. The Texas port system is essential in supporting all of these industries. This package recognizes potential future funding constraints and prioritizes projects/strategies that directly support key industries to provide for the efficient, cost-effective, and safe transport of goods and materials that support the supply chains for these industries. As such, it draws heavily from the Phase I work with the Stakeholder Advisory Committee to identify bottlenecks, issues, and system deficiencies that correspond to specific supply chains.

Package Definition

- This package includes multimodal projects/strategies from the waterborne, highway, rail, air cargo, or intermodal systems.
- This package includes projects/strategies that support the supply chains of key Texas industries.
- This package includes maintenance, capacity enhancement, and strategic investment projects/strategies.

The projects included in this package, their costs and relative benefits are included in Table 3.14.

Table 3.14 Strategic Package No. 4: Projects, Costs, and Relative Benefits

Strategic Package	Name	Cost (in Millions)	Projects in Package	Relative Benefits of Package
No. 4	Focus Resources on Key Industries	$3,266	• 21 USACE Maintenance Dredging Segments • Dow Chemical Plant Near Freeport Harbor – Rail Siding • SH 146 – Upgrade • Spencer Hwy and Redbluff Rd – Upgrade • SH 288 – Upgrade • Belt Junction – Double Track Extension • Settegast Yard – Sidings • Pierce Yard – Upgrade • Additional Track Between Englewood Yard and Sheldon • Jacintoport Boulevard – Upgrade • West Belt Sub Capacity – Additional Track Between Tower 81 and Double Track Junction • Rail Capacity Between Galena Junction and Manchester Junction – Doubletracking • Rail Bridge Crossings at Angelton and Placedo • UPRR Brownsville Sub Capacity – Sidings and Signal Improvement • Colorado Structures – Mooring Maintenance • Rail Bridge 5A – PTRA Sub – Doubletrack • SH 225 – Connectivity to Other Roads • Velasco Terminal Construction	• Includes ports and projects that are tied to developing or new types of business and industry, or support the supply chains of key industries • Benefits include safety and emissions benefits (in particular from rail grade crossing projects) • Includes multimodal projects and a mixture of public and private participation – could prove useful for funding purposes

Table 3.14 Strategic Package No. 4: Projects, Costs, and Relative Benefits (continued)

Strategic Package	Name	Cost (in Millions)	Projects in Package	Relative Benefits of Package
			• Freeport Channel Widening/Deepening • KCS Bridge Across Port of Beaumont Ship Channel (Neches River) – Upgrade • High Island Wiggles – Straightening of the Bends • Port O'Connor – Encroachment Removal and Mooring relocation • Grade Separation – Shepherd/Durham – Terminal • Grade Separation – San Felipe – Terminal • UPRR Brownsville and Angleton Subs Rail Capacity – Load Capabilities of Bridges • Corpus Christi Ship Channel Capacity Dredging • Widening and Deepening of Brownsville Ship Channel • Extend Heavy Haul Permits for FM 1405 to Cedar Bayou • Authorization of Permits for Overweight Trucks on Roadways Near the Port of Houston	

Strategic Package No. 5: Position for Economic Growth

Description

This package reflects the fact that Texas's port system is a part of a global economy, and will respond to emerging economic and supply chain trends at the statewide, national, and international levels. This package assumes continuous improvements in global supply chain efficiency, and demand for additional capacity at Texas Ports based on factors such as: rising national consumption, emergence of new industries, increasing exports from U.S.-based agriculture and manufacturing, and increased imports due to rising U.S. income levels.

Package Definition

- This package assumes that the current global economic challenges will be resolved and that the U.S. and world economy will return to a strong rate of growth. It is not constrained by cost or timeframe of projects, and therefore includes capital – intensive projects and projects with long-term benefits.
- This package includes projects from all categories – maintenance, capacity enhancement, and strategic investment. However, strategic investment projects will appear prominently as the focus of this strategic package.
- This package includes multimodal and geographically diverse projects as needed to create a thriving Texas waterborne freight system.

The projects included in this package, their costs and relative benefits are included in Table 3.15.

Table 3.15 Strategic Package No. 5: Projects, Costs, and Relative Benefits

Strategic Package	Name	Cost (in Millions)	Projects in Package	Relative Benefits of Package
No. 5	Position for Economic Growth	$2,889	• USACE Maintenance Dredging of the Brownsville Ship Channel, Channel to Victoria, Sabine-Neches Canal, and Sabine Pass • SH 146 – Upgrade • Belt Junction – Double Track Extension • Settegast Yard – Sidings • Pierce Yard – Upgrade • Additional Track Between Englewood Yard and Sheldon • Freeport Wiggles – Widening and Straightening • Brazos River Floodgates – Removal/Reconfiguration • Brazos River Intersection – Mooring Capacity • Rollover Bay – Channel Widening • Port Bolivar – Channel Widening • Pelican Island Mooring Capacity and Basin Widening • Rail Bridge 5A – PTRA Sub – Doubletrack • Rail Bridge 16 – East Belt Sub – Doubletrack • West Belt Sub Improvement – Grade Separations and/or Crossing Closure • SH 225 – Connectivity to Other Roads • Velasco Terminal Construction • Freeport Channel Widening/Deepening • KCS Bridge Across Port of Beaumont Ship Channel (Neches River) – Upgrade	• Most directly enhances Texas's global competitiveness • Allows Texas to take advantage of emerging opportunities and global supply chain trends/changes (such as the opening of the Panama Canal in 2014)

Table 3.15 Strategic Package No. 5: Projects, Costs, and Relative Benefits (continued)

Strategic Package	Name	Cost (in Millions)	Projects in Package	Relative Benefits of Package
			• La Quinta Terminal Road Access to U.S.-181 • New Corpus Christi Harbor Bridge • Matagorda Bay Re-Route • Nueces River Rail Yard • Ingleside Industrial Corridor • Grade Separation – Shepherd/Durham – Terminal • Grade Separation – San Felipe – Terminal • Grade Separation – Houston – Terminal • Grade Separation – Bellaire – Terminal • Grade Separation – San Felipe – Terminal • Grade Separation – Richmond – Terminal • Grade Separation – Westheimer – Terminal • Grade Separation – Canal – East Belt • U.S.-77 Between I-37 and U.S.-83 – Upgrade to IH standards • UPRR Brownsville and Angleton Subs Rail Capacity – Load Capabilities of Bridges • Corpus Christi Ship Channel Capacity Dredging • Lydia Ann Channel mooring capacity and maintenance • Widening and Deepening of Brownsville Ship Channel • Extend heavy haul permits for FM 1405 to Cedar Bayou • Authorization of Permits for Overweight Trucks on Roadways Near the Port of Houston	

4.0 Implementation

The five-step project evaluation process provides a framework for TxDOT to form strategic packages of projects, strategies, and policies that work towards accomplishing different goals for waterborne freight system participation. Data and information were gathered and analyzed for each project as part of this process, in order to better understand the impacts of potential projects in terms of cargo throughput, efficiency, safety, jobs, and GDP.

To turn these project/strategy lists into actionable strategies requires the support of several additional items. This section reviews some of the key support items suggested to accompany the projects/strategies and solutions emerging from the five-step project evaluation process, including the development of waterborne freight performance measures and funding and finance opportunities. Other supporting policies and data collection activities that support implementation activities are included in Section 5.0, "Recommendations."

4.1 WATERBORNE FREIGHT PERFORMANCE MEASURES

Development of waterborne freight performance measures would have several immediate and long-term benefits. They would allow stakeholders such as carriers, shippers, recreational users, and Federal, state, and local transportation entities to understand the performance of the system over time. In addition, stakeholders could evaluate the success of various improvement strategies, and prioritize future investments. Finally, it is likely that performance measures will continue to grow in importance given current trends in Federal legislative language that prioritize system performance and measurement as a basis for Federal funding.

However, a universal set of waterborne performance measures does not currently exist. On the contrary, the development of maritime performance metrics is still at a very early stage of development. Some preliminary examples exist at the Federal, State, and International level – from organizations, including the Permanent International Association of Navigational Congresses, the National Cooperative Freight Research Program, the University of Texas, the Oregon Department of Transportation, as well as international efforts from the University of Natural Resources and Applied Science/Austria Tech. These studies vary considerably in scope – some set out to provide a recommended list of performance metrics for measuring waterway performance, while others discuss in detail some of the key features of ports and waterways that are critical to effective and efficient goods movement. In addition, most of these examples are qualitative or only reflect specific parts of the waterborne freight system.

Reasons cited for the lack of existing waterborne freight performance measures include the difficulties of objectively measuring port performance in a comparative way. There are many different types of ports, and each port has a unique

profile of clients, commodities, and supply chains. Therefore, the development of appropriate "standardized" measures is very difficult.

Preliminary Performance Measures for the Texas Waterborne System

While the lack of standardized performance metrics for deepwater port transportation is concerning, it also presents an opportunity for Texas ports to help shape the discussion and ensure that performance metrics that do emerge are consistent with diversity of cargo types handled at Texas ports. Preliminary waterborne performance measures for Texas were created by building on the goals of the TxDOT 2011-2015 Strategic Plan, building on the work completed in Phase I of this study, and drawing from examples from National, State, or International research efforts.

Table 4.1 provides a list of potential performance metrics developed from the sources described in this memo. Because some measures are applicable to multiple aspects of the maritime system, each performance measure is assigned to one or more of the following areas of the maritime system, including inland waterways (WW), deepwater ports (P), and landside infrastructure (L).

Additional research is required to refine these preliminary performance measures, and to ensure that they are consistent with TxDOT's goals, other national efforts, are based on national best practices, and have minimal data collection requirements.

Table 4.1 TxDOT Waterborne Freight System Performance Measures
Proposed for Further Study/Refinement

Category	Performance Metric	WW	P	L
Congestion	Total stop of navigation on a specific waterway section measured in days	✓	✓	
	Total navigable days per year within a maritime corridor	✓	✓	
	Average vessel delay at locks	✓		
	Frequency and duration of lock closures	✓		
	Number of lockages/lock capacity	✓		
	Truck turn time		✓	✓
	Container throughput and land utilization: (TEUs per Container-Yard acre/year)		✓	
	Container dwell time		✓	
	Ship unload rate (time per container or per ton)		✓	
	Ship load rate (time per container or per ton)		✓	
	Average time in transit per barge tow on GIWW	✓		
	Annual TEU or Tons per Crane		✓	
	Port-handling capacity per quay meter and per truck loading bay		✓	✓

Table 4.1 TxDOT Waterborne Freight System Performance Measures (continued)

Proposed for Further Study/Refinement

Category	Performance Metric	WW	P	L
Congestion (continued)	Rail movement constraints on port access tracks: delay from at-grade rail/street crossings		✓	✓
	Average ship travel time in bottleneck areas		✓	
	Miles of the GIWW with unsuitable channel width, as defined by TxDOT	✓		
	Miles of the GIWW with unsuitable channel depth, as defined by TxDOT	✓		
	Miles of the GIWW with difficult turns and one-way zones, as defined by TxDOT	✓		
Safety	Vessel to vessel collisions (annually)	✓	✓	
	Vessel to fixed object collisions (annually)	✓	✓	
	Percentage of port containers inspected annually		✓	
	Hazardous spills by water modes/hazmat carried by water	✓	✓	
	Number of locations to park a barge along the GIWW (mooring structures)	✓		
Economy	Number of direct jobs sustained through waterborne commerce	✓	✓	✓
	Ratio of imports/exports		✓	✓
	Logistics cost/percentage of state GDP	✓	✓	✓
	Tons of traffic arriving at key ports by barge/alternative modes	✓	✓	
	Annual TEU or tonnage per berth		✓	
	Total tons and value of freight moving on the GIWW	✓		
	Total tons and value of freight moving on the GIWW			
	Total value of key industries income generated by the GIWW (for example, total weight and value of shrimp, oysters and finfish facilitated by the GIWW)	✓		
System Preservation	Acres of land available for future maritime industrial use		✓	
	Number of rail miles abandoned			✓
	Average age of waterway infrastructure assets	✓	✓	
	Average age of cranes and other major cargo handling assets		✓	
	Dollars spent on freight marketing and education to the general public	✓	✓	✓
	Annual increase in acreage of developed properties along navigable waterways	✓	✓	
	Total cost of maintenance per lock, per month	✓		
	Cubic yards of sediment dredged/projected	✓	✓	
Emissions	Tons of CO_2, PM, SO_x, NO_x, HC related to marine engine combustion	✓	✓	
	Discharge of waste and ballast water		✓	
	GHG emissions/tonnage	✓	✓	✓
	Evaporative emissions by vessels in transit	✓	✓	

Source: Cambridge Systematics, Inc., 2011.

WW – Inland Waterway, P – Deepwater Port, and L – Landside Infrastructure.

4.2 FUNDING AND FINANCE MECHANISMS

A workable funding strategy will be critical to successfully implementing any of the strategy packages or their components. TxDOT has assessed all available Federal and State funding sources and rated them according to their overall applicability to each solution package. The results for grant funding streams are shown in Table 4.2, while the results for financing (loan) programs are in Table 4.3. A description of each of the funding and finance methods mentioned in these tables is included as Appendix G.

Overall there is a lack of comprehensive public funding or financing programs targeted specifically at the marine mode, although maritime projects are eligible for funding under many programs. This means that TxDOT and its partners will need to ensure that freight projects can compete on a level playing field with other transportation priorities.

Federal and State Grant Programs

In general, there are many different grant funding streams at the Federal and State levels that TxDOT and its partners can access (Table 4.2). Grant awards under many programs tend to be comparatively small, making them most applicable to *Strategy Package No. 3 Create System Redundancy* which focuses more on preserving existing capacity rather than system expansion. Nonetheless certain programs – notably TIGER – can be used for large waterside capacity improvements with demonstrable regional or national economic benefits. Moreover, there have been several national policy proposals to make the TIGER program more permanent, and this could be a part of the next surface transportation authorization. Finally, all of the strategy packages contain some smaller-scale projects which would be good candidates for funding under specific grant programs. For instance, projects that create jobs in economically distressed areas could qualify for Economic Development Administration (EDA) Grants, while those that encourage freight mode shift away from trucks would be candidates for Congestion Mitigation and Air Quality (CMAQ) funds, which can be used for freight projects sponsored by private sector firms.

Federal and State Loan Programs

As shown in Table 4.3, there are four key financing programs that are accessible to TxDOT. Financing programs tend to be better suited for the large-scale, capital-intensive projects found in *Strategy Package No. 2 Maximize Texas' Cargo Capacity*, and *Strategy Package No. 5 Position for Economic Growth,* and in a few other packages. Many large port capital projects are backed by the private sector and can be expected to generate revenue streams (e.g., docking fees) to help pay loans back, making Private Activity Bonds an attractive choice for certain waterside capacity enhancements. For highway or port access projects where tolling or other user fees are acceptable, Transportation Infrastructure Financing and Innovation Act (TIFIA) loans can often help accelerate project delivery. Rail

Rehabilitation and Improvement Financing (RRIF) loans are historically underutilized and may therefore provide a viable financing source for rail capital projects, provided the railroads involved can realize a financial benefit sufficient to pay the loan back.

It is important to note that whatever combination of funding strategies TxDOT and its partners ultimately adopt will be implemented in the context of an evolving Federal role for transportation funding. The ongoing debate over reauthorization has produced several proposals which may expand freight and waterborne funding opportunities. Besides permanently authorizing the TIGER program, there have been proposals for a National Freight Program (with its own Federal-aid funding stream), a Federal infrastructure bank, complete spend down of the Harbor Maintenance Trust Fund, and increased flexibility in Federal loan programs, including TIFIA and RRIF.

Table 4.2 Applicability of Federal and State Grant Programs by Strategic Package

Strategy Packages	Grant Funding Programs											
	HMTF	Coast Guard Bridge Program	Continuing Authorities Program	TIGER III	Railway-Highway Crossings	EDA Grants	Capital Grants for Rail Line Relocation	NHS	Surface Transportation Program	Congestion Mitigation and Air Quality	TxDOT GIWW Matching Funds	Statewide Transportation Programming
Package No. 1a: Improve Port and Waterways Access	●	◑	●	◑	○	◑	○	○	○	●	●	○
Package No. 1b: Improve GIWW	●	◑	◑	○	○	○	○	○	○	◑	●	○
Package No. 2: Maximize Texas' Cargo Capacity	○	●	○	●	●	◑	●	◑	◑	○	○	◑
Package No. 3: Create System Redundancy	●	○	●	◑	○	○	○	●	●	◑	●	●
Package No. 4: Focus Resources on Key Texas Industries	●	◑	◑	◑	◑	◑	●	◑	◑	◑	●	◑
Package No. 5: Position for Economic Growth	◑	●	○	●	◑	●	●	◑	◑	◑	○	◑

○ Low ◑ Medium ● High

Source: Cambridge Systematics, Inc., 2011.

Table 4.3 Applicability of Financing Tools by Strategic Package

Strategy Packages	Financing Tools			
	Private Activity Bonds	SIB	TIFIA	Rail Rehabilitation and Improvement Financing
Package No. 1a: Improve Port and Waterways Access	●	○	○	○
Package No. 1b: Improve GIWW	◑	○	○	○
Package No. 1: Maximize Texas' Cargo Capacity	●	◑	●	●
Package No. 2: Create System Redundancy	○	●	○	◑
Package No. 3: Focus Resources on Key Texas Industries	●	●	◑	◑
Package No. 5: Position for Economic Growth	●	◑	●	●

○ Low ◑ Medium ● High

Source: Cambridge Systematics, Inc., 2011.

5.0 Recommendations

This section summarizes key conclusions and recommendations arising out of Phase II of the Waterborne Freight Corridor Study effort. Recommendations were primarily developed from discussions with waterborne freight system stakeholders, and reflect their needs and goals for the State's waterborne system. Other recommendations are designed to fill data and knowledge gaps that were identified throughout this study process, as well as policies that must be in place to support the implementation of strategies and projects discussed throughout this effort.

Ultimately, recommendations are designed to better integrate waterborne freight system planning into TxDOT's long range planning efforts. Doing so will help to build a waterborne freight system that is efficient, safe, productive, and supports the State's economy and key businesses. It is important to note that these recommendations do not include everything that needs to be done on the system; rather, they focus on the state's role only.

Work with the Legislature to Fully Fund the Port Access Account Fund

Even though a state budget line item exists for funding port and waterway projects, the Legislature has never appropriated money for it; therefore all of the projects in the biannual Port Capital Program represent unfunded needs. TxDOT should therefore work with the Legislature to fully fund the Port Access Account Fund (PAAF). This would provide a much-needed source of capital to complete important port and waterway projects, which typically do not receive much attention or funding in the statewide planning process.

In order to make the case for full PAAF funding, TxDOT should definitively link improvements to the GIWW to benefits related to cargo diversion through short sea shipping (which would relieve congested highway and rail links), system redundancy in the event of emergencies, cost savings, and industry benefits. All of this should be linked to Texas' rapid population growth trend and in particular the emergence of the Gulf Coast and Texas Triangle "megaregions."[26] Growth in these regions – part of a group that is expected to produce much of the nation's innovation and economic growth over the next several decades – will continue to challenge the capacity of the State's waterborne transportation system, making it critical to identify funding sources for ports and waterways going forward.

[26] Regional Plan Association, "America 2050"-2007.

Consider Making Targeted Investments in Port-Related Projects That Have Defined Public Benefits

This analysis has shown that there are many port projects in Texas that have value based on multiple criteria, including economic and job growth, congestion relief, safety, and system redundancy. TxDOT should consider funding those projects that have a significant and demonstrable public benefit. More detailed study will be necessary in order to fully assess the benefits of particular projects. The development of a benefits assessment tool for port and waterway projects (mentioned above) would be a crucial tool to further this discussion.

In order to make the case for waterborne system funding, it will be important to be able to evaluate the benefits associated with a given project to inform a funding decision.

Build on the Five-Step Process Created in this Plan to Develop a Benefits Assessment Tool for Port and Waterway Projects

This study proposed a five-step project evaluation process by which projects and strategies could be evaluated for their impact on issues, bottlenecks, and other problems plaguing the State's waterborne freight system. This process includes qualitative and quantitative evaluation techniques that rely on publicly available data and knowledge. This process was designed to be simple, easy to reproduce, and transparent, so that TxDOT can take ownership of it, refine it, and apply it in their waterborne freight system planning efforts. As an example, it could be reviewed and updated at each semiannual meeting between TxDOT and the Port Authority Advisory Committee (PAAC) and also presented at the annual Ports and Waterways Conference sponsored by TxDOT and the Texas Transportation Institute. It can also be refined and modified by the TxDOT Commission and the state Legislative committees responsible for transportation and business development.

TxDOT should therefore work to refine this five-step project evaluation process, and use it as the background to develop a waterborne freight project benefits assessment tool. The final tool would provide a standardized, consistent method for assessing the merits of each project and ranking them if necessary. The Florida DOT has developed a Seaport Investment Framework which is designed to screen projects applying for funding based on a common set of questions/criteria, then evaluate the transportation and economic benefits associated with them utilizing a benefit/cost approach.

A recently completed National Cooperative Freight Research Program (NCFRP) study developed a framework for estimating the public and private benefits of

freight infrastructure investments.[27] The research is intended to help guide project cost allocation decisions between public and private sector freight interests, and therefore may make it easier for TxDOT to identify public-private partnership opportunities for freight investments.

TxDOT may want to use this as a model to develop its own assessment tool for port and waterway projects.

Monitor Developments in the Federal Funding Debate

The Federal government's role in making investments to U.S. ports and waterways is evolving. The nation's long-term fiscal challenges and slow economic growth over the last few years are spurring vigorous debate over all Federal spending, including infrastructure investments. Meanwhile, a decline in Highway Trust Fund revenues brought about by improvements in vehicle fuel efficiency and changes in driving habits has reduced the amount of money available for infrastructure spending. These factors have created a policy environment in which it will be challenging just to maintain existing transport funding, let alone increase it. Nonetheless, it appears likely that there will be special provisions for freight in the next reauthorization. The Moving Ahead for Progress in the 21st Century draft reauthorization currently moving through Congress includes a core Federal-aid National Freight Program. Moreover, under the present language states would be allowed to dedicate up to 10 percent of their freight apportionment under the program to rail and marine projects. Although the final language of any reauthorization is highly uncertain at this time, TxDOT and its partners should monitor the ongoing freight funding debate closely to quickly identify new funding sources if and when they become available.

Particular attention should be placed on identifying **funding provisions for rural areas.** There is a lack of funding for infrastructure improvements in rural areas. Urban areas receive the majority of funding for capacity improvements even though they may be reliant on rural infrastructure located far from population centers. Funding allocations and formulas that consider the needs of rural areas – and how they contribute to economic activity in the cities – would help provide solutions for the system as a whole.

[27] Transportation Research Board. *NCFRP Report 12: Framework and Tools for Estimating Benefits of Specific Freight Network Investment Needs*. Washington, D.C.

Consider Ongoing Coordination with Waterborne Freight System Stakeholders, Including Representation from a Wide Variety of Public and Private Entities

There already are certain groups operating in the State that provide some communication on port issues, such as the PAAC, and the Texas Port Authority (TPA). However, these groups are comprised of port and waterborne system stakeholders only, and do not include representation of shippers, land use agencies, regional governments, or others whose activities may have some bearing on the performance of the State's system.

New issues seem to indicate a need for greater coordination between the ports and other types of waterborne freight system stakeholders. For example, land use and zoning conflicts around ports can restrict access for goods movement and create safety issues. Lack of knowledge about the benefits of improved goods movement can engender public opposition to freight projects. Meanwhile, the multiplicity of stakeholders involved in marine system planning leads to an inherently complex process which negatively impacts system planning, funding, and operations**.** Better coordination with the public and between agencies and other stakeholder groups may therefore enhance project delivery.

One way to achieve this may be by formalizing a Waterborne freight advisory group at the State level. There are several different models that could be adopted for an advisory group. One model is a standing "roundtable" where system stakeholders are invited to a meeting once a month with a rotating agenda and voluntary attendance. A good example of this is the PSRC (Puget Sound Regional Council) Freight Mobility Roundtable, a public/private forum to define and recommend actions serving freight mobility needs. Such a venue might allow for greater coordination among waterborne stakeholders without the commitment of a standing meeting.

This could help to alleviate concerns with the integration of waterborne freight into the planning process. Certain issues with the statewide transportation planning process itself may contribute to underinvestment in the system: Freight planning at the local level occurs on an ad-hoc basis and there are no requirements for MPOs to identify freight needs. Similarly, ports are not required to plan for or fund "outside the gates" roadway improvements, which can lead to disjointed project decisions and planning activities.

Develop a Better Understanding of Rail and Truck Linkages to the Waterborne Freight System. Ensure that these Projects are Integrated Into the Waterborne Freight Planning Process

Rail access and service to key domestic markets and commodity load centers play a critical role in the growth strategies of Texas ports. Over half of the projects discussed in this study are rail improvement projects – including rail yards, mainlines, shortlines, etc. Additional work would include targeted research to understand the linkages between rail and waterborne freight movements, including an understanding of which industries benefit the most from intermodal movements, and which ones could use both systems more under the right set of operational and system improvements.

The importance of efficient rail service is linked to the potential growth of bulk imports and exports. There is, for example, a perceived opportunity to export coal from Gulf ports and this requires access to port terminals by several unit trains a week – something that would require a series of packaged improvements to enhance the total rail system efficiencies.

Likewise, the issue of OS/OW truck movement deserves additional study for its impacts on the efficient movement of overweight loads around Texas ports. State and interstate highways have an 80,000 pound weight limit, although operators using only state highways can purchase a permit to raise both axle and gross loads. Recently, certain cargoes – such as oil field equipment – frequently exceed this limit, necessitating special permits and longer routing for trucks. Under Texas Transportation Code, only four political subdivisions of the State of Texas are authorized to issue permits for overweight trucks: the Brownsville Navigation District, the Victoria Navigation District, the Port of Corpus Christi Authority, and Chambers County.[28] The authorization of permits for overweight trucks on additional facilities would be required to help remedy this problem. Increased trucking fees would likely be required to compensate for the increased maintenance and shortened service life of the roadways. Therefore, this issue deserves discussion at the Statewide level, and Waterborne freight system stakeholders should be involved in this discussion.

Since each District is largely responsible for planning and programming key projects within its area, it will be important to make sure they are involved in this process early on. TxDOT should therefore encourage its Districts to work with ports and MPOs to identify port-related capital and maintenance needs more effectively.

[28] Chapter 623, Texas Transportation Code, Subchapters K, L, M, O, and P.

Continue to Refine Waterborne Freight Performance Measures, Define Data Needed to Support Their Use, and Design a Data Collection Strategy Accordingly

Waterborne freight performance metrics are important because they allow stakeholders (e.g., carriers, shippers, recreational users, and Federal, state, and local transportation entities) to understand the performance of the system over time, evaluate the success of various improvement strategies, and prioritize future investments. However, the development of maritime performance metrics is still at a very early stage of development. Though some examples exist at the Federal, state, and international level, many of these examples are qualitative or only reflect specific parts of the waterborne freight system.

Preliminary waterborne performance measures for Texas were created by building on the goals of TxDOTs 2011-2015 Strategic Plan, building on the work completed in Phase I of this study, and drawing from examples from national, state, or international research efforts.

However, additional research is required to refine these preliminary performance measures, and to ensure that they are consistent with TxDOT's goals, other national efforts, are based on national best practices, and have minimal data collection requirements.

The development of Waterborne Freight Performance Measures should be accompanied by improved data collection targeted to support the evaluation of performance metrics. Although TxDOT does have a data collection program, it focuses largely on the highway mode; consequently there is no formalized statewide data collection program for marine data, which makes it difficult to gauge system progress and performance. Defined marine system performance metrics (and the data to support them) would allow for consistent measurement of marine system decline or improvement and the appropriate targeting of limited resources.

As a corollary, TxDOT should consider including waterway performance measures and projects in the TxDOT Tracker and Project Tracker programs. TxDOT Tracker is TxDOT's on-line performance management reporting tool intended for both public and internal use. It aims to provide the public with current information on the agency's performance while also assisting internal users in making important transportation decisions. Project Tracker is a comprehensive database that provides information about the status and progress of funded transportation projects throughout the State. Within Project Tracker, users can find project information by searching by county, TxDOT District, State Representative, State Senate member, or U.S. Representative. Integrating waterborne projects into these on-line tools would help fully integrate waterway projects and performance monitoring into TxDOT's planning and programming process, and could help build support for port and waterway-related investments.

Perform a Supply Chain Study to Better Understand How Key Industries Use the Waterborne Freight System

Phase I and II of this study identified the basic transportation and business needs of the State's key industries, including the ports and modes that each industry relies upon. It also quantified, at a high level, the benefits that would accrue from making investments in the system. However, more work is required to fully understand the supply chains of these key industries, their transportation system needs, and how improvements to the transportation system might benefit them.

TxDOT should consider performing an industry supply chain study. The work would include extensive outreach to private-sector users of the waterborne freight system in order to understand which performance metrics (cost, time, variability) are most important to them in making supply chain decisions. This study would help TxDOT to understand how it can use investments in ways that will truly support the operations of key industries. It would also open the door to potential cost sharing arrangements with those stakeholders in the future.

Develop a Performance-Based Statewide Waterborne System Plan

This Study provides a baseline assessment of the importance of the waterborne freight system to the Texas economy, as well as some key strategies to achieve the maximum potential from the existing system. However, TxDOT may wish to build on the work performed in this plan to create a more comprehensive, systemwide investment plan for ongoing State participation in port and waterway-related activities. This would include a more in-depth look at the issues and challenges facing the system as well as key multimodal supply chain decisions and the implications for the waterborne freight system. This knowledge would allow for a more thorough analysis of infrastructure, operational, and institutional issues under consideration by TxDOT and its partners. The plan would serve as a blueprint to guide future state investment into the waterborne system – including its deepwater ports, shallow ports, intracoastal waterways, bulk, breakbulk and container facilities, and intermodal (rail, highway, air) connectors and feeder facilities.

One important outcome of this Statewide Waterborne System Plan would be a strategic vision for marine freight that is explicitly recognized in the TxDOT Strategic Objectives and Organization. Current TxDOT waterway planning and investment activities are primarily focused on routine maintenance of the GIWW. Although that is a necessary and important activity, the approach is reactive rather than proactive and is not linked to the port industry's long-term

vision for maritime development in Texas. Similarly, port and waterway investments – both landside and waterside – are not actively considered during the TxDOT planning and programming process, partially because the responsibilities of different agencies such as TxDOT and MPOs are not clearly defined. TxDOT has taken an important first step in developing this Waterborne Freight Corridor Study. A Statewide Waterborne Freight System plan, completed in consultation with key stakeholders, would help to define a vision for waterborne freight in Texas. This plan should be linked firmly to goals and performance measures in the existing *TxDOT 2011-2015 Strategic Plan*, which describes the short-term goals, objectives, and strategies the agency will use to meet the State's transportation needs over the next five years, with performance measures to help track progress.

A. Master Project List

Table A.1 Master Project List

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
All Ports											
1	Insufficient maintenance dredging of shallow draft waterways, including the GIWW and tributaries. **This is the umbrella project to 1a-1k.**	USACE	Waterside	All	In recent years, the USACE has been unable to maintain the waterway to its authorized 12-foot depth because of the scarcity of dredging equipment and the high price of fuel. Insufficient depth reduces potential barge payloads and overall efficiency.	Increase USACE maintenance funding.	Maintenance dredging	$160,000,000	100% Federal	GIWW: 3.1 million CY in USACE FY 11 budget; Central Coast: 1 million CY in USACE FY 11 budget; South Coast: 850,000 CY in USACE FY 11 budget.	Maintenance
1a	GIWW High Island to Galveston Bay	USACE	Waterside	All	Average water depths 5-10 feet.	Maintenance dredging.	Maintenance dredging	$6,000,000	100% Federal	USACE FY 12 O&M.	Maintenance
1b	GIWW Galveston Bay To Chocolate Bayou	USACE	Waterside	All	Average water depths 10-11 feet.	Maintenance dredging.	Maintenance dredging	$7,500,000	100% Federal	USACE FY 12 O&M.	Maintenance
1c	GIWW Freeport Harbor to San Bernard River	USACE	Waterside	All	Average water depths 5.5-12.5 feet (5.5-8 feet Freeport Harbor to Brazos River).	Maintenance dredging.	Maintenance dredging	$17,000,000	100% Federal	1.2M CY USACE FY 11 budget; and 2.25M CY additional USACE FY 11.	Maintenance
1d	GIWW San Bernard to Colorado River	USACE	Waterside	All	Average water depths 9-11 feet.	Maintenance dredging.	Maintenance dredging	$23,000,000	100% Federal	1.9M CY USACE FY 11 budget; 1.5M CY USACE FY 11 additional; and1.2M CY USACE FY 12 O&M.	Maintenance
1e	GIWW Colorado River to Matagorda Bay	USACE	Waterside	All	Average water depths 7 feet.	Maintenance dredging.	Maintenance dredging	$8,000,000	100% Federal	USACE FY 11 additional.	Maintenance
1f	GIWW Matagorda Bay to Port O'Conner	USACE	Waterside	All	Average water depths 5-9 feet.	Maintenance dredging.	Maintenance dredging	$5,000,000	100% Federal	USACE FY 12 O&M.	Maintenance
1g	GIWW Port O'Conner to San Antonio Bay	USACE	Waterside	All	Average water depths 7.5-10 feet	Maintenance dredging.	Maintenance dredging	$5,000,000	100% Federal	USACE FY 12 O&M.	Maintenance
1h	GIWW Aransas Bay to Corpus Christi Ship Channel	USACE	Waterside	All	Average water depths 5-11 feet.	Maintenance dredging.	Maintenance dredging	$6,500,000	100% Federal	USACE FY 12 O&M.	Maintenance
1i	GIWW Alternate Lydia Ann Channel	USACE	Waterside	All	Average water depths 7.5-12 feet.	Maintenance dredging.	Maintenance dredging	$4,000,000	100% Federal	USACE FY 12 O&M.	Maintenance
1j	GIWW Corpus Christi Ship Channel to Port Brownsville (Laguna Madre section of GIWW)	USACE	Waterside	All	Average water depths 6-12.5 feet (<10 feet S. Bird Island to Light 175 and Arroyo Colorado to Port Brownsville); sections of the GIWW in Laguna Madre shoal up frequently, and high winds are also a problem.	Maintenance dredging.	Maintenance dredging	$10,000,000	100% Federal	1.65M USACE FY 11 additional; and 352,000 USACE FY 12 O&M.	Maintenance

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
All Ports (continued)											
1k	San Bernard River Channel Entrance	M&N	Waterside	All	Average water depths 2-6 feet (design: 9 feet).		Maintenance dredging	$1,300,000	100% Federal	USACE FY 11 additional.	Maintenance
2	Rollover Bay	M&N	Waterside	All	Existing channel width combined with current and wind conditions greatly limit doubled-up tow movements. Meeting situations are especially difficult. Groundings and buoy discrepancies result.	Widen of Rollover Bay by about 50-80 feet to the south. Section 216 report: Create sediment trap between GIWW & Bird Islands and maintain Rollover Pass.	New dredging	$4,000,000	100% Federal with TxDOT providing ROW/ Easements	Rollover Pass to be closed by GLO. Fishing pier may be built if pass closed (cost not included in total cost).	Capacity Enhancement
3	Port Bolivar	M&N	Waterside	All	Tight channel entrance forces tows to "crab" as they transit in order to counteract current and wind conditions. Repeated knockdowns and buoy hull discrepancies show traffic is repeatedly set along the green (southern) side of the channel.	Widen of the southern side of Bolivar Peninsula (locally known as the Bolivar Buoys) from mile 349.4 to mile 348.6.	New dredging	$2,000,000	100% Federal with TxDOT providing ROW/ Easements		Capacity Enhancement
4a	High Island Wiggles (Bends)	M&N	Waterside	All	Curves, width limitations and one-way barge traffic, average of 4 accidents/year.	Dredge and reconfigure geometry of the GIWW at this location.	New dredging	$5,000,000	100% Federal with TxDOT providing ROW/ Easements	One-way traffic only at current bridge. In order to have 2-way traffic, new bridge is required.	Strategic Investment
4b	High Island Bridge	M&N	Waterside	All	Width of bridge restricts to one-way traffic.	Replace with wider nonmovable bridge.	Structures	$20,000,000	100% TxDOT?	Widening channel needed in conjunction with bridge.	Strategic Investment
5	Northeast of Halls Lake	M&N	Waterside	All	Very rapid erosion of the islands on the south side of the GIWW is occurring in this area.	Reestablish the south bank to prevent shoaling in the waterway and eventual erosion of the north bank. This specific problem was not identified in the reconnaissance phase of the 216 study, and is therefore not currently being addressed. Alternate funding will have to be pursued for this project.	Erosion protection	$2,000,000	100% Federal		Maintenance
6	Freeport Wiggles	M&N	Waterside	All	Curves, width limitations and one-way barge traffic.	USACE has examined bend widening/easing and channel realignment opportunities for the GIWW at this location. Simulations show that widening and easing will have little impact. The realignment alternative did improve navigation, but at a high cost and with adverse environmental impacts.	New dredging	$5,000,000	100% Federal with TxDOT providing ROW/ Easements	The study received limited funds in FY 2005. The project is not currently in the FY 2006 budget. Therefore, this segment of the GIWW was omitted from the 2003 feasibility report. However, these issues will be addressed during subsequent studies, when additional GI funds are received.	Capacity Enhancement

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
All Ports (continued)											
7	Dangerous currents at the Brazos River Floodgates	M&N	Waterside	All	Strong currents, believed to be the result of sedimentation at the mouth of the San Bernard River push barges entering the GIWW from via the western floodgates underwater. The current has increased significantly in the west gate over time. Approach to both gates is hazardous in high water.	Remove or reconfigure flood gates and/or dredge the mouth of the San Bernard River. Initiated Section 216 Study GIWW Modifications to examine possible modifications to existing structure. Short term: Add mooring structures to accommodate tripping.	New dredging structures	$7,000,000	100% Federal with TxDOT providing ROW/ Easements	San Bernard River Mouth has been dredged. Repairs to east and west floodgates underway (est. completion 11/30/10). The GIWW Modifications Study was suspended in FY 2004, was not funded in FY 2006, and is not in the President's Budget for FY 2007.	Capacity Enhancement
8	Pelican Island Moorings	M&N	Waterside	All	Insufficient mooring buoys available. Tows double up on buoys creating traffic hazard and damaging buoys. Mooring area not large enough to handle demand.	Install at least 3 additional buoys to the west of existing buoys. The bottom of the mooring basin will be widened 80 feet to the north, yielding a total width of 155 feet. In conjunction with the widening, the 13 existing mooring buoys will be cut away from their anchors and set back 80 feet.	New dredging structures	$4,000,000	100% Federal with TxDOT providing ROW/ Easements	This segment of the GIWW received limited PED funding in FY 05. FY 06 funds were dedicated to developing "draft" P&S for the Texas City Wye and Pelican Island Moorings segments of the GIWW system.	Capacity Enhancement
9	Texas City Wye	M&N	Waterside	All	Turning channel difficult to navigate; pilots use main Texas City Channel instead resulting in average of 9 accidents/year at Texas City Channel and GIWW intersection area.	Section 216 study: Widen Main Texas City Channel and GIWW Intersection (triangle shaped turning area). Create marsh with dredge material.	New dredging	$3,600,000	100% Federal with TxDOT providing ROW/ Easements	Part of 216 report with Pelican Island Moorings, does not appear to be pressing issue.	Strategic Investment
10	West Bay Washout	M&N	Waterside	All	West Bay breached this entire section on the south bank of the GIWW. USACE replaced 1/3 of the bank with dredge material that is eroding. Some fabric tubes were used.	Install 24-foot circumference by 10,058-foot-long geotubes between GIWW and the West Bay, offset 300 feet from the centerline of the channel. Additionally, install a concrete barrier along the channel's north shoreline, which would separate the GIWW from Halls Lake.	Erosion protection	$3,000,000	100% Federal	This segment of the GIWW received limited PED funding in FY 05. FY 06 funds were dedicated to developing "draft" P&S for the Texas City Wye and Pelican Island Moorings segments of the GIWW system.	Maintenance
11	Sievers Cove	M&N	Waterside	All	Initial: Shoaling north bank at Sievers Cove. USACE determined that widening the GIWW channel along the west approach to the gap is the selected alternative. The bottom channel will be widened 75' on its north side of the GIWW.	Initial: Consider reestablishing north bank to reduce shoaling and strong currents in the GIWW. Discarded following 216 study. Final: Widen west bank of channel (1400LF x 75' wide by 16' deep) and create marsh on bay shoreline with dredge material and geotube.	Erosion protection	$1,000,000	100% Federal	This segment of the GIWW received limited PED funding in FY 05. FY 06 funds were dedicated to developing "draft" P&S for the Texas City Wye and Pelican Island Moorings segments of the GIWW system.	Maintenance
14	Mile 363 Bend	M&N	Waterside	All	Possible location for new mooring area, less exposure to wind and current than Red Can Bend.	Install moorings (assume 10).	Structures	$2,000,000	100% Federal		Capacity Enhancement
15	Bolivar Moorings	HNTB	Waterside	All	Need 2nd mooring basin.	Install moorings (assume 10).	Structures	$2,000,000	100% Federal		Strategic Investment

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
All Ports (continued)											
16	Greens Lake Mooring Facility	?	Waterside	All	Need mooring buoys at this location to provide safe "waiting weather" spot for Galveston Bay crossing. Currently, tows push into the bank of Greens Lake to wait-out weather.	Install 6 mooring buoys on south bank near Greens Cut. Insure placement out of main navigation channel. The Section 216 study (2003) recommends that a new mooring basin with 7 mooring buoys be constructed at the mouth of Greens Lake.	Structures	$2,000,000	100% Federal	This segment of the GIWW has received limited PED funding in FY 05. FY 06 funds were dedicated to developing "draft" P&S for the Texas City Wye and Pelican Island Moorings segments of the GIWW system.	Capacity Enhancement
17	Brazos River Intersection	?	Waterside	All	Of the 10 buoys placed just east of the Brazos intersection, only 5 are functional (2 on the north bank and 3 on the south bank). Mooring area not large enough to handle demand.	Repair or replace nonfunctional buoys and double the number of buoys available. New "floating anvil" style buoys will be placed for evaluation in April or May. If the new design works well, additional buoys of the same type should be feasible without much deliberation.	Structures	$3,000,000	100% Federal	Contract issued, but work not underway as of 12/2010.	Capacity Enhancement
18a	Matagorda Bay Reroute (Entire Project)	M&N	Waterside	All	Shoaling, because this is an area of significant crosscurrent and requires more frequent dredging than in the past. Install ranges on westernmost reach of Matagorda Bay Alternate Route.	Relocate GIWW further north to take advantage of the natural deep water and avoid these strong crosscurrents.	New dredging structures	$20,000,000	100% Federal with TxDOT providing ROW/ Easements	Feasibility report was completed in June 2002. Project authorization pending. Preconstruction, Engineering, and Design (PED) phase was stopped due to funding shortfall in FY 04. Survey of the beneficial use sites is needed; however, core borings efforts are complete. USCG marked, not dredged.	Capacity Enhancement
18b	Matagorda Bay Reroute Marking Existing Channel	M&N	Waterside	All	Install ranges on westernmost reach of Matagorda Bay Alternate Route.	Install ranges (assume 10).	Navigation	$100,000	100% Federal	Alternate channel complete. Channel marked sufficiently, but need range established.	Capacity Enhancement
19	"Hole in the Wall" Gap in GIWW at north end of Corpus Christi Bay	M&N	Waterside	All	Narrow gap between two islands difficult to navigate.	Widen channel.	New dredging	$1,000,000	Likely 100% Federal with TxDOT providing ROW/ Easements	Conceptual.	Capacity Enhancement
20	Caney Creek Wiggles	M&N	Waterside	All	Curves, width limitations and one-way barge traffic.	Recommend shaving of banks to straighten bends.	New dredging	$5,000,000	100% Federal with TxDOT providing ROW/ Easements		Capacity Enhancement

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
All Ports (continued)											
21	Dangerous currents at the Colorado River Locks and Colorado Locks Bypass Channel	M&N	Waterside	All	Tows are experiencing cross-current related-tow control problems. USACE has imposed tow size limits at higher current rates, requiring tripping. This area is extremely hazardous for both commercial and recreational vessels.	Study removal of both locks and increasing the depth of the bypass channel at the intersection with the GIWW. The feasibility study for the GIWW Modifications was suspended in FY 2004. Additional modeling is required.	New dredging structures	?	100% Federal with TxDOT providing ROW/ Easements	No funds were received in FY 2006 for the diversion channel or jetty analysis, and no funds are in the President's FY 2007 budget. Conceptual.	Strategic Investment
22	Port O'Connor	M&N	Waterside	All	Need to reestablish mooring basin and resolve dangerous encroachment issue in the GIWW. Possible sites are the south side of the GIWW west of Air Force Channel, near MM 470-481 WHL.	Relocate moorings (assume 10).	Structures	$2,000,000	100% Federal	GICA trying to get under study, No. 1 priority.	Capacity Enhancement
23	Lydia Ann Channel	M&N	Waterside	All	Unsafe or inadequate mooring structures.	Increase capacity and improve existing mooring structures (assume 14).	Structures	$3,000,000	100% Federal	Not high priority, but would replace lost moorings at Ingleside.	Strategic Investment
24	Colorado Structures	M&N	Waterside	All	Structures need to be regularly maintained.	Maintenance.	Structures	?	100% Federal		Maintenance
25	UP Brownsville Subdivision Capacity	Lower Rio Grande Valley and Laredo Region Freight Study, TxDOT	Landside	All	At capacity.	Sidings and signal improvements to accommodate projected growth.	Sidings/mainline capacity	$102,300,000		Analyzed, modeled in RTC in TxDOT Lower Rio Grande Valley and Laredo Region Freight Study, not yet published.	Maintenance
26	UPRR Angleton and Brownsville Subcapacity – load capability of bridges	WB Phase I Report (BNSF comments)	Landside	All	Structures not rated for 286k loading.	Upgrade or replace bridges to allow for 286k load rating.	286K upgrade	$35,700,000		Analyzed, modeled in RTC in TxDOT Lower Rio Grande Valley and Laredo Region Freight Study, not yet published.	Maintenance
147	I-69 Capacity	HNTB	Landside	All	Interstate Highway Connectivity to the Ports.	Upgrading U.S. 59, U.S. 77, and U.S. 281 to become Interstate 69.	Highway capacity upgrade	$4.6 billion priority/$10.2 bill ion complete	100% TxDOT?	Under analysis as part of I-69 Corridor Program.	Capacity Enhancement
Port of Beaumont/Port of Port Arthur											
27	KCS bridge across Port of Beaumont Ship Channel (Neches River)	WB Phase I Report, CTR 5068-1 Report	Landside	Beaumont	Low speeds and single track.	Upgrade and double track.	Rail bridge	$16,000,000		In design.	Capacity Enhancement
28	Sabine-Neches Canal	?	Waterside	Port Arthur/ Beaumont	Average water depths 15-40 feet (design: 30-40 feet).	Maintenance dredging.	Maintenance dredging	$25,500,000	100% Federal	3.4M CY USACE FY 2011 budget; and 1.72M CY USACE FY 2012 O&M.	Maintenance

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Port of Beaumont/Port of Port Arthur (continued)											
29	Erosion of SH 87 and SH 82 in the Pleasure Island area on the GIWW	?	Waterside	Port Arthur/ Beaumont	Waves and wake from passing barges on the GIWW are undermining SH 87 and SH 82 in the Pleasure Island area.	Place riprap alongside the highways to shield the highway from waves eroding the roadbed.	Erosion protection	$15,000,000	Approx. 50% TxDOT/50% other		Maintenance
30	Air draft limitations at the Martin Luther King (16 miles inland on the SNWW)	?	Waterside	Port Arthur/ Beaumont	Air draft limitations limit access to ports by tall ships.	Raise bridges.	Structures	$900,000,000	100% TxDOT?		Capacity Enhancement
31	Sabine-Neches Waterway Depth individual segments are listed in Deep Draft Channels worksheet	?	Waterside	SNWW Ports	The waterway is not maintained to its Federally authorized depth. Many components of the waterway are 6-12 feet shallower than their authorized depths of 40-42 feet.	Maintenance dredging.	Maintenance dredging	$81,000,000	100% Federal	5.2 million CY in USACE FY 2011 budget	Maintenance
32	Sabine Pass	?	Waterside	SNWW Ports	Average water depths 20-42 feet (design: 40-42 feet), not including anchorage basin.	Maintenance dredging.	Maintenance dredging	$50,500,000	100% Federal	1.8M CY USACE FY 2011 budget (channel); and 8.3M CY USACE FY 2012 O&M.	Maintenance
Port of Brownsville											
33	Lack of Interstate Highway connectivity at the Port of Brownsville.	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	Brownsville	Lack of Interstate Highway access.	The Port Access Road project provides a connection from the Port to SH 550, which connects to U.S. 77. Requires upgrades to U.S. 77 to interstate standards.	Roadway connection	$2,600,000		Constructed in 2011.	Capacity Enhancement
34	Delays for rail freight accessing UPRR main line at Brownsville	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	Brownsville	Delays accessing UPRR main line.	Brownsville Port Line Capacity Upgrades.	Rail capacity	$6,740,000		Conceptual.	Maintenance
35	Lack of intermodal ramp in the Port of Brownsville	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	Brownsville	The nearest intermodal ramp to the Port of Brownsville is in San Antonio, adding 250 highway miles that containers must be drayed before being put on trains. This greatly reduces the competitiveness of container freight in Brownsville and southern Texas.	Construct a new intermodal ramp in the Brownsville area.	Rail yard	$175,000,000		Requested by stakeholder in Phase I surveys. Has not been studied to determine feasibility or if the project is economically or operationally justified.	Strategic Investment
36	Harlingen Yard	Cameron County	Landside	Brownsville	Vehicular safety and impedance at at-grade roadway/rail crossings in Harlingen.	Relocate RVSC switching operations to new yard outside of Harlingen. (Near Olmita)	Rail yard	$17,000,000	100% City and County Sources	Conceptual. UPRR operations relocated to Olmito Yard as 1st step.	Strategic Investment

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Port of Brownsville (continued)											
37	Commerce Street Congestion in Harlingen	Cameron County	Landside	Brownsville	Vehicular impedance and safety concerns associated with train operations in Harlingen.	Commerce Street Connection will eliminate crossings.	Connection	$5,500,000		Preliminary design done by UPRR. Cameron County anticipated to fund this project in near term (<5 years).	Capacity Enhancement
38	Brownsville Ship Channel individual segments are listed in Deep Draft Channels worksheet	M&N	Waterside	Brownsville	The waterway is not maintained to its Federally authorized depth and may need to be deepened to accommodate larger ships.	Maintenance dredging.	Maintenance dredging	$8,300,000	100% Federal	250,000 CY USACE FY 2011 budget; 750,000 USACE FY 2011 additional; 650,000 USACE FY 2012 O&M; fully funded.	Maintenance
52	Insufficient connectivity between Kosmos and Brownsville Subdivisions	Corpus Christi Freight Study	Landside	Brownsville	Insufficient connection between rail lines.	Construct rail connection.	Connection	$3,240,000		Fully funded and underway – will be completed in June 2012.	Maintenance
159	Rail Bridge Crossings at Angelton and Placedo	Port of Brownsville Staff	Landside	Brownsville		Rail bridge crossings at Angelton and Placedo.	Rail crossings	$20,000,000	Applied to TIGER Grant – did not receive	Under study.	Maintenance
160	SH 550 – Phase I	Port of Brownsville Staff	Landside	Brownsville				$35,000,000	Under construction – fully funded	Phase I – under construction; and Phase II – partially funded and under study.	Capacity Enhancement
160a	SH 550 – Phase II	Port of Brownsville Staff	Landside	Brownsville				$57,000,000		Currently under design.	Capacity Enhancement
160b	SH 550 Direct Connectors	Port of Brownsville Staff	Landside	Brownsville		This would provide a new tolled direct connection to U.S. 77/83. It would include a new tolled main lane extending to the east of Old Alice Roads, with an overpass at Old Alice Road.	Highway Connections	$36,400,000	Cameron County/TxDOT	Letting scheduled for Jan. 2012	Capacity Enhancements
161	Widening and Deepening of Brownsville Ship Channel	PB	Waterside	Brownsville				?	Under study	Under study.	Capacity Enhancement
53	UPRR Brownsville Subcapacity	Corpus Christi Freight Study	Landside	Brownsville	Insufficient capacity.	Construct new siding at MP 171.	Sidings/mainline capacity	$6,700,000		Conceptual.	Maintenance
175	Veterans International Bridge Expansion	Port of Brownsville Staff	Landside	Brownsville	Insufficient capacity.	New 4-lane twin bridge.	Highway capacity	$5,800,000	Cameron County/TxDOT	Currently under construction	Capacity Enhancement
176	SH 32 – New Connection	Port of Brownsville Staff	Landside	Brownsville	Connectivity	New connection from U.S. 77/83 to U.S. 4- provides a direct connection to the Port of Brownsville.	Highway capacity	$38,800,000	CCRMA/TxDOT	Letting scheduled for April 2013	Capacity Enhancement

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Port of Brownsville (continued)											
177	U.S. 281 Connection	Port of Brownsville Staff	Landside	Brownsville	Connectivity	New connection of U.S. 281 near FM 1577 to U.S. 77 near SH 100.	Highway Connectors	$140,000,000	Unknown	Conceptual	Strategic Investment
178	U.S. 77 Upgrades	Port of Brownsville Staff	Landside	Brownsville	Capacity, safety, and mobility concerns	Several different portions are recently funded (as of November 2011). These include the section from SH 44 to FM 892, FM 892 to 0.8 miles South of CR 28, the Overpasses at Caesar Avenue and Sarita, and the conversion of 2-way frontage roads.	Highway Capacity	$420,000,000 (all segments combined)	Cameron County/TxDOT	Recently funded, under design and/or construction	Capacity Enhancement
Calhoun Port Authority											
39	Limited land available for future growth at the Calhoun Port Authority	Stakeholder Meeting	Waterside	Calhoun Port Authority	Lack of available land for future growth.	Zone remaining available land for port uses.	ROW	?			Capacity Enhancement
40	Lack of Interstate Highway connectivity at the Calhoun Port Authority	Stakeholder Meeting	Landside	Calhoun Port Authority	Lack of Interstate highway access at the Calhoun Port Authority.	Widen SH 35 and SH 172 from the Calhoun Port Authority to U.S. 59.	Roadway connection	$103,900,000		Conceptual.	Capacity Enhancement

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Port of Brownsville (continued)											
41	Matagorda Ship Channel Individual segments are listed in Deep Draft Channels worksheet	?	Waterside	Calhoun Port Authority	Current depth of 35 feet and width of 200 feet restricts traffic to one-way and forces over 93% of deep draft ships to be light-loaded when transiting.	Deepen (to 45 feet) and widen (to 400 feet) the channel. TxDOT working with USACE to modify channel dimensions.	New dredging	$540,000,000	75% Federal/ 25% Local (could include TxDOT)	3M CY USACE FY 2011 budget; 3.4M CY USACE FY 2011 additional; and3.55M CY USACE FY 2012 O&M.	Strategic Improvements
42	Port Lavaca	M&N	Waterside	Calhoun Port Authority	Average water depths 3.5-5.5 feet (design: 12 feet).	Maintenance dredging.	Maintenance dredging	$16,500,000	100% Federal	1.5M CY USACE FY 11 additional; and1.8M CY USACE FY 12 O&M.	Maintenance
43	Railroad siding length: Angleton – Port Lavaca	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	Port Lavaca	14-mile industrial lead linking the UP Angleton Subdivision with Port Lavaca.	Lengthen sidings on key freight corridors.	Sidings/mainline capacity	$6,070,000		Conceptual.	Maintenance
Cedar Bayou											
44	Cedar Bayou Channel	M&N	Waterside	Cedar Bayou	The portion of the Cedar Bayou Channel from the Houston Ship Channel to the land cut portion of Cedar Bayou is marked only on the red side. With current increases in barge traffic, there is also increasing risk of groundings.	Industry requests USACE to investigate placement of navigation aids on the green side of the channel, resulting in both sides of the channel being marked.	Navigation	$100,000	100% Federal		Maintenance
153	Cedar Bayou Navigation Channel	Stakeholder Meeting	Waterside	Cedar Bayou		8-mile project to extend the existing channel, providing same depth and dimension as the authorized channel.		$16,000,000	Federal authorized – unfunded		Capacity Enhancement
Port of Corpus Christi											
45	Insufficient connectivity between La Quinta Terminal and U.S. 181	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	Corpus Christi	Port of Corpus Christi's La Quinta terminal access road does not provide sufficient connectivity to U.S. 181.	Enhance capacity or construct alternate access route.	Roadway connection	$25,000,000		Completed in 2011.	Capacity Enhancement
46	Insufficient sidings to accommodate increasing rail freight at the La Quinta Terminal at Port of Corpus Christi	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	Corpus Christi	Insufficient rail capacity to serve expected rail freight growth.	Construct new sidings.	Sidings/mainline capacity	$10,400,000		Conceptual.	Maintenance

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Port of Corpus Christi (continued)											
47	Nueces River Rail Yard	Corpus Christi Port Authority/ Corpus Christi Terminal Railroad	Landside	Corpus Christi	New switching and storage capacity for Corpus Christi Terminal Railroad.	Construct new rail yard to replace existing CCTR yard.	Service tracks	$21,500,000	26% POCCA, 28% BNSF, KCS, UP, CCTR. Applied for TIGER grant for remainder.	Under-design – study (new capacity).	Strategic Investment
48	KCS Laredo Subdivision Capacity	Lower Rio Grande Valley and Laredo Study	Landside	Corpus Christi	Insufficient capacity for projected growth.	Signal improvements (controlled switches) at all sidings.	Sidings/mainline capacity	$16,300,000		Analyzed, modeled in RTC in TxDOT Lower Rio Grande Valley and Laredo Region Freight Study, not yet published.	Maintenance
49	NW Ingleside Dr (Gregory) – Brownsville	Corpus Christi Freight Study	Landside	Corpus Christi	Vehicular safety and impedance.	Grade separation.	Grade separation	$8,000,000		Analyzed in Corpus Christi Region Freight Study, TxDOT, included in rail plan.	Capacity Enhancement
50	Sinton St (Sinton) – Brownsville	Corpus Christi Freight Study	Landside	Corpus Christi	Vehicular safety and impedance.	Grade separation.	Grade separation	$5,600,000		Analyzed in Corpus Christi Region Freight Study, TxDOT, included in rail plan.	Capacity Enhancement
51	Park Ave (Odem) – Brownsville	Corpus Christi Freight Study	Landside	Corpus Christi	Vehicular safety and impedance.	Grade separation.	Grade separation	$6,700,000		Analyzed in Corpus Christi Region Freight Study, TxDOT, included in rail plan.	Capacity Enhancement
139	La Quinta Channel Extension	M&N	Ship	Port of Corpus Christi	Extend channel – 41 feet depth to new terminal.			$75,000,000	Thus far 100% Federal and Port Partner Funding	Partially funded, under construction.	Strategic Investment
140	Ingleside Industrial Corridor	M&N	Landside	Port of Corpus Christi	Highway/bypass to Kiewet and others off of TX-381.		New Highway/ relief route to serve industrial operations along La Quinta Ship Channel	$23,000,000	County and TxDOT Funding	Design.	Capacity Enhancement
54	ROW conflicts at Port of Corpus Christi	HNTB	Landside	Corpus Christi	Removal of Tule Lake Lift Bridge requires KCS to operate over UPRR tracks (and past UPRR Viola Yard) between Fulton Wye and CCTR Savage lane line.	Construct additional KCS track between Fulton Wye and CCTR facilities.	Sidings/mainline capacity	$8,200,000		Conceptual.	Capacity Enhancement
55	Upgrade U.S. 77 to interstate standards	Corpus Christi MPO	Landside	Corpus Christi	Insufficient capacity.	Upgrade U.S. 77 to I-69.	Roadway capacity	$180,000,000		(note: $180M is cost for interim project, ultimately $850M for full project).	Strategic Investment
56	Insufficient capacity on SH 44	Corpus Christi MPO	Landside	Corpus Christi		Upgrade SH 44 between Corpus Christi and U.S. 59.	Roadway capacity	$350,000,000		Conceptual.	Capacity Enhancement

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Port of Corpus Christi (continued)											
141	Corpus Christi Ship Channel	M&N	Ship	Corpus Christi	Deepening (45-52 feet) and widening (to 500 feet).		Capacity dredging	$450,000,000	100% Federal?	Design has been authorized, but not funded.	Strategic Investment
142	Garcitas Creek and Colorado Bridges on UPRR	TIGER App: ftp://ftp.dot.state.tx.us/pub/txdot-info/rail/tiger/south_tex/grant_app.pdf	Landside	Corpus Christi and Brownsville	Currently load restricted to 268k lbs, want to get to 282k lbs, shared BNSF and KCS line but mostly used by BNSF.	Capacity upgrades at the Angleton Subdivision. Construction of two large rail bridges and improvements to 31 smaller timber structure so that each one in 286,000 rail car compliant.	Bridge construction/ rehabilitation	$16,500,000		Unfunded. Did not receive TIGER Grant. Would be mixture of Federal, state, Local?	Strategic Investment
57	Former railroad lift bridge over the Corpus Christi Ship Channel	Stakeholder Meeting	Waterside	Corpus Christi	Bumpouts in the channel for bridge supports prevent 2-way ship traffic.	Remove or reconfigure bridge.	Structures	$7,000,000-$8,000,000	100% others (could include TxDOT)	Bridge removed, abutments and fenders remain.	Strategic Investment
58	Air draft limitations at the Corpus Christi Harbor Bridge	Stakeholder Meeting	Waterside	Corpus Christi and the SNWW ports	Air draft limitations limit access to ports by tall ships.	New bridge.	Structures	$600,000,000 (Note: This number from TxDOT, but someone else handed sheet saying $350M.)	100% TxDOT?	Status: EIS to be completed in 2013, ROD in 2014.	Capacity Enhancement
Port of Freeport											
59	FM 523	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	Freeport	Poor pavement condition, limited capacity for trucks.	H-GAC TIP: Smart Streets project from SH 36 to SH 332, pavement rehab from SH 32 to Dow Wastewater Canal, widening project from FM 2004 to SH 332 and from SH 332 to FM 1495.	Roadway capacity	$53,400,000		Conceptual.	Maintenance
60	SH 36	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	Freeport	Lack of capacity and access controls on many segments.	Widen from U.S. 59 to the Port of Freeport.	Roadway capacity	$167,500,000		Conceptual.	Maintenance
13	UPRR Swing Bridge over the Old Brazos River Channel near the Port of Freeport	Pete Reixach, Port Director	Waterside	All	Poor condition. Bridge occasionally becomes stuck.	Construct new bridge.	Structures	$124,000,000	100% railroads/ Non-TxDOT	Replacement bridge under construction: Recycled lift bridge from Houma, LOS Angeles – completed 2011.	Capacity Enhancement

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Port of Freeport (continued)											
61	SH 288	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	Freeport	Low capacity, lack of access controls on some segments.	Construct grade separations to increase capacity.	Roadway capacity	$124,000,000		Conceptual.	Maintenance
62	Lack Interstate Highway access	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	Freeport	Lack of interstate highway access at the Port of Freeport.	Construct new Interstate Highway connection (62a), or upgrade and reclassify an existing facility (62b).	Roadway connection	Delete – This project is accomplished through project No. 60 (widening of SH 36 to U.S. 59).		Conceptual.	Capacity Enhancement
63	New Freeport Access	HNTB	Landside	Freeport	Indirect access to future intermodal yards in Rosenberg, and capacity constraints on existing mainline due to eventual build-out of new Freeport terminals.	Extend and add new mainline to existing Freeport corridor.	Sidings/mainline capacity	$32,990,000		Conceptual.	Strategic Investment
64	Capacity between Angleton and UP Hoskins Yard	HNTB	Landside	Freeport	Insufficient capacity.	New 10,000-foot siding between Angleton and UP Hoskins Yard.	Sidings/mainline capacity	$12,610,000		Conceptual.	Maintenance
65	Freeport Harbor	POF	Waterside	Freeport	Outer Bar Channel to Brazosport Turning Basin average water depth 36-43 feet (design: 45-47 feet).	Maintenance dredging.	Maintenance dredging	$39,000,000	100% Federal	2.3M CY USACE FY 2011 budget (entrance); 1.8M CY USACE FY 2011 additional (maintenance assumption); 3.7M CY USACE FY 2012 O&M (entrance and maintenance).	Maintenance
66	Capacity at DOW Chemical Plant	HNTB	Landside	Freeport	Insufficient capacity.	New dedicated siding track at DOW Chemical Plant.	Sidings/Mainline capacity	$9,500,000		Conceptual.	Maintenance
67	FM 1495	Stakeholder Meeting	Landside	Freeport	Insufficient capacity.	Widen roadway from FM 523 to SH 288.	Roadway capacity	$35,500,000		Conceptual.	Maintenance
137	Freeport Channel	Port of Freeport/Alan Meyers	Waterside	Freeport		Widen and deepen channel from 400-600 feet wide and 55 feet deep.		$330,000,000	Under study/fully funded	Expect to be permitted spring 2011.	Capacity Enhancement
138	Lack of Capacity in Marine Terminals – Velasco Terminal Construction	Port of Freeport/Alan Meyers	Landside	Freeport		Phase I, 800 feet berth complete, 22 acres stabilized, 90 acres total; multipurpose terminal capable of handling 780,000 TEUs and an elevated intersection at FM 1495 and SH 36, which we are partnering with the County and State on design and funding.		$380,000,000			Capacity Enhancement

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Port of Freeport (continued)											
156	Number of Grade Crossing Projects/Rail Bridge Crossings at Angelton and Placedo	Stakeholder Meeting	Landside	Freeport				Need more info to complete cost estimate. Not sure of source of project.		Could not show us due to insufficient map detail.	Capacity Enhancement
157	Rail Storage Facility	Alan Meyers	Landside	Freeport		Capacity to build unit trains – 5 tracks.		Need more info to complete cost estimate. Not sure of source of project.		Conceptual.	Capacity Enhancement
152	Capacity on Hwy 36 and 288 from Freeport	HNTB	Landside	Freeport				Delete – This project is accomplished through project No. 60 (widening of SH 36 to U.S. 59) and No. 61 (grade separations along SH 288).			Capacity Enhancement
158	Freeport Harbor Deepening	Stakeholder Meeting	Waterside	Freeport		55-feet project deepening from 45 feet, expect USACE chief's report Sept 2011.		$300,000,000	Federal/Port/ Other?	Unfunded.	Capacity Enhancement
Port of Harlingen											
68	W. Colorado Avenue (Rio Hondo, Texas) Lift span bridge over the Arroyo Colorado (~22 miles inland of GIWW)	?	Waterside	Harlingen	The bridge needs to be lifted about once a day to allow passage for Port of Harlingen waterway traffic, needs regular inspections and maintenance, and has been out of operation for multiple days on several occasions.	Replace with a new liftspan bridge or a higher nonmovable bridge.	Structures	$20,000,000	100% TxDOT?		Capacity Enhancement
69	Channel to Port Harlingen	?	Waterside	Harlingen	Average water depths 8-13 feet (design: 12 feet).		Maintenance dredging	$1,800,000	100% Federal	USACE FY 2011 budget	Maintenance
Houston-Galveston Area Ports											
70	Lack of rail access to Pelican Island	HNTB	Landside	Galveston	Lack of rail access. As Pelican island is further developed, this will become more of an issue.	Construct new rail bridge.	Rail bridge	Delete – Only need if Houston Container Facility is located on Pelican Island. Not able to discuss due to NDA.			Strategic Investment

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Houston-Galveston Area Ports (continued)											
71	Galveston Harbor Channel Depth *Individual segments are listed in Deep Draft Channels worksheet	N/A	Waterside	Galveston	The waterway is not maintained to its Federally authorized depth. Some components of the waterway are significantly shallower than their authorized depths, particularly the anchorage basin, which is 12-17 feet shallower than its authorized depth of 34 feet.	Maintenance dredging.	Maintenance dredging	$51,000,000	100% Federal	Galveston: 4.75M CY in USACE FY 2011 budget; Texas City: 200,000 CY in USACE FY 2011 budget. Note: Texas City is separate port from Galveston, should be kept separate.	Maintenance
72	Galveston Harbor	M&N	Waterside	Galveston	Average water depths 23-48 feet (design: 40-47 feet), not including anchorage basin.	Maintenance dredging.	Maintenance dredging	$29,000,000	100% Federal	4.75M CY USACE FY 2011 budget; 1.9M CY USACE FY 2012 O&M; and Phase II funded (as of 2009).	Maintenance
73	Railroad-highway grade crossing at FM 1960 east of SH 249	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	H-GAC area ports	Identified as a auto-train collision hotspot.	Improve grade crossing safety.	Grade separation	$11,700,000		Conceptual.	Capacity Enhancement
74	Railroad-highway grade crossing at Hillcroft Street near Main Street (U.S. 90A)	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	H-GAC area ports	Identified as a auto-train collision hotspot.	Improve grade crossing safety.	Grade separation	$18,000,000		Conceptual.	Capacity Enhancement
75	Railroad-highway grade crossing at Bellfort near Mykawa Road	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	H-GAC area ports	Identified as a auto-train collision hotspot.	Improve grade crossing safety.	Grade separation	Delete – No impact on ports, not located near the ports or on key routes to/ from the ports.			Capacity Enhancement
76	Railroad-highway grade crossing at Almeda-Genoa near Mykawa Road	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	H-GAC area ports	Identified as a auto-train collision hotspot.	Improve grade crossing safety.	Grade separation	Delete – No impact on ports, not located near the ports or on key routes to/ from the ports.			Capacity Enhancement
77	Railroad-highway grade crossing at Antoine Drive near Tidwell	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	H-GAC area ports	Identified as a auto-train collision hotspot.	Improve grade crossing safety.	Grade separation	Delete – No impact on ports, not located near the ports or on key routes to/ from the ports.			Capacity Enhancement

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Houston-Galveston Area Ports (continued)											
78	Railroad-highway grade crossing at Park Terrace near Galveston Road	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	H-GAC area ports	Identified as a auto-train collision hotspot.	Improve grade crossing safety.	Grade separation	$12,000,000		Conceptual.	Capacity Enhancement
79	Railroad-highway grade crossing at Fairmont Parkway	?	Landside	H-GAC area ports	Identified as a auto-train collision hotspot.	Improve grade crossing safety.	Grade separation	Delete – Already grade separated			Capacity Enhancement
80	Jacintoport Blvd	?	Landside	Houston	Limited capacity, lack of median and shoulders.	Widen from BW 8 to Peninsula.	Roadway capacity	$9,600,000		Conceptual.	Maintenance
81	Spencer Hwy and Redbluff Rd	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	Houston	Poor pavement condition, low bridge clearances, lack of access controls, poor turning radii.	H-GAC TIP: Grade separation at Spencer Hwy, widen Redbluff to 6 lanes.	Roadway capacity	$35,150,000			Maintenance
82	SH 146	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	Houston	Poor pavement condition, congestion, grade crossing issues.	Pavement maintenance, capacity enhancement, and grade crossing upgrades included in H-GAC TIP.	Roadway capacity	$595,427,341			Maintenance
83	SH 225	?	Landside	Houston	Poor connectivity to I-610 and Beltway 8, and safety issues.	Direct connectors to BW8.	Roadway connection	$30,000,000		Conceptual.	Capacity Enhancement
84	Loop 610 bridge	Stakeholder Meeting	Landside	Houston	Low clearance.	Raise bridge.	Roadway bridge	This is not a land use issue – it is a waterside project.			Capacity Enhancement
85	Rail bridge 5A – PTRA	Houston Region Freight Study	Landside	Houston	Insufficient capacity – single-track bottleneck on double-track corridor.	Double track.	Rail bridge	$10,000,000		Analyzed, modeled in RTC in TxDOT Houston Region Freight Study, 2007 and GCRD Study, 2009.	Capacity Enhancement
86	Belt Jct.	Houston Region Freight Study	Landside	Houston	Insufficient capacity.	Double track.	Sidings/mainline capacity	$11,000,000		Analyzed, modeled in RTC in TxDOT Houston Region Freight Study, 2007 and GCRD Study, 2009.	Maintenance
87	Galena Jct. to Manchester Jct.	Houston Region Freight Study	Landside	Houston	PTRA required to use trackage rights on UPRR line.	Double track.	Sidings/mainline capacity	$42,000,000		Analyzed, modeled in RTC in TxDOT Houston Region Freight Study, 2007 and GCRD Study, 2009.	Maintenance

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Houston-Galveston Area Ports (continued)											
88	Englewood Yard to Sheldon	Houston Region Freight Study	Landside	Houston	Insufficient capacity.	Additional mainline track from Englewood Yard to Sheldon.	Sidings/mainline capacity	$50,000,000		Analyzed, modeled in RTC in TxDOT Houston Region Freight Study, 2007 and GCRD Study, 2009.	Maintenance
89	Rail bridge 16 – East Belt	Houston Region Freight Study	Landside	Houston	Insufficient capacity – single track bottleneck on double-track corridor.	Double track.	Rail bridge	$10,000,000		Analyzed, modeled in RTC in TxDOT Houston Region Freight Study, 2007 and GCRD Study, 2009.	Capacity Enhancement
90	New Container Terminal Facility	Port of Houston Terminal Next	Landside	Houston	Port of Houston needs additional container capacity.	Build new container terminal.	Rail yard	Unable to discuss due to confidentiality agreement with POH.		Being analyzed by the Port of Houston currently.	Strategic Investment
91	West Belt Improvement Project	Gulf Coast Rail District	Landside	Houston	Vehicular safety and impedance at at-grade roadway/ rail crossings on the West Belt Subdivision.	Grade separation or closure of the at-grade crossings.	Grade separation	$53,400,000		Feasibility analysis/ conceptual design under contract by GCRD.	Capacity Enhancement
92	Overweight Truck Facilities	?	Landside	Houston	84,000-lb limit on highways.	Authorization of permits for overweight trucks on roadways near the port of Houston. Increased trucking fees would be required to compensate for the increased maintenance and shortened service life of the roadways.	Roadway capacity	No Infrastructure cost – this is a policy issue.		Conceptual.	Maintenance
163	Port Road	Port of Houston Authority	Landside	Houston	Accommodate increased traffic for Bayport terminal.	Widen Port Road to divided 6-lane (SH 146 to Todville Road).	Roadway Capacity (2 new lanes)	$13,364,094	Federal – with local share	Conceptual.	Capacity Enhancement
164	SH 146	Port of Houston Authority	Landside	Houston	Access management from Port Road to SH 146.	Construct connector Eastbound from Port Road to SH 146.	Roadway Capacity (New connector)	$2,943,369	TxDOT – with local share	In Construction.	Strategic Investment
165	Spencer Highway	Port of Houston Authority	Landside	Houston	Intermodal Traffic Management.	Construct grade separation over Double rail.	Roadway Capacity (new roadway)	$12,518,818	Federal – with local share	Conceptual.	Strategic Investment
166	Clinton Drive	Port of Houston Authority	Landside	Houston	Poor roadway condition for road w/heavy truck traffic.	Clinton Drive Improvements (widening, lighting, drainage)	Roadway Capacity (new lanes)	$8,724,141	TxDOT – COH share	Will go to procurement in 2012.	Capacity Enhancement
167	SH 146(new connector)	Port of Houston Authority	Landside	Houston	Facility road needed for terminal access to SH146.	Construct direct connector from SB lanes of SH 416 to Bayport Southern Access.	Roadway Capacity (new lanes)	$13,379,661	Unknown	Conceptual.	Strategic Investment
168	Southern Access Road	Port of Houston Authority	Landside	Houston	Facility road needed for Terminal Access to SH146.	Construct two new lanes with raised median on Southern Access Road from Old SH146 to terminal.	Roadway Capacity (new lanes)	$13,538,650	Unknown	Conceptual.	Capacity Enhancement

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Houston-Galveston Area Ports (continued)											
169	Southern Access Road	Port of Houston Authority	Landside	Houston	Anticipated traffic to cruise terminal.	Widen Southern Access Road to four-lane divided highway from old SH 146 to Bayport Cruise terminal.	Roadway Capacity (new roadway)	$5,716,418	Unknown	Conceptual.	Strategic Investment
170	Jacintoport Road	Port of Houston Authority	Landside	Houston	Roadway existing conditions are fair to poor and have heavy truck traffic.	Widen Jacintoport Road to four lanes, improve rail crossings from Beltway 8 to Houston Ship Channel.	Roadway Capacity (new lanes)	$33,965,568	Unknown	Conceptual.	Strategic Investment
171	Penn City Road	Port of Houston Authority	Landside	Houston	Roadway existing conditions are fair to poor and have heavy truck traffic.	Widen Penn City Road from two to four lanes (from I-10); make drainage, lighting, and other improvements.	Roadway Capacity (new lanes)	$23,317,632	Unknown	Conceptual.	Strategic Investments
172	610 Bridge	Port of Houston Authority	Landside	Houston	IH 610 truck off-ramp to Port frequently backs up.	New truck entrance from 610 loop for all traffic crossing the 610 bridge.	Roadway Capacity (new lanes)	$20,000,000	Unknown	Conceptual.	Strategic Investments
173	Broadway Street	Port of Houston Authority	Landside	Houston	Traffic flow on Broadway needs to accommodate increased volumes.	Widen Broadway (from Barbours Cut Blvd to North L St.), increase to four lanes.	Roadway Capacity (new lanes) and improvements	$2,632,282	Unknown	Conceptual.	Strategic Investments
174	Old SH 146	Port of Houston Authority	Landside	Houston	Provide improved road to connect to warehouse development.	Improve Old SH 146 (Port Road to Red bluff).	Roadway Improvements	$3,325,000	Unknown	Conceptual.	Strategic Investments
93	Scott/York – West Belt	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$11,700,000		Feasibility analysis/ conceptual design under contract by GCRD.	Capacity Enhancement
94	Leeland – West Belt	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$7,400,000		Feasibility analysis/ conceptual design under contract by GCRD.	Capacity Enhancement
95	Navigation/Commerce – West Belt	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$26,500,000		Feasibility analysis/ conceptual design under contract by GCRD.	Capacity Enhancement
96	Lyons – West Belt	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$6,400,000		Feasibility analysis/ conceptual design under contract by GCRD.	Capacity Enhancement
97	Shepherd/Durham – Terminal	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$30,700,000		Conceptual.	Capacity Enhancement
98	Houston – Terminal	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$13,800,000		Conceptual.	Capacity Enhancement

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Houston-Galveston Area Ports (continued)											
99	Bellaire – Terminal	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$17,000,000		Conceptual.	Capacity Enhancement
100	San Felipe – Terminal	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$32,900,000		Conceptual.	Capacity Enhancement
101	Richmond – Terminal	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$29,700,000		Conceptual.	Capacity Enhancement
102	TC Jester – Terminal	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$8,900,000		Conceptual.	Capacity Enhancement
103	Westheimer – Terminal	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$66,800,000		Conceptual.	Capacity Enhancement
104	Market – Strang	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$4,900,000		Conceptual.	Capacity Enhancement
105	Lyons – Strang	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$5,300,000		Conceptual.	Capacity Enhancement
106	Wallisville – Strang	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$9,000,000		Conceptual.	Capacity Enhancement
107	Federal – PTRA	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$7,400,000		Conceptual.	Capacity Enhancement
108	Wallisville – East Belt	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$8,700,000		Conceptual.	Capacity Enhancement
109	Hirsch – East Belt	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$6,500,000		Conceptual.	Capacity Enhancement
110	Harrisburg – East Belt	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$14,800,000		Conceptual.	Capacity Enhancement
111	Canal – East Belt	Houston Region Freight Study	Landside	Houston	Vehicular safety and impedance.	Grade separation.	Grade separation	$11,700,000		Conceptual.	Capacity Enhancement

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Houston-Galveston Area Ports (continued)											
112	Connectivity at Tower 76	Houston Region Freight Study	Landside	Houston	Connectivity between the HB&T East Belt with the UP Lufkin Subdivision.	Wye connection in northeast quadrant.	Sidings/mainline capacity	$3,000,000		Analyzed, modeled in RTC in TxDOT Houston Region Freight Study, 2007.	Maintenance
113	West Belt Capacity	Houston Region Freight Study	Landside	Houston	Insufficient capacity.	Additional mainline from Tower 81 to Double Track Junction on the West Belt Subdivision.	Sidings/mainline capacity	$19,100,000		Analyzed, modeled in RTC in TxDOT Houston Region Freight Study, 2007.	Maintenance
114	Capacity and Allowable Speeds on Galveston Subdivision from Tower 30 to GH&H Junction	Houston Region Freight Study	Landside	Houston	Insufficient capacity.	Upgrade track and signals from Tower 30 to GH&H Junction on UPRR Galveston Subdivision.	Sidings/mainline capacity	$5,300,000		HRFS.	Maintenance
115	Pierce Yard	Houston Region Freight Study	Landside	Houston	Yard movements occupying mainline tracks on East Belt Subdivision.	Lengthen yard tracks.	Rail yard	$15,900,000		HRFS.	Maintenance
116	Settegast Yard	Houston Region Freight Study	Landside	Houston	Through movements through yard are blocked.	Construct 9,000-feet siding track.	Rail yard	$6,700,000		Analyzed, modeled in RTC in TxDOT Houston Region Freight Study, 2007.	Maintenance
117	East Houston Bypass	TxDOT Houston Region Freight Study and Texas Rail Plan	Landside	Houston	Constraints and congestion between Belt Junction and Basin Yard on the East Belt Subdivision.	32 mile bypass from Baytown Subdivision at Dayton to Cleveland with a connection to Lufkin Subdivision (new rail line).	Rail bypass	$283,400,000		Analyzed, modeled in RTC in TxDOT Houston Region Freight Study, 2007.	Strategic Investment
151	Harborside Drive Corridor on Pelican Island	HNTB	Landside	Houston				Delete. Only need if Houston Container Facility is located on Pelican Island. Not able to discuss due to NDA.			Strategic Investment
118	Fort Bend Bypass	Harris County Regional Freight Rail Improvement Plan	Landside	Houston	Vehicular safety and impedance associated with rail traffic on the Glidden Subdivision.	34-mile bypass through Fort Bend County from Rosenberg to Arcola (new rail line).	Rail bypass	$932,600,000		Currently being studied by Fort Bend County. Modeled in RTC in TxDOT study – has public benefit, but no private benefit (increased maintenance and operational costs).	Strategic Investment
119	Bell Main	Houston Region Freight Study	Landside	Houston	Upgrade condition of track.	Track and signal improvements, upgrades to restore line to service.	Sidings/mainline capacity	$6,600,000		Modeled in RTC in GCRD/ TxDOT study. Shown to have relatively small benefit.	Maintenance

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Houston-Galveston Area Ports (continued)											
120	PTRA North Shore	HNTB	Landside	Houston	Single-track constraints to primarily double tracked line.	Double-track sections and construct bridges.	Sidings/mainline capacity	$13,230,000		Conceptual.	Maintenance
121	Houston Ship Channel and Tributaries *Individual segments are listed in Deep Draft Channels worksheet	N/A	Waterside	Houston	Portions of the waterway are not maintained to their authorized depth and depths need to be increased to accommodate larger post-Panamax ships.	Maintenance dredging.	Maintenance dredging	$54,000,000	100% Federal	Barbours and Bayport: 3 million CY in USACE FY 2011 budget.	Maintenance
122	Houston Ship Channel	M&N	Waterside	Houston	Average water depths 33-46 feet (design: 45 feet); depths need to be increased for larger Post-Panamax ships.	Maintenance dredging.	Maintenance dredging	$15,000,000	100% Federal	USACE FY 2012 O&M	Maintenance
148	Boliver Bridge	HNTB	Landside	Houston/ Galveston	This has been extensively studied and may not be deemed feasible.			Delete – Project determined not feasible in previous study.		Has been studied previously. Study was terminated due to political opposition, significant environmental issues, and engineering constraints. The bridge will not be built.	Capacity Enhancement
123	Bayport Channel	?	Waterside	Houston	Average water depths 25-40 feet (design: 40-45 feet); depths need to be increased for larger Post-Panamax ships.	Maintenance dredging.	Maintenance dredging	$12,000,000	100% Federal	1.4M CY USACE FY 11 budget; and 900,000 CY USACE FY 2012 O&M.	Maintenance
149	Pelican Island Bridge for Rdwy access	HNTB	Landside	All	Vehicular access was damaged in Hurricane Ike.			$117,000,000		Unfunded, concept design plan to be made public in 30-60 days.	
150	Extend heavy haul permits for FM 1405 to Cedar Bayou (policy issue)	HNTB	Landside	All				No Infrastructure cost – this is a policy issue.		Conceptual.	Capacity Enhancement

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Houston-Galveston Area Ports (continued)											
153	Tower 55 Grade Separation (Fort Worth)	HNTB		Port of Houston	Tower 55 in Fort Worth is one of the most heavily traveled railroad intersections in the U.S. (approximately 100-120 trains per day), and is a major cause of congestion for north-south train traffic in Texas.	BNSF has been spending substantial sums of money to improve the infrastructure (double tracking, siding extensions, rail yard improvements) on its Mid Continent (Mid-Con) Corridor in order to accommodate existing energy-related business and to prepare for growth in this international trade. Improve conditions at Tower 55. These short-term improvements include additional north-south tracks through the intersection, redesigned centralized traffic control (CTC) signals, improved interlocker capabilities, and street improvements that support the closure of some highway-rail grade crossings. However, these improvements are only intended to lessen deficiencies that exist in current railroad capacity, evident by 90-minute train delay times during peak operating hours of the day, and do not resolve the long-term capacity problems of this intersection. This railroad intersection will ultimately need to be grade separated by constructing new railroad bridge structures that allow for the efficient movement of freight between Houston and the Midwest as port traffic continues to grow.		$87,000,000	TIGER, BNSF/ UP, City of Forth Worth, TxDOT	$34 million in TIGER II funding, combined with investments from BNSF and UP totaling $51 million, $1 million from the City of Fort Worth, and $1 million from TxDOT.	Capacity Enhancement
12	Galveston Railroad Bridge Widening	?	Waterside	All	The Galveston Railroad bridge presents a major hazard and chokepoint for barges on the GIWW because of its 105-feet width between its supports.	Reconstruct the bridge with 300-feet wide opening.	Structures	$80,000,000	100% Others?	Bridge under construction. TxDOT installed six 25-foot wide dolphins between Railroad and highway bridges in interim ($2.3 million). Underway and fully funded – completion June 2012.	Capacity Enhancement
155	Galveston Channel Deepening	Submitted during meeting	Waterside	Port of Galveston	45-feet deepening. The authorized channel work is completed with an extension and turning basin work underway.			$42,000,000	Fully funded – Federal appropriations for the extension and turning basin work are anticipated, but not yet received.		Capacity Enhancement
124	Barbours Terminal Channel (Exxon Oil Slip to Hunting Bayou)	?	Waterside	Houston	Average water depths 34-44 feet (design: 40-45 feet); depths need to be increased for larger Post-Panamax ships.	Maintenance dredging.	Maintenance dredging	$27,000,000	100% Federal	1.6M CY USACE FY 2011 budget (Exxon to Carpenters); 1.9M CY USACE FY 2011 additional (Greens to Hunting); and 1.9M CY USACE FY 2012 O&M (Carpenter to Greens).	Maintenance

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Houston-Galveston Area Ports (continued)											
125a	Houston Ship Channel to Smith Point (Tributary)	?	Waterside	Anahuac	Average Water Depths 1-2 feet (design 9 feet).	Maintenance dredging.	Maintenance dredging	$6,500,000	100% Federal	USACE FY 2011 additional.	Maintenance
125b	Double Bayou	?	Waterside	Oak Island	Average water depths 0-4 feet (design: 7 feet).	Maintenance dredging.	Maintenance dredging	$3,500,000	100% Federal	USACE FY 2011 additional.	Maintenance
126	Greens Bayou Channel	?	Waterside	Houston	Average water depths 10-11.5 feet (design: 15 feet) Parker Brothers Slip	Maintenance dredging.	Maintenance dredging	$1,500,000	100% Federal	USACE FY 2012 O&M.	Maintenance
Port of Texas City											
127	Loop 197	H-GAC TIP	Landside	Texas City	Limited capacity, lack of access control, poor geometrics for truck traffic.	Direct connectors to Port of Texas City.	Roadway capacity	$55,000,000			Maintenance
128	At-grade crossing at the intersection of Loop 197 and SH 3	?	Landside	Texas City	Congestion and safety issues.	Grade separation.	Grade separation	$20,000,000			Capacity Enhancement
129	Texas City Harbor	?	Waterside	Texas City	Average water depths 30-41 feet (design: 40 feet)	Maintenance dredging.	Maintenance dredging	$22,000,000	100% Federal	200,000 CY USACE FY 11 budget; 4.2M CY USACE FY 12 O&M and deepening to 45 feet authorized and funded with stimulus money (as of 2009).	Maintenance
Port of Orange											
130	Sabine River Channel	?	Waterside	Orange	Average water depths 5-30 feet (design: 25-30 feet).	Maintenance dredging.	Maintenance dredging	$4,500,000	100% Federal	USACE FY 2012 O&M.	Maintenance
162	Alabama Street Terminal Major Investments	Port of Orange	Landside	Orange and GIWW Terminals	Complete Rebuild after Hurricane Rita and Meeting DHS Security Needs, including Gates.	Alabama Terminal Projects $3.1 million (2006-2010); Transmodal Marine Yard $7.6 million (2009-2011); Security Enhancements $3.9 million (2006-20100 and Railroad Dockside Improvements $2.0 million (2006-2011)	Terminal Capacity	$16.6 million	0 Grants $5.7 million, Port Funding 10.9 million	Port Alabama and Security completed, Transmodal and Rail to be completed by 01/2012	Capacity Enhancement and Strategic GIWW
163	Floating Crane to serve GIWW traffic and Local shipyard	Port of Orange	Waterside	Orange and GIWW Terminals	Crane Investment final element in serving containers on barge to local plants and shippers (including Dow and International paper) who currently transport containers on IH-10. Submitted as a TIGER II Grant based on a calibrated Cost-Benefit Model.	Discount rates of 3% and 7% linked to crane cost, operating and crane maintenance cost and IH-10 congestion assumptions, together with vehicle operating cost, agency savings, safety and emission benefits yielded a C-B ratio of 2.95 at 7% and 3.81 at 3%.	Terminal Capacity	$9 million	0 Port of Orange local match $1.8 million, TIGER II request $7.2 million	TIGER II unsuccessful, seeking other funding sources	Capacity Enhancement and Strategic GIWW
Port of Port Mansfield											
131	Channel to Port Mansfield	?	Waterside	Mansfield	Average water depths 7.5-14.5' (design: 12-16').	Maintenance dredging.	Maintenance dredging.	7500000	100% Federal	500,000 CY USACE FY 2011 budget; 600,000 CY USACE FY 2011 additional; and 350,000 CY USACE FY 2012 O&M.	Maintenance

Table A.1 Master Project List (continued)

Project ID	Chokepoints/ Critical Issues	Source	Landside/ Waterside	Port Impacted	Issue	Remedy	Type	Total Cost	Percent Cost TxDOT versus Percent Other Sources	Status	Maintenance, Capacity Enhancement, or Strategic Investments
Port of Port Arthur											
132	UPRR Sabine Industrial Lead	Texas Waterborne Freight Corridor Study, Phase I Report	Landside	Port Arthur	Lack of connection between UPRR Sabine Industrial Lead and the Port.	Construct rail connection.	Rail Connection			No Infrastructure cost – This is a policy issue. Infrastructure exists, but trackage rights would be needed to provide access.	
Port of Port Isabel											
133	Port Isabel Ship Channel *Individual segments are listed in Deep Draft Channels worksheet	?	Waterside	Port Isabel	The waterway is not maintained to its Federally authorized depth (36 feet). Average water depths 27-37 feet.	Maintenance dredging.	Maintenance dredging	$2,500,000	100% Federal	Not included in USACE O&M USACE FY 11 or USACE FY 2012; quantity approximated from survey results. Fully funded.	Maintenance
Port of Victoria											
134	Channel to Victoria	?	Waterside	Victoria	Navigation aids cannot be kept in place in "Y" of intersection with Victoria Barge Canal due to narrow channel width in the turn.	Increase width of channel throughout intersection turns. At this time, the total removal of the split appears to be the best alternative. A ship simulation is required; however, the project has been temporarily suspended due to lack of funds.	New dredging	$1,000,000	100% others (Federal and Port) with TxDOT providing ROW/ Easements	In addition to maintenance dredging.	Capacity Enhancement
146	Extend KCS Rosenberg to Victoria line south to Robstown and extension to Port of Victoria	M&N	Landside	Victoria				Need more info to complete cost estimate – project does not seem valid.			Capacity Enhancement
145	Maintenance dredging of Channel to Palacios	M&N	Ship			Needs additional dredging.		?			Maintenance
144	Maintenance dredging of Channel to Victoria	M&N	Ship					?			Maintenance
135	Channel to Victoria	?	Waterside	Victoria	Average water depths 4-14 feet (design: 12 feet).	Maintenance dredging.	Maintenance dredging	$18,500,000	100% Federal	Funding uncertain.	Maintenance
Port of Bay City											
136	Colorado River Mouth and Channel	?	Waterside	Bay City	Average water depths 0-10 feet (design: 9 feet).	Maintenance dredging.	Maintenance dredging	5300000	100% Federal	USACE FY 2012 O&M.	Maintenance

B. Agencies and Entities Represented on the Stakeholder Advisory Committee

Table B.1 Agencies and Entities Represented on the Stakeholder Advisory Committee

Company/Organization	
Berger/ABAM	Port of Corpus Christi Authority
Brownsville MPO	Port of Freeport
Brownsville Rio Grande Railroad	Port of Galveston
Burlington Northern Santa Fe	Port of Harlingen
Cameron County	Port of Houston Authority
Cameron County RMA	Port of Orange
Cedar Bayou Navigation District	Port of Point Comfort/Port Lavaca
Conoco-Phillips/NITL	Port of Port Arthur Navigation District
Corpus Christi MPO	Port of Texas City
Economic Alliance Houston Port Region	Port of Victoria
Exelon (in Victoria)	Port of West Calhoun (West Side Calhoun County Navigation Dist.)
Galveston Chamber of Commerce	Port Terminal Railroad Association
Galveston Texas City Pilots	Reynolds (Corpus Christi, Bauxite Aluminum)
Golden Crescent Regional Planning Commission	Rick Maldonado and Associates
Goldston Engineering	RVSC
Greater Houston Partnership	Sabine Pilots
Gulf Coast Freight Rail District	Sabine-Neches Navigation District
Gulf Copper	San Benito Chamber of Commerce
Hapag-Lloyd (America) Inc.	Sequoia Financial Group LLC
Harlingen Chamber of Commerce	Southeast Texas Regional Planning Commission
Harlingen EDC	SPCRRTD
Harlingen San Benito MPO	Texas A&M Galveston

Table B.1 Agencies and Entities Represented on the Stakeholder Advisory Committee (continued)

Company/Organization (continued)	
Houston Galveston Area Council	Texas Chemical Council
Houston Pilots Association	Texas Economic Development Council
Invista (in Victoria)	Texas Oil and Gas Association
KCS Railway	Texas Waterway Operators Association
Kirby Corporation	TXDOT
Kirby Inland Marine Transportation	TXDOT – Beaumont District
Louis Dreyfus Commodities	TXDOT – Corpus Christi District
LydondellBassell Industries/NITL	TXDOT – Houston District
Matagorda County Economic Development Corporation	TXDOT – Pharr District
Matagorda County Nav. Dist. No. 1	TXDOT – Yoakum District
McDonough Marine Service – Channelview, TX	U.S. Coast Guard
Nueces County Rural Rail District	U.S. Corps of Engineers
Osprey Lines	U.S. Army Surface Deployment and Distribution Command, 842nd Transportation Battalion, Port of Beaumont
Parker and Company	Union Pacific
Port Isabel Chamber of Commerce	Valero Marketing and Supply Company
Port Isabel/San Benito Navigation District	Victoria Chamber of Commerce
Port Lavaca-Point Comfort Calhoun County Navigation Dist.	Victoria Economic Development Corporation
Port Mansfield/Willacy County Navigation District	Victoria MPO
Port of Bay City	Walmart
Port of Beaumont	Waterways Council, Inc.
Port of Brownsville	West Gulf Maritime Association

C. Tier I Evaluation Matrices

Table C.1 TXDOT Waterborne Freight Corridor Study
South Region Project Evaluation, Updated November 2011

				Tier 1 Screening Evaluation				
Project ID	**Potential Project/Solution**	**Port***	**Anticipated Cost**	**Maintain/ Enhance Capacity**	**Maintain/ Enhance Mobility**	**Meet Strategic Statewide Goals**	**Potential to Implement**	**Recommendation**
Maintenance Projects								
48	KCS Laredo Sub Capacity – Signal Improvements	PCC	$16.3 Million	Yes	Yes	No	N/A	Local Issue
24	Colorado Structures – Mooring Maintenance	All	$250,000/year	Yes	Yes	Yes	Yes	Advance to Packages (USACE)
135	USACE Maintenance Dredging – Channel to Victoria	PV	$18.5 Million	Yes	Yes			Advance to Packages (USACE)
1i	USACE Maintenance Dredging – Lydia Ann Channel	All	$4 Million	Yes	Yes			Advance to Packages (USACE)
1e	USACE Maintenance Dredging – Colorado River Channel	All	$8 Million	Yes	Yes			Advance to Packages (USACE)
1g	USACE Maintenance Dredging – Port O'Conner to San Antonio Bay	All	$5 Million	Yes	Yes			Advance to Packages (USACE)
1f	USACE Maintenance Dredging – Matagorda Bay to Port O'Conner	All	$5Million	Yes	Yes			Advance to Packages (USACE)
136	USACE Maintenance Dredging – Colorado River Mouth and Channel	All	$5.3 Million	Yes	Yes			Advance to Packages (USACE)
1d	USACE Maintenance Dredging – San Bernard to Colorado River	All	$23 Million	Yes	Yes			Advance to Packages (USACE)
42	USACE Maintenance Dredging – Port Lavaca	All	$16.5 Million	Yes	Yes			Advance to Packages (USACE)

Table C.1 TXDOT Waterborne Freight Corridor Study (continued)
South Region Project Evaluation, Updated November 2011

				Tier 1 Screening Evaluation				
Project ID	**Potential Project/Solution**	**Port***	**Anticipated Cost**	**Maintain/ Enhance Capacity**	**Maintain/ Enhance Mobility**	**Meet Strategic Statewide Goals**	**Potential to Implement**	**Recommendation**
Maintenance Projects (continued)								
1j	USACE Maintenance Dredging – GIWW Corpus Christi Ship Channel to Port Brownsville	All	$10.0 Million	Yes	Yes			Advance to Packages (USACE)
1h	USACE Maintenance Dredging – Aransas Bay to Corpus Christi Ship Channel	All	$6.5 Million	Yes	Yes			Advance to Packages (USACE)
1d	USACE Maintenance Dredging – GIWW San Bernard to Colorado River	All	$23 Million	Yes	Yes			Advance to Packages (USACE)
145	Maintenance Dredging of Channel to Palacios	All	$14.5 Million	Yes	Yes	Yes	Yes	Advance to Packages (USACE)
144	Maintenance Dredging of Channel to Victoria	All	$18.5 Million	Yes	Yes	No	Yes	Advance to Packages (USACE)
52	UPRR Kosmos and UPRR Brownsville Subs Rail Connection	PB	$3.24 Million	Yes	Yes	No	Yes	Already underway
53	UPRR Brownsville Sub Capacity – Sidings	PB	$6.7 Million	No	Yes		No	Conceptual
159	Rail Bridge Crossings at Angelton and Placedo		$20 Million	Yes	Yes		No	Advance to Tier 2
25	UPRR Brownsville Sub Capacity – Sidings and Signal Improvement	PB	$102.3 Million	Yes	Yes	Yes		Advance to Tier 2
34	Brownsville Port Line- Capacity	PB	$6.7 Million	Yes			No	Conceptual
1j	USACE Maintenance Dredging – GIWW Corpus Christi Ship Channel to Port Brownsville (Umbrella project)	All	$10 Million	Yes	Yes			Advance to Packages (USACE)
131	USACE Maintenance Dredging – Channel to Port Mansfield	All	$7.5 Million					Advance to Packages (USACE)

Table C.1 TXDOT Waterborne Freight Corridor Study (continued)

South Region Project Evaluation, Updated November 2011

				Tier 1 Screening Evaluation				
Project ID	**Potential Project/Solution**	**Port***	**Anticipated Cost**	**Maintain/ Enhance Capacity**	**Maintain/ Enhance Mobility**	**Meet Strategic Statewide Goals**	**Potential to Implement**	**Recommendation**
Maintenance Projects (continued)								
38	USACE Maintenance Dredging – Brownsville Ship Channel	PB	$8.3 Million					Advance to Packages (USACE)
133	USACE Maintenance Dredging – Port Isabel Ship Channel	PPI	$2.5 Million					Advance to Packages (USACE)
69	USACE Maintenance Dredging – Channel to Port Harlingen	PH	$1.8 Million					Advance to Packages (USACE)
Capacity Enhancement Projects								
45	La Quinta Terminal Road Access to U.S.-181	PCC	$25 Million	No	Yes	Yes	Yes	Advance to Tier 2
46	La Quinta Terminal Rail Capacity – Sidings	PCC	$10.4 Million	Yes	Yes	Yes	No	Conceptual
54	UPRR New Tracks Between Fulton Wye and Corpus Christi Terminal Railroad	PCC	$8.2 Million				No	Conceptual
56	SH 44 Between U.S.-77 and U.S.-59 – Upgrade	PCC	$350 Million	Yes	Yes		No	Conceptual
57	Corpus Christi Ship Channel Lift Bridge Removal	PCC	$7-8 Million	No	No	No	Yes	Local Issue
58	New bridge at the Corpus Christi Harbor Bridge	PCC	$600 Million	Yes	Yes	Yes	Yes	Advance to Tier 2
22	Port O'Connor – Encroachment Removal and Mooring relocation	All	$2 Million	Yes	Yes	Yes		Advance to Tier 2
19	"Hole in the Wall" Gap in GIWW – Channel Widening	All (PCC)	$1 Million	Yes	No	No	No	Conceptual
40a	Interstate Highway Connectivity Option 1 – Calhoun Port Authority	PL/CPA	$103.9 Million				No	Conceptual
18a	Matagorda Bay Re-Route	All	$20 Million	Yes	Yes	Yes	Yes	Advance to Tier 2

Table C.1 TXDOT Waterborne Freight Corridor Study (continued)
South Region Project Evaluation, Updated November 2011

				Tier 1 Screening Evaluation				
Project ID	**Potential Project/Solution**	**Port***	**Anticipated Cost**	**Maintain/ Enhance Capacity**	**Maintain/ Enhance Mobility**	**Meet Strategic Statewide Goals**	**Potential to Implement**	**Recommendation**
Capacity Enhancement Projects (continued)								
47	Nueces River Rail Yard	PCC	$21.5 Million	Yes	Yes	Yes	Yes	Advance to Tier 2
139	La Quinta Channel Extension	PCC	$75 Million	Yes	Yes	Yes	Yes	Already underway
49	Grade separation – NW Ingleside Dr. (Gregory)	PB/PCC	$8 Million					B/C = 0.60
50	Grade separation – Sinton St. (Sinton)	PB/PCC	$5.6 Million					B/C = 0.43
51	Grade separation – Park Avenue (Odem)	PB/PCC	$6.7 Million					B/C = 0.28
140	Ingleside Industrial Corridor	PCC	$23 Million	No	Yes	Yes	No	Advance to Tier 2
68	W. Colorado Avenue Lift Space Bridge Across Arroyo Colorado – Replacement	PH	$20 Million			No		Local Issue
37	Harlingen Train Operations – Commerce Street Connector	PH	$5.5 Million	Yes	Yes	No	Yes	Local Issue
160	SH 550 – Phase I	PB/PH	Phase I – $35 Million					Under construction
160a	SH 550 – Phase II	PB/PH	Phase II				Yes	Under design
33	Improve Port of Brownsville connectivity to the interstate freeway system. Construct new Interstate Highway connection or upgrade and reclassify an existing facility.	PB	$2.6 Million	Yes	Yes			Under construction

Table C.1 TXDOT Waterborne Freight Corridor Study (continued)

South Region Project Evaluation, Updated November 2011

				Tier 1 Screening Evaluation				
Project ID	**Potential Project/Solution**	**Port***	**Anticipated Cost**	**Maintain/ Enhance Capacity**	**Maintain/ Enhance Mobility**	**Meet Strategic Statewide Goals**	**Potential to Implement**	**Recommendation**
Strategic Investments								
55	U.S.-77 Between I-37 and U.S.-83 – Upgrade to IH standards	Central and South Texas Ports	$180 Million	Yes	Yes			Advance to Tier 2
43	Port Lavaca – UPRR Angleton Sub Rail Capacity – Sidings	PL/CPA	$6.1 Million	Yes	Yes	No	No	No
26	UPRR Brownsville and Angleton Subs Rail Capacity – Load Capabilities of bridges	All Central Texas	$35.7 Million	Yes	Yes	Yes	No	Advance to Tier 2
41	Matagorda ship channel Strategic Improvements	PL/CPA	$540 Million	Yes	Yes	No	No	Local Issue
21	Colorado River Locks Removal and Bypass Channel Deepening	All	?	Yes	Yes	Yes	No	Needs More Study
23	Lydia Ann Channel mooring capacity and maintenance	All	$3 Million	Yes	Yes	Yes	Yes	Advance to Tier 2
141	Corpus Christi Ship Channel Capacity Dredging	PCC	$450 Million	Yes	Yes	Yes	Yes	Advance to Tier 2
36	Harlingen Yard – Relocation of RVSC Switching Operations to new yard location	PH	$17 million				No	Conceptual
35	Port of Brownsville – New Intermodal Ramp	PB	$175 Million		Yes	Yes	?	Conceptual
161	Widening and Deepening of Brownsville Ship Channel	PB	?	Yes	Yes	Yes	?	Advance to Tier 2
Policies								
39	Calhoun port area – land use zoning	PL/CPA	N/A	N/A	N/A	N/A	N/A	Advance to Packages (Policy)

Table C.1 TXDOT Waterborne Freight Corridor Study (continued)

South Region Project Evaluation, Updated November 2011

				Tier 1 Screening Evaluation				
Project ID	Potential Project/Solution	Port*	Anticipated Cost	Maintain/ Enhance Capacity	Maintain/ Enhance Mobility	Meet Strategic Statewide Goals	Potential to Implement	Recommendation

*Port Key
Port of Corpus Christi = PCC
Port Lavaca/Calhoun Port Authority= PL/CPA
Port of Palacios = PP
Port of Victoria=PV
Port of West Calhoun= PWC
Port of Brownsville = PB
Port of Harlingen = PH
Port of Port Isabel = PPI
Port of Port Mansfield = PPM

Tier II	13
Red	24
Packages	20
Total	57

Table C.2 TXDOT Waterborne Freight Corridor Study

East Region Project Evaluation, Updated November 2011

				Tier 1 Screening Evaluation				
Project ID	**Potential Project/Solution**	**Port***	**Anticipated Cost**	**Maintain\ Enhance Capacity**	**Maintain\ Enhance Mobility**	**Meet Strategic Statewide Goals**	**Potential to Implement**	**Recommendation**
Maintenance Projects								
66	DOW Chemical Plant near Freeport Harbor – Rail Siding	FH	$9.5 Million	Yes	Yes	Yes	Yes	Advance to Tier 2
60	SH 36 – Upgrade	POF	$167.5 Million	Yes	Yes	Yes	No	Advance to Tier 2
64	Rail Capacity Between UPRR Angleton and Hoskins Yard – Sidings	POF	$12.6 Million	Yes	Yes	No	No	No
59	FM 523 – Upgrade	POF	$53.4 Million	Yes	Yes	Yes	Yes	Advance to Tier 2
67	FM 1495 – Upgrade	POF	$35.5 Million	Yes	Yes	No	No	No
82	SH 146 – Upgrade	POH	$595.4 Million	Yes	Yes	Yes	Yes	Advance to Tier 2
10	West Bay – Shore Protection	All	$3 Million	No	No	No		Local Issue
11	Sievers Cove Near Port Bolivar – Shore Protection	All	$1 Million	No	No	No	No	Local Issue
5	Northeast of Halls Lake – Shore Protection	All (POG)	$2 Million	No	No	No	No	Local Issue
127	Loop 197 and I-45 Interchange – Upgrade	POTC	$55 Million	Yes	Yes	No		Local Issue
81	Spencer Highway and Redbluff Road – Upgrade	POH	$35.2 Million	Yes	Yes	Yes		Advance to Tier 2
61b	SH 288 Upgrade	POF	$124 Million	Yes	Yes	Yes		Advance to Tier 2
112	Tower 76 Wye – Rail Connection	POH	$3 Million	Yes	Yes	No	No	No
86	Belt Jct. – Double Track Extension	POH	$11 Million	Yes	Yes		Yes	Advance to Tier 2
116	Settegast Yard – Sidings	POH	$7 Million	Yes	Yes	No	Yes	Advance to Tier 2
115	Pierce Yard – Upgrade	POH	$16 Million	Yes	Yes		Yes	Advance to Tier 2

Table C.2 TXDOT Waterborne Freight Corridor Study (continued)
East Region Project Evaluation, Updated November 2011

				Tier 1 Screening Evaluation				
Project ID	**Potential Project/Solution**	**Port***	**Anticipated Cost**	**Maintain\ Enhance Capacity**	**Maintain\ Enhance Mobility**	**Meet Strategic Statewide Goals**	**Potential to Implement**	**Recommendation**
Maintenance Projects (continued)								
120	PTRA Sub North Shore Jct. – Switching Lead Extension	POH	$13.2 Million	No	Yes	No	No	No
88	Additional Track Between Englewood Yard and Sheldon	POH	$50 Million	Yes	Yes		Yes	Advance to Tier 2
80	Jacintoport Blvd – Upgrade	POH	$9.6 Million	Yes	Yes	Yes		Advance to Tier 2
114	Galveston Sub Capacity – Upgrade Between Tower 30 and GH&H Jct.	POH	$5 Million	Yes	No	No		No
113	West Belt Sub Capacity – Additional Track Between Tower 81 and Double Track Jct.	POH	$20 Million	Yes	Yes	No	Yes	Advance to Tier 2
87	Rail Capacity Between Galena Jct. and Manchester Jct. – Doubletracking	POH	$42 Million	Yes	Yes	Yes		Advance to Tier 2
44	Cedar Bayou Channel – Markings	POH	$100K	Yes	Yes	No	Yes	Advance to Tier 2
122	USACE Maintenance Dredging – Houston Ship Channel	All	$15 Million					Advance to Packages (USACE)
124	USACE Maintenance Dredging – Barbours Terminal Channel	All	$27 Million					Advance to Packages (USACE)
123	USACE Maintenance Dredging – Bayport Channel	All	$12 Million					Advance to Packages (USACE)
125b	USACE Maintenance Dredging – Double Bayou	All	$3.5 Million					Advance to Packages (USACE)
126	USACE Maintenance Dredging – Greens Bayou Channel	All	$1.5 Million					Advance to Packages (USACE)

Table C.2 TXDOT Waterborne Freight Corridor Study (continued)
East Region Project Evaluation, Updated November 2011

				Tier 1 Screening Evaluation				
Project ID	**Potential Project/Solution**	**Port***	**Anticipated Cost**	**Maintain\ Enhance Capacity**	**Maintain\ Enhance Mobility**	**Meet Strategic Statewide Goals**	**Potential to Implement**	**Recommendation**
Maintenance Projects (continued)								
1k	USACE Maintenance Dredging – San Bernard River Channel Entrance	All	$1.3 Million					Advance to Packages (USACE)
1c	USACE Maintenance Dredging – GIWW Freeport Harbor to San Bernard River	All	$17 Million					Advance to Packages (USACE)
1a	USACE Maintenance Dredging – GIWW High Island to Galveston Bay	All	$6 Million					Advance to Packages (USACE)
72	USACE Maintenance Dredging – Galveston Harbor	All	$29 Million					Advance to Packages (USACE)
1b	USACE Maintenance Dredging – GIWW Galveston Bay to Chocolate Bayou	All	$7.5 Million					Advance to Packages (USACE)
125a	USACE Maintenance Dredging – Houston Ship Channel to Smith Point	All	$6.5 Million					Advance to Packages (USACE)
65	USACE Maintenance Dredging – Freeport Harbor	All	$39 Million					Advance to Packages (USACE)
129	USACE Maintenance Dredging – Texas City Harbor	All	$22 Million					Advance to Packages (USACE)
149	Pelican Island Bridge – Roadway Access	All	$117 Million	No	Yes	Yes	Yes	Already Underway
29	SH 82/SH 87 Near Pleasure Island (GIWW) – Shore Protection	GIWW	$15 Million	No	Yes	No		No
130	USACE Maintenance Dredging – Sabine River Channel	GIWW	$4.5 Million					Advance to Packages (USACE)

Table C.2 TXDOT Waterborne Freight Corridor Study (continued)
East Region Project Evaluation, Updated November 2011

				Tier 1 Screening Evaluation				
Project ID	**Potential Project/Solution**	**Port***	**Anticipated Cost**	**Maintain\ Enhance Capacity**	**Maintain\ Enhance Mobility**	**Meet Strategic Statewide Goals**	**Potential to Implement**	**Recommendation**
Maintenance Projects (continued)								
28	USACE Maintenance Dredging of the Sabine-Neches Canal	PB/PPA	$25.5 Million					Advance to Packages (USACE)
32	USACE Maintenance Dredging of Sabine Pass	GIWW	$50.5 Million					Advance to Packages (USACE)
Capacity Enhancement Projects								
13	UPRR Old Brazos Swing Bridge – Replacement	FH	$13 Million	Yes	Yes	Yes	Yes	Already Underway
6	Freeport Wiggles – Widening and Straightening	POF	$5 Million	No	Yes	Yes	Yes	Advance to Tier 2
7	Brazos River Floodgates – Removal/Reconfiguration	FH	$7 Million	Yes	Yes	Yes	No	Advance to Tier 2
17	Brazos River Intersection – Mooring Capacity	FH	$3 Million	Yes	No	Yes	Yes	Advance to Tier 2
2	Rollover Bay – Channel Widening	POG/ POTC/POH	$4 Million	Yes	Yes	Yes	Yes	Advance to Tier 2
3	Port Bolivar – Channel Widening	All	$2 Million	Yes	Yes	Yes	Yes	Advance to Tier 2
12	Galveston Railroad Bridge – Reconstruction/Widening	All	$80 Million	Yes	Yes		Yes	Already Underway
16	Greens Lake – Mooring Capacity	POG/POH/ POTC	$2 Million	Yes	No	No	Yes	Local Issue
14	Mile 363 Bend – Mooring Capacity	All	$2 Million	Yes	No	No	No	No
8	Pelican Island Mooring Capacity and Basin Widening	All	$4 Million	Yes	Yes	Yes	Yes	Advance to Tier 2
20	Caney Creek Wiggles – Straightening of Bends	All	$5 Million	Yes	Yes	Yes	No	No

Table C.2 TXDOT Waterborne Freight Corridor Study (continued)
East Region Project Evaluation, Updated November 2011

				Tier 1 Screening Evaluation				
Project ID	**Potential Project/Solution**	**Port***	**Anticipated Cost**	**Maintain\ Enhance Capacity**	**Maintain\ Enhance Mobility**	**Meet Strategic Statewide Goals**	**Potential to Implement**	**Recommendation**
Capacity Enhancement Projects (continued)								
85	Rail Bridge 5A – PTRA Sub – Doubletrack	POH		Yes	Yes		Yes	Advance to Tier 2
89	Rail Bridge 16 – East Belt Sub – Doubletrack	POH	$10 Million	Yes	Yes		Yes	Advance to Tier 2
91	West Belt Sub Improvement – grade separations and/or crossing closure	POH	$53.4 Million	Yes	Yes		Yes	Advance to Tier 2
83	SH 225 – Connectivity to Other Roads	POH	$30 Million	Yes	Yes	Yes		Advance to Tier 2
138	Velasco Terminal Construction	POF	$380 Million	Yes			Yes	Advance to Tier 2
137	Freeport Channel Widening/Deepening	POF	$330 Million	Yes	Yes		Yes	Advance to Tier 2
153	Cedar Bayou Navigation Channel	POH	$16 Million	Yes			No	No
158	Freeport Harbor Deepening	POF	$300 Million	Yes	Yes	No	No	Local Issue
163	Tower 55 Grade Separation at Fort Worth	POH	$87 Million	Yes			Yes	Already Underway
155	Galveston Channel Deepening	POH	$42 Million	Yes	Yes		No	Already Underway
151	Harborside Drive Corridor on Pelican Island	POH	?	Yes				Conceptual
83	Roadway connection (SH 225) to I-610 and Beltway 8	POH	$30 Million	Yes	Yes		No	No
119	Bell main – Track and signal improvements, upgrades to restore line to service	POH	$6.6 Million	Yes		No	Yes	No
30	Martin Luther King Bridge (near SNWW) Air Draft Improvements	PB/PPA	$900 Million	Yes	Yes	No	No	Local Issue
27	KCS Bridge Across Port of Beaumont Ship Channel (Neches River) – Upgrade	PB	$16 Million	Yes	Yes	Yes	Yes	Advance to Tier 2

Table C.2 TXDOT Waterborne Freight Corridor Study (continued)
East Region Project Evaluation, Updated November 2011

				Tier 1 Screening Evaluation				
Project ID	**Potential Project/Solution**	**Port***	**Anticipated Cost**	**Maintain\ Enhance Capacity**	**Maintain\ Enhance Mobility**	**Meet Strategic Statewide Goals**	**Potential to Implement**	**Recommendation**
Capacity Enhancement Projects (continued)								
4a	High Island Wiggles – Straightening of the Bends	All	$5 Million	Yes	Yes		Yes	Advance to Tier 2
73	Grade separation – FM 1960 east of SH 249	H-GAC area ports	$11.7 Million	Yes				B/C = 0.12
78	Grade separation – Park Terrace near Galveston Road	H-GAC area ports	$12 Million					B/C=0.15
97	Grade separation – Shepherd/Durham – Terminal	POH	$30.7 Million					B/C = 5.02
98	Grade separation – Houston – Terminal	POH	$13.8 Million					B/C = 3.14
99	Grade separation – Bellaire – Terminal	POH	$17 Million					B/C = 1.59
100	Grade separation – San Felipe – Terminal	POH	$32.9 Million					B/C = 3.24
101	Grade separation – Richmond – Terminal	POH	$29.7 Million					B/C =2.16
102	Grade separation – TC Jester – Terminal	POH	$8.9 Million					B/C =0.98
103	Grade separation – Westheimer – Terminal	POH	$66.8 Million					B/C =2.33
104	Grade separation – Market – Strang	POH	$4.9 Million					B/C =0.29
105	Grade separation – Lyons – Strang	POH	$5.3 Million					B/C =0.09
106	Grade separation – Wallisville – Strang	POH	$9 Million					B/C =0.14
107	Grade separation – Federal – PTRA	POH	$7.4 Million					B/C =0.90
108	Grade separation – Wallisville – East Belt	POH	$8.7 Million					B/C =0.94
109	Grade separation – Hirsch – East Belt	POH	$6.5 Million					B/C =0.91

Table C.2 TXDOT Waterborne Freight Corridor Study (continued)
East Region Project Evaluation, Updated November 2011

				Tier 1 Screening Evaluation				
Project ID	**Potential Project/Solution**	**Port***	**Anticipated Cost**	**Maintain\ Enhance Capacity**	**Maintain\ Enhance Mobility**	**Meet Strategic Statewide Goals**	**Potential to Implement**	**Recommendation**
Capacity Enhancement Projects (continued)								
111	Grade separation – Canal – East Belt	POH	$11.7 Million					B/C =1.05
128	Grade separation – Loop 197 and SH 3	POTC	$20 Million			Yes		B/C= 0.13
163	Port Road	POH	$13 Million	Yes	Yes	No	No	Conceptual
166	Clinton Drive	POH	$8.7 Million	Yes	Yes	No	Yes	Underway
168	Southern Access Road	POH	$13.5 Million	Yes	Yes	No	No	Conceptual
Strategic Investments								
63	Rail Access to Freeport Harbor from Rosenberg Intermodal Center	POF	$33 Million	Yes	Yes	No	No	Conceptual
4b	High Island Bridge – Replacement	All	$20 Million	Yes	Yes		Yes	Local Issue
15	Port Bolivar – Mooring Capacity	All	$2 Million	Yes	No	No	Yes	Local Issue
9	Texas City Wye – Channel Intersection Widening	All	$3.6 Million	No	Yes	Yes	No	Not a Priority
117	East Houston Rail Bypass – New line Between Dayton and Cleveland	POH	$283.4 Million	Yes	Yes		Yes	Advance to Tier 2
164	SH 146 – Connector Eastbound from Port Road to SH 146	POH	$3 Million	Yes	Yes	No	Yes	Under Construction
165	Spencer Highway	POH	$12.5 Million	Yes	Yes	No	No	Conceptual
167	SH 146 – New Connector	POH	$13.4 Million	Yes	Yes	No	No	Conceptual
169	Southern Access Road	POH	$5.7 Million	Yes	No		No	Conceptual

Table C.2 TXDOT Waterborne Freight Corridor Study (continued)
East Region Project Evaluation, Updated November 2011

				Tier 1 Screening Evaluation				
Project ID	**Potential Project/Solution**	**Port***	**Anticipated Cost**	**Maintain\ Enhance Capacity**	**Maintain\ Enhance Mobility**	**Meet Strategic Statewide Goals**	**Potential to Implement**	**Recommendation**
Strategic Investments (continued)								
170	Jacintoport Road	POH	$40 Million	No	Yes		No	Conceptual
171	Penn City Road	POH	$23.3 Million	No	Yes	No	No	Conceptual
172	610 Bridge	POH	$20 Million	Yes	No		No	Conceptual
172	Broadway Street	POH	$2.6 Million	Yes	No		No	Conceptual
174	Old SH 146	POH	$3.3 Million	No	Yes	No	No	Conceptual
118	Fort Bend Rail Bypass – New line Between Rosenberg and Arcola	POH	$932.6 Million	Yes	Yes	Yes	No	No
Policies								
150	Extend heavy haul permits for FM 1405 to Cedar Bayou	All		N/A	N/A	N/A	N/A	Advance to Packages (Policies)
92	Authorization of permits for overweight trucks on roadways near the port of Houston. Increased trucking fees would be required to compensate for the increased maintenance and shortened service life of the roadways	POH		N/A	N/A	N/A	N/A	Advance to Packages (Policies)

Table C.2 TXDOT Waterborne Freight Corridor Study (continued)
East Region Project Evaluation, Updated November 2011

				Tier 1 Screening Evaluation				
Project ID	Potential Project/Solution	Port*	Anticipated Cost	Maintain\ Enhance Capacity	Maintain\ Enhance Mobility	Meet Strategic Statewide Goals	Potential to Implement	Recommendation
	*Port Key						Tier II	36
	Freeport Harbor = FH						Red	51
	Port of Freeport = POF						Packages	18
	Port of Galveston = POG							
	Port of Houston = POH						Total	105
	Port of Texas City = POTC							
	Port of Beaumont = PB							
	Port of Port Arthur = PPA							
	Port of Orange = PO							

D. Selection of Macroeconomic Selection Tool

The best tool available to make this economic assessment is an input-output based macroeconomic assessment tool. Input-output models provide a set of economic multipliers to trace the impacts of individual actions (such as an improvement project) to the economic activity of a region. Several different vendors specialize in creating macroeconomic models to assess transportation project impacts. Though each of the options is essentially an input-output model, they all differ in terms of their complexity, appearance, or the type of inputs required.

The following projects were assessed for their potential use on this project:

- **IMPLAN[29] –** a static economic model that estimates the direct and indirect effects of dollars invested in industry sectors at defined geographical resolution;
- U.S. Maritime Administration **(MARAD) Port Kit –** which provides both an user interface to prepare port side development related transportation system changes as inputs for IMPLAN and the outputs of the economic model;
- **Transportation Economic Development Impact System** (**TREDIS**) **–** this tool is based on IMPLAN. It provides both an user interface to prepare multimodal transportation impact inputs for IMPLAN and the outputs of the economic model; and
- **REMI TranSight –** which provides total economic effects of changes to transportation system in a dynamic manner.

Each of these tools has a proven ability to measure the economic benefits of planned transportation improvement projects. However, there are certain differences between them that served as decision criteria in our tool selection process. Most notably, the models differ substantially in terms of their complexity, their cost, and the amount of analysis that takes place within a "black box" (i.e., the user can input data, and see the results of the analysis, but does not know the extent of the multipliers or how they interacted). For the purposes of this project, TxDOT determined that a simpler, less expensive model was sufficient. Therefore, IMPLAN and

[29]IMPLAN uses a wide array of data sources including, U.S. Bureau of Economic Analysis Benchmark I/O Accounts., U.S. Bureau of Labor Statistics Covered Employment and Wages (ES202), U.S. Census Bureau County Business Patterns, and U.S. Census Bureau Economic Censuses and Surveys.

MARAD PortKit were the preferred option. The criteria used to evaluate economic assessment models are included as Table D.1.

Table D.1 Comparison of Different Macroeconomic Models and Tools

	Design Criteria					Decision
Tool	Evaluates Economic Benefits	Front-End Module	Economic Feedback Loops	Cost[a]	"Black Box"	
REMI	Y	Y	Y	$50K+	Y	Not necessary/ "Black Box" feature is undesirable
TREDIS	Y	Y	N	$6-$30K	Y	
IMPLAN	Y	N	N	$4K	N	Translates improvements into economic impacts without unnecessary complexity
MARAD PortKit	Y – (marine projects only)	Y	N	$0	N	

Source: Cambridge Systematics, Inc., 2011.

[a] This value only represents the tool procurement costs. It does not include the additional costs required for data processing, input preparation, and scenario testing.

Though this project relied on the two simplest economic assessment tools (IMPLAN and PortKit), it recognizes that a more robust economic assessment may be desirable in the future. Therefore, it is possible that TxDOT will chose to utilize a different model in the future, in particular when the five-step framework is refined and adopted into the project planning process.

What is IMPLAN?

Input-output model such as IMPLAN describes the commodity flows from producers to intermediate and final consumers. The total industry purchases of commodities, services, employment compensation, value added, and imports are equal to the value of the commodities produced. Industries producing goods and services for final use and purchases for final use (final demand) drive the model. Industries producing goods and services for final demand purchase goods and services from other producers. These other producers, in turn, purchase goods and services. This buying of goods and services continues until leakages from the region stop the cycle. The resulting sets of multipliers describe the change of output for every regional industry caused by a U.S. $1.00 change in final demand for any given industry.

E. Tier II Data Matrices

Table E.1 Tier II Data Matrices

Region	Project ID	Potential Project/Solution	Port	Anticipated Cost	Stage II Data				
					Increased/Maintained Volume (TEUs, Tonnage)	Type of Cargo (Bulk, Breakbulk, Etc.)	Project Lifespan	Modal Split (Landside)	Distance Cargo Travels in Texas
Maintenance									
South	25	UPRR Brownsville Sub Capacity – Sidings & Signal Improvement	PB	$102.3 Million	Would increase train volume from 169 to 199 trains. Current tonnage on Brownsville sub is 5-10 million.	Petrochemical, Dry Bulk	20 years	Rail	101.0
East	44	Cedar Bayou Channel – Markings	POH	$100K	0% (This project will result in safety benefits but will not result in a throughput increase)	Dry Bulk, Breakbulk, Petrochemical	10 years	Waterway	
East	59	FM 523 – Upgrade	POF	$53.4 Million	2009 Volume on FM 523 was 8400 vehicles near the intersection with 332. 5600 north of Oyster Creek.	Dry Bulk, Breakbulk, Petrochemical	20 years	Truck	5
East	60	SH 36 – Upgrade	POF	$167.5 Million	Traffic volume on SH 36 between U.S. 59 and FM 2218 is expected to increase from 14,200 in 2006 to 20,900 by 2027. 2009 AADT was 6800 within the city and 5400 outside.	Containerized, Bulk, Breakbulk, Project Cargo	20 years	Truck	3
East	66	DOW Chemical Plant near Freeport Harbor – Rail Siding	FH	$9.5 Million	Would add rail capacity to support Dow's largest integrated manufacturing site in the U.S. and result a higher percentage of shipments utilizing rail. Dow recently relocated a 500 million pound PDMI plant to Freeport from La Porte. Rail traffic on the sub is between 5-10 million tons.	Petrochemical	50 years	Rail	61.0

Table E.1 Tier II Data Matrices (continued)

Region	Project ID	Potential Project/Solution	Port	Anticipated Cost	Stage II Data: Increased/Maintained Volume (TEUs, Tonnage)	Stage II Data: Type of Cargo (Bulk, Breakbulk, Etc.)	Stage II Data: Project Lifespan	Stage II Data: Modal Split (Landside)	Stage II Data: Distance Cargo Travels in Texas
Maintenance (continued)									
East	80	Jacintoport Blvd – Upgrade	POH	$9.6 Million	Supports deliveries to the Jacintoport terminal that specializes in agricultural shipments.	Dry Bulk, Petrochemical	20 years	Truck	N/A
East	81	Spencer Hwy and Redbluff Rd – Upgrade	POH	$35.2 Million	This intersection is useful as a reliever route for the main corridors connecting both Barbours Cut and Bayport.	Containerized	20 years	Truck	N/A
East	82	SH 146 – Upgrade	POH	$595.4 Million	2009 ADTT was 7534 near Barbours Cut and 2701 near Bayport. TxDOT estimated that volume on the most congested portions of SH 146 to increase for 50,000 vehicles per days to 74,000 by 2022. AADT at the Bridge was 39000, while next to the Bayport terminal it was 29000.	Containerized	20 years	Truck	5
East	86	Belt Jct. – Double Track Extension	POH	$11 Million	Palestine Sub had 23 trains per day in 2005. HNTB estimates 20-30 million tons per year for most of the route with over 60 million tons near downtown. Would improve overall network speed	Dry Bulk, Breakbulk, Petrochemical	50 years	Rail	?
East	87	Rail Capacity Between Galena Jct. & Manchester Jct. – Doubletracking	POH	$42 Million	Would remove a bottleneck and increase total network speed for the PTRA line which handles approximately 50,000 cars per month	Petrochemical, Dry Bulk, Containerized	50 years	Rail	N/A
East	88	Additional Track Between Englewood Yard & Sheldon	POH	$50 Million	Lafayette Subdivision has 20 daily trains and Supports the Englewood Yard which currently performs 215,000 annual lifts. Amtrak also uses the Lafayette Sub	Containerized, Dry Bulk	50 years	Rail	76.7

Table E.1 Tier II Data Matrices (continued)

Region	Project ID	Potential Project/Solution	Port	Anticipated Cost	Stage II Data: Increased/Maintained Volume (TEUs, Tonnage)	Stage II Data: Type of Cargo (Bulk, Breakbulk, Etc.)	Stage II Data: Project Lifespan	Stage II Data: Modal Split (Landside)	Stage II Data: Distance Cargo Travels in Texas
Maintenance (continued)									
East	113	West Belt Sub Capacity – Additional Track Between Tower 81 & Double Track Jct.	POH	$20 Million	The railroad is utilized in a bi-directional manner, with trains dispatched to operate in both directions, averaging between 50 and 60 trains daily, depending upon location.	Dry Bulk	50 years	Rail	
East	115	Pierce Yard – Upgrade	POH	$16 Million	There are 8 trains a day through Pierce Junction. Would assist in the movement of 10 to 15 trains daily through Settegast Yard.	Dry Bulk, Containerized	50 years	Rail	76.7
East	116	Settegast Yard – Sidings	POH	$7 Million	Aims to improve mobility for 10-15 trains per day.	Containerized & Petrochemical	50 years	Rail	76.7
South	159	Rail Bridge Crossings at Angelton and Placedo		$20 Million	Would increase maximum shipment weight to 286K. Rail tonnage on Angleton Sub is 20-30 million.	Petrochemical, Dry Bulk	50 years	Rail	88.9
East	61b	SH 288 Upgrade	POF	$124 Million	2009 AADT south of 610 is 136000 while ADTT is 9030. Volume is 105,000 south of Beltway 8. A major source of additional traffic on SH 288 will be truck traffic from the Port of Port Freeport.	Dry Bulk, Petrochemical, Containerized	20 years	Truck	5
Capacity Enhancement									
East	2	Rollover Bay – Channel Widening	POG/ POTC/ POH	$4 Million	10% (Volumes could grow to 1,940,127 tons if project is completed)	Containers, Dry Bulk, Petrochemicals	50 years	Waterway	76.7
East	3	Port Bolivar – Channel Widening	All	$2 Million	10% (Volumes could grow to 1,940,127 tons if project is completed)	Containers, Dry Bulk, Petrochemicals	50 years	Waterway	76.7
East	4a	High Island Wiggles – Straightening of the Bends	All	$5 Million	10% (Volumes could grow to 1,940,127 tons if project is completed)	Containers, Dry Bulk, Petrochemicals	50 years	Waterway	76.7

Table E.1 Tier II Data Matrices (continued)

Region	Project ID	Potential Project/Solution	Port	Anticipated Cost	Stage II Data: Increased/Maintained Volume (TEUs, Tonnage)	Stage II Data: Type of Cargo (Bulk, Breakbulk, Etc.)	Stage II Data: Project Lifespan	Stage II Data: Modal Split (Landside)	Stage II Data: Distance Cargo Travels in Texas
Capacity Enhancement (continued)									
East	6	Freeport Wiggles – Widening & Straightening	POF	$5 Million	10% (Volumes could grow to 2,084,226 tons if project is completed)	Dry Bulk, Petrochemical, Containerized	50 years	Waterway	76.7
East	7	Brazos River Floodgates – Removal/ Reconfiguration	FH	$7 Million	20% (Volumes could grow to 4,186,453 tons if project is completed)	Dry Bulk, Petrochemical, Containerized	50 years	Waterway	76.7
East	8	Pelican Island Mooring Capacity & Basin Widening	All	$4 Million	3% (Volumes could grow to 625,268 tons if project is completed)	Containers, Dry Bulk, Petrochemicals	50 years	Waterway/Ship	76.7
East	17	Brazos River Intersection – Mooring Capacity	FH	$3 Million	3% (Volumes could grow to 625,268 tons if project is completed)	Dry Bulk, Petrochemical, Containerized	50 years	Waterway	76.7
South	18a	Matagorda Bay Re-Route	All	$20 Million			50 years	Ship and Waterway	N/A
South	22	Port O'Connor – Encroachment Removal & Mooring relocation	All	$2 Million	1% increased capacity		50 years	Waterway	101.0
East	27	KCS Bridge Across Port of Beaumont Ship Channel (Neches River)- Upgrade	PB	$16 Million	This bridge opens about 100 times per year for river traffic, closing the railroad for at least 20 minutes each time it opens. This segment is the only stretch of single track on the Sunset Route between New Orleans and Houston. In 2003 traffic volume on the Sunset Route was about 40 to 50 trains per day	Dry Bulk, Breakbulk, Petrochemical, Containerized	50 years	Rail and Waterway	58.0
South	47	Viola Channel Interchange Yard – New Capacity	PCC	$25 Million	Rail traffic through the port of Corpus Christi amounts to approximately 1.5 million tons per year. The Corpus Christi Terminal Railroad uses RailLink to operate its railroad which connects to UP, KCS and BNSF.	Petrochemical, Dry Bulk	50 years	Rail	101.0

Table E.1 Tier II Data Matrices (continued)

Region	Project ID	Potential Project/Solution	Port	Anticipated Cost	Stage II Data: Increased/Maintained Volume (TEUs, Tonnage)	Stage II Data: Type of Cargo (Bulk, Breakbulk, Etc.)	Stage II Data: Project Lifespan	Stage II Data: Modal Split (Landside)	Stage II Data: Distance Cargo Travels in Texas
Capacity Enhancement (continued)									
South	58	New bridge at the Corpus Christi Harbor Bridge	PCC	$600 Million	Would raise the bridge by 67' ft to allow larger ships to pass under the Harbor bridge and thereby access all of the terminals on the channel. Would also aid truck flows.	Petrochemical, Dry Bulk	50 years	Ship/Truck	101.0
East	83	SH 225 – Connectivity to Other Roads	POH	$30 Million	The principal route for containerized traffic to Barbours Cut had AADT of 133,000 east of 610 (ADTT of 11061), 102,000 east of Beltway 8.	Containerized, Petrochemical, Dry Bulk, Break Bulk	20 years	Truck	N/A
East	85	Rail Bridge 5A – PTRA Sub – Doubletrack	POH		To be performed together with Galena Junction. Will facilitate traffic flowing to Barbours Cut Terminal	Petrochemical, Dry Bulk, Containerized	50 years	Rail and Truck	76.7
East	89	Rail Bridge 16 – East Belt Sub – Doubletrack	POH	$10 Million	Would improve train speed for the rail network on the East Belt Subdivision as well as traffic to Barbours Cut terminal	Dry Bulk, Petrochemical	50 years	Rail and Truck	76.7
East	91	West Belt Sub Improvement – grade separations and/or crossing closure	POH	$53.4 Million	West Belt Sub handles 50 and 60 trains daily, depending upon location. Would improve safety and train speed by removing 6000 vehicle crossings at Leeland street, 4,600 at Lyons Ave, 8000 vehicles at Quitman street	Dry Bulk, Petrochemical	50 years	Rail and Truck	N/A
East	97	Grade separation – Shepherd/ Durham – Terminal	POH	$30.7 Million	Reduce vehicle interaction and improve train speed on the terminal subdivision, which accommodates 50-60 trains per day. Improve speed for trains accessing the Englewood yard, which produces 215,000 lifts per year.	Containers, Dry Bulk, Petrochemicals	40 years	Rail and Truck	N/A
East	98	Grade separation – Houston – Terminal	POH	$13.8 Million		Containers, Dry Bulk, Petrochemicals	40 years	Rail and Truck	N/A

Table E.1 Tier II Data Matrices (continued)

Region	Project ID	Potential Project/Solution	Port	Anticipated Cost	Stage II Data: Increased/Maintained Volume (TEUs, Tonnage)	Stage II Data: Type of Cargo (Bulk, Breakbulk, Etc.)	Stage II Data: Project Lifespan	Stage II Data: Modal Split (Landside)	Stage II Data: Distance Cargo Travels in Texas
Capacity Enhancement (continued)									
East	99	Grade separation – Bellaire – Terminal	POH	$17 Million		Containers, Dry Bulk, Petrochemicals	40 years	Rail and Truck	N/A
East	100	Grade separation – San Felipe – Terminal	POH	$32.9 Million		Containers, Dry Bulk, Petrochemicals	40 years	Rail and Truck	N/A
East	101	Grade separation – Richmond – Terminal	POH	$29.7 Million		Containers, Dry Bulk, Petrochemicals	40 years	Rail and Truck	N/A
East	103	Grade separation – Westheimer – Terminal	POH	$66.8 Million		Containers, Dry Bulk, Petrochemicals	40 years	Rail and Truck	N/A
East	111	Grade separation – Canal – East Belt	POH	$11.7 Million	The railroad is utilized in a bi-directional manner, with trains dispatched to operate in both directions, averaging between 40 and 60 trains daily, depending upon location. East Belt at Hirsh has 42 trains per day. Harrisburg 33.	Petrochemical, Dry Bulk, Containerized	40 years	Rail and Truck	N/A
East	137	Freeport Channel Widening/Deepening	POF	$330 Million	This project would allow an additional 878,138 tons to move through the Port of Freeport. (representing a 5% growth constraint if not completed)	Dry Bulk, Petrochemical, Containerized	50 years	Ship	76.7
East	138	Velasco Terminal Construction	POF	$380 Million	This project would allow an additional 7,903,246 tons to move through the Port of Freeport. (representing a 45% growth constraint if not completed)	Dry Bulk, Petrochemical, Containerized	50 years	Ship	76.7

Table E.1 Tier II Data Matrices (continued)

Region	Project ID	Potential Project/Solution	Port	Anticipated Cost	Stage II Data: Increased/Maintained Volume (TEUs, Tonnage)	Stage II Data: Type of Cargo (Bulk, Breakbulk, Etc.)	Stage II Data: Project Lifespan	Stage II Data: Modal Split (Landside)	Stage II Data: Distance Cargo Travels in Texas
Capacity Enhancement (continued)									
South	140	Ingleside Industrial Corridor	PCC	$23 Million	AADT on SH 361 at 1069 is 14,700. 1069 is 16,900. Corridor would provide a reliever route to connect to State Highway 361 at a point west of the Union Pacific Railroad grade crossing. It would travel south through the old Humble refinery property and connect with FM 1069 at a point south of Hultgreen Avenue	Containers, Liquid Bulk, Dry Bulk	50 years	Truck	5
Strategic Investment									
South	23	Lydia Ann Channel mooring capacity & maintenance	All	$3 Million			10 years	Waterway	101.0
South	26	UPRR Brownsville & Angleton Subs Rail Capacity – Load Capabilities of bridges	All Central TX	$35.7 Million	Tonnage on Brownsville sub is 5-10 million from the border until Corpus Christi. 10-20 million from Corpus until Port Lavaca. Tonnage on the Angleton sub is between 20-30 million.	Petrochemicals, Dry Bulk, Containers	50 years	Truck and Rail	101.0
South	55	U.S.-77 Between I-37 and U.S.-83 – Upgrade to IH standards	Central & South TX Ports	$180 Million	Daily Truck Traffic is 3439 on U.S. 77 at Odem and 4139 at SH 239.	Containers, Liquid Bulk, Dry Bulk, Project Cargo	20 years	Truck	120
East	117	East Houston Rail Bypass – New line Between Dayton & Cleveland	POH	$283.4 Million	Would reduce train congestion by 4-9% on the East Belt Sub and between 12-15% on the West Belt Sub.	Containers, Dry Bulk, Petrochemicals	50 years	Rail	76.7
South	141	Corpus Christi Ship Channel Capacity Dredging	PCC	$450 Million			10 years	Ship	101.0
South	161	Widening and Deepening of Brownsville Ship Channel	PB	$250 Million			10 years	Ship	101.0

F. Strategy Packages

Table F.1 Strategy Packages

Project ID	Potential Project/ Solution	Affiliated Port	Anticipated Cost (Millions)	Strategic Package #1a (Ports and WW)	Strategic Package #1b (GIWW)	Strategic Package #2 (Maximize Capacity)	Strategic Package #3 (Redundancy)	Strategic Package #4 (Key Industries)	Strategic Package #5 (Strategic Growth)	Number of Yes by Project
Maintenance Projects										
66	DOW Chemical Plant near Freeport Harbor – Rail Siding	Port of Freeport	$9.5	No	No	No	Yes	Yes	No	2
60	SH 36 – Upgrade	Port of Freeport	$167.5	No	No	Yes	Yes	No	No	2
59	FM 523 – Upgrade	Port of Freeport	$53.4	No	No	Yes	Yes	No	No	2
82	SH 146 – Upgrade	Port of Houston	$595.4	No	No	Yes	No	Yes	Yes	2
81	Spencer Hwy and Redbluff Rd – Upgrade	Port of Houston	$35.2	No	No	Yes	Yes	Yes	No	3
61b	SH 288 Upgrade	Port of Freeport	$124.0	No	No	Yes	Yes	Yes	No	3
86	Belt Jct. – Double Track Extension	Port of Houston	$11.0	No	No	Yes	No	Yes	Yes	2
116	Settegast Yard – Sidings	Port of Houston	$7.0	No	No	Yes	No	Yes	Yes	2
115	Pierce Yard – Upgrade	Port of Houston	$16.0	No	No	Yes	No	Yes	Yes	2
88	Additional Track Between Englewood Yard and Sheldon	Port of Houston	$50.0	No	No	Yes	No	Yes	Yes	2
80	Jacintoport Blvd – Upgrade	Port of Houston	$9.6	No	No	Yes	No	Yes	No	2

Table F.1 Strategy Packages (continued)

Project ID	Potential Project/ Solution	Affiliated Port	Anticipated Cost (Millions)	Strategic Package #1a (Ports and WW)	Strategic Package #1b (GIWW)	Strategic Package #2 (Maximize Capacity)	Strategic Package #3 (Redundancy)	Strategic Package #4 (Key Industries)	Strategic Package #5 (Strategic Growth)	Number of Yes by Project
Maintenance Projects (continued)										
113	West Belt Sub Capacity – Additional Track Between Tower 81 and Double Track Jct.	Port of Houston	$20.0	No	No	Yes	No	Yes	No	2
87	Rail Capacity Between Galena Jct. and Manchester Jct. – Doubletracking	Port of Houston	$42.0	No	No	Yes	No	Yes	No	2
44	Cedar Bayou Channel – Markings	Port of Houston	$0.1	Yes	No	No	No	No	No	1
159	Rail Bridge Crossings at Angelton and Placedo	Port of Freeport	$20.0	No	No	Yes	Yes	Yes	No	3
25	UPRR Brownsville Sub Capacity – Sidings and Signal Improvement	Port of Brownsville	$102.3	No	No	Yes	Yes	Yes	No	3
1j	USACE Maintenance Dredging- GIWW Corpus Christi Ship Channel to Port Brownsville (Umbrella project)	All	$10.0	No	Yes	Yes	Yes	Yes	No	4
131	USACE Maintenance Dredging – Channel to Port Mansfield	All	$7.5	No	Yes	No	No	No	No	1
38	USACE Maintenance Dredging – Brownsville Ship Channel	Port of Brownsville	$8.3	No	Yes	Yes	Yes	Yes	Yes	4

Table F.1 Strategy Packages (continued)

Project ID	Potential Project/ Solution	Affiliated Port	Anticipated Cost (Millions)	Strategic Package #1a (Ports and WW)	Strategic Package #1b (GIWW)	Strategic Package #2 (Maximize Capacity)	Strategic Package #3 (Redundancy)	Strategic Package #4 (Key Industries)	Strategic Package #5 (Strategic Growth)	Number of Yes by Project
Maintenance Projects (continued)										
133	USACE Maintenance Dredging – Port Isabel Ship Channel	Port of Port Isabel	$2.5	No	Yes	No	No	No	No	1
69	USACE Maintenance Dredging – Channel to Port Harlingen	Port of Harlingen	$1.8	No	Yes	Yes	Yes	Yes	No	4
24	Colorado Structures – Mooring Maintenance	All	$0.3	No	Yes	Yes	Yes	Yes	No	4
135	USACE Maintenance Dredging – Channel to Victoria	Port of Victoria	$18.5	No	Yes	Yes	Yes	Yes	Yes	4
1i	USACE Maintenance Dredging -Lydia Ann Channel	All	$4.0	No	Yes	Yes	Yes	Yes	No	4
1e	USACE Maintenance Dredging -Colorado River Channel	All	$8.0	No	Yes	Yes	Yes	Yes	No	4
1g	USACE Maintenance Dredging -Port O'Conner to San Antonio Bay	All	$5.0	No	Yes	Yes	Yes	Yes	No	4
1f	USACE Maintenance Dredging -Matagorda Bay to Port O'Conner	All	$5.0	No	Yes	Yes	Yes	Yes	No	4
136	USACE Maintenance Dredging- Colorado River Mouth and Channel	All	$5.3	No	Yes	Yes	Yes	Yes	No	4
1d	USACE Maintenance Dredging -San Bernard to Colorado River	All	$23.0	No	Yes	Yes	Yes	Yes	No	4

Table F.1 Strategy Packages (continued)

Project ID	Potential Project/ Solution	Affiliated Port	Anticipated Cost (Millions)	Strategic Package #1a (Ports and WW)	Strategic Package #1b (GIWW)	Strategic Package #2 (Maximize Capacity)	Strategic Package #3 (Redundancy)	Strategic Package #4 (Key Industries)	Strategic Package #5 (Strategic Growth)	Number of Yes by Project
Maintenance Projects (continued)										
42	USACE Maintenance Dredging – Port Lavaca	All	$16.5	Yes	No	Yes	Yes	Yes	No	4
1j	USACE Maintenance Dredging – GIWW Corpus Christi Ship Channel to Port Brownsville	All	$10.0	No	Yes	Yes	Yes	Yes	No	4
1h	USACE Maintenance Dredging – Aransas Bay to Corpus Christi Ship Channel	All	$6.5	No	Yes	Yes	Yes	Yes	No	4
1d	USACE Maintenance Dredging -GIWW San Bernard to Colorado River	All	$23.0	No	Yes	Yes	Yes	Yes	No	4
145	Maintenance Dredging of Channel to Palacios	All	$14.5	No	Yes	No	No	No	No	1
144	Maintenance Dredging of Channel to Victoria	All	$18.5	No	Yes	Yes	Yes	Yes	No	4
122	USACE Maintenance Dredging – Houston Ship Channel	All	$15.0	No	Yes	Yes	No	Yes	No	3
124	USACE Maintenance Dredging – Barbours Terminal Channel	All	$27.0	No	Yes	Yes	No	Yes	No	3
123	USACE Maintenance Dredging – Bayport Channel	All	$12.0	No	Yes	Yes	No	Yes	No	3

Table F.1 Strategy Packages (continued)

Project ID	Potential Project/ Solution	Affiliated Port	Anticipated Cost (Millions)	Strategic Package #1a (Ports and WW)	Strategic Package #1b (GIWW)	Strategic Package #2 (Maximize Capacity)	Strategic Package #3 (Redundancy)	Strategic Package #4 (Key Industries)	Strategic Package #5 (Strategic Growth)	Number of Yes by Project
Maintenance Projects (continued)										
125b	USACE Maintenance Dredging – Double Bayou	All	$3.5	No	Yes	No	Yes	Yes	No	3
126	USACE Maintenance Dredging – Greens Bayou Channel	All	$1.5	No	Yes	No	Yes	No	No	2
1k	USACE Maintenance Dredging – San Bernard River Channel Entrance	All	$1.3	No	Yes	No	Yes	No	No	2
1c	USACE Maintenance Dredging – GIWW Freeport Harbor to San Bernard River	All	$17.0	No	Yes	Yes	Yes	Yes	No	3
1a	USACE Maintenance Dredging -GIWW High Island to Galveston Bay	All	$6.0	No	Yes	Yes	Yes	Yes	No	4
72	USACE Maintenance Dredging -Galveston Harbor	All	$29.0	No	Yes	No	Yes	Yes	No	3
1b	USACE Maintenance Dredging -GIWW Galveston Bay to Chocolate Bayou	All	$7.5	No	Yes	Yes	Yes	Yes	No	4
125a	USACE Maintenance Dredging -Houston Ship Channel to Smith Point	All	$6.5	No	Yes	Yes	No	Yes	No	3
65	USACE Maintenance Dredging -Freeport Harbor	All	$39.0	No	Yes	Yes	No	Yes	No	3

Table F.1 Strategy Packages (continued)

Project ID	Potential Project/ Solution	Affiliated Port	Anticipated Cost (Millions)	Strategic Package #1a (Ports and WW)	Strategic Package #1b (GIWW)	Strategic Package #2 (Maximize Capacity)	Strategic Package #3 (Redundancy)	Strategic Package #4 (Key Industries)	Strategic Package #5 (Strategic Growth)	Number of Yes by Project
Maintenance Projects (continued)										
129	USACE Maintenance Dredging -Texas City Harbor	All	$22.0	No	Yes	Yes	No	Yes	No	3
130	USACE Maintenance Dredging – Sabine River Channel	GIWW	$4.5	No	Yes	Yes	No	Yes	No	3
28	USACE Maintenance Dredging of the Sabine-Neches Canal	Port of Beaumont	$25.5	No	Yes	Yes	No	Yes	Yes	3
32	USACE Maintenance Dredging of Sabine Pass	GIWW	$50.5	No	Yes	Yes	No	Yes	Yes	3
Capacity Enhancement Projects										
6	Freeport Wiggles – Widening and Straightening	Port of Freeport	$5.0	Yes	No	No	No	No	Yes	2
7	Brazos River Floodgates – Removal/Reconfiguration	Port of Freeport	$7.0	Yes	No	No	No	No	Yes	2
17	Brazos River Intersection – Mooring Capacity	Port of Freeport	$3.0	Yes	No	No	No	No	Yes	2
2	Rollover Bay – Channel Widening	All	$4.0	Yes	No	No	No	No	Yes	2
3	Port Bolivar – Channel Widening	All	$2.0	Yes	No	No	No	No	Yes	2
8	Pelican Island Mooring Capacity and Basin Widening	All	$4.0	Yes	No	No	No	No	Yes	2

Table F.1 Strategy Packages (continued)

Project ID	Potential Project/ Solution	Affiliated Port	Anticipated Cost (Millions)	Strategic Package #1a (Ports and WW)	Strategic Package #1b (GIWW)	Strategic Package #2 (Maximize Capacity)	Strategic Package #3 (Redundancy)	Strategic Package #4 (Key Industries)	Strategic Package #5 (Strategic Growth)	Number of Yes by Project
Capacity Enhancement Projects (continued)										
85	Rail Bridge 5A – PTRA Sub – Doubletrack	Port of Houston		No	No	Yes	No	Yes	Yes	3
89	Rail Bridge 16 – East Belt Sub – Doubletrack	Port of Houston	$10.0	No	No	Yes	No	No	Yes	2
91	West Belt Sub Improvement – grade separations and/or crossing closure	Port of Houston	$53.4	No	No	Yes	No	No	Yes	2
83	SH 225 – Connectivity to Other Roads	Port of Houston	$30.0	No	No	Yes	Yes	Yes	Yes	4
138	Velasco Terminal Construction	Port of Freeport	$380.0	Yes	No	Yes	Yes	Yes	Yes	5
137	Freeport Channel Widening/Deepening	Port of Freeport	$330.0	Yes	No	Yes	No	Yes	Yes	4
27	KCS Bridge Across Port of Beaumont Ship Channel (Neches River)- Upgrade	Port of Beaumont	$16.0	No	No	Yes	No	Yes	Yes	3
4a	High Island Wiggles – Straightening of the Bends	All	$5.0	Yes	No	Yes	No	Yes	No	3
45	La Quinta Terminal Road Access to U.S.-181	Port of Corpus Christi	$25.0	No	No	No	Yes	No	Yes	2
58	New bridge at the Corpus Christi Harbor Bridge	Port of Corpus Christi	$600.0	No	No	No	No	No	Yes	1

Table F.1 Strategy Packages (continued)

Project ID	Potential Project/ Solution	Affiliated Port	Anticipated Cost (Millions)	Strategic Package #1a (Ports and WW)	Strategic Package #1b (GIWW)	Strategic Package #2 (Maximize Capacity)	Strategic Package #3 (Redundancy)	Strategic Package #4 (Key Industries)	Strategic Package #5 (Strategic Growth)	Number of Yes by Project
Capacity Enhancement Projects (continued)										
22	Port O'Connor – Encroachment Removal and Mooring relocation	All	$2.0	Yes	No	No	Yes	Yes	No	3
18a	Matagorda Bay Re-Route	All	$20.0	Yes	No	No	No	No	Yes	2
47	Nueces River Rail Yard	Port of Corpus Christi	$21.5	No	No	Yes	No	No	Yes	2
140	Ingleside Industrial Corridor	Port of Corpus Christi	$23.0	No	No	No	No	No	Yes	1
97	Grade separation – Shepherd/Durham – Terminal	Port of Houston	$30.7	No	No	Yes	No	Yes	Yes	3
98	Grade separation – Houston – Terminal	Port of Houston	$13.8	No	No	No	No	No	Yes	1
99	Grade separation – Bellaire – Terminal	Port of Houston	$17.0	No	No	No	No	No	Yes	1
100	Grade separation – San Felipe – Terminal	Port of Houston	$32.9	No	No	Yes	No	Yes	Yes	3
101	Grade separation – Richmond – Terminal	Port of Houston	$29.7	No	No	No	No	No	Yes	1
103	Grade separation – Westheimer – Terminal	Port of Houston	$66.8	No	No	No	No	No	Yes	1
111	Grade separation – Canal – East Belt	Port of Houston	$11.7	No	No	No	No	No	Yes	1

Table F.1 Strategy Packages (continued)

Project ID	Potential Project/ Solution	Affiliated Port	Anticipated Cost (Millions)	Strategic Package #1a (Ports and WW)	Strategic Package #1b (GIWW)	Strategic Package #2 (Maximize Capacity)	Strategic Package #3 (Redundancy)	Strategic Package #4 (Key Industries)	Strategic Package #5 (Strategic Growth)	Number of Yes by Project
Strategic Investments										
55	U.S.-77 Between I-37 and U.S.-83 – Upgrade to IH standards	Central and South Texas Ports	$180.0	No	No	No	No	No	Yes	1
26	UPRR Brownsville and Angleton Subs Rail Capacity – Load Capabilities of bridges	All Central Texas	$35.7	No	No	Yes	Yes	Yes	Yes	4
23	Lydia Ann Channel mooring capacity and maintenance	All	$3.0	Yes	No	No	No	No	Yes	2
141	Corpus Christi Ship Channel Capacity Dredging	Port of Corpus Christi	$450.0	Yes	No	Yes	Yes	Yes	Yes	5
161	Widening and Deepening of Brownsville Ship Channel	Port of Beaumont	$200.0	Yes	No	Yes	Yes	Yes	Yes	5
117	East Houston Rail Bypass – New line Between Dayton and Cleveland	Port of Houston	$283.4	No	No	Yes	No	Yes	Yes	3

Table F.1 Strategy Packages (continued)

Project ID	Potential Project/ Solution	Affiliated Port	Anticipated Cost (Millions)	Strategic Package #1a (Ports and WW)	Strategic Package #1b (GIWW)	Strategic Package #2 (Maximize Capacity)	Strategic Package #3 (Redundancy)	Strategic Package #4 (Key Industries)	Strategic Package #5 (Strategic Growth)	Number of Yes by Project
Policies										
150	Extend heavy haul permits for FM 1405 to Cedar Bayou	All	$0.0	No	No	Yes	Yes	Yes	Yes	4
39	Calhoun port area – land use zoning	Calhoun Port Authority	$0.0	Yes	No	No	Yes	No	No	2
92	Authorization of permits for overweight trucks on roadways near the port of Houston. Increased trucking fees would be required to compensate for the increased maintenance and shortened service life of the roadways.	Port of Houston	$0.0	No	No	Yes	Yes	Yes	Yes	4
	Number of Included Projects by Package			**17**	**34**	**58**	**40**	**58**	**33**	
	Cost (in Millions) by Package			**$1,432**	**$439**	**$3,511**	**$1,864**	**$3,266**	**$2,889**	

G. Federal and State Funding Opportunities

G.1 FEDERAL AND STATE GRANT FUNDING PROGRAMS

Harbor Maintenance Trust Fund (HMTF)

The HMTF was authorized under the Water Resources Development Act of 1986. This Act created an ad valorem tax levied on cargoes imported or moved domestically through Federally maintained channels and harbors. The tax is paid on imported and domestic cargoes (the levy on exports was declared unconstitutional in 1988). Tax proceeds are deposited into the Harbor Maintenance Trust Fund and are used by the U.S. Corps of Engineers to offset channel maintenance costs. Projects are normally funded through the USACE district offices, similar to the Inland Waterways Trust Fund. The Federal share is 100 percent for coastal ports with a harbor less than 45 feet deep, and 50 percent for those with harbors more than 45 feet deep. However, money from the HMTF is subject to annual appropriations from Congress, just like the Inland Waterways Trust Fund. In recent years, Congress has not appropriated the full amount of Trust Fund revenues for harbor maintenance activities, which has caused a surplus to accumulate in the fund that now stands at more than $4 billion. Although funds are not completely unavailable (as is the case with the Inland Waterways Trust Fund), they are severely restricted. USACE estimates that annual dredging needs range from $1.3 billion to $1.6 billion, but channel maintenance appropriations have only averaged about $800 million annually over the last five years.[30]

Coast Guard Bridge Program

The Coast Guard Bridge Program was authorized by the Truman-Hobbs Act of 1940.[31] That act requires the Secretary of Transportation to order the alteration or removal of any bridge that is found to be an unreasonable obstruction to navigation. Bridges are normally found to present unreasonable obstructions when changes in the use of waterways – for example, larger ships – create the need to raise bridge clearances or make other improvements that allow ships to pass safely. Congress makes appropriations for this program each year, which are

[30] American Association of Port Authorities, *Harbor Maintenance Tax*, Policy Position Paper dated March 2009.

[31] 33 U.S.C. 516.

then disbursed and obligated by the Coast Guard to specific bridge alteration projects. Funds accumulate for projects once design work is complete, but are not expended until the Federal share of project costs is reached, whereupon the Coast Guard authorizes the bridge owner to begin construction. Bridge owners are reimbursed for the Federal government's share of project costs during construction. In FY 2009, this program received $120.4 million during the regular appropriations cycle, but it also received an additional $142 million under the American Recovery and Reinvestment Act (ARRA, commonly known as the stimulus bill). All of these funds were dedicated to four bridge improvements around the country, including the Galveston Causeway Bridge. The Federal share of project costs varies, but is usually in the 90-95 percent range (for the Galveston Causeway Bridge, it was 92 percent).

Continuing Authorities Program

The Continuing Authorities Program is administered by the Corps of Engineers. It provides a framework whereby the Corps can resolve a variety of water resource issues without the need to obtain Congressional approval for each project, thus decreasing project delivery time. Although the program is mostly used for flood control and environmental projects, it can be used for small navigation projects including channel dredging, breakwater or jetty construction, and widening of turning basins. Projects are funded on a match basis between the Corps and a non-Federal sponsor. The Federal share is limited to $4 million for navigation projects. Applications for funding are made through Corps District offices. Provisions for land, easements, rights-of-way, relocations, and dredged material placement are the responsibility of the local sponsor and may be credited towards the sponsor's share of project costs.

TIGER III

The Transportation Investments Generating Economic Recovery (TIGER) program was first established in 2009 as part of the American Recovery and Reinvestment Act (ARRA, commonly known as the stimulus bill). Whereas the first two rounds of TIGER were mainly focused on immediate job creation through "shovel-ready" projects, this third round aims to fund projects, which would improve long-term competitiveness and sustainability for the nation, a region, or a locality. Port infrastructure projects are specifically included as an eligible type of project; however, dredging projects are not eligible. Other eligible project categories are highway and bridge projects, transit projects, and freight rail projects. States, localities, port authorities, transit agencies, metropolitan planning organizations (MPO), and coalitions that include private partners are eligible for the grants.

TIGER III will award a total of $527 million to the selected projects. Of this, up to $150 million may be awarded in the form of TIFIA payments.[32] These would offset the subsidy and administrative costs of the TIFIA program, if such an arrangement would further the purposes of the TIGER grant program. Applicants are required to provide a 20-percent match. The DOT will accept initial applications from August 22, 2011 through October 3, 2011; final applications will be due from October 4 through October 31. While this is certainly a viable near-term option for funding port projects in Texas, it should be noted that the competition for funding under this program is intense: The first two rounds of TIGER attracted about 2,500 applications valued at $79 billion, of which 126 projects were funded totaling $2.1 billion.[33]

Railway-Highway Crossings

Formerly a set-aside of the STP program, the Railway-Highway Crossings program provides funding for projects that improve safety at public highway-rail at-grade crossings through the elimination of hazards and/or the installation/upgrade of protective devices at crossings. SAFETEA-LU requires that states set aside at least 50 percent of the funding allocation for the installation of protective devices at rail-highway crossings. If all needs for installation of protective devices have been met, then the funds available can be used for other at-grade crossing projects eligible under this program. The Federal share is 90 percent.

Eligible projects include separation or protection of grades at crossings, reconstruction of existing railroad grade crossing structures, and relocation of highways or rail lines to eliminate grade crossings. An extension of the SAFETEA-LU funded this program at $220 million for FY 2010.

Economic Development Administration (EDA) Grants

EDA provides grants for projects in economically distressed industrial sites that promote job creation and/or retention. Eligible projects must be located within an EDA-designated redevelopment area or economic development center. Port development and expansion projects are eligible for funding. Grantees must provide evidence of the economic distress that the project is intended to alleviate. Grant assistance is available up to 50 percent of the project, although the EDA can provide up to 80 percent for projects in severely depressed areas.

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[32] The TIFIA program is described below under *Federal Financing Tools*.

[33] Edmondson, R. G., *DOT Announces Scaled-Down TIGER Grants*, Journal of Commerce, June 30, 2011. Of the funded projects, 33 were planning projects; the rest were all capital improvements.

Capital Grants for Rail Line Relocations

The Rail Line Relocation Grant program provides grants to states for local rail line relocation and improvement projects that improve rail traffic safety, motor vehicle traffic flow, community quality of life, or economic development; or involve relocation of any portion of the rail line. SAFETEA-LU authorized $350 million per year for this program for FY 2006 through 2009, subject to appropriations. No funds were appropriated for this program until FY 2008. In FY 2010 (the most recent year for which data are available), Congress appropriated approximately $34.5 million to this program; however, $24.5 million was earmarked for 27 noncompetitive projects, including 4 in Texas. At least 50 percent of the funds shall be awarded for grants of $20 million or less. The Federal share of project costs is 90 percent.

Assuming Congress continues to appropriate funds for this program, it could be a viable funding source for certain projects if they involve the relocation of a rail line. At the same time, it is hard to say with certainty whether appropriations will continue given the ongoing budget negotiations in Washington, as well as the impending reauthorization of surface transportation legislation.

National Highway System (NHS)

The NHS currently is comprised of approximately 160,000 miles (256,000 kilometers) of roadway that have been determined to be important to the nation's economy, defense, and mobility. The NHS includes five subsystems of roadways, one of which is intermodal connectors between NHS highways and intermodal facilities including ports. The NHS program provides formula funding for roadways designated as part of the NHS. Construction, reconstruction, resurfacing, and rehabilitation on a roadway connecting the NHS with a port are all eligible activities under this program.

The Federal share of NHS port access road funding is 80 percent. SAFETEA-LU funding for this program was $30.5 billion for FY 2005 to FY 2009 (funding has been extended since then through temporary authorizations). The NHS is a "formula distributed highway funding program," meaning funds are distributed to states using formulas provided in law. Once apportioned to states, the use of these funds is subject to statewide and metropolitan planning process requirements set forth in law and regulation. This means that port access projects will have to compete with other transportation needs to access these limited funds.

Surface Transportation Program (STP)

The STP program provides flexible funding for projects on any Federal-aid highway, bridges on public roads, transit capital investments, and intracity and intercity bus terminals and facilities. Eligible freight projects include:

- Preservation of abandoned rail corridors;
- Bridge clearance increases to accommodate double-stack freight trains;

- Capital costs of advanced truck stop electrification systems; and
- Freight transfer yards.

The Federal share of STP funding is generally 80 percent. Like the NHS program, STP funds are distributed through formula appropriation, so port projects would have to compete with other projects for funding. For FY 2005 to FY 2009, SAFETEA-LU funded this program at $32.6 billion. Continuing extensions have provided additional funding since then.

Congestion Mitigation and Air Quality Improvement Program (CMAQ)

The CMAQ program funds transportation projects and programs that improve air quality (by reducing transportation-related emissions) in nonattainment and maintenance areas for ozone, carbon monoxide (CO), and particulate matter (PM_{10}, $PM_{2.5}$).

CMAQ funds have been used for freight-related projects that improve air quality by reducing truck, locomotive or other emissions. Examples of CMAQ-funded freight projects include construction of intermodal facilities for moving containers off of highways and onto rail, defraying barge operating costs, rail track rehabilitation, diesel engine retrofits, idle-reduction projects, and new rail sidings. Additionally, though previously eligible, SAFETEA-LU highlighted advanced truck stop electrification system at truck parking facilities, on-road diesel engine retrofits, and other cost-effective mitigation activities as CMAQ eligible projects. In addition, SAFETEA-LU provided new eligibility for nonroad diesel engine retrofit projects.

CMAQ funds may be used to fund construction and other activities that could benefit a private entity, if it can be documented that the project will remove truck traffic on the Federal-aid system or reduce other freight-related emissions, thus improving the region's air quality. This would be accomplished through a public-private partnership agreement. It is the public-private partnership agreement that allows spending public CMAQ funds on most private freight projects. CMAQ is often the only funding source that many freight projects can access.

The Federal share is generally 80 percent for CMAQ projects. In FY 2010, the program was funded at about $1.8 billion under a SAFETEA-LU extension.

GIWW Matching Funds

TxDOT is the designated non-Federal sponsor of the Texas portion of the Gulf Intracoastal Waterway. In this role, TxDOT participates/initiates studies relating to the GIWW; acquires property for dredged material disposal; and provides all other lands, easements, relocations, and right-of-way for maintenance and new construction along the waterway. The TxDOT *2012 Unified Transportation Program* provides a total of $6.75 million for these activities for FY 2012 through

2021; however, appropriations are subject to approval by the Texas Transportation Commission through separate minute order.

Statewide Transportation Programming

TxDOT plans and programs improvements to the State's transportation network through a defined statewide planning process, including the development of a Statewide Long Range Transportation Plan in collaboration with MPOs, local governments, and other stakeholders. This plan is operationalized through the Unified Transportation Plan (UTP), a 10-year plan that guides transportation project investments within the State.

Projects in the UTP are funded according to different project categories, normally on a match basis with Federal dollars (although some projects are 100-percent state funded). Since few if any of these categories are port-specific, we do not review each one here. However, some do affect ports; for instance, Statewide Connectivity Corridor Projects includes mobility or capacity improvements on corridors connecting the Texas Trunk System or NHS to Texas water ports, among other things.

Although the latest UTP includes projects totaling nearly $28 billion, access to these funds for port projects will likely be restricted to some degree since they must compete with other transportation needs.

G.2 FEDERAL FINANCING TOOLS

Private Activity Bonds

Title XI Section 11143 of SAFETEA-LU amended Section 142(a) of the IRS Code to allow the issuance of tax-exempt private activity bonds (also known as tax-exempt facility bonds) for highway and freight transfer facilities. Therefore, states and local governments are allowed to issue tax-exempt bonds to finance highway and freight transfer facility projects sponsored by the private sector. In effect, this allows tax-exempt financing for transportation facilities owned or used by private entities, such as airports and docks. SAFETEA-LU includes a cap of $15 billion on private activity bonds; approximately 30 percent of this total has been approved by U.S. DOT as of May 2011, providing funds for seven large, complex transportation projects.

Tax-exempt facility bonds have been used finance port capital projects. For example, the Port of Tacoma used private activity bonds (along with several other funding sources) to help pay for the construction of a 100-acre container terminal in partnership with Hyundai Merchant Marine. The Port issued $40 million in private activity bonds for the project, which were repaid through lease income and container handling charges. More recently, three of the seven projects authorized under the PAB provisions of SAFETEA-LU were intermodal

rail projects: two for the CenterPoint Intermodal Center in Joliet, Illinois; and one for the I-80 RailPort in Seneca, Illinois.

State Infrastructure Bank (SIB)

The SIB program, expanded under SAFETEA-LU, allows all states, the District of Columbia, Puerto Rico, and other United States territories to establish infrastructure revolving funds eligible to be capitalized with Federal transportation funds. States can issue loans or other credit tools to public and private sponsors of transportation projects through their SIB.

States participating in the SIB program may capitalize their account(s) in their SIBs with Federal surface transportation funds as follows:

- **Highway Account.** Up to 10 percent of the funds apportioned to the state for the NHS, STP, Bridge, and Equity Bonus;
- **Transit Account.** Up to 10 percent of funds made available for capital projects under Urbanized Area Formula Grants, Capital Investment Grants, and Formula Grants for Other Than Urbanized Areas;
- **Rail Account.** Funds made available for capital projects under Subtitle V (Rail Programs) of 49 USC; and
- The state must match Federal funds used to capitalize the SIB on an 80 to 20 Federal/non-Federal basis.

The Texas Legislature established a State Infrastructure Bank for Texas within the state Transportation Code.[34] The TTC is authorized to capitalize the SIB with Federal funds, the proceeds of bonds issued under the Transportation Code, loan repayments, investment income, state funds, and other money received by the State that is eligible for deposit. In February 2011, the TTC transferred $60 million in unallocated money from the state highway fund to the SIB, to be used for financial assistance to qualified projects. Additionally, the 2009 Legislature appropriated $1 billion in bond proceeds to capitalize the SIB.

Transportation Infrastructure Finance and Innovation Act (TIFIA)

The TIFIA credit program was originally enacted in the Transportation Equity Act for the 21st Century (TEA-21), and was continued with slight modifications under SAFETEA-LU. The strategic goal of this program is to leverage limited Federal resources and stimulate private capital investment by providing credit assistance (up to 33 percent of the project cost) for major transportation investments of national or regional significance. Credit assistance is provided through secured loans, loan guarantees, or lines of credit. Project costs must be at least $50 million or one-third of the state's annual apportionment of Federal-aid

[34] Transportation Code, Chapter 222, Subchapter D.

highway funds, whichever is less. SAFETEA-LU expanded TIFIA eligibility to certain private rail projects. Eligibility for freight facilities include:

- Public or private freight rail facilities providing benefits to highway users;
- Intermodal freight transfer facilities;
- Access to freight facilities and service improvements, including capital investments for intelligent transportation systems (ITS); and
- Port terminals, only when related to surface transportation infrastructure modifications to facilitate intermodal interchange, transfer, and access into and out of the port.

SAFETEA-LU authorizes $122 million per year to pay the subsidy costs of supporting Federal credit under TIFIA. There is no limit on the amount of credit assistance that can be provided to borrowers in a given fiscal year. Repayment of TIFIA loans is required to come from tolls, user fees, or other dedicated revenue sources. As of May 2011, TIFIA assistance amounted to $8.3 billion, leveraging $30.7 billion in transportation investments for a total of 24 projects. About $1.6 billion in TIFIA debt has been repaid to date.

An example of a port-related project financed through TIFIA is the Port of Miami Tunnel project, which received a $341.5 million TIFIA loan to help pay for a tunnel to link the Port (located on an island in Biscayne Bay) with critical highway connections on the mainland.

Rail Rehabilitation and Improvement Financing (RRIF)

The RRIF program provides loans and credit assistance to both public and private sponsors of rail and intermodal projects. Eligible projects include acquisition, development, improvement, or rehabilitation of intermodal or rail equipment and facilities. Direct loans can fund up to 100 percent of a railroad project with repayment terms of up to 25 years and interest rates equal to the cost of borrowing to the government. Thirty loans have been issued since 2002 for a total of $1.7 billion. Projects can be of almost any size; the smallest loan issued was about $56,000 (to C&J Railroad), while the largest was $5.6 million (to Amtrak). Texas railroads such as Permian Basin Railways and the Tex-Mex Railroad have made use of RRIF.

SAFETEA-LU authorizes $35 billion for this credit program, of which $7 billion is directed to short line and regional railroads. In addition, SAFETEA-LU eliminated two major issues that had made RRIF loans virtually unusable to the railroads. First, it removed the requirement that collateral be provided. Second, it removed the "lender of last resort" provision, which required applicants to provide evidence that private lending was denied for the project by two lenders. Nonetheless, many observers still claim the application process is too burdensome. The fact that only about $1.7 billion in loans have been issued out of $35 billion authorized may lend some support to this contention, although other factors – such as the economic crisis – also may play a part.