CAMBRIDGE SYSTEMATICS

# TxDOT Waterborne Freight Corridor Study

# final report

*prepared for*

**Texas Department of Transportation**

*prepared by*

**Cambridge Systematics, Inc.**

*with*

HNTB Corporation
Moffatt and Nichol Engineers
Center for Transportation Research – University of Texas

*July 2010*

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# 1.0 Introduction and Background

Texas ports, ship channels, and waterways are of vital regional, national, and international significance. The State's ports are critical national and international trade gateways, linking key Texas industries, particularly its chemical, oil, and agriculture industries, with markets and suppliers located throughout the world. They also serve industries and markets located in other parts of the country, particularly those in the Plains states of Kansas and Oklahoma. While chemicals and petroleum are responsible for making Texas' ports among the largest in the nation (as measured by total weight), the Texas waterway system's importance in supporting the flows of containerized goods, grains, cement, and other commodities continues to grow. As a result, Texas ports and waterways continue to be key contributors 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.

However, this vital transportation network is being stressed by continued growth in freight volumes, driven by the growing populations and economies of Texas, in general, and the Gulf Coast region, in particular. Even amid the current global economic recession, container volumes at Texas ports are expected to nearly triple by 2035, general cargo volumes are expected to grow by more than 50 percent, and volumes along the Gulf Intracoastal Waterway (GIWW) are expected to grow by 48 percent. These growth patterns will exacerbate existing or creating new capacity and congestion problems along the GIWW, at critical ports and intermodal terminals, and along critical highway and rail corridors and access facilities. Travel time and cost will increase, service reliability will decrease, and the ability of the system to recover from emergencies and service disruptions will become severely taxed. Layered on top of these concerns is the increasing challenge of balancing freight mobility needs with environmental, social, and financial concerns; rapidly rising infrastructure maintenance costs; and a recognition that neither the public nor private sectors – acting independently – have the necessary resources to fully address rising port and waterway system demands. Individually or collectively, these issues may erode the efficiency and productivity of the Texas freight transportation system, leading to economic implications that will reverberate locally, regionally, nationally, and internationally.

Although many TxDOT Districts, metropolitan planning organizations (MPO), ports, and railroads along the Gulf Coast state have examined these issues – and have in many cases identified regional-, metropolitan-, or facility-specific solutions – there has been no systemwide examination of the needs and deficiencies in the Texas ports and waterway system as an integrated whole. A system approach is critical, as without a clear understanding of how trade trends and transportation constraints are likely to affect the entire port and waterway system, TxDOT, MPOs, ports, and other freight stakeholders cannot effectively meet future needs and ensure continued economic growth.

Through completion of this Waterborne Freight Corridor Study, TxDOT has begun to identify and address these systemwide issues. Through the identification of key trade, infrastructure, operational, and policy concerns affecting Texas ports and waterways at the system level, this study provides a foundation to allow TxDOT to develop system-level, multimodal solutions to address statewide freight needs and issues. Just as important, it provides a vehicle for TxDOT to work 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.

# 2.0 The Setting

## 2.1 Texas Ports and Waterways Represent a System of Statewide, Regional, and National Significance

The Texas waterborne transportation system consists of a network of Federally maintained coastal and inland waterways and deep and shallow-draft ports, shown below in Figure 2.1. This system is critical to statewide and national economic vitality, handling high volumes of oil, chemicals, stone, cement, machinery, steel, autos, and containers – critical inputs and outputs for Texas industrial, commercial, and consumer markets. Texas's waterborne transportation also is critical in making U.S. and Texas food and agricultural products, including wheat, cotton, fruits, and vegetables, available throughout the world.

The backbone of this network is the Gulf Intracoastal Waterway (GIWW), 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. 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 406 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.

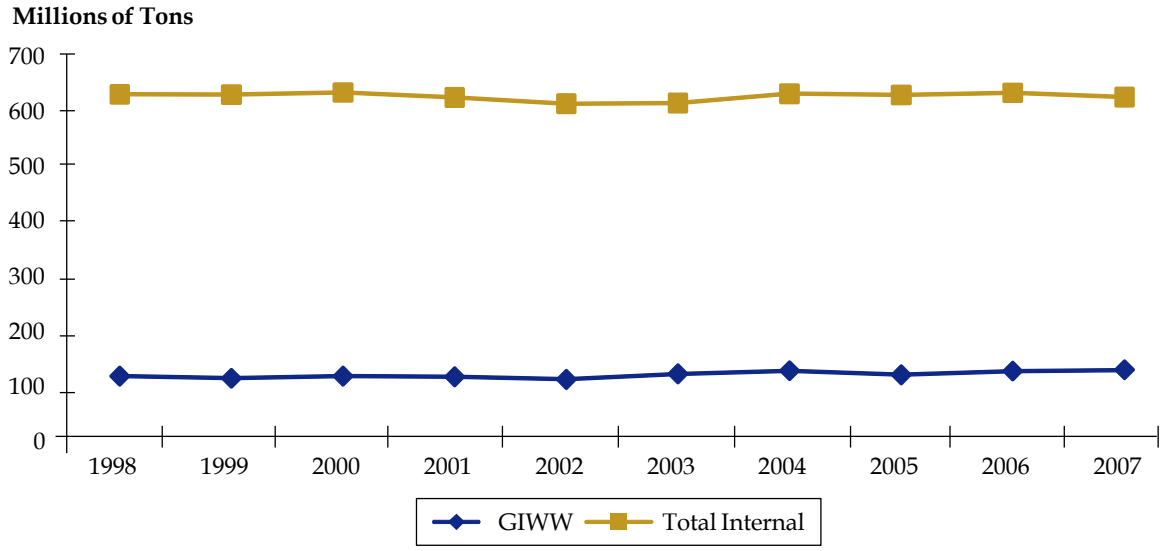
Of the five major internal waterways in the United States, the GIWW has consistently carried the third highest tonnage over the past decade, approximately 110 to 125 million tons of goods per year, equivalent to approximately 20 percent of total U.S. inland waterway traffic as illustrated in Figure 2.2. Of this total, approximately 60 to 80 million tons, or well over half the total volume, moved within the Texas portions of the waterway. More recently the State waterborne transportation system began handling over 90 million tons of domestic shipment annually, accounting for nearly 10 percent of total domestic waterborne trade.

The Texas portion of 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. The Texas Port Association identifies 16 key deepwater and shallow draft ports, shown in Figure 2.3, that drive the State's waterborne economy. These include the Ports of Beaumont, Brownsville, Corpus Christi, Freeport, Galveston, Harlingen, Houston, Bay City and Cedar Bayou the Calhoun Port Authority (previously known as the Port of Lavaca-Point Comfort), the West Side Calhoun Navigation District, the Ports of Orange, Palacios, Port Arthur, Port Isabel, Port Mansfield, Texas City, and Victoria. 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.

## 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).

## Figure 2.2 Domestic Waterborne Freight Volumes
*1998-2007*




Source: U.S. Army Corps of Engineers, 2008.

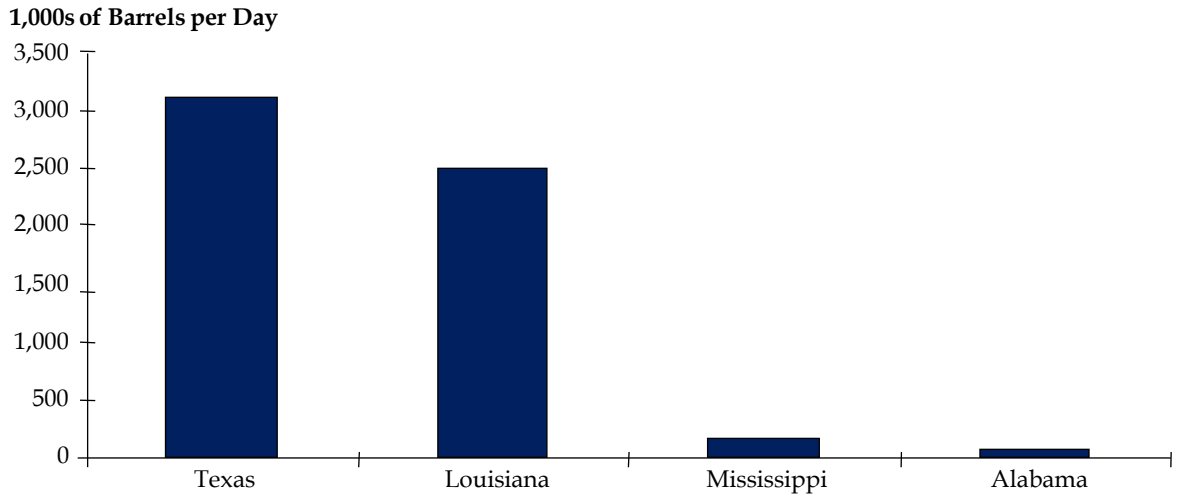
## Figure 2.3 Texas Ports


Source: Cambridge Systematics, Inc.

These 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. Nearly 60 percent of all oil consumed in the United States is imported (approximately 12 million barrels per day),[1] and roughly one-quarter of all imported oil enters the United States through Texas ports, as shown in Figure 2.4.

[1] Congressional Research Service Report RS22332, 2005.

## Figure 2.4 Gulf State Crude Oil Imports

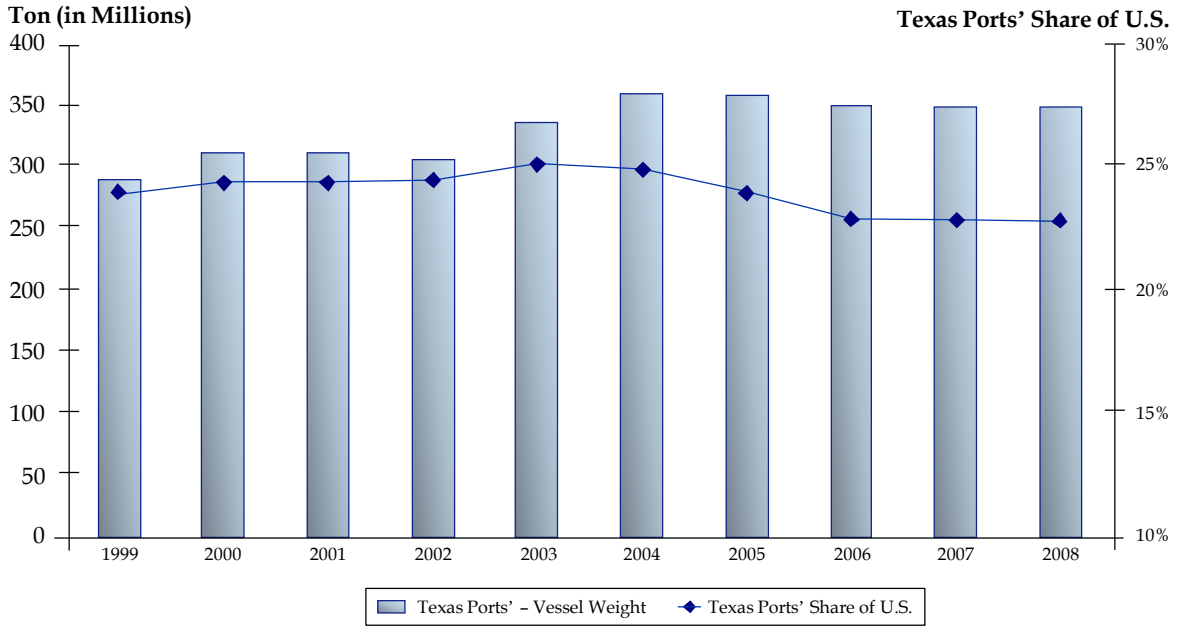



Source: VesselTrax, 2008.

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. Most of the State's refineries are clustered near major ports along the Gulf Coast, including Houston, Port Arthur, and Corpus Christi. 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.

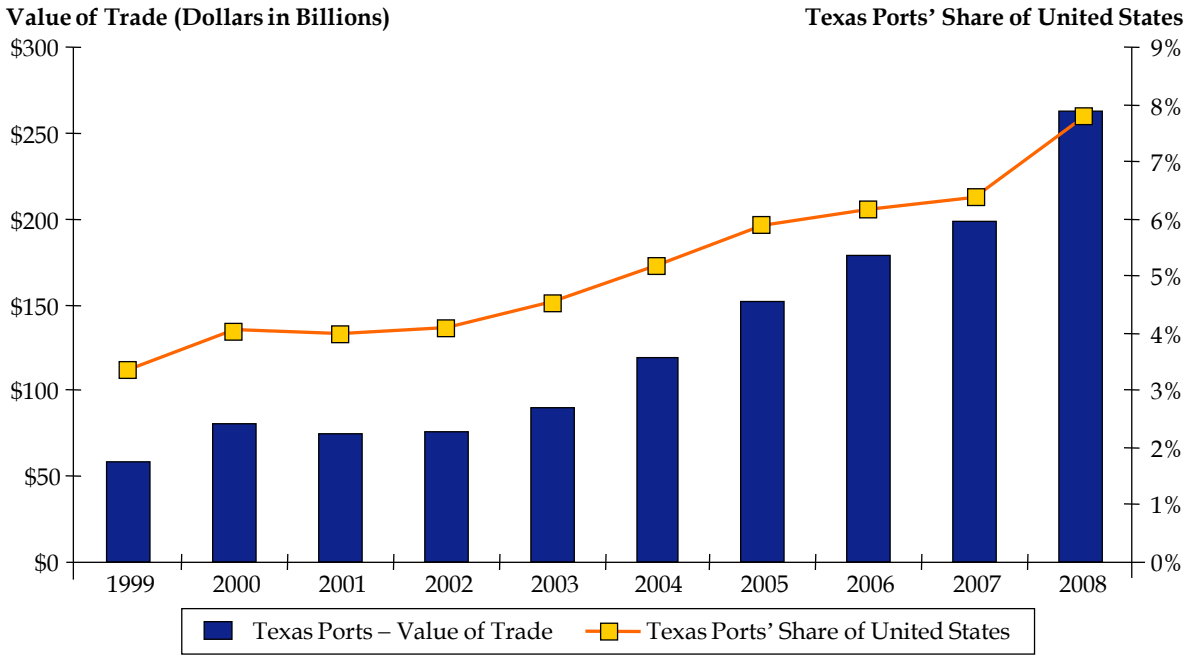
Service to this immense petrochemical industry contributes to the fact that the Texas waterborne transportation system accounts for a very high share of total U.S. international trade based on weight. On an annual basis, Texas ports import and export goods weighing between 575 million to 700 million tons in total. This accounts for slightly less than one-quarter of all trade based on weight handled in the United States, as illustrated in Figure 2.5.

**Figure 2.5 Texas Ports' Share of United States Trade**
*By Weight*




Texas ports also provide gateways that connect consumer goods manufactured overseas with U.S. markets. As shown in Figure 2.6, between 1999 and 2008, the value of total trade handled by Texas ports more than quadrupled from $57.8 billion to $263.1 billion. During the same period, Texas ports' share of all U.S. international trade rose from 3.4 percent in 1999 to 7.7 percent in 2008. Although much of this growth can be attributed to rising oil prices, there were also sizable gains in the value of other commodities, including chemicals, machinery, steel products, and agricultural products.

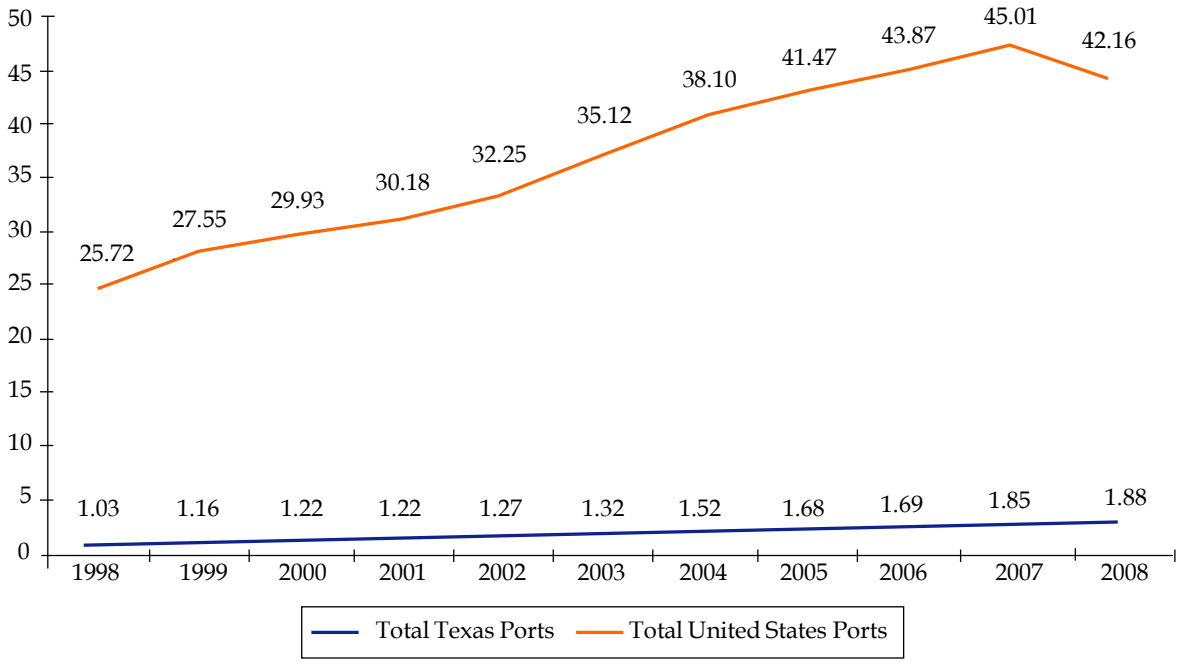
**Figure 2.6 Texas Ports Share of United States Trade by Value**
*1999-2008*




Source: World Institute for Strategic Economic Research (WISERTrade), 2009.

Higher-weight, lower-value commodities (such as crude petroleum, chemicals, and agricultural goods) have been traditional markets of the Texas port and waterway system and clearly Texas ports are national leaders in these market segments. However, system's importance in supporting the flows of containerized goods bound for local, regional, and national consumer markets is growing. Container throughput at Texas seaports reached approximately 1.9 million 20-foot equivalent units (TEUs) in 2008, nearly 83 percent more than a decade ago. As shown in Figure 2.7, even in a declining national market for container movements (6.3 percent decline nationally from 2007 to 2008), container volumes at Texas ports rose slightly.

**Figure 2.7 Texas Ports Container Volumes**
*1998-2008, Twenty-Foot Equivalent Units (TEUs)*

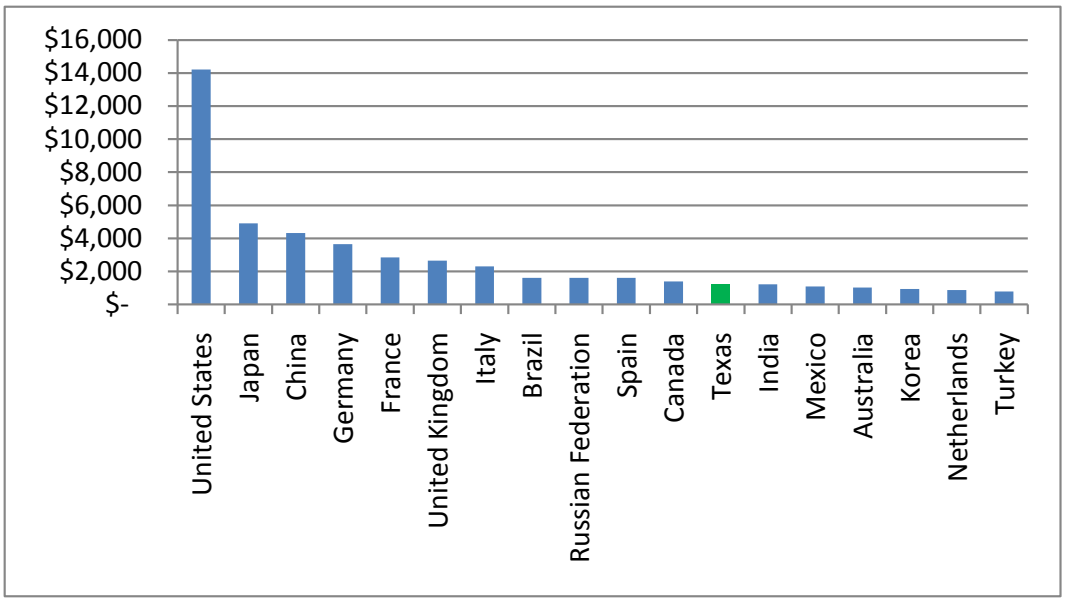



Source: American Association of Port Authorities (AAPA), 2009.

## 2.2 Texas Ports and Waterways Support Key Statewide Industries

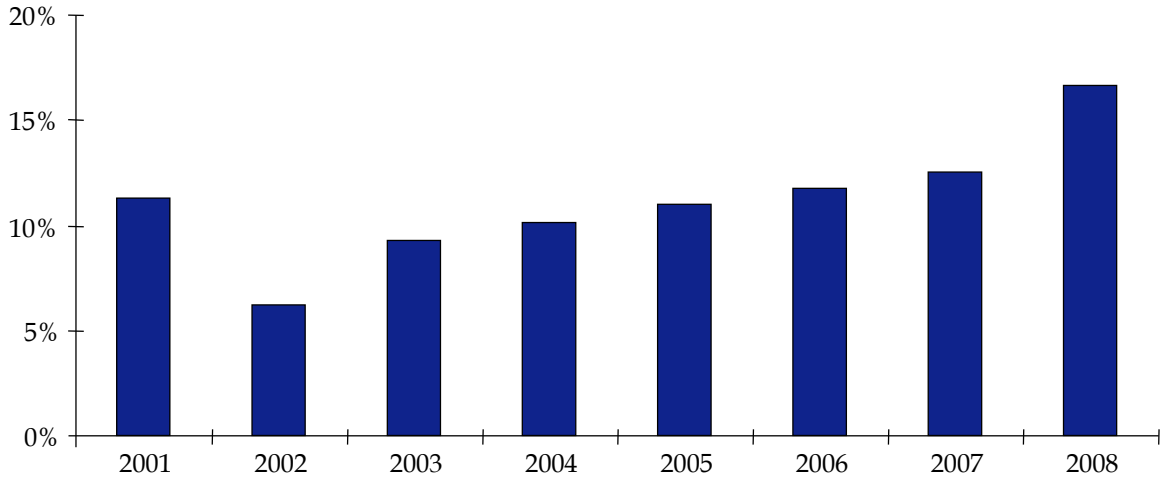
The economic output of Texas and its role within the national and world economies cannot be overemphasized – and the State's port and waterway system plays a critical role in supporting this output. In terms of overall size, the Texas economy is the 12th largest economy in the world, with a gross state product (GSP) of $1.2 trillion in 2008, as shown in Figure 2.8. And Texas is a key driver of the U.S. economy, responsible for about one-eighth of the national increases in gross domestic product (GDP) in recent years (Figure 2.9). In 2008 Texas accounted for one-sixth of U.S. economic growth, a sharp rise attributable to higher oil prices and an economic slowdown affecting other parts of the country more severely than Texas. Although Texas was one of the last states to enter the current (2007 to 2009) recession and is currently (as of late 2009) feeling its impact, the State is expected to emerge from this recession early and continue its long-term trend towards robust growth that outpaces the nation.

## Figure 2.8 2008 Gross Domestic Product




Sources: World Bank and U.S. Bureau of Economic Analysis

## Figure 2.9 Texas Share of United States Economic Growth
*2001-2008*

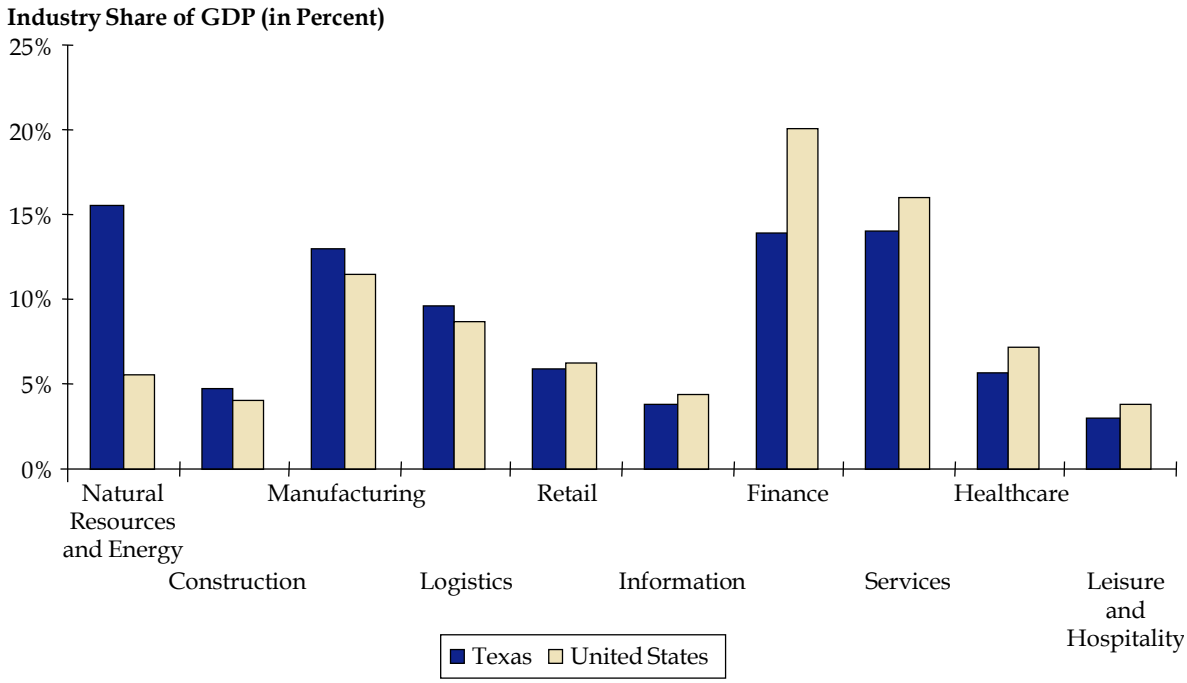



Source: U.S. Bureau of Economic Analysis, 2009.

As shown in Figure 2.10, Texas's economic structure is much more resource-, manufacturing-, and logistics-oriented than the U.S. economy as a whole. The State's particular strengths in

energy, agriculture, manufacturing, construction, and logistics services reflect an economy that is more dependent than many other states on an effective efficient transportation system.

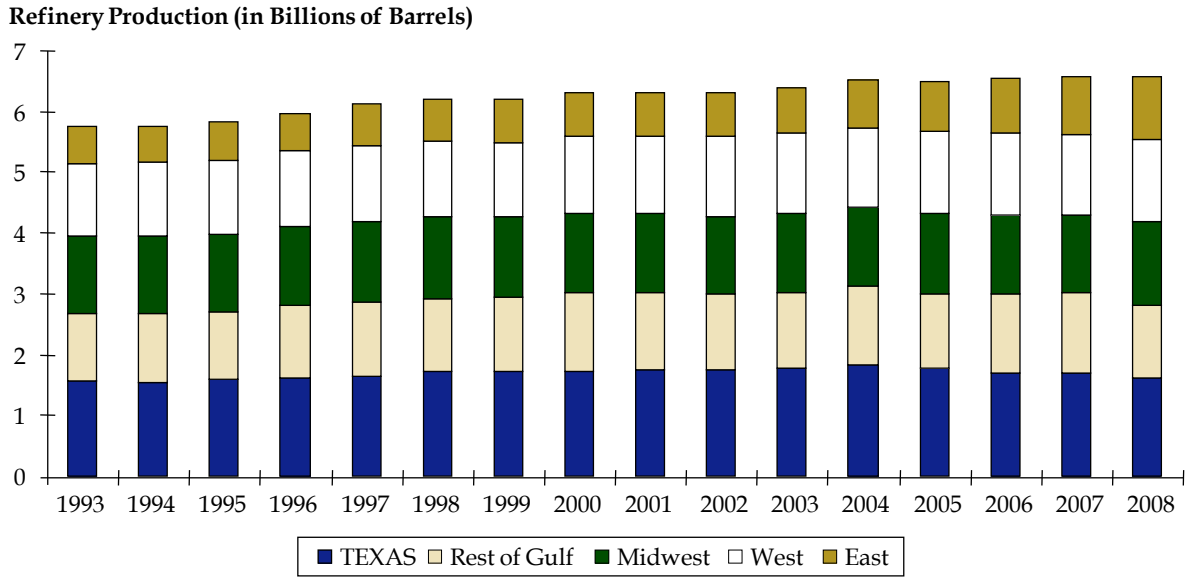
## Figure 2.10 Texas Economic Structure Compared to the United States
*2008*




Source: Bureau of Economic Analysis, 2009.

Much of Texas's historic growth and economic influence can be attributed to the strength of its energy sector, including both the production of oil and natural gas, the downstream manufacture of refined petroleum and organic chemicals (those that use petroleum or natural gas as feedstock), and the technologies and equipment required to produce petroleum and natural gas. In 2008, Texas's natural resources and energy sector (which includes mining, oil and gas production, agriculture, and utilities) accounted for 16 percent of the State economy, a far greater share than for the nation (less than 6 percent). Texas refining output has remained fairly constant over the last several years (see Figure 2.11) with over 80 percent of the State refining capacity located along the Gulf Coast. A massive expansion at a refining facility in Port Arthur – the largest in the nation to date – will add about 325,000 barrels per day capacity, representing a 7 percent increase in total Texas refining capacity when it opens in early 2012.

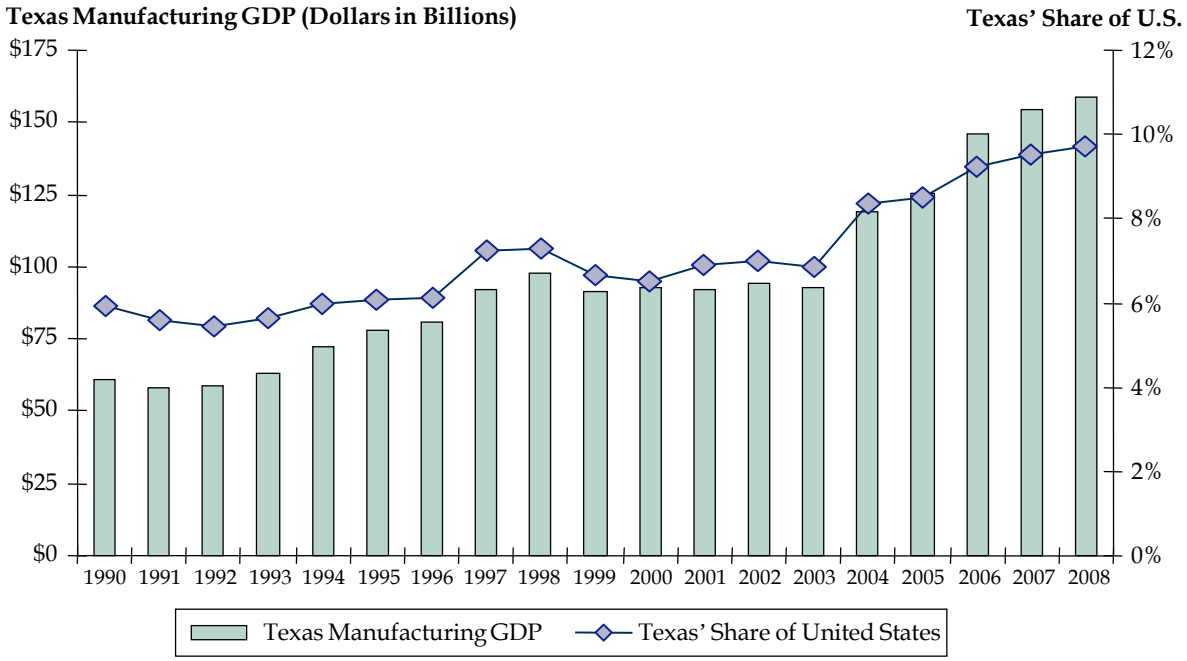
## Figure 2.11 U.S. Petroleum Refinery Production by Region
*1993-2008*




Source: Energy Information Administration, Petroleum Supply Annual, 2009.

Texas's manufacturing sector also is relatively large compared to the nation's as a whole, accounting for 13 percent of Texas's GSP (compared to 11.6 percent of national GDP). Between 1990 and 2008, the State's factory output grew from $61 billion to $159 billion, as described in Figure 2.12. During this period, Texas' share of total U.S. manufacturing output rose from 6 percent to about 10 percent, an extraordinary gain.

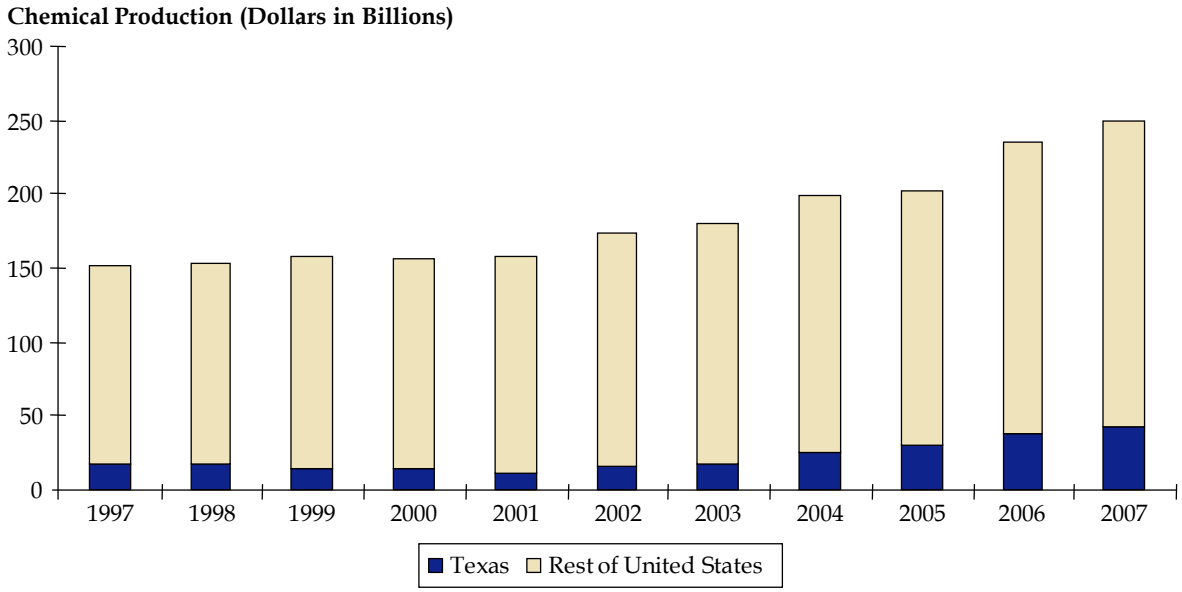
## Figure 2.12 Manufacturing Production in Texas and Share of United States
*1990-2008*




Source: Bureau of Economic Analysis, 2009.

Texas chemicals production has been rising dramatically for several years, increasing from $15 billion in 2002 to $42 billion in 2007, as shown in Figure 2.13. Texas now accounts for 17 percent of U.S. chemicals production, up from less than 10 percent earlier in the decade.

## Figure 2.13 Texas and United States Chemical Production
*1997-2007*

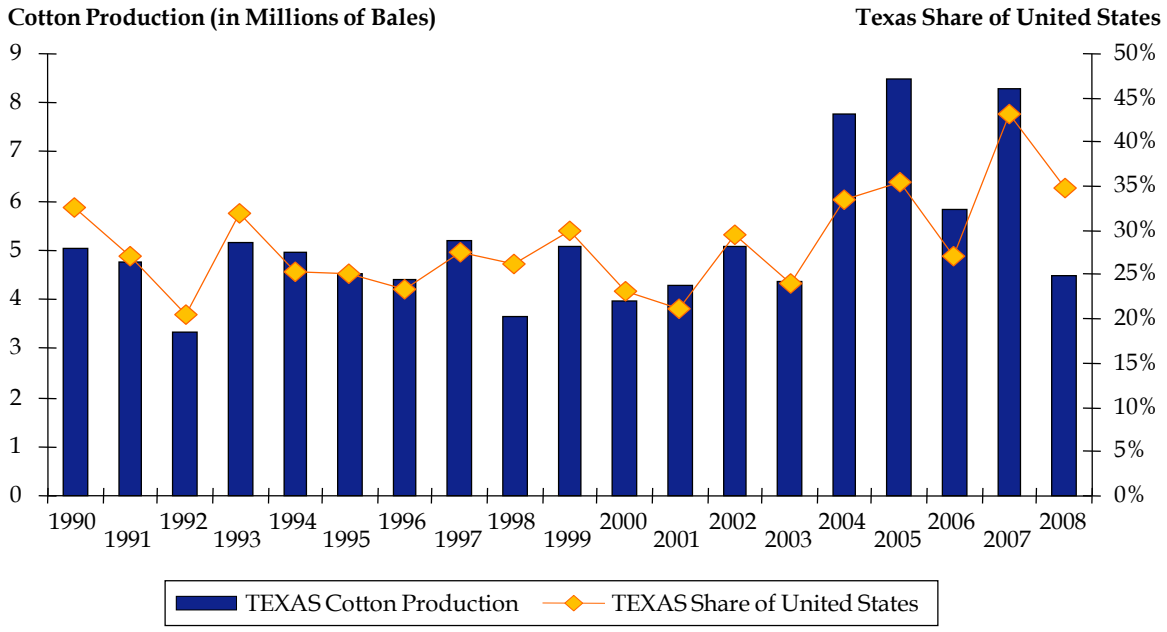



Source: Bureau of Economic Analysis, GDP for Chemical Industry, 2009.

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, and road networks, to produce and deliver products reliably. Using just-in-time logistics practices, manufacturers aim to keep inventories low to reduce costs, which require a dependable multimodal supply chain. Texas ports and waterways are a crucial link in the 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.

Texas's agriculture industry is another leading national market, the second largest in the country following California's, producing crops and livestock valued at $20.0 billion in 2007, and $6.0 billion in agricultural exports in 2008. Texas cotton production alone accounted for approximately 35 percent of U.S. production, as shown in Figure 2.14. These industries are also critically dependent on the port and waterway system – Texas ports exported over 565 million bushels of grain in 2008 (approximately 12.5 percent of the U.S. total, Figure 2.15), and more than 20 percent of total U.S. cotton exports travel through Texas gateways, as shown in Figure 2.16, most through the Port of Houston.

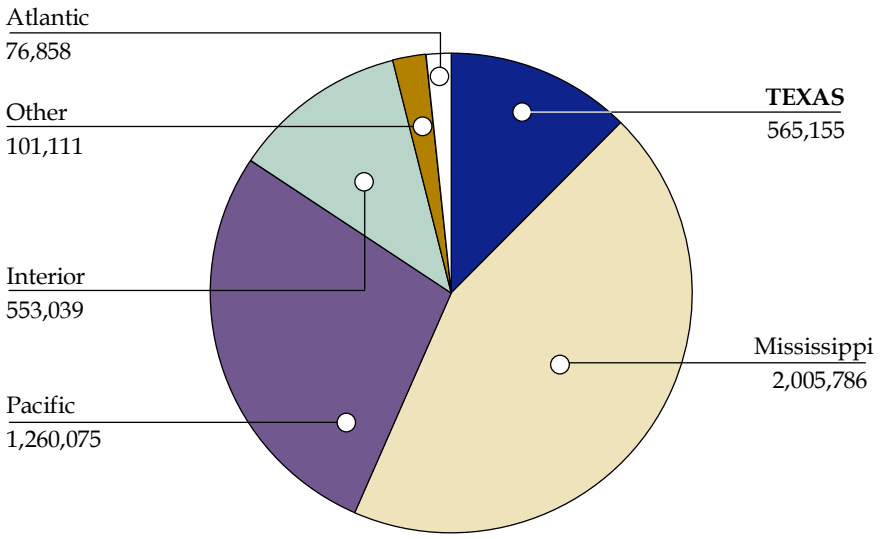
## Figure 2.14 Texas Cotton Production and Share of United States




Source: Bureau of Economic Analysis, 2009.

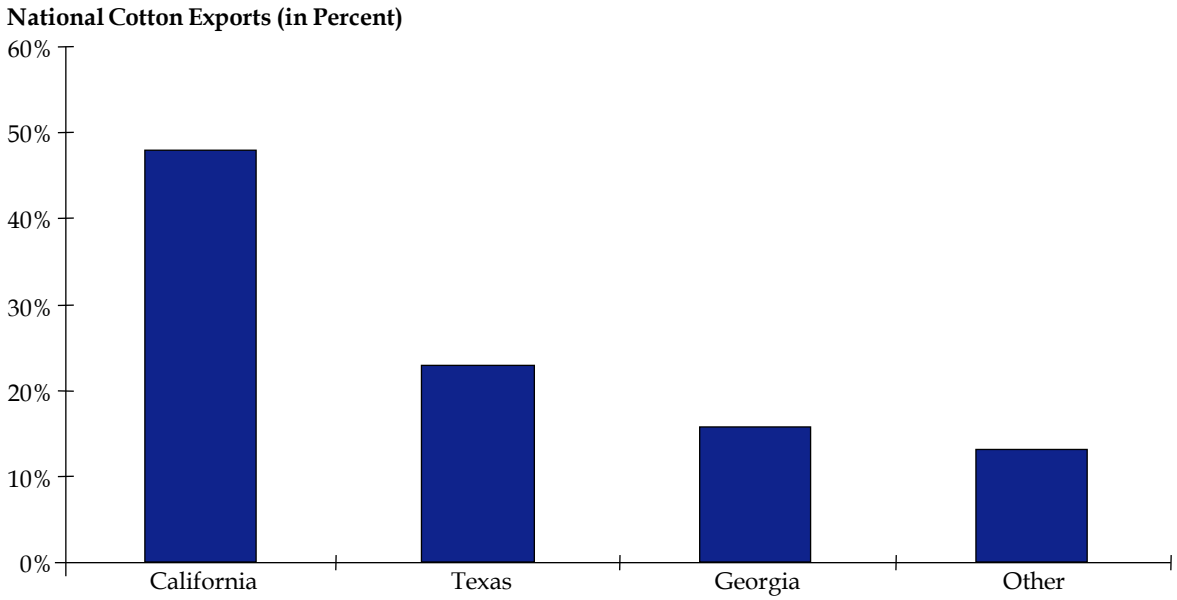
## Figure 2.15 United States Grain Exports by Gateway Region

*Thousands of Bushels, 2008*




Source: U.S. Department of Agriculture, 2009.

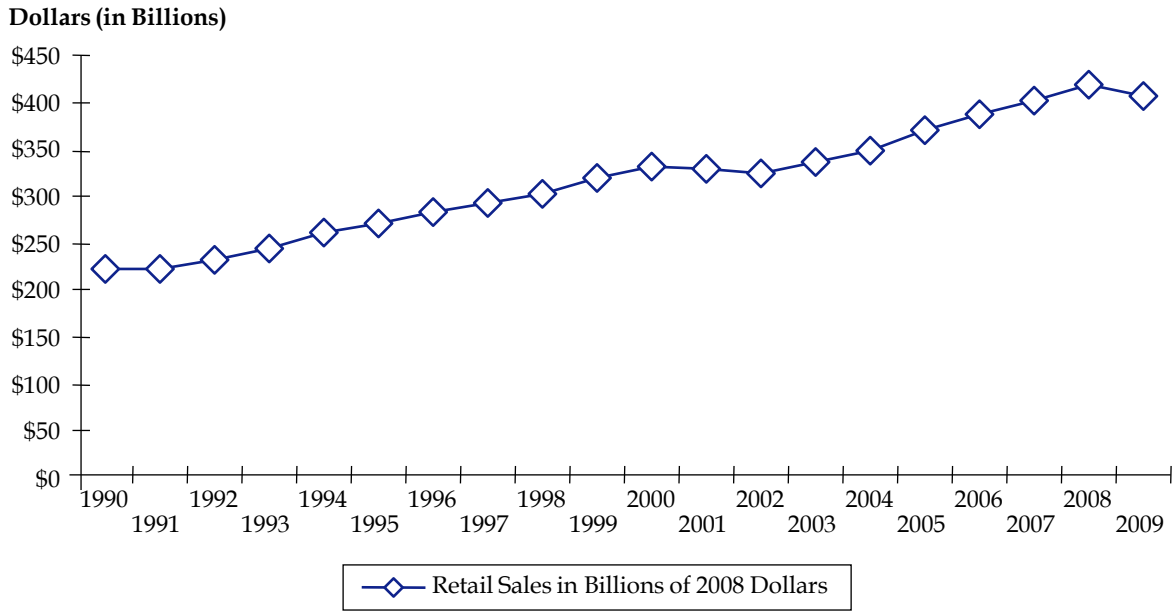
## Figure 2.16 Cotton Exports by Gateway




Source: Bureau of Economic Analysis, 2009.

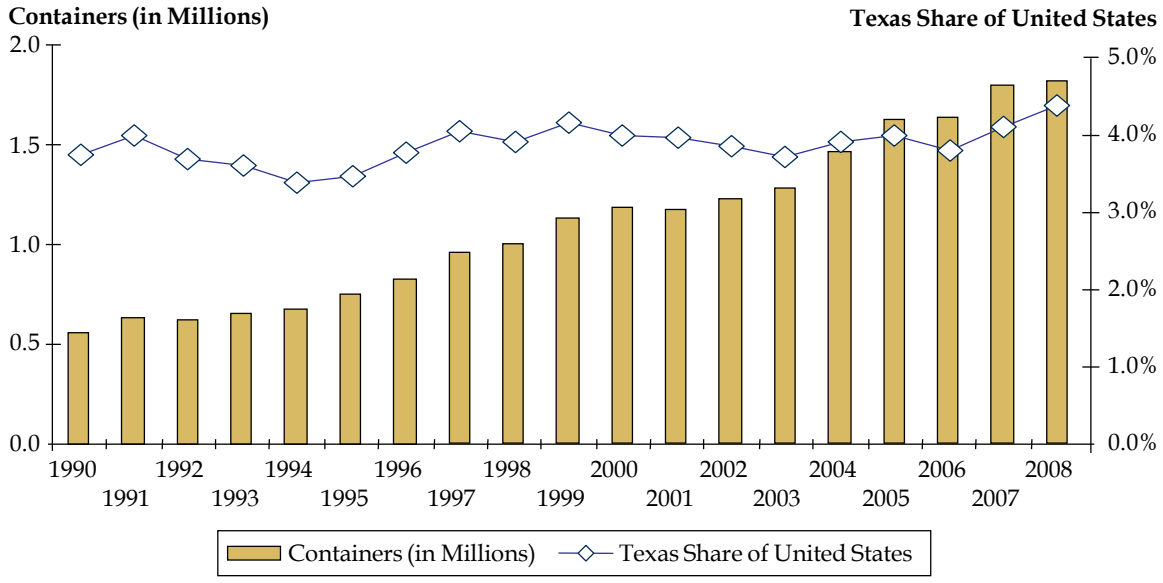
Finally, the retail industry in Texas sector is growing, with total retail sales reaching $418 billion in 2008, up from $224 billion (Figure 2.17), and accounting for 11 percent of jobs and 5.9 percent of the State economy. Retail merchandise, today, is often imported through container port facilities, and the total volume of containers handled by Texas ports has more than tripled since 1990, from less than 600,000 in 1990 to nearly 1.9 million in 2008 (see Figure 2.18). The strong growth in retail trade is a reflection of Texas' demographic and income expansion and the State's robust economy. Texas's legacy of strong growth and the long-term population and employment trends suggest that retail sales in the State are likely to continue growing at a fast pace relative to the United States as a whole, although growth is currently stalled by the recession.

## Figure 2.17 Texas Retail Sales




Note: 2009 data is projected.
Source: Federal Reserve Bank of Dallas, 2009.

## Figure 2.18 Texas Share of Containers Handled at United States Ports

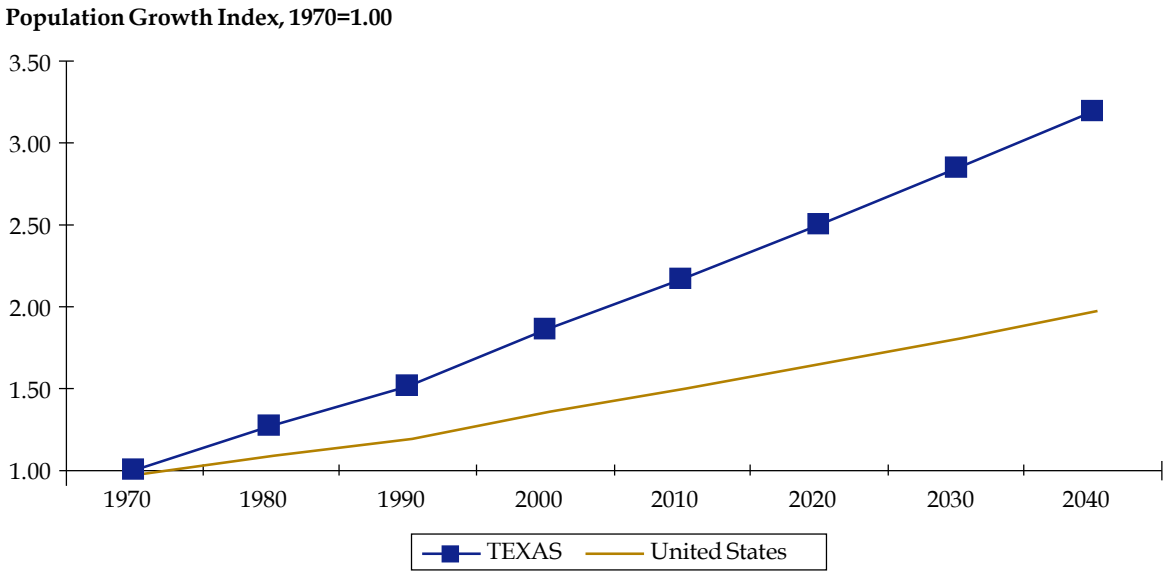



Source: American Association of Port Authorities (AAPA), 2009.

## 2.3 Gulf Coast Population Is Booming

Texas, historically, has been one of the fastest growing states in the country and it is expected to continue to outpace the nation in population growth through 2040, as shown in Figure 2.19. By 2040, Texas is projected to have 35.8 million people, roughly the size of present-day California.[2] In fact, one in eight people added to the U.S. population through 2040 will live Texas, as shown in Figure 2.20.

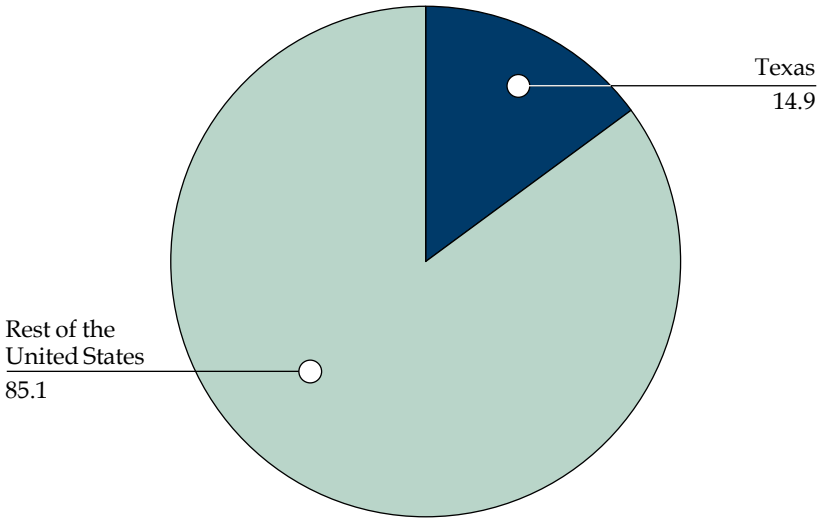
### Figure 2.19 Texas and National Population Growth Index




Source: U.S. Census Bureau and Texas State Data Center (Scenario 0.5, February 2009).

[2] The Texas State Data Center releases multiple population projections and recommends using the "0.5 Scenario" for long-term planning purposes. This scenario assumes that long-term immigration will be half that of the 1990s, a period of high growth in the State.

**Figure 2.20 Texas Share of the United States Population Growth**
*2000-2040*

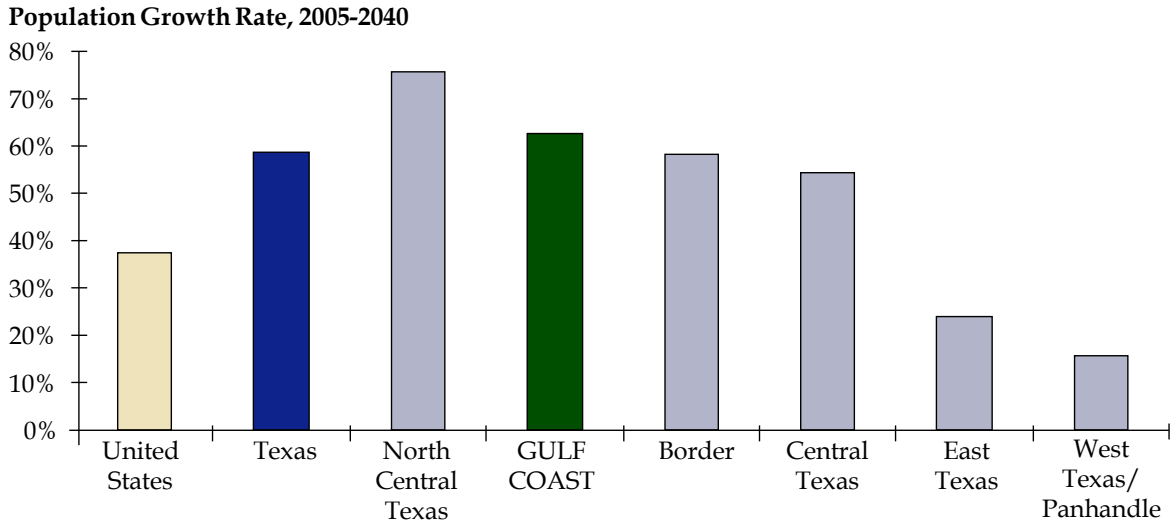



Source: U.S. Census Bureau and Texas State Data Center (Scenario 0.5, February 2009).

The Texas Gulf Coast will be leading much of this growth. As shown in Figure 2.21, Gulf Coast counties[3] are expected to grow by more than 60 percent and account for will account for over one-third of the State's overall population at 12.2 million residents by 2040 (Figure 2.22).

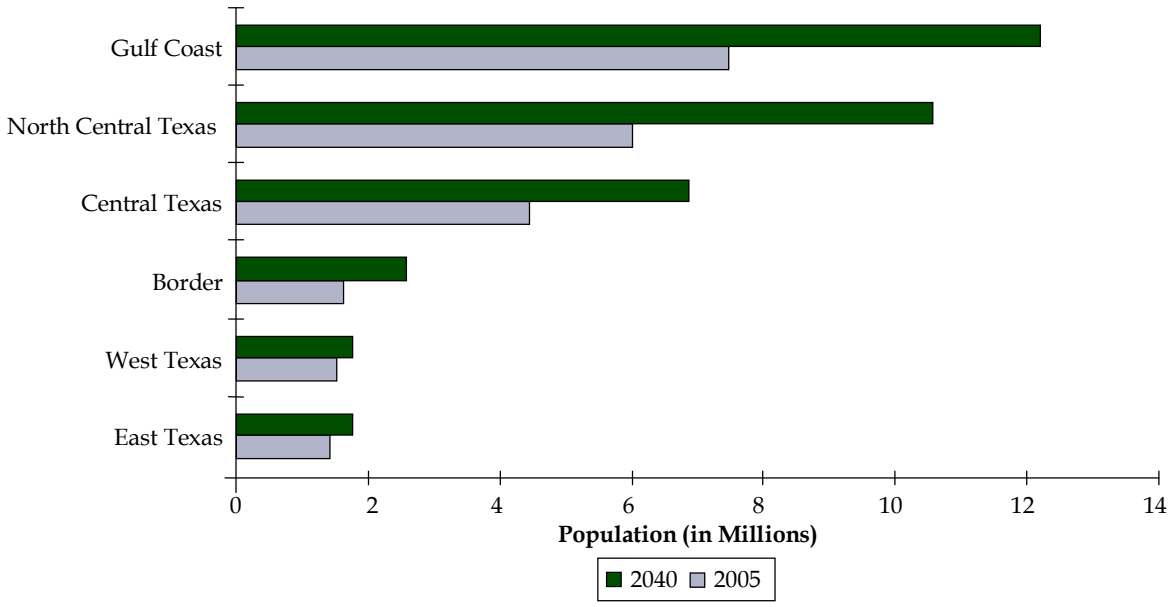
[3] Orange, Jefferson, Chambers, Harris, Galveston, Brazoria, Matagorda, Jackson, Calhoun, Victoria, Refugio, Aransas, San Patricio, Nueces, Kleberg, Kenedy, Willacy, and Cameron.

## Figure 2.21 Rate of Population Growth 2005-2040, Gulf Coast Compared to Texas Regions and the United States




Source: U.S. Census Bureau and Texas State Data Center (Scenario 0.5, February 2009).

## Figure 2.22 Texas Population Growth by Region



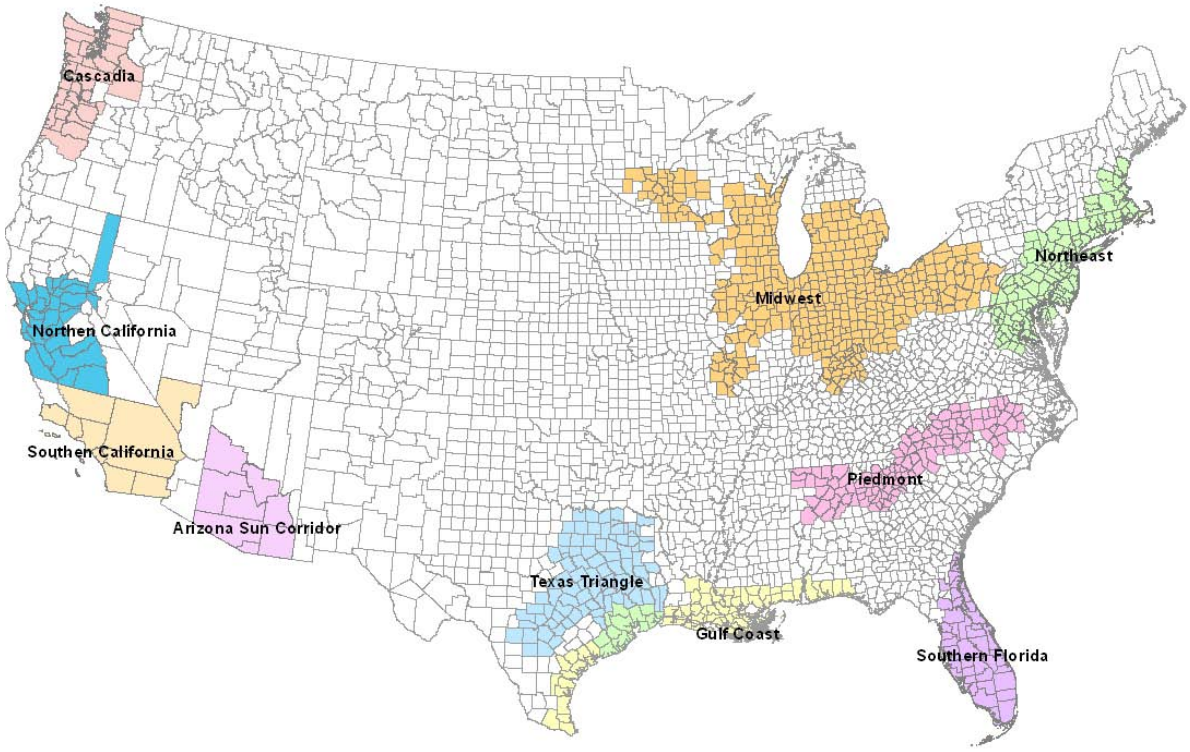

Source: Texas State Data Center (Scenario 0.5, February 2009).

The Gulf Coast region is part of one of several emerging "megaregions"[4] in the country, shown in Figure 2.23. These regions are those that are anticipated to produce hundreds of billions of dollars in economic output and become one of the principal catalysts of national economic growth – generating the majority of its wealth, attracting highly educated people, and spawning the technological innovations (and jobs) that spur further economic growth.[5] In light of current relaxed land use codes and regulations, anticipated growth in economic activity in the next decades is likely to attract additional mixed-used land development along key corridors – including along the GIWW – and in the proximity of key freight centers and hubs such as seaports – that will put increasing pressure on the State and region's natural resources and transportation infrastructure.

[4] Unlike megacities, which are described simply by the size of their populations, megaregions are by definition places with large markets, significant economic capacity, substantial innovation, and highly skilled talent, as well as large overall populations ranging in size from 10 to 50 million people and producing hundreds of billions of dollars in economic output.

[5] Richard Florida, *The New Megalopolis*, Newsweek, July 2006.

**Figure 2.23 Emerging Megaregions**




Source: Regional Plan Association, 2007.

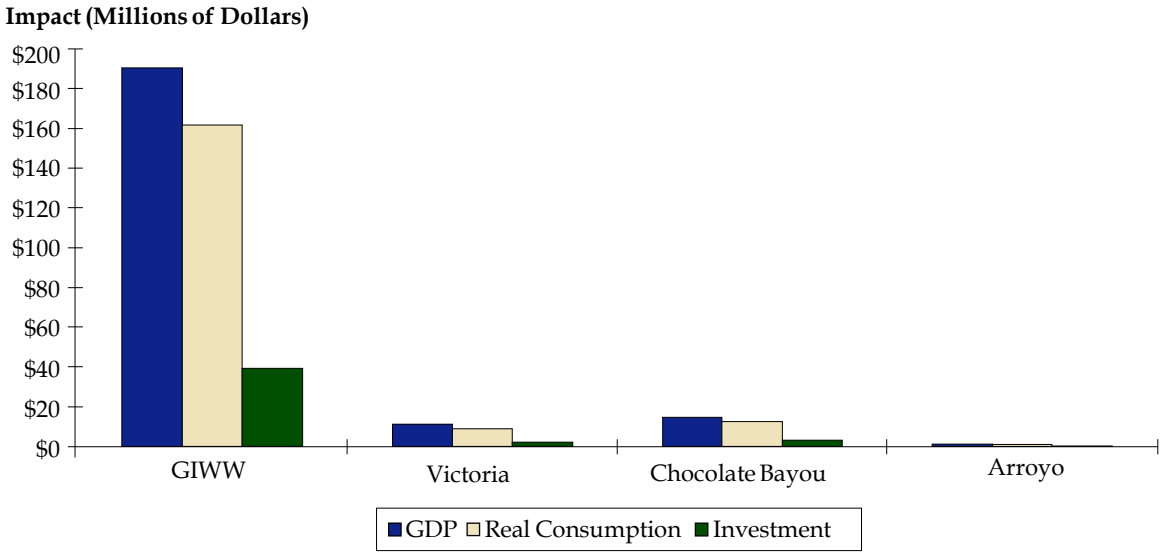
Continued employment and population growth along the Gulf Coast is a particular concern, given the important role the region plays in supporting national and international trade shipments, particularly oil imports and refining. As shown in Figure 2.23, the emerging megaregions within and adjacent to the Gulf Coast are also home to major gateways for international trade using the Texas transportation system. Many of the region's largest gateways, including its largest ports, are located within the Gulf Coast megaregion. Maintaining the efficiency, reliability, and sustainability of the Texas port and waterway system amidst population and employment growth in both the Gulf Coast and Texas Triangle megaregions is critical to continued regional and national mobility and economic vitality.

## 2.4 Texas Ports and Waterways Have Significant Economic Impacts

In addition to their critical role in facilitating national, state, and regional growth, the economic contributions of Texas ports and waterways are immense, though generally not fully measured. According to a 2006 Martin and Associates Study, the Port of Houston alone helps to generate over 785,000 jobs in Texas, $39.3 billion in personal income, $117.6

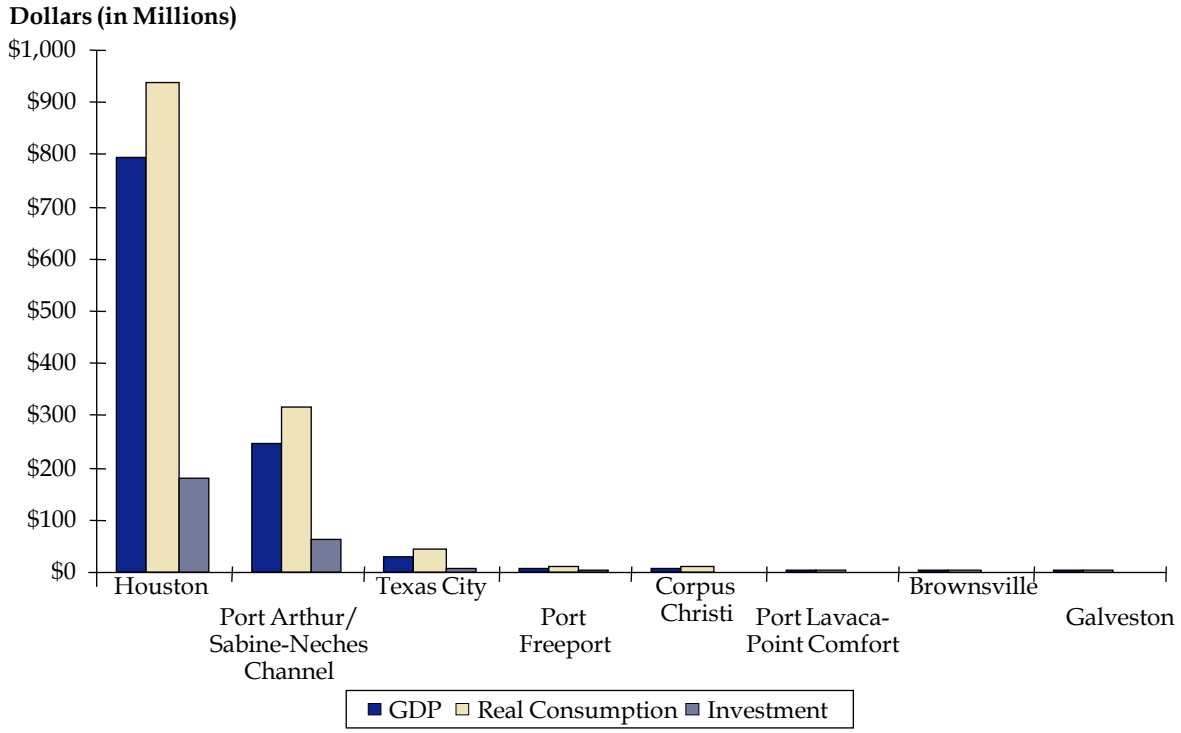
billion in economic activity, and $3.7 billion in state and local taxes. Furthermore, a recent study conducted by TxDOT measured the economic value (in terms of GDP and real consumption) generated by keeping key channels and deepwater ports at their authorized depths along with the investment required to perform such maintenance. The study concludes investments in waterway and ports improvements generate benefits that generally exceed costs by a four to one ratio (Figures 2.24 and 2.25).

## Figure 2.24 Texas Shallow Draft Waterway Impact




Source: *An Analysis of the Value of Texas Seaports in an Environment of Increasing Global Trade*, TxDOT Report 0-5538, Center for Transportation Research, University of Texas-Austin, October 2008.

## Figure 2.25 Texas Deep Draft Impacts[6]




Source: *An Analysis of the Value of Texas Seaports in an Environment of Increasing Global Trade*, TxDOT Report 0-5538, Center for Transportation Research, University of Texas-Austin, October 2008.

[6] The methodology used to determine the economic impact of the Port of Houston differs from that used to determine the economic impact of the other ports and may overestimate the disparity in economic impact between the Port of Houston and other Texas ports.

# 3.0 The Challenge

The Texas waterborne freight system is a patchwork of landside and waterside transportation networks and freight facilities, some owned and maintained privately, some publicly; a number of operators, providing a wide range of services to an array of local, national, and international customers; several complex access agreements and strategic partnerships among different stakeholders that impact how goods move into, out of, through, and within the State; and a variety of institutional relationships among the State, ports, railroads, public authorities, and other entities. Together, this system provides a critical gateway for freight traffic entering/leaving the country and also supports significant volumes of domestic trade throughout the United States.

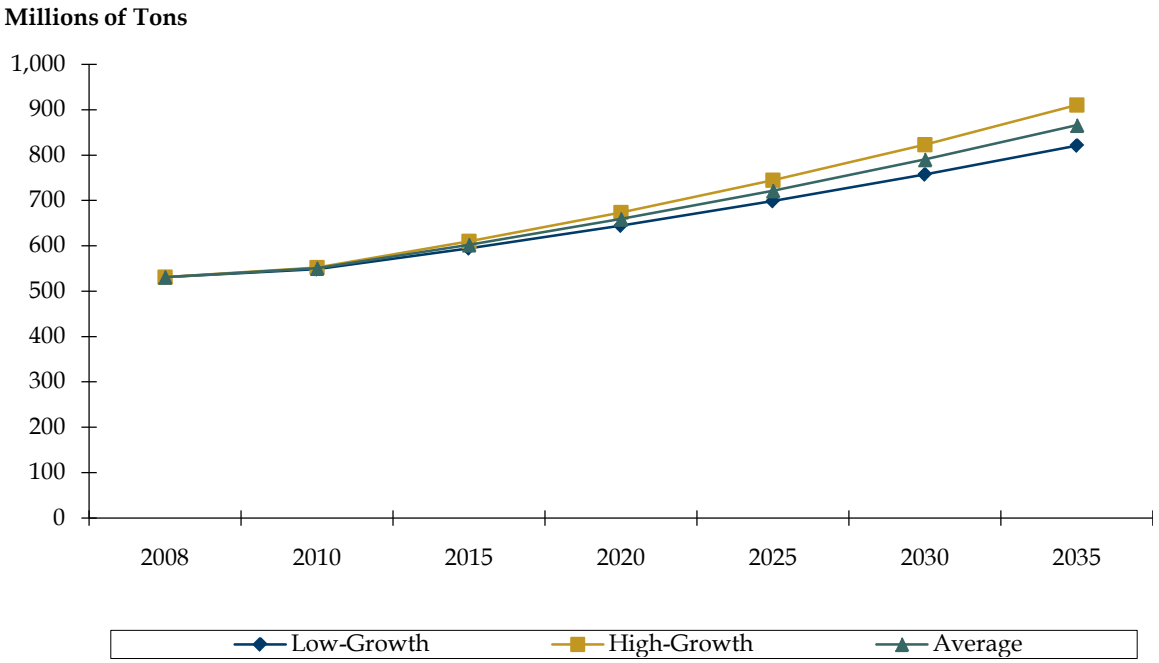
Although the system is capable of serving current international and domestic trade volumes, there are a number of transportation, domestic and international trade, financial, and demographic trends and issues that, individually or collectively, may negatively impact system condition and performance in the future. In some cases, these trends and issues are resulting in physical or operational chokepoints in the system. In other cases, they are preventing public and private port and waterway stakeholders from effectively managing existing or adding new system capacity to keep pace with rising demand. Regardless, these trends and issues will have important implications on the ability of the Texas waterborne freight system to meet future regional and national freight mobility needs. Without a clear understanding of how these trends and system constraints are likely to affect the transportation system, TxDOT, along with its regional, local, and private sector partners, cannot effectively meet future needs and assure continued economic growth. This section describes the most critical challenges facing the Texas waterborne freight system.

## 3.1 Demand on the System is Growing

Despite the current (2007-2009) global economic recession, average overall demand on the Texas port and waterway system to support Texas's growing population and economy – both domestic and international – is expected to grow significantly by 2035 :

- General cargo tonnage at Texas seaports is expected to grow by approximately 63 percent, to nearly 866 million tons (Figure 3.1).
- Container movements through Texas seaports will grow much faster, nearly tripling to approximately 8.6 million TEUs over the forecast horizon (Figure 3.2).
- Total freight volumes along the GIWW are expected to grow by 45 percent, to nearly 131 million tons (Figure 3.3).

## Figure 3.1 Statewide Waterborne Tonnage Forecasts
*2008-2035*




## Figure 3.2 Statewide Container Forecasts
*2008-2035*

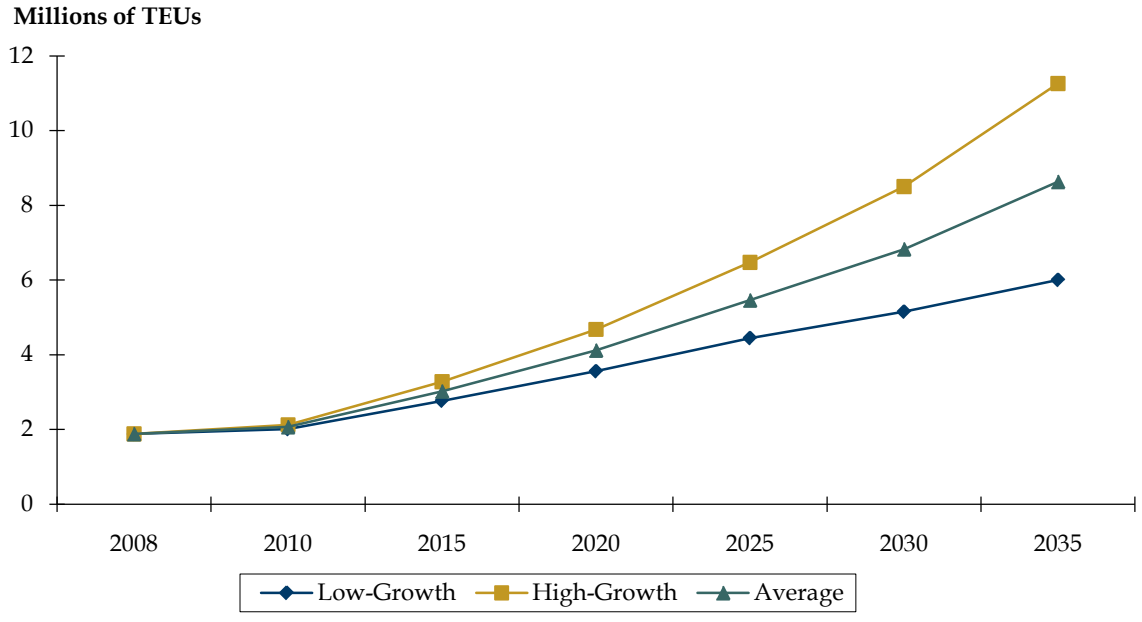
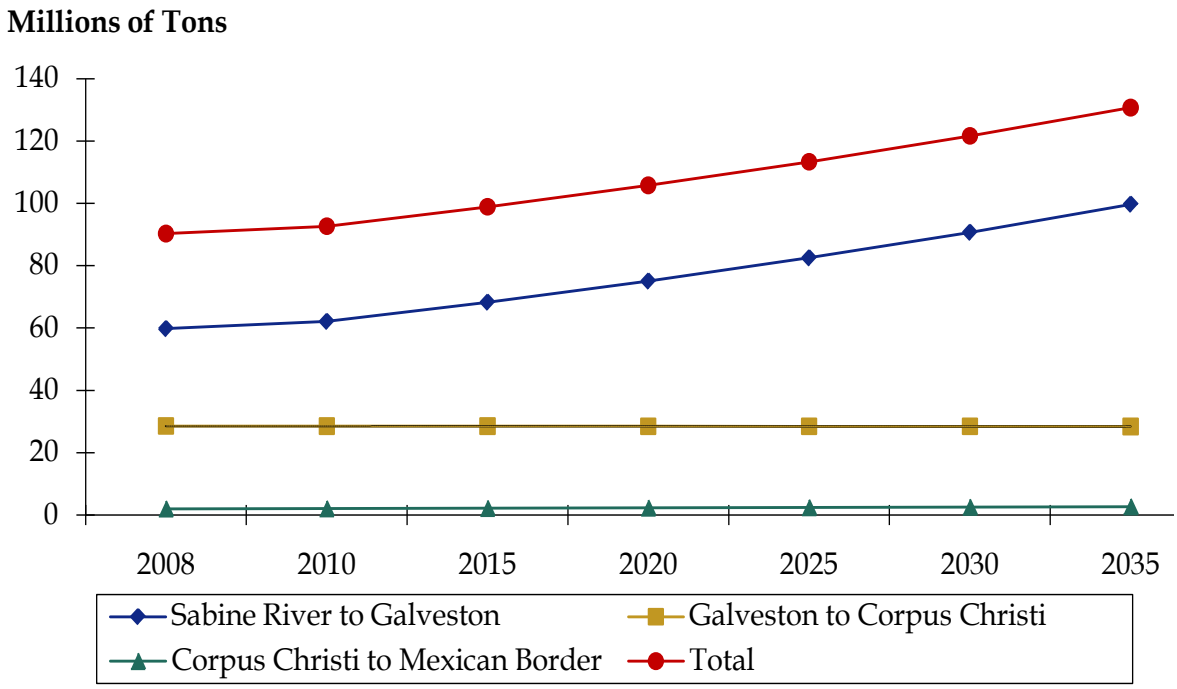


**Figure 3.3 Gulf Intracoastal Waterway Tonnage Forecast**
*2008-2035*




Although the Port of Houston will account for much of this anticipated growth, other Texas ports, notably Port Freeport and the Port of Corpus Christi, will experience significant growth in both general and container cargo over the next 25 years (Appendix H provides port-specific forecast information).

The anticipated growth in container movements is reflective of the strong position of Texas ports (relative to their peers) for capturing a larger share of this market. Expanding Texas and U.S. markets will stimulate increased imports through Texas ports and even faster growth overseas will result in higher demand for both Texas and U.S. exports. Figure 3.4 shows the top trading partners (imports and exports) for Texas ports, led by Europe ($58 billion) and South America ($53 billion). The growing economies of these and other important trading partners (as shown in Figure 3.5) will result in higher relative trade volumes between Texas and East Asia (via the Panama Canal and the Pacific), Mexico, Central, and South America, and the Mideast/Africa. Even regions like Western Europe, whose economy will grow at a much slower rate than other regions, will be important growth markets for Texas ports due to the sheer size of its combined economy.

## Figure 3.4 Key Trading Partners for Texas Ports, 2008
*By Value*

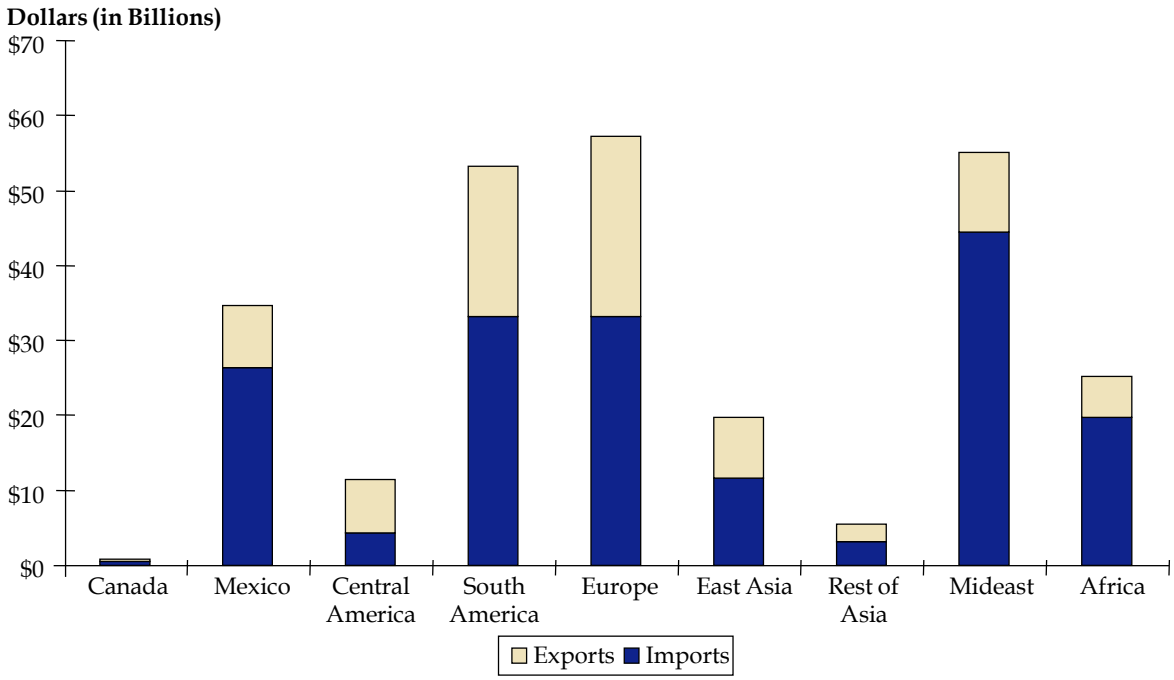
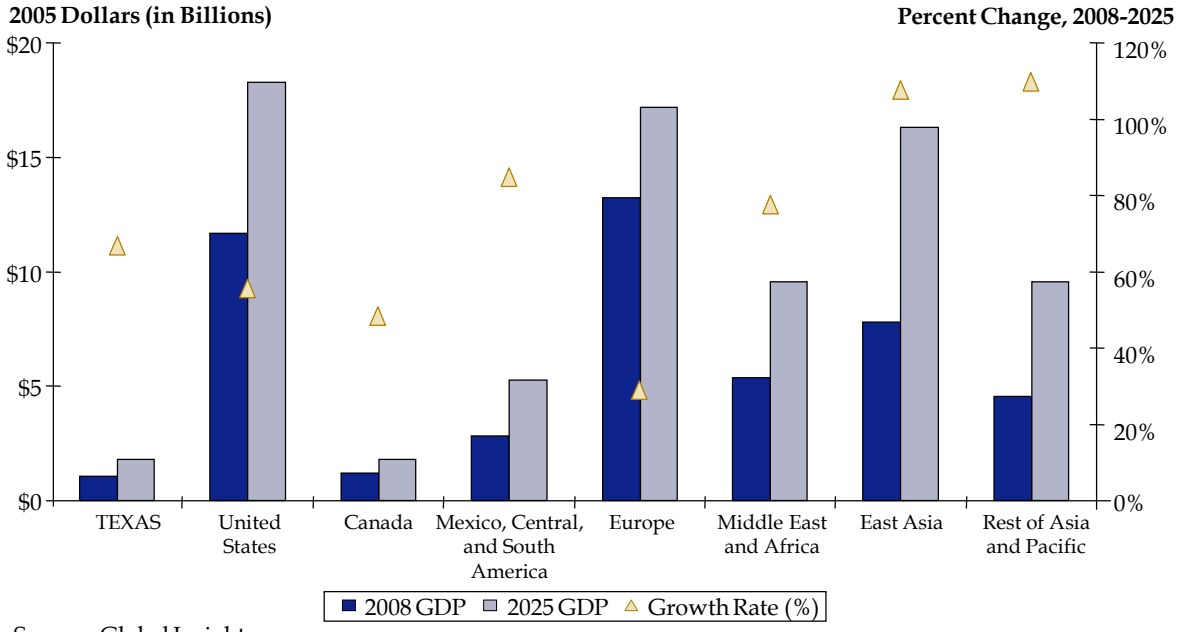


**Figure 3.5 Long-Term Economic Growth of Key Trading Partners**
*2008-2025*




Source: Global Insight.

In addition, the expansion of the Panama Canal, scheduled to be completed during the mid-2010s, is expected to have an effect on world logistics patterns, likely stimulating container traffic on the Texas Gulf Coast. The larger container ships (over 13,000 TEUs) going through the Panama Canal will be more efficient, providing a cost savings for longer distance deep-sea shipping services. By moderating transportation costs, China and other East Asian nations will be aided in their efforts to keep their manufacturers competitive even as labor costs increase. Finally, competition for rail capacity between the West Coast and the interior U.S. is expected to intensify, especially as fuel prices increase and shippers seek to shift products to rail to save costs. These trends will further encourage a shift in container traffic growth to Gulf Coast and East Coast ports.

Continued growth in container traffic will result in freight movements becoming a larger component of the traffic mix within the Gulf Coast region, as these movements favor trucks and railroads as their primary mode of transportation. These increases will have a dramatic impact on the condition, performance, and capacity of both the land- and waterside transportation infrastructure.

# 3.2 Existing Chokepoints Will Affect Ability of the System to Absorb Growth

The Texas port and waterway system generally provides sufficient access to regional, statewide, national, and global markets. However, existing waterside and landside physical and operational chokepoints may prevent this system from effectively absorbing future growth in freight traffic, and will have other economic, social, and environmental impacts.

These chokepoints occur on both the landside and waterside and affect ports and waterways throughout the State. But it is their cumulative effect at the system level that will most significantly impact Texas's ability to effectively balance freight mobility, economic vitality, and community livability demands. The most critical chokepoints must be eliminated to allow the Texas waterborne freight system to absorb the expected growth in freight traffic and continue to play a vital role in the regional and national freight supply and distribution chain.

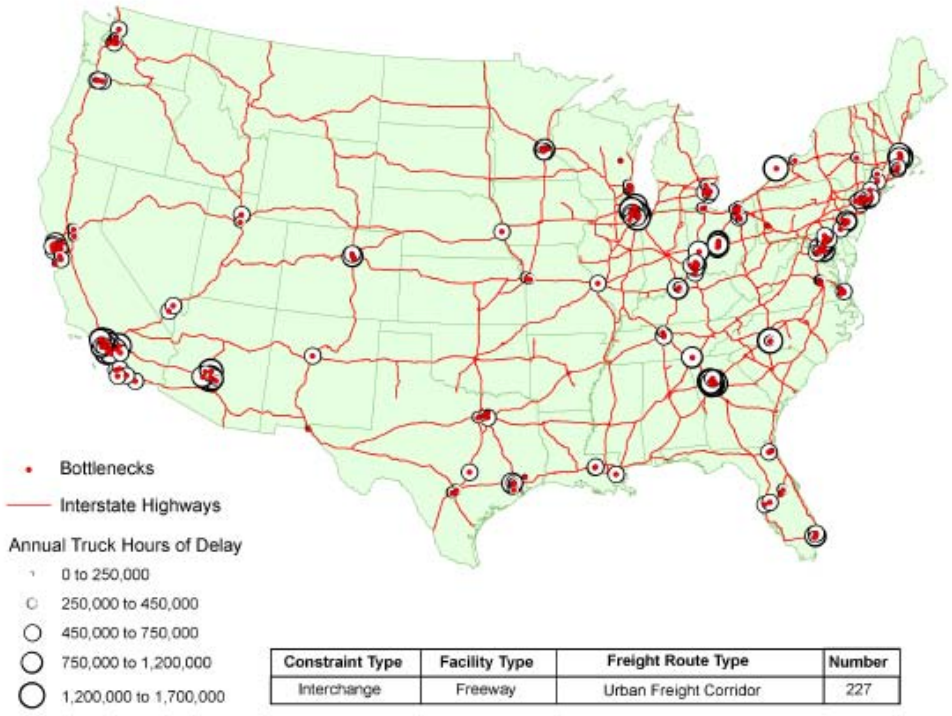
## Landside Chokepoints

Efficient landside access is a primary factor in overall port competitiveness and Texas ports identified landside access as the single most pressing infrastructure issue affecting the State's waterborne system. However, the Texas ports and waterway system is being impacted by three key landside issues: traffic growth along major trade corridors, lack of high-capacity port access routes, and limited rail access.

### *Trade Corridor Volumes*

Texas ports and waterways are being impacted by highway bottlenecks at both the regional and local levels. As shown in Figure 3.6, major highway trade corridors in Texas, including those directly serving major port facilities, already are home to significant freight bottlenecks.

## Figure 3.6 Existing U.S. Freight Bottlenecks



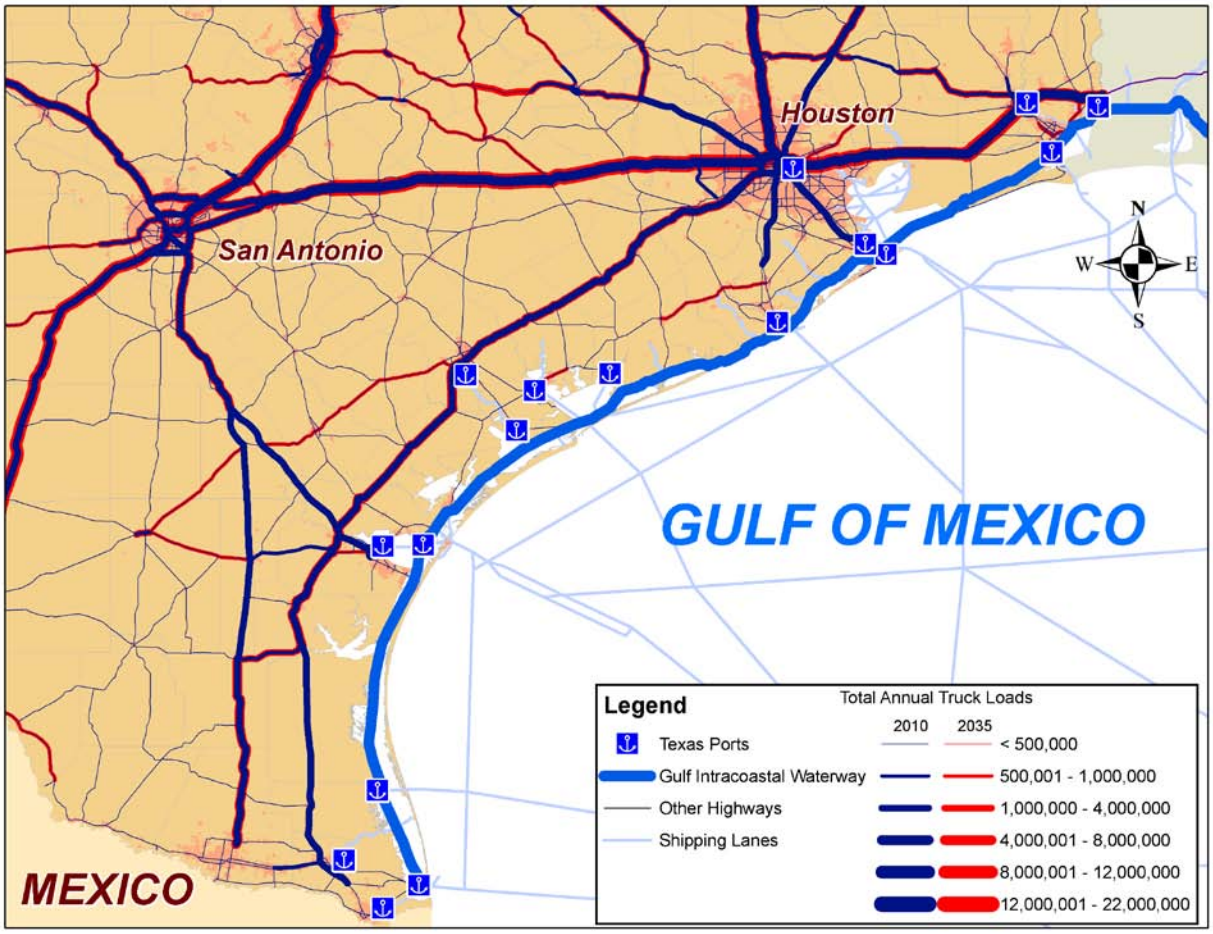

| Constraint Type | Facility Type | Freight Route Type | Number |
|---|---|---|---|
| Interchange | Freeway | Urban Freight Corridor | 227 |

Source: FHWA, "Initial Assessment of Freight Bottlenecks on Highways," 2005.

And as shown in Figure 3.7, truck volumes are expected to grow significantly along the major trade corridors serving the Texas port and waterway system, particularly I-10 and I-69, both of which are Federally designated "Corridors of the Future." Volumes along Interstate 10, which runs across the entire state of Texas, could rise to an average 85,000 ADT and 20,000 average daily trucks traffic (ADTT) by 2035. And projections indicate that average daily traffic (ADT) on Interstate 69, which will connect Laredo and Houston before turning north and east toward Texarkana/Shreveport,[1] could rise to 90,000 with 19,000 trucks.

[1] Specific modal improvements, final route alignments, and project impacts, costs, and mitigation measures are currently being assessed. For more information, see: http://www.keeptexasmoving.com/index.php/i-69-ttc.

**Figure 3.7 Total Annual Truckloads on Key Texas Highway Corridors**
*2010 and 2035*




Source: FHWA Freight Analysis Framework (FAF) Data, analyzed by Cambridge Systematics.

Continued traffic growth – particularly truck traffic growth – along these corridors will make it difficult for some ports, especially those located in urbanized areas, from accessing more distant markets and may also drive up costs for shippers, carriers, and ultimately consumers.

### *Limited Port Access*

Although most ports in the state have direct and sufficient access to these trade corridors, many do not. At the state's largest ports, access roads often are not physically capable of efficiently serving large volumes of truck traffic, and many suffer from inadequate clearances, poor turning radii, and substandard pavement conditions. SH-255, Spencer Highway, and Red Bluff Road in Houston provide examples of these and other issues. Access to these and other ports can also suffer from congestion and incidents along surrounding highway corridors, particularly in urban areas such as Houston and Corpus Christi.

Finally, access to many ports is provided by lower-capacity roadways which may not be sufficient to handle larger volumes of truck traffic and may limit the ability of these ports to attract additional business. For instance, Port Freeport is served by State Highway 288 (which provides access to the Houston metropolitan area and I-10) and State Highway 36 (which provides access to U.S. 59 and points south and west). Large segments of these corridors are low capacity (fewer than six lanes) with few access controls, which can reduce overall efficiency for movements into and out of the Port. This type of access may not efficiently support future growth at the Port, as full build-out of the Port's Velasco Terminal is expected to result in total annual capacity of 800,000 to 1 million TEUs.

Table 3.1 describes existing port access routes and capacity concerns identified by port and waterway stakeholders.

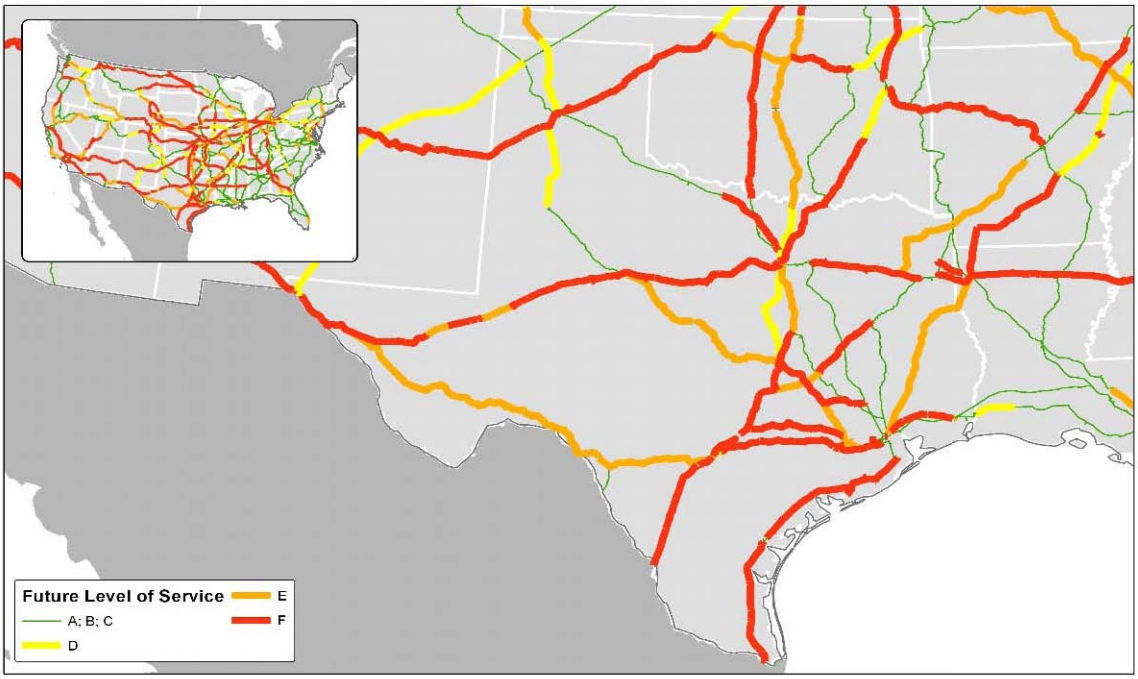
## Table 3.1 Issues and Concerns of Port Access Routes

| Port | Access Route | Key Issues |
|---|---|---|
| Corpus Christi | La Quinta Access Road | Poor connectivity to US 181 (limits access to US 77, US 59) |
| Freeport | FM 523 | Poor pavement condition, limited capacity for trucks |
| | SH 36 | Lack of access controls in many segments |
| | SH 288 | Low capacity, lack of access controls in some segments |
| Houston | Jacintoport Boulevard | Limited capacity, lack of median and shoulders |
| | Spencer Highway and Red Bluff Road | Poor pavement condition, low bridge clearances along some segments, lack of access controls, poor turning radii |
| | SH 146 | Poor pavement condition, congestion issues, grade crossings |
| | SH 225 | Poor connectivity (I-610, Beltway 8), safety issues |
| Texas City | Loop 197 | Limited capacity, access control, poor geometrics for truck traffic |

### *Limited Rail Access*

Texas ports and waterways will similarly be impacted by a combination of national and local rail bottlenecks. Without additional investment, the national freight rail system is expected to be at, or near capacity, within 20 years, as shown in Figure 3.8.

## Figure 3.8 Projected Railroad Level of Service in Texas, 2030




Source: National Rail Freight Infrastructure Capacity and Investment Study prepared for the Association of American Railroads by Cambridge Systematics, Inc.

Source: Association of American Railroads National Rail Freight Infrastructure Capacity and Investment Study.

These capacity constraints will make it difficult for Texas ports to access the national rail system, contribute to delays on the system, and hinder the ability of Texas ports to handle increased volumes. Exacerbating these issues are local rail bottlenecks that are hindering efficient movements into and out of Texas port facilities. Critical rail access issues include:[2]

- **Grade Crossings** – Safety at rail grade crossings is major issue for the Houston greater area and several crossings have been identified as being "hot spots" for auto-train collisions. Conflicts between trains and trucks at grade crossing on the railroad mainlines are creating further reductions in mobility of trucks that serve the Port of Brownsville. The Ports of Texas City and Lavaca also have significant grade crossing issues, as shown in Figure 3.9.

- **Sidings –** Longer and heavier trains also are being used by the railroads to maximize existing capacity and improve efficiency. For example, the BNSF prefers that all their

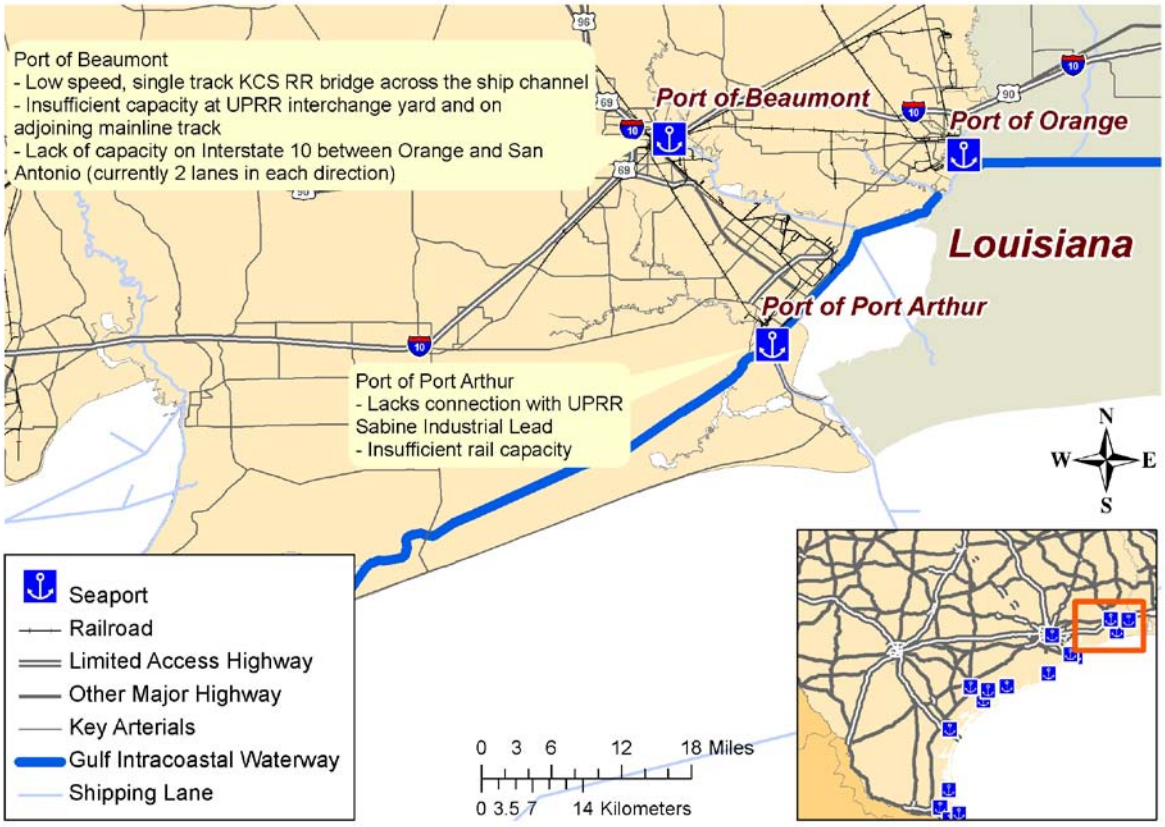
[2] Detailed rail bottleneck information can be found in the TxDOT Houston Region Freight Rail Study (http://www.txdot.gov/project_information/projects/houston/railway/default.htm), and the Corpus Christi-Yoakum Regional Freight Rail Study.

international intermodal shipments be handled in 40-foot well cars and all their intermodal trains are 8,000 feet in length. These changes will allow the BNSF to increase the amount of freight that can be handled over its mainlines without increasing the number of trains. However, the longer trains cannot be handled without lengthening sidings to permit trains to meet and pass; and without providing the corresponding yard capacity to assemble and hold the longer trains. The Union Pacific (UP) rail line between the Port of Corpus Christi and the Brownsville area subdivision currently is not equipped with rail siding to marshal, store, load, and unload vehicles. Furthermore, rail freight is moved between Port Lavaca and the UP railroad Angleton Subdivision over a 14-mile port industrial lead, also with no sidings (Figure 3.10).

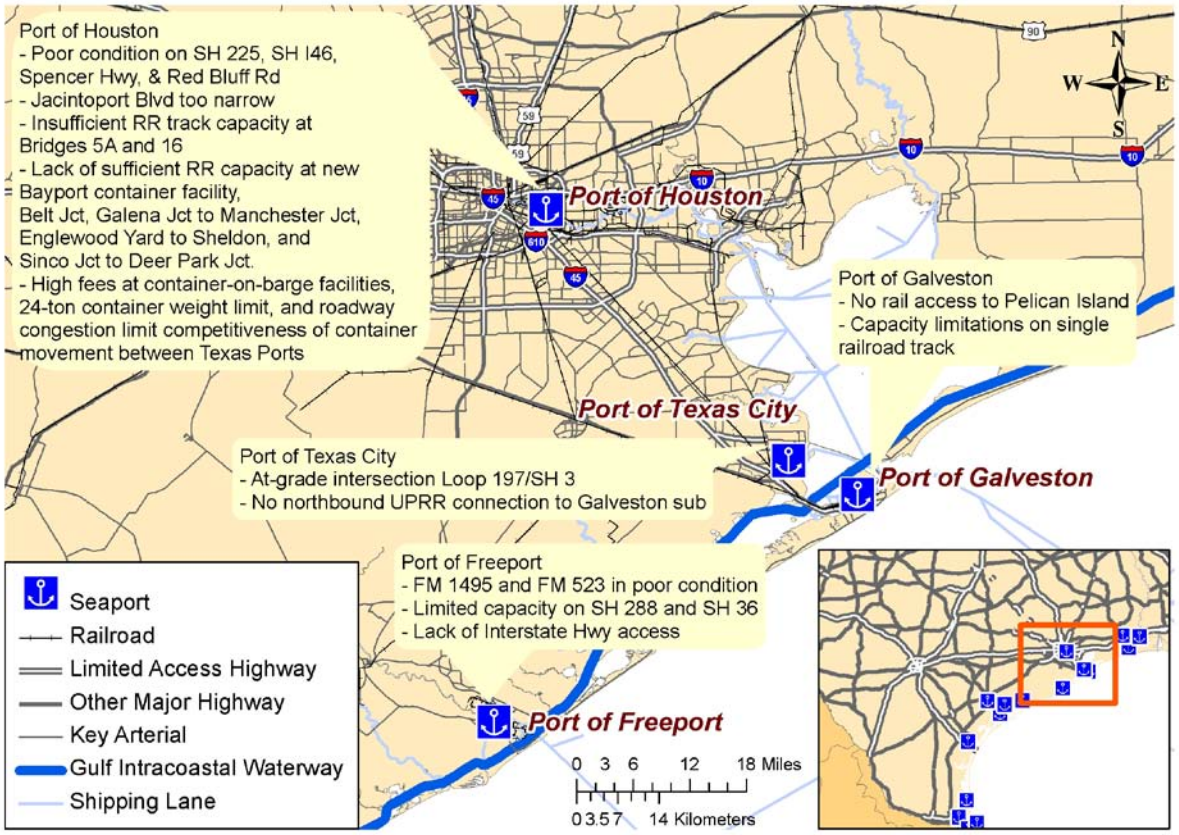
- **Rail Yard Capacity –** Increasing amounts of freight are straining capacity at rail yards. In many parts of the state. For instance, over 95 percent of all freight trains moving in the Houston region must stop to pick up or drop off cars. Yard capacity is also a concern at the UP railroad interchange yard at the Port of Beaumont (Figure 3.11).

Figures 3.9 through 3.12 summarize the most critical landside access issues (both rail and highway access) affecting Texas waterborne freight system, which were identified by a combination of quantitative analysis of freight demand and expected capacity, as well as interviews with Texas port and waterway stakeholders.

## Figure 3.9 Landside Chokepoints – Sabine-Neches Area



## Figure 3.10 Landside Chokepoints – Houston-Galveston Area



## Figure 3.11 Landside Chokepoints – Central Coast Area

## Figure 3.12 Landside Chokepoints – South Texas Area

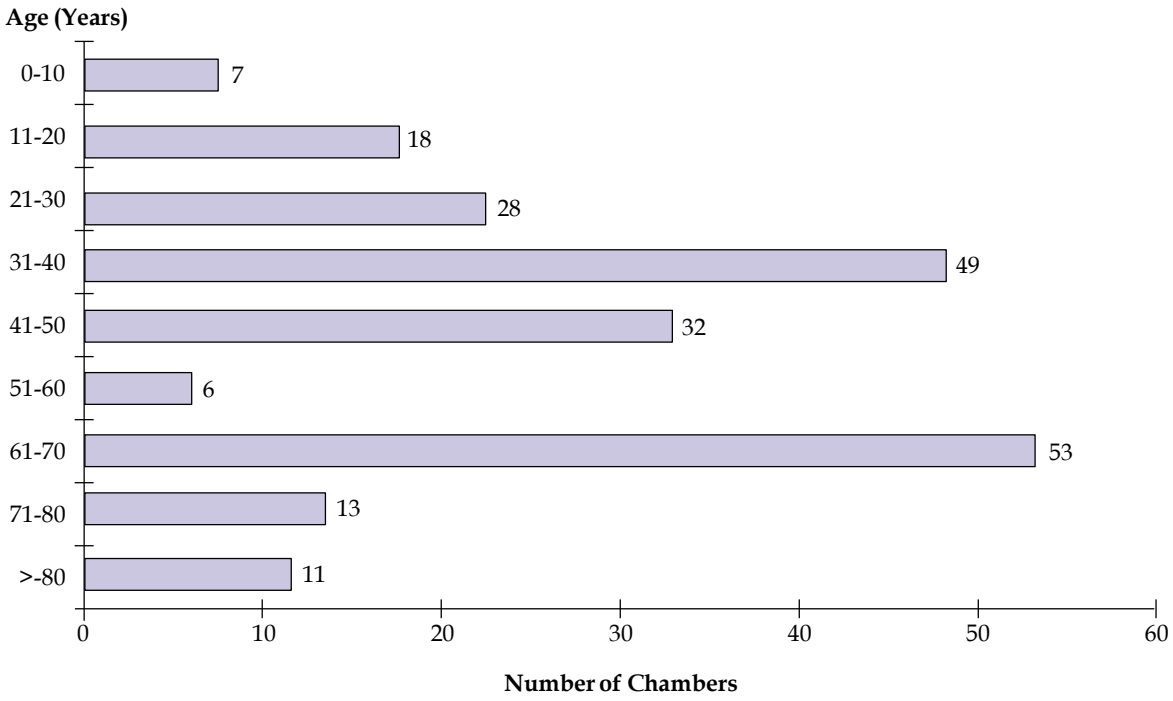

## Waterside Chokepoints

On the waterside, the inland and intracoastal waterway system in both Texas and throughout the country is generally considered reliable, but faces increasing challenges as the system ages and dredging becomes more expensive. Critical waterside chokepoints include aging locks, channel depths, and span widths and clearance issues.

### *Aging Locks*

Many of the locks along the nation's inland waterway system were constructed in the early part of the 20th Century. As shown in Figure 3.13, most of the nation's locks are at least 30 years old, many are more than 60 years old, and many states have identified unmet lock and dam maintenance needs as being among their most critical concern.

## Figure 3.13 Age of Inland Waterway Locks (National Summary)




Source: Transportation Research Board, 2004.

The Brazos River Floodgates and Colorado River Locks are of particular concern, as these facilities are increasingly unsafe for modern barge traffic along the GIWW. At two locations along the Texas portion of the GIWW, the Colorado River Locks and the Brazos Floodgates (both more than 50 years old), barge tows must be broken up and tripped through separately and reassembled on the other side because they exceed the 75-foot width of the locks. This process adds a great deal of time and expense to barge shipments using the waterway, estimated at an additional cost of over $2 million in 2006.[3]

The Brazos Floodgates present a serious safety hazard as well, with vessels entering the GIWW via the western floodgates being pushed underwater by strong currents in the location,[4] as shown in Figure 3.14.

[3] Gulf Intracoastal Waterway – Legislative Report to the 81st Legislature (2008) Texas Department of Transportation.

[4] Ibid.

## Figure 3.14 Hazardous Condition at Brazos River Floodgates

Source: Texas DOT, GIWW Legislative Report, 2007.

### *Channel Depths and Widths*

The GIWW, along with its tributaries, require some degree of maintenance, similar to periodic road repairs. Over time, the depths and dimensions of navigable waterways can change due to or the action of wind, waves, currents, and rain that causes the bottom of the waterway system to be filled with sediments storms, and maintenance dredging is needed to restore the appropriate dimensions. Additionally, as the dimensions of vessels used in marine transportation change over time, the standards for the dimensions of navigable waterways must be upgraded.

The inability to maintain channel depths can have a number of impacts, including reductions in overall volumes, safety, operational, and efficiency concerns related to passing restrictions, and even modal shifts that could result in reduced capacity along parallel highway or rail corridors. In the best case, waterway segments are passable but restricted to shallower-draft vessels carrying reduced loads, or to barge tows of limited size; in the worst case, waterway segments become unusable for their intended purpose.

Channel deepening and dredging are needs cited by several ports, including the Ports of Corpus Christi, Freeport, Galveston, and Houston. The new generation of containerships, including many of the post-Panamax ships that will be attracted to the expanded Panama Canal, typically require channel depths of at least 50 feet, particularly for fully loaded vessels. Few Texas ports currently have the ability to handle ships of that depth. Although at 45 feet, the Port of Houston will have one of the deeper channels among Gulf Coast ports, it will still lag behind several of its major East Coast competitors for containerized traffic, including the Port of New York/New Jersey, which has plans to increase its depth to 50 feet, and the Port of Hampton Roads (Virginia), whose channel already is at a depth of 50 feet.

The current depth and width of the Matagorda Ship Channel is also a concern. With opening depth of 35 feet and a width of 200 feet, the Channel currently restricts deep water waterborne movements to only one-way traffic and can only accommodate first generation ships with engineering designs dating back to the early 1960s. These restrictions are resulting in significantly higher transportation costs for Calhoun County industries and therefore negatively impacting the cost of doing business for the County and region. In 2006, the Calhoun Port Authority estimated that over 93 percent of deep draft vessels currently transiting the Matagorda Ship Channel must be light-loaded.

Finally, depth and width limitations also are concern along the GIWW. While the base width of the navigable channel in the GIWW is 125 feet at a depth of 12 feet, barges are authorized to travel at a width of 108 feet. When barges must pass each other, they must utilize the waters outside of the authorized channel. In some cases barges operate on the bank of the channel to provide enough space for the pass to be made. Several other locations where width limitations are affecting operations are the High Island Wiggles (Sabine-Neches Area), Caney Creek Wiggles (Central Coast Area) and the Freeport Wiggles (Houston-Galveston Area). Barge tows are slowed at these locations because of one-way traffic and the many curves that necessitate slow speeds. In addition, some sections of the GIWW are currently only 8 feet deep, significantly reducing the load capacity of barges and increasing waterway traffic.

Adding in the use of the waterway by fishermen, recreational users, and waterfront development, there is constant activity and/or conflicts occurring outside the constructed channel. These factors have led many to believe that the current dimensions of the GIWW and its associated structures do not adequately support modern barge transportation needs.

### *Span Widths, Height, Alignment, and Clearance*

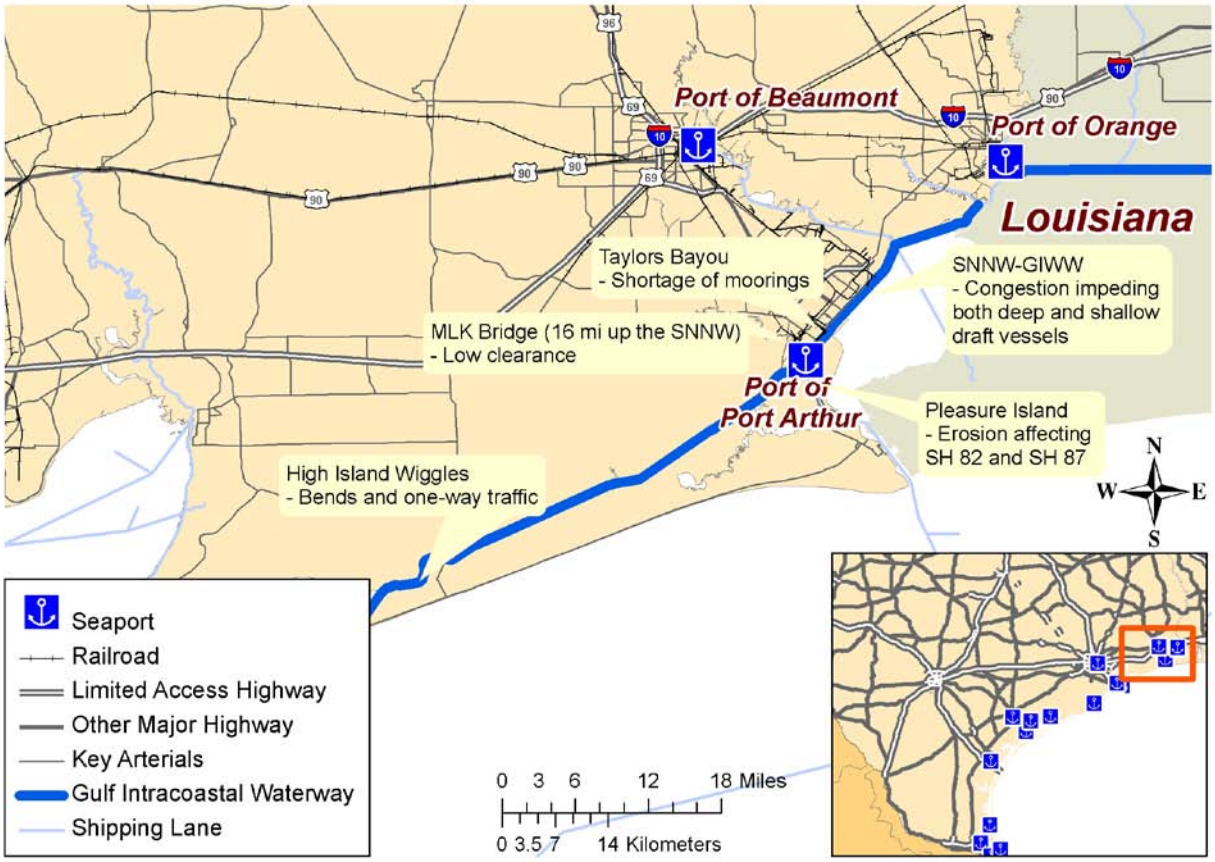
Along with the breath limitations of at the Colorado Locks and the Brazos Floodgates, mentioned previously, the Galveston Railroad Bridge is a serious chokepoint for barge shipments moving on the GIWW. The 105 feet opening through which barge traffic must pass under the bridge has been identified by the towing industry as the greatest navigation hazard along the entire length of the GIWW.[5]

In addition to the physical dimensions (depth and breadth) of the GIWW and its tributaries, there also is the need for more "air draft" in many locations. Air draft is the unobstructed area between high water and an overhead clearance. The Corpus Christi Harbor Bridge and the Martin Luther King Bridge, 16 miles inland on the Sabine Neches Waterway, are two locations where limited air draft is impacting operations.

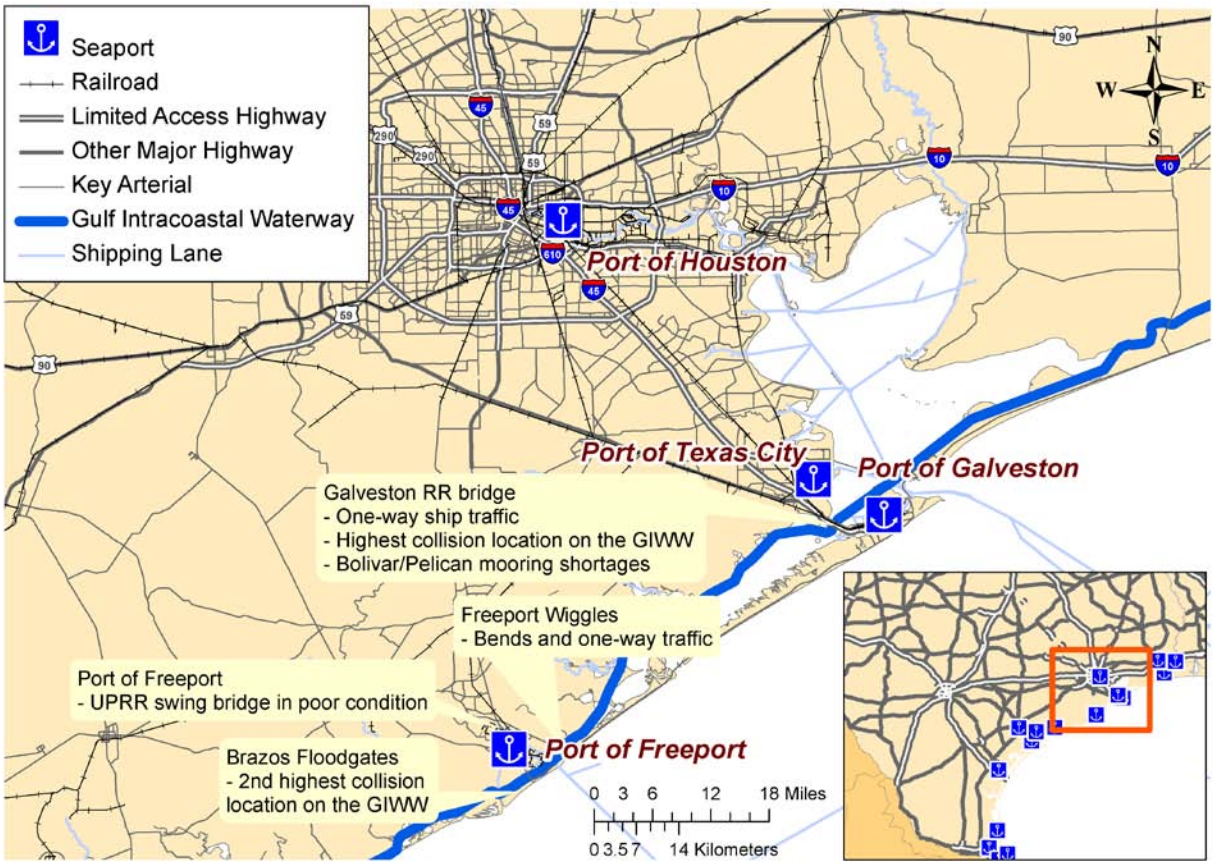
[5] Gulf Intracoastal Waterway – Legislative Report to the 81st Legislature (2008) Texas Department of Transportation.

Figures 3.15 through 3.18 illustrate the major waterside chokepoints – aging locks, clearance, alignment, channel depth and width issues – affecting waterborne freight movements in Texas. Again, these were identified by a combination of quantitative analysis and interviews with Texas port and waterway stakeholders.

## Figure 3.15 Waterside Chokepoints – Sabine-Neches Area



## Figure 3.16 Waterside Chokepoints – Houston-Galveston Area



## Figure 3.17 Waterside Chokepoints – Central Coast Area

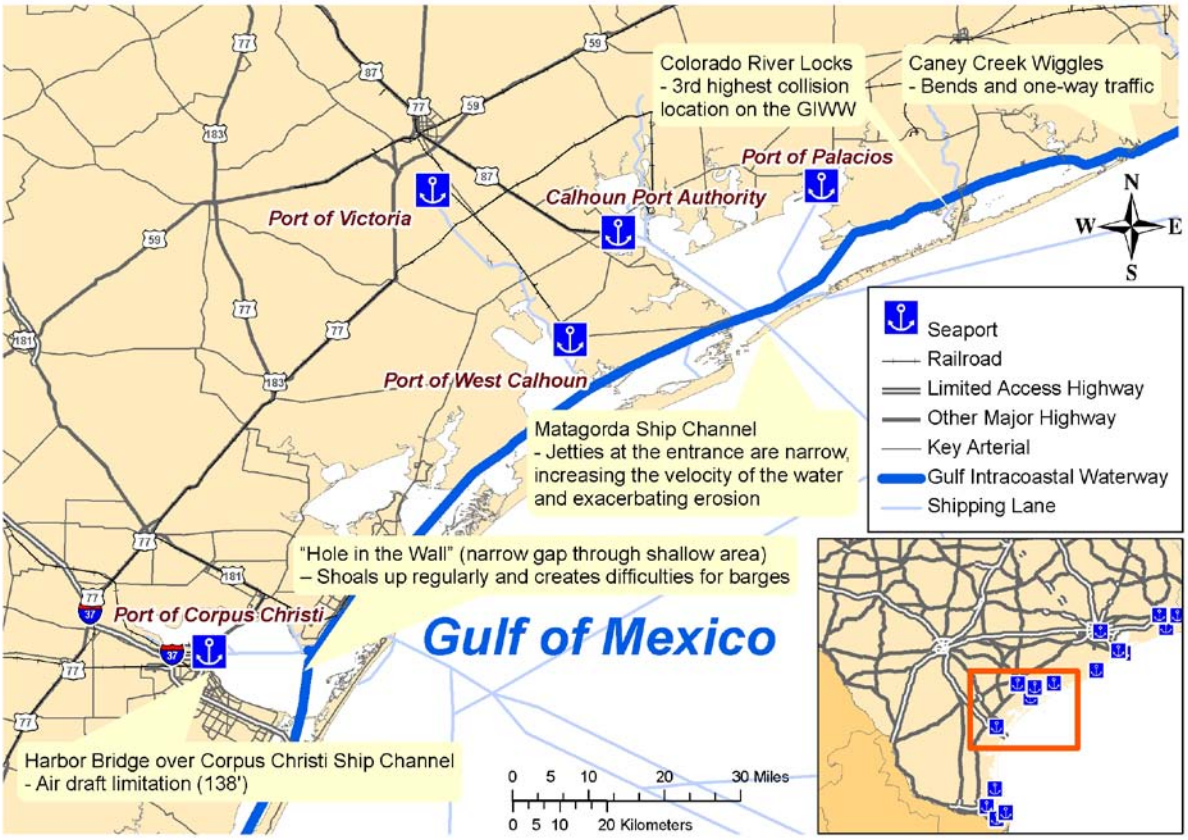


**Figure 3.18 Waterside Chokepoints – South Texas Area**


## ■ 3.3 Institutional Issues Make it Challenging to Add Capacity to the System

The anticipated growth in freight activity at Texas ports and along the State's waterway system is encouraging many port and waterway stakeholders to undertake significant capacity enhancement, maintenance, and operational improvement projects. Over $65 million in Federal funding was spent by the U.S. Army Corps of Engineers during 2007 and 2008 on Federally contracted and funded projects to maintain the navigability of the Texas portion of the GIWW.[6] Over 5.5 million cubic yards of sediment were dredged in four separate projects during 2007 and approximately 4.3 million cubic yards of sediment were dredged in 2008.[7] And the Ports of Beaumont, Corpus Christi, Freeport, Galveston,

[6] Gulf Intracoastal Waterway – Legislative Report to the 81st Legislature (2008) Texas Department of Transportation.

[7] Ibid.

Houston, Orange, and Victoria are undertaking major land development and expansion activities that are likely to affect waterborne trade in the region and the State's overall economy.[8]

Clearly, Texas port and waterway stakeholders understand the importance of investing in the waterborne freight corridor system. However, the ability to quickly, effectively, and equitably enhance the overall capacity and efficiency of the system is hindered by a variety of institutional issues and constraints, i.e., key social, financial, legal waterfront development, and environmental matters that combine to limit the ability of Texas port and waterway stakeholders to add or enhance system capacity in a meaningful way.

## Lack of Reliable Funding Sources

The waterborne transportation system faces a lack of reliable funding sources at both the Federal and State Levels, as described below.

### *Federal Funding*

Federal funding for the maritime transportation system comes from a combination of sources, including:

- **Inland Waterways Trust Fund**, which takes in revenues from a tax levied on diesel fuel used in inland waterborne commerce and distributes the funds to pay for up to half the cost of eligible inland waterway projects.

- **Harbor Maintenance Trust Fund**, an ad valorem tax levied on imports or moved domestically through Federally maintained channels and harbors and deposited into the Harbor Maintenance Trust Fund.[9]

- **Port security grants**, which provide funding to port areas for the protection of critical port infrastructure from terrorism. Texas is home to three Group 1 (highest risk) ports (Houston, Galveston, and Texas City), and four Group 2 ports (Corpus Christi, Port Arthur, Port of Beaumont, and Port Freeport).

However, fund disbursements from both the Inland Waterway and Harbor Maintenance Trust Funds require annual appropriations from Congress, which has not appropriated the full amount of the Harbor Maintenance Trust Fund for many years nor appropriated any funds from the Inland Waterway Trust Fund since the late 1980s.

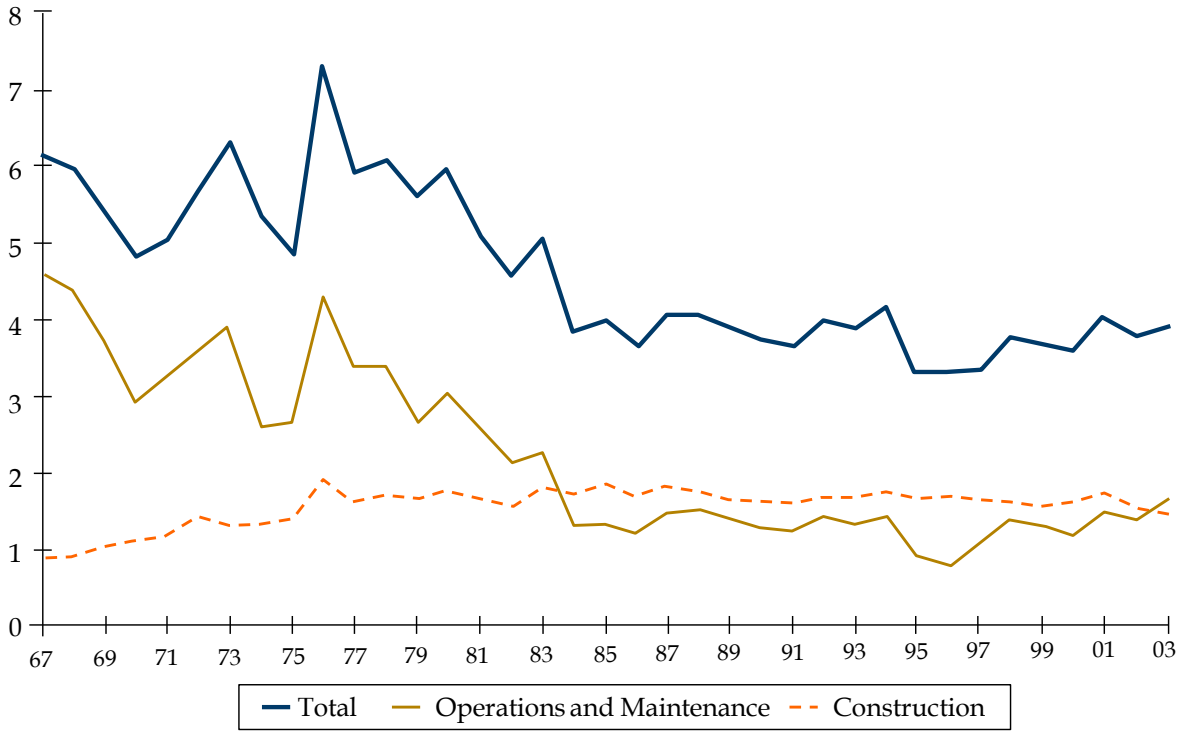
As a result, Federal expenditures on the waterway system have not been sufficient to fully address needs. As shown in Figure 3.19, in constant dollars, appropriations to the Army

[8] Detailed information on Port and Waterway expansion projects is provided in Appendix F.

[9] The levy on exports was declared unconstitutional in 1988.

Corps for waterway improvements and maintenance have been dropping. Over the same period, as the system has aged and demand has grown, USACE's estimated operations/ maintenance and construction backlogs have grown to $772 million and $44 billion, respectively.[10]

**Figure 3.19 USACE Civil Works Appropriations 1967-2003**
*Constant (FY 95) Dollars*

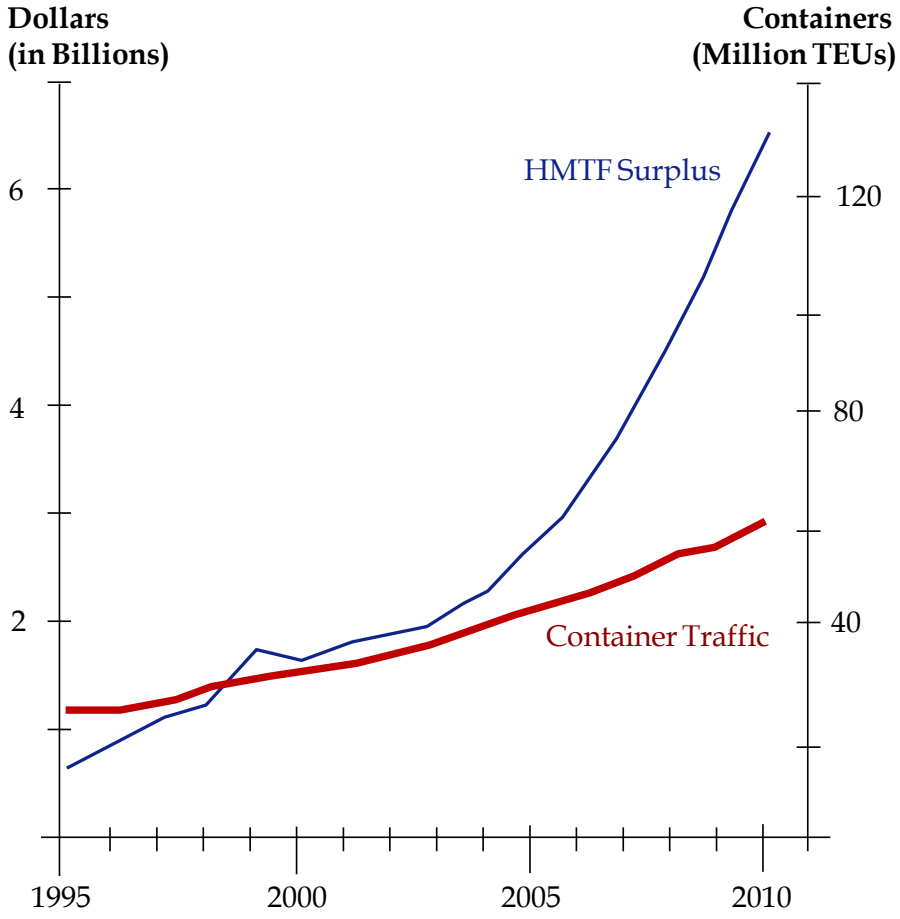



Source: U.S. Army Corps of Engineers

In fact, the American Association of Port Authorities (AAPA) projects significant surplus in the Harbor Maintenance Trust Fund, as shown in Figure 3.20.

[10]Department of the Army Corps of Engineers, *Civil Works Strategic Plan FY 2004 to FY 2009*, March 2004.

# Figure 3.20 AAPA Projection of Growth in the HMTF Surplus




Source: American Association of Port Authorities.

The lack of a reliable Federal funding stream has caused the system to be increasingly dependent on appropriations from the Treasury's general fund. In fact, between 1999 and 2001, about 80 percent of Federal expenditures on the marine transportation system came from the general fund.[11] This complicates project planning and programming since general fund surpluses fluctuate a great deal from year to year, making it impossible to predict with any certainty whether a given project will be funded.

[11] U.S. General Accounting Office, *Federal Financing and a Framework for Infrastructure Investments*, September 2002.

### *State Funding*

TxDOT is the designated non-Federal sponsor of the GIWW in Texas. In this capacity, TxDOT coordinates with the USACE (the Federal sponsor) to provide all necessary lands, easements, relocations, right-of-way and disposal areas required for new construction and regular maintenance of the GIWW. TxDOT also reviews dredge placement plans, environmental documents, and other technical documents provided by the Corps.

Recognizing this role, as well as the importance of the Texas port and waterway system to the statewide economy, in 2001, the Texas Legislature created the Port Access Account Fund, which is a line item in the general revenue fund that can be appropriated to TxDOT to fund port and waterway projects. However, to date the Legislature has not appropriated any money for the fund; therefore, the projects contained in the Port Capital Program represent unfunded needs. The most recent Port Capital Program, for the 2009-2010 biennium, identified 71 projects worth $546 million.[12]

## Environmental and Security Mandates Increase Costs

There are a variety of state, Federal, and local agencies involved in the planning and approval of port and waterway improvements. Interlocking requirements for coordination among Federal, state, and local agencies, along with permit and environmental approvals, can significantly expand the time required to plan and implement projects, often driving up the cost of a project significantly. Although these reviews and approvals serve an essential function, the costs of the reviews themselves, in dollars, time to complete, and uncertainty, are substantial. Changes in practices and policies that engage affected stakeholders and communities earlier and more consistently in the process and encourage collaboration and consensus building may ultimately shorten delivery time and reduce the difficulty of efficiently matching capacity to demand.[13]

Expansion of freight facilities in existing locations also can create other serious environmental and environmental justice concerns, as these facilities are usually located in environmentally sensitive waterfront or urban areas and access improvements may generate additional truck or rail trips in air quality non-attainment regions. Freight-related pollutants, and in particular $NO_x$, and particulates ($PM_{2.5}$), make it harder to attain health-based national, state, and regional air quality goals, and many goods movement sources are regulated Federally, not at the state level. The Houston-Galveston-Brazoria region is facing a Federal attainment date of 2019 for the eight-hour ozone standard and new diesel engine standards (for trucks, non-road equipment, locomotives, and maritime equipment) will be fully phased in by 2020.[14] And the Beaumont-Port Arthur region, while in

[12]Texas Department of Transportation, *Texas Ports 2009-2010 Capital Program*.

[13] Transportation Research Board, *Freight Capacity for the 21st Century.*

[14]Houston-Galveston Area Council, Port of Houston Authority.

compliance with the 1997 ozone standard, is marginally noncompliant with the new standard.[15] The Port of Houston Authority and the Port of Corpus Christi, through their Clean Air Strategy Plan and Environmental Management System (respectively), are working with public and private stakeholders to reduce emissions from maritime- and goods movement-related industries.

Finally, through the creation of the Department of Homeland Security, the enactment of legislation, such as the Marine Transportation Security Act (MTSA), and the publication of rules and regulations governing security of the nation's seaports and waterways, the Federal government has taken the lead in addressing the security of the nation's freight shipments. In many cases, however, the costs of these additional security requirements have trickled down to states, metropolitan areas, and port authorities, who have been forced to hire additional police, fire, and rescue personnel, increase overtime hours for existing personnel, and make significant investments in security-related infrastructure and operational improvements, often at the expense of capacity enhancements.

## Balancing GIWW Private Property Rights and Navigation Interests

Continued population growth in Texas, coupled with the increasing desirability of water-front property, has led to a development boom of private property along navigable waterways. Marinas, residential developments, docks, piers and other shoreline modifications are occurring throughout the coastal regions of the State. As more projects are developed, safety issues are developing for navigation interests as the navigation channels become restricted and congested.

Although TxDOT has discussed this issue with the work groups of the Texas Coastal Management Program[16] and the USACE, the ability to control shoreline development along navigable waterways has been limited and TxDOT itself has little or no power to control land uses. In addition to safety concerns at points where commercial and recreational traffic comingle, continued development along the GIWW may hinder efforts to increase freight capacity and absorb additional freight demand along the GIWW.

## Port and Waterway Issues Not Comprehensively Incorporated within Existing Planning and Programming Processes

As described earlier, TxDOT is the non-Federal sponsor of the GIWW, charged with working with other stakeholders to maintain the Texas portion of the waterway. In addition to this role, the Texas statute requires TxDOT to engage the Port Authority

[15]Southeast Texas Regional Planning Commission. Formal designation is expected from EPA in August 2011.

[16]The Coastal Management Program includes a forum for the coordination of federal, state, and local programs and activities along the Gulf Coast.

Advisory Committee (PAAC) when developing or implementing policies that affect the Texas port system. This committee, required by Texas Statute,[17] provides a forum for the exchange of information between the port industry, TxDOT, and Texas Transportation Commission. Advice and recommendations from the committee provide broad guidance to TxDOT and the Commission when developing policies that affect the Texas port system.

But while TxDOT has been commendably engaged in port and waterway planning in the past, current efforts are primarily focused on routine maintenance (e.g., of the GIWW) and keeping up with landside infrastructure investments necessitated by port expansions. However, this approach is essentially reactive rather than proactive, and both waterside and landside investments receive comparatively little attention in statewide transportation planning. For instance, the Unified Transportation Plan only includes waterway investments in the preservation section; even these are informational only and subject to separate approval by the Texas Transportation Commission. The PAAC, as its name implies, is advisory only. As a result, port and waterway issues often are not viewed as a normal component of the TxDOT transportation planning program, making it more difficult for potential improvement projects to be included in discussions of statewide or regional transportation priorities or to compete for funds and planning resources.

Meanwhile, neighboring Gulf Coast states are incorporating port and waterway issues within their existing planning and programming activities. In many cases, these states are employing a variety of institutional arrangements and funding programs in order to support waterway and port investments and, by extension, their statewide and regional economies. By investing in their own systems, these states are positioning their ports to capture anticipated growth in freight traffic, and collectively pose a threat to the ability of Texas ports to capture additional market share. These programs include:

- **Florida Seaport Transportation and Economic Development (FSTED) Council**, a public entity charged with implementing the State of Florida's economic development mission by facilitating the implementation of seaport capital improvement projects at the local level through financing port transportation projects on a 50-50 matching basis. It was established as an alternative to the traditional Department of Transportation port funding program because of the importance of Florida's international trade to the State's economic progress and the need for additional capacity at the State's 14 public deepwater seaports to satisfy customer demand and compete in the fast-paced global marketplace. The Council was created within the Department of Transportation and consists of the port directors of the 14 publicly owned seaports and a representative from the Department of Transportation, the Department of Community Affairs, and the Governor's Office of Tourism, Trade and Economic Development. By explicitly linking port improvements to economic development goals, the FSTED Council helps to put port and waterway projects on equal footing with other transportation modes when competing for scarce funding.

[17] Section 55.006.

- **Louisiana Port Construction and Development Priority Program**, which provides State funding for the construction of port infrastructure with the goal of creating or retaining jobs and improving the State's quality of life. It is limited to construction, improvement, capital facility rehabilitation, and expansion of publicly owned port facilities (including landside investments such as intermodal terminals and port industrial parks). This program is normally funded at $20 million per year, but in 2008 it received $42.3 million. As of 2007, over $335 million had been allocated under the program to 160 port and waterway projects.[18]

- **Mississippi State Port Authority** is an Enterprise Agency of the State of Mississippi and is responsible for the daily operations of the Port of Gulfport Mississippi, the third largest container handling port on the Gulf Coast. Gulfport is undertaking a $1.5 billion expansion to repair damage caused by Hurricane Katrina, as well as enhance the overall capacity of the port to handle both breakbulk and containerized cargo. Funding is being provided by a variety of state and Federal sources, including the Federal Emergency Management Agency (FEMA) and Community Development Block Grants targeted to the Port,

- **Mississippi Multimodal Transportation Improvement Program**, a grant program targeted at operators of Federally funded transportation services. The Mississippi DOT selects projects for funding based on a competitive application process. The program awards approximately $5 million annually, of which, Mississippi ports receive 58 percent or $1.9 million annually for capital improvements.[19]

[18] Kruse, C.J.; Morgan, C.A.; and Hutson, N. *Potential Policies and Incentives to Encourage Movement of Containerized Freight on Texas Inland Waterways*. Texas Transportation Institute, Texas A&M University, March 2009.

[19] Ports Association of Louisiana, 2007.

# 4.0 Conclusions

This section presents the conclusions of this phase of the study, which were developed from the analysis of transportation, socioeconomic, and domestic and international trade trends described earlier, and from the identification and description of key chokepoints, constraints, and issues affecting the Texas port and waterway system.

**The Texas waterborne freight system plays a critical role in supporting strategic statewide, regional, and national industries.**

The Texas port and waterway system – both the GIWW and the ports and terminals that it serves – provides a critical gateway for freight traffic entering and leaving the country while also serving domestic trade traffic between important markets in the Gulf Coast and the rest of the U.S. Texas ports 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. Nearly 60 percent of all oil consumed in the U.S. is imported (approximately 12 million barrels per day),[1] and roughly one-quarter of all imported oil enters the United States through Texas ports. Most of the State's 27 refineries are clustered near major ports along the Gulf Coast, including Houston, Port Arthur, and Corpus Christi. 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 the State. In addition, these ports also handle commodities that play vital roles in ensuring the diversity and vitality of the statewide and national economy, including consumer goods, cotton, grain, and chemical products.

Texas is a key driver of the national economy, responsible for about one-eighth of the national increases in gross domestic product (GDP) in recent years. Texas industries, which are much more resource-, manufacturing-, and logistics-oriented than their counterparts in other states, rely on a safe, reliable, and efficient waterborne freight transportation system to ship raw materials, components, and finished products to markets within the region as well as to other locations within the U.S. and throughout the world. These industries also provide a significant number of jobs and income to Texans working for the businesses that process, ship, and deliver goods. Overall, these and other industries have helped drive the overall gross state product (GSP) to $1.2 trillion in 2008, making Texas the 12th largest economy in the world.

[1] Congressional Research Service Report RS22332, 2005.

**Demand on the system will continue to grow.**

Texas population and employment levels are growing significantly. The State is expected to reach a population of 35.8 million by 2040, roughly the size of present-day California, and employment growth is expected to grow apace. The Texas Gulf Coast will be leading much of this growth – Gulf Coast counties[2] are expected to grow by more than 60 percent and account for will account for over one-third of the State's overall population at 12.2 million residents by 2040.

Economic growth of and infrastructure investments by other states and countries – and their impacts on global trade, transportation, and logistics patterns – will also increase demand on the Texas ports and waterways system. Texas ports' top trading partners include the fast-growing economies of South and Central America, East Asia, and the Mideast/Africa. Even in the midst of the 2007-2009 global economic recession, these economies are expected to grow by 30 to 120 percent by 2025. In addition, the expansion of the Panama Canal, scheduled to be completed during the mid-2010s, is expected to significantly increase container traffic on the Texas Gulf Coast, particularly in Houston and Corpus Christi. Overall, these and other trends will result in significant increases in general cargo tonnage (expected to grow by approximately 51 percent, to nearly 800 million tons, by 2035); in containerized traffic (expected to nearly triple, to approximately 5.6 million TEUs, by 2035); and in tonnage moving along the GIWW (expected to grow by 48 percent, to nearly 131 million tons, by 2035).

**Existing chokepoints and issues may not allow the system to absorb future growth.**

Although the Texas waterborne freight system is adequately managing existing demand, there are several physical, operational, and institutional issues (both landside and waterside) that may, individually or collectively, hinder the ability of the system from effectively serving expected growth in freight traffic and result in other economic, social, and environmental impacts. These chokepoints include inadequate channel depths, widths, and clearances, limited or constricted port access routes, and bottlenecks on mainline highway and rail networks that are critical in serving port-related traffic.

Exacerbating the impacts of these chokepoints is the fact that Texas population and employment growth will be concentrated in the Gulf Coast region, also home to many of the region's key international trade gateways, the GIWW, and its largest ports. This growth, coupled with the increasing desirability of waterfront property, has led to a development boom of private property along navigable waterways, which already

[2] Orange, Jefferson, Chambers, Harris, Galveston, Brazoria, Matagorda, Jackson, Calhoun, Victoria, Refugio, Aransas, San Patricio, Nueces, Kleberg, Kenedy, Willacy, and Cameron.

contribute to safety and navigation concerns and will make it difficult to implement system expansion and maintenance projects in some areas. And while many Texas port and waterway stakeholders already have undertaken or plan to undertake significant capacity enhancement, maintenance, and operational improvement projects on the GIWW and at individual ports and terminals, the ability to quickly, effectively, and equitably enhance the overall capacity and efficiency of the system is hindered by a variety of institutional issues and constraints, i.e., key social, financial, legal, and environmental matters that combine to limit the ability of Texas port and waterway stakeholders to add or enhance system capacity in a meaningful way.

Continued growth in freight demand, coupled with the fact that the environmental, social, security, and financial costs of adding capacity to the system continues to rise, will require the physical, operational, and institutional issues affecting the Texas waterborne freight system to be appropriately addressed. Not addressing chokepoints and issues will have significant impacts on the State's transportation system and economic competitiveness.

**TxDOT, along with its regional, local, and private sector partners, should proactively address these challenges.**

The cumulative effect of infrastructure, operational, and institutional chokepoints at the system level will significantly impact Texas's ability to effectively balance freight mobility, economic vitality, and community livability demands. The most critical chokepoints must be eliminated to allow the Texas waterborne freight system to absorb the expected growth in freight traffic and continue to play a vital role in the regional and national freight supply and distribution chain. Not addressing these issues may pose a threat to the ability of Texas ports to capture additional market share, particularly when many other Gulf Coast states are employing institutional arrangements and funding programs in order to support waterway and port investments and, by extension, their statewide and regional economies.

TxDOT, already the non-Federal sponsor of the GIWW, should take a leadership role in working with regional, local, and private sector partners to address these challenges. A critical first step is to develop infrastructure, operational, and policy solutions to these bottlenecks and needs, describe the costs of benefits of these solutions, and develop a phased implementation strategy for consideration by TxDOT and other stakeholders. Developing a better understanding of the types of improvements that are required and how they relate to each other, as well as their economic, mobility, and environment benefits and how they will accrue to different public and private port and waterway stakeholders, will allow the State to identify the most critically-needed improvements as well as how costs and responsibilities should be shared.