U.S. Army Corps
of Engineers
Galveston District

U.S. Army Corps of Engineers
Galveston District
Final Environmental
Impact Statement

for

Texas City's Proposed
Shoal Point Container Terminal

Volume I

November 2002

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE PROPOSED SHOAL POINT CONTAINER TERMINAL
TEXAS CITY, GALVESTON COUNTY, TEXAS

The responsible lead agency for the permit action is the U.S. Army Corps of Engineers, Galveston District (USACE), under the authority of Section 404 (33 U.S.C. 1344) of the Clean Water Act and Section 10 (33 U.S.C. 403) of the Rivers and Harbors Act.

Abstract: This Final Environmental Impact Statement (FEIS) was prepared as required by the National Environmental Policy Act (NEPA) to present information regarding the potential impacts of the City of Texas City's proposed Shoal Point Container Terminal. The proposed project is located on Shoal Point, a dredged material placement area, adjacent to the Texas City Channel and Galveston Bay. The FEIS addresses the direct, indirect, and cumulative impacts of the proposed development on human and environmental issues identified during the public interest review, including onsite and offsite alternatives. All factors that may be relevant to the proposed development were considered. Among those factors are: air quality, dredged material management, landside transportation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, land use, navigation, shore erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, mineral needs, considerations of property ownership, and, in general, the needs and welfare of the people. The FEIS provides relevant information to the public and the USACE on the potential impacts of the proposed project. The public response to the findings of the FEIS will be considered in the preparation of the Record of Decision (ROD). The FEIS will be an informational document used by the USACE in its decision to grant or deny the permit.

Comments on this Final Environmental Impact Statement must be postmarked by:

14 December 2002
date

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EXECUTIVE SUMMARY

ES.1 DESCRIPTION OF THE PROPOSED ACTION

This Environmental Impact Statement (EIS) has been prepared to analyze and disclose the potential impacts of the proposed project and reasonable alternatives on the natural and human environment. The City of Texas City has applied to the U.S. Army Corps of Engineers (USACE), Galveston District, for a Clean Water Act Section 404 permit and Rivers and Harbors Act Section 10 permit for dredge and fill activities related to the construction of the proposed Shoal Point Container Terminal in Texas City. The proposed terminal would be located on an approximately 400-acre undeveloped site on Shoal Point in Galveston County, Texas. Shoal Point is an active USACE Dredged Material Placement Area (DMPA) for maintenance of the Texas City Channel, Texas City Turning Basin, Industrial Canal, Industrial Canal Turning Basin, and other areas maintained by the Port of Texas City Users Group. Activities subject to the jurisdiction of the USACE would include dredging in navigable waters to deepen the Texas City Channel and to construct berthing areas and a turning basin, and placement of fill in waters of the U.S. (including wetlands) to prepare the project site for construction of proposed facilities related to the container terminal.

The City proposes to develop the Shoal Point Container Terminal in partnership with Texas City International Terminal (TCIT). TCIT is a joint effort of Stevedoring Services of America (SSA) and Americana Ships (Americana). SSA will manage the terminal operation. Americana will provide a base load cargo volume for the project. The City is the permit applicant and will provide the real estate for the project. The City owns approximately 375 acres in the Shoal Point area and leases additional property from the Texas General Land Office (GLO).

The proposed Shoal Point Container Terminal project site is located along the northern shoreline of Shoal Point in Galveston County, Texas, and is located south of the existing Texas City Channel. The City of Texas City borders the project site to the west. The Texas City Channel is currently maintained by the USACE to a depth of –40 feet mean low tide (MLT). The terminal would be developed as a Texas Central Gulf region container port, capable of providing deepwater facilities for Post-Panamax vessels. Plans for the proposed facility include deepening a portion of the Texas City Channel to –45 feet MLT. However, a Federal study is in progress to address the feasibility of deepening the entire channel, and it is possible that the deepening would be done under the Federal process, regardless of the project.

ES.2 PURPOSE AND NEED

The Shoal Point Container Terminal is proposed to meet a regional need for development of a containerized cargo gateway similar to the gateways established for the Pacific Rim at the ports of Los Angeles and Long Beach. The regional need is driven by significant growth in container traffic within the Texas Central Gulf region, as well as projected growth in the Latin American market (VZM/Tran-Systems et al., 1998).

In its 1986 Galveston Bay Area Navigation Study, the USACE recognized that the economy of the U.S. has become increasingly dependent on waterborne transportation of materials. This factor, and the rapid growth of vessel sizes, capacities, and drafts, provided the impetus for studies by the USACE and other public and private entities on the feasibility of developing alternate deepwater port systems. The ports of Galveston, Houston, and Texas City combined, make the Galveston Bay area one of the busiest centers of shipping commerce in the nation (USACE, 1986).

Due to ever-increasing trade with Latin America, it is likely that the Gulf region will continue to experience faster growth than the U.S. as a whole. Over the last decade, total U.S. container growth has increased 4.3 percent per year, while Gulf container growth has increased 10 percent per year. Over the last 30 years, containerized cargo grew faster than the combined annual growth rate for the greater Houston region. Twenty years ago, containers were relatively rare with about 200,000 TEUs (twenty-foot equivalent units) moving through Galveston Bay. By 2000, this volume exceeded 1 million TEUs, and is projected to double by 2010 and triple by 2020 (VZM/TransSystems et al., 1998).

According to the VZM/TranSystems study (1998), commissioned by City of Texas City, between four and eleven new containerized cargo modules will be needed in the Texas Central Gulf region, particularly at the ports of Houston and Texas City between 1998 and 2028. The estimates show that the Texas Central Gulf region will exceed its Sustainable Practical Capacity of approximately 3,400,000 TEUs around the year 2019 (using 6 percent Compound Annual Growth Rate [CAGR]). These estimates are based on the assumption that existing and proposed container facilities in the region operate at a sustainable Practical Capacity of 75 percent of the Maximum Practical Capacity. However, if the actual CAGRs for the region are higher, or if new container terminal facilities are not built, the shortfall in capacity would occur even sooner.

In addition to the existing and projected growth in container traffic, containership technology has improved significantly over the last few decades. This improvement results in a demand on existing and future port terminals to make substantial changes in their infrastructure. High capacity, largely automated cargo handling equipment is projected to be increasingly used at ports, requiring improvements and upgrades to wharf infrastructure and other terminal features (VZM/TranSystems et al., 1998). As a result, many U.S. ports are currently faced with economic decisions affecting their ability to remain viable competitors in an increasingly competitive containerized cargo market.

The proposed Shoal Point Container Terminal has the capability to meet part of the regional capacity demands and to allow the Texas Central Gulf region to remain a viable competitor in the containerized cargo market. In addition, the proposed Shoal Point Container Terminal has the capacity to relieve many of the landside constraints currently experienced by other container facilities in the Houston region and the greater U.S. port system (VZM/TranSystems et al., 1998). The applicant has proposed the Shoal Point site for the terminal because, they have stated, it offers the following features:

- Easy and direct access to ocean trade routes in the Gulf of Mexico without the expense and potential delays of long channel navigation experienced at Houston or New Orleans

- Direct access to the existing roadway infrastructure network and rail access to the mainlines of the Union Pacific Railroad (UPRR) and Burlington Northern and Santa Fe Railway (BNSF)
- The potential to accommodate Post-Panamax vessels
- Available undeveloped land without the constraints of urban congestion and encroaching development
- Consistent use with neighboring properties
- Capacity to accommodate some of the overflow containerized cargo destined for the Texas Central Gulf region that cannot be accommodated by the Port of Houston, thereby keeping the economic benefits within Texas.

ES.3 ALTERNATIVES CONSIDERED

Many project alternatives initially considered were eliminated during a screening process because they were found to be unreasonable or infeasible (based on several criteria) and, therefore, did not receive the more rigorous study required for all reasonable alternatives. The restrictions indicated by the screening criteria resulted in a geographic range beyond which any alternative site would trigger some screening criterion that would make it infeasible. Many areas within the geographic range were excluded because the 400-acre footprint required for the port facility would impinge on areas of high-density residential and/or industrial land uses or high concentrations of petroleum wells and/or pipeline crossings.

A more detailed and systematic study was made of all reasonable alternatives before they were evaluated. The relative positive and negative impacts on specific receptors (e.g., threatened and endangered species) of the seven reasonable alternatives are compared in tabular form and in discussion.

- No Action
- Shoal Point (the applicant's proposed alternative)
- Pelican Island
- Bayport
- Spillman's Island
- Alexander Island
- Cedar Point

The intent of the alternatives analysis is to provide the basis for selection of the environmentally preferred alternative(s). The environmentally preferred alternative(s) will be identified in the Record of Decision.

ES.3.1 NO-ACTION ALTERNATIVE

The No-Action alternative (also referred to as the No-Build scenario) is equivalent to a USACE denial of the permit for the facility. In the event of permit denial, no container terminal would be built at Shoal Point, and it is assumed for this EIS that no new container terminal facilities would be built to

serve the Houston area. The market for containerized cargo in this region is expected to rise steadily over the next several years. While it is possible that other container terminal facilities would be constructed to meet this regional need, the uncertainties related to the size, location, and timing of such facilities lead to the approach used to evaluate the No-Action alternative in this EIS (i.e., that no such facilities would be constructed). Under the No-Action assumption that no new container terminal facilities would be constructed in the Galveston Bay area, it is further assumed that the additional containerized cargo would most likely be transported into and out of the Houston area from other container terminals (e.g., New Orleans) via truck or rail.

The Shoal Point site would likely continue to serve as a DMPA for the foreseeable future. Assuming that the results of the current Federal study indicate that deepening of the channel is justified as a Federal project, this dredging activity would likely proceed. Thus, many of the dredging impacts for the proposed container terminal would also take place in the No-Action scenario under the Federal project.

Many of the impacts associated with development of the Shoal Point site as a container terminal would not occur under the No-Action scenario. In addition, any benefits that may be gained from the project (e.g., employment opportunities, increased revenues to local taxing jurisdictions) would also not be realized.

ES.3.2 ALL BUILD ALTERNATIVES

The proposed project at Shoal Point, or at any of the alternative sites, would involve construction of the terminal in three independent phases, with construction of each phase dependent on the market share of anticipated container moves. The design vessel for the container terminal is a Post-Panamax vessel with a beam width of 135 feet and a length of approximately 900 to 1,000 feet. Each phase of the project would include two berths, and each berth would be 1,000 feet in length, for a total of 6,000 feet of wharf accommodating six berths.

Phase I of the proposed project is expected to be a 125-acre terminal; Phase II, 125-acre terminal; and Phase III, 150-acre terminal, for a total terminal footprint of 400 acres. The proposed six-berth container terminal footprint would cover 400 acres for any Build alternative; however, the total acreage impacted by a given alternative varies depending on the area required for the land access corridor, ship channel, berthing area, and turning basin requirements. The layout of facilities at each site (the footprint) was selected to minimize negative environmental impacts and conflicts with the existing land use while serving the needs of the applicant.

The 400-acre footprint of the terminal yard is based on a design that uses operational parameters set by the terminal operator. In the proposed container configuration, the yard is sized using combinations of container stacks that are serviced either by rubber-tired gantries (RTGs), top handlers, or sidepicks. In general, this arrangement provides a relatively dense stacking configuration to optimize utilization of the yard space, thereby minimizing the overall size of the facility. Other specialized zones within the yard would accommodate refrigerated containers, parking for bare chassis, and equipment storage. The total storage space has been laid out using estimated throughput volumes for the terminal,

estimated dwell times for the containers, plus reserve space for peak operating months. The design project includes provisions for on-site fueling of land-based equipment and water-based fueling (i.e., bunkering) of vessels at the berth.

ES.3.2.1 Proposed Alternative – Shoal Point

The Shoal Point site (applicant's proposed alternative) is located in the southwestern part of Galveston Bay, south of the Texas City Dike and south of the Texas City Channel. Shoal Point is an active USACE DMPA for maintenance of the Texas City Channel, Texas City Turning Basin, Industrial Canal, Industrial Canal Turning Basin, and other areas maintained by the Port of Texas City Users Group.

The proposed container terminal footprint would cover 400 acres. Part of the area corresponds to a 100-acre site originally known as Snake Island, but most of the area was built up as part of the USACE's placement of dredged material on the area referred to as Shoal Point. The site currently consists of poorly consolidated dredged material. Approximately 51 acres of wetland habitats occur on the site, including approximately 13 acres of jurisdictional wetlands. During the construction of the terminal, the project site would undergo a consolidation program to minimize the amount of settlement that could occur after the terminal is in operation. The consolidation program would likely consist of the installation of wick drains, along with soil surcharge.

Wharf frontage for the terminal would be along the Texas City Channel, which is currently maintained to a depth of –40 feet MLT. The existing channel is approximately 6.8 miles in length and approximately 400 feet in width. The project includes a provision in the second phase to allow private deepening of the Federal channel to –45 feet MLT from the confluence with Bolivar Roads to the container facility. That deepening would not include further widening. A parallel Federal feasibility study is planned to address the deepening of the entire Texas City Channel. Because it is now a Federal project and no interest has been expressed in changing that status, it is likely that the deepening would be done under the Federal process. Nevertheless, the permit application includes a provision for deepening in the event that the Federal deepening project on the Texas City Channel does not proceed.

All areas of dredging for the proposed project would be to a depth of –45 feet MLT. Development of a container terminal in this location would require a new berthing area. The berthing area would be approximately 6,000 feet in length, approximately 825 feet in width, and located south of the Texas City Channel. It is likely that each phase of development would involve dredging one two-berth slip. The berthing area for each phase would be approximately 2,000 feet in length. It is estimated that approximately 8.7 million cubic yards (mcy) of material would be dredged for the berthing areas. Slope protection in the form of rip-rap would be placed along the affected slopes of the berthing area to ensure that surge from ship bow thrusters would not erode the embankment.

The proposed turning basin would be located within and north of the existing Texas City Channel. It is estimated that approximately 750,000 cubic yards of material would be dredged during the construction of the turning basin. The current geometry of the Texas City Channel would not be changed during the construction of the terminal.

It is estimated that an additional 2.4 mcy of material would be generated during the deepening of the Texas City Channel to –45 feet MLT, which is proposed to occur during Phase II of the project. The total dredged quantity, approximately 11.9 mcy of dredged material, would be placed into a combination of existing upland DMPAs and Beneficial Use sites. As mitigation for unavoidable impacts to approximately 13 acres of jurisdictional wetlands, the proposed project plans include construction of approximately 45 acres of marsh habitat using dredged material in the northern portion of Swan Lake during Phase I.

Since the Shoal Point project site is part of a DMPA, converting the land from its existing use to that of container terminal operations would require that a provision be made to replace the lost dredged material placement capacity. That requirement has generated the need to prepare a new long-term (50-year) Dredged Material Management Plan (DMMP) that partly deals with the actions of the applicant and partly deals with the routine maintenance dredging activities of the USACE. The USACE would undertake an evaluation of the DMMP prior to adopting any part of it for existing or future Federal dredging projects at Texas City.

The site is connected to the mainland just north of Swan Lake and south of the Port of Texas City. Current access is by levee road to Loop 197. A new access corridor would provide access from the terminal location to Loop 197. Loop 197 is 82 feet in width and consists of four 12-foot lanes, two 10-foot shoulders, and one 14-foot interior turning lane. The proposed access corridor would consist of four 12-foot lanes and two 6-foot shoulders, resulting in a 60-foot roadway prism. The access corridor would originate south of the existing Loop 197 bridge crossing the Galveston County Discharge Canal. The access road would follow the southern side of the canal right-of-way (ROW) to the Shoal Point DMPA.

Construction of an electric transmission line would be necessary at the Shoal Point alternative site. The alignment corridor of the proposed facility would be along the southern fringe of the Galveston County Discharge Canal, adjacent to the proposed access road. Just east of Swan Lake, the transmission line would deviate from the proposed access road and continue along the west side of Shoal Point to the terminal. This alignment avoids additional impacts caused by the transmission line by sharing right-of-way with the proposed access road for much of its length. To minimize the potential for bird strikes along the transmission line, aviator balls would be installed.

Initially, rail traffic is expected to be distributed evenly between the UPRR, BNSF railroad, and Barbours Cut intermodal yards. A new off-site intermodal yard, not part of this project, is expected to be constructed at a later date when justified by the growth of the terminal. The proposed intermodal yard would be located within approximately 5 miles of the project site. No rail access would be provided at the proposed project site.

No demolition of structures would be expected for this site.

ES.3.2.2 Pelican Island Alternative

Pelican Island is an active, upland confined USACE DMPA, located just north of and separated from Galveston Island by the Galveston Ship Channel. The 400-acre footprint for the terminal

would be located on the northeastern corner of the island, with wharf frontage on the north side of the island, facing the Bolivar Roads channel. Part of this footprint would be located outside of the leveed DMPA in a lagoonal area that has no tidal inlet. The only apparent tidal influence occurs during seasonal events. Mitigation would be required for unavoidable impacts to approximately 96 acres of potential Section 404 jurisdictional wetlands in this area. Also, approximately 7 acres of non-jurisdictional freshwater wetlands would be impacted by the land access corridor.

This alternative would require a new berthing area and entrance channel. No turning basin would be needed because of the configuration of the proposed entrance channel. All areas of dredging would be deepened to –45 feet MLT. The berthing area would be approximately 6,000 feet in length and 200 feet in width. The berthing area and entrance channel would be located southwest of Bolivar Roads. An estimated 13.1 mcy of material would be dredged for the berthing area and entrance channel. This material would be used as fill for the terminal and placed into existing upland DMPAs or used in the creation of Beneficial Use areas. Placement of material in existing DMPAs would result in loss of DMPA capacity currently used for Bolivar Roads and the Gulf Intracoastal Waterway (GIWW).

The Pelican Island alternative site is part of a DMPA, so the change in land use would require that a provision be made to replace the lost dredged material capacity. That requirement would generate the need to prepare a new long-term (50-year) DMMP. During the construction of the terminal, the project site would undergo a consolidation program as described for the Shoal Point alternative.

An existing two-lane bascule bridge provides access to Pelican Island. The existing roadway and bascule bridge is owned and maintained by Galveston County. This alternative would likely require the development and construction of a new four-lane bascule bridge as well as the widening of the existing two-lane roadway to accommodate a four-lane facility.

Initially, rail traffic would be expected to be distributed evenly between the UPRR, BNSF, and Barbours Cut intermodal yard. A new intermodal yard would be expected to be constructed at a later date when justified by the growth of the terminal. The proposed intermodal yard would be located on Galveston Island approximately 10 miles from the project site at an existing rail siding. No rail access would be provided at the project site.

ES.3.2.3 Bayport Alternative

The Bayport alternative site is located along the western shore of Galveston Bay in Harris County, Texas, within the City of Pasadena's corporate boundaries. The terminal would be located on the southern side of the existing Bayport Ship Channel, a channel cut into the mainland just north of Red Bluff to serve existing industry.

All areas of dredging for the Bayport alternative would be deepened to –45 feet MLT. The Bayport Ship Channel (3.6 miles in length) is currently maintained to a depth of –40 feet MLT. This alternative would require a new berthing area approximately 6,000 feet in length and 200 feet in width, located south of the existing Bayport Ship Channel. It is estimated that approximately 2.4 mcy of material would be dredged for the berthing area. The proposed turning basin would be 1,200 feet in diameter. It is

estimated that approximately 0.4 mcy of material would be dredged during the construction of the turning basin. The current geometry of the Bayport Ship Channel would not be changed during the construction of the terminal. It is estimated that approximately 3.9 mcy of material would be generated during the deepening of the channel. The total, 6.7 mcy of dredged material, would be used as fill for the terminal and placed into existing upland DMPAs or used in the creation of Beneficial Use areas. Placement of material in existing DMPAs would result in loss of DMPA capacity currently used for the Houston Ship Channel.

The 400-acre terminal footprint would be situated on undeveloped land north and south of the existing Port Road. The Port of Houston Authority (PHA) owns approximately 1,086 acres at and near the Bayport site. Approximately 41 acres of wetland habitats would be lost, 38 acres being freshwater wetlands including wooded wetlands. However, only approximately 15.5 acres are considered jurisdictional under Section 404 regulations, and so, only those 15.5 acres would require mitigation.

Port Road, an existing two-lane collector street, would provide access from the terminal location to State Highway 146 (SH 146). Port Road probably would be widened to accommodate four lanes of traffic and reclassified as a principal arterial in this location due to the truck traffic associated with the container terminal. The interchange at the intersection of SH 146 and Port Road would be studied at a later date by TxDOT to determine whether the current configuration would remain acceptable with the increased traffic generated by the terminal. The existing Todville Road, which serves the residents of El Jardin Del Mar, would remain at its current state of two lanes at the initial construction of Phase I. As increased truck traffic occurs at the terminal, Todville Road would be reanalyzed to address the impacts of increased truck traffic.

No intermodal yard would be expected for this alternative. It is anticipated that the majority of rail traffic would use the existing Barbours Cut intermodal yard facility (less than 10 miles from site). It is anticipated that two additional yards in the greater Houston area would experience a minimal amount of rail traffic originating from this terminal location.

ES.3.2.4 Spillman's Island Alternative

Spillman's Island, an active USACE upland confined DMPA, is located on the shoreline along the San Jacinto River on the western side of the Houston Ship Channel. No longer an island, Spillman's Island is located just south of the Fred Hartman Bridge (SH 146 river crossing). If constructed at this site, the terminal would be located within the City of La Porte and Harris County. The City of La Porte borders the City of Morgan's Point to the south.

All areas of dredging for the development of a container terminal at Spillman's Island would need to be deepened to –45 feet MLT. The Houston Ship Channel is scheduled to be deepened from –40 feet MLT to –45 feet MLT in this area by late 2003. The berthing area would be located southwest of the Houston Ship Channel. It is estimated that approximately 7.7 mcy of material would be dredged for the berthing area and channel. The proposed turning basin would be 1,200 feet in diameter

and located on the opposite (eastern) side of the Houston Ship Channel. It is estimated that approximately 1.9 mcy of material would be dredged during the construction of the turning basin.

The total volume of dredged material (9.6 mcy) would be used as fill for terminal development and placed into existing upland DMPAs and/or Beneficial Use areas. Placement of material in existing DMPAs would result in a loss of DMPA capacity currently used for the Houston Ship Channel. The Spillman's Island alternative site is a DMPA, so the change in land use would require that a provision be made to replace the lost dredged material capacity. That requirement would generate the need to prepare a new long-term (50-year) DMMP. During the construction of the terminal, the project site would undergo a consolidation program as described for the Shoal Point alternative. Mitigation would be required for unavoidable impacts to approximately 3 acres of jurisdictional wetlands located along the eastern shoreline.

Roadway infrastructure is available at the site. It is assumed that the project would tie in with the existing network of roadway systems at the Barbours Cut terminal. No intermodal yard is expected for this alternative. It is anticipated that the majority of rail traffic would use the existing Barbours Cut facility. It is anticipated that two additional intermodal yards in the greater Houston area would experience a minimal amount of rail traffic originating from this terminal location.

ES.3.2.5 Alexander Island Alternative

Alexander Island, an active, upland confined USACE DMPA, is located along the San Jacinto River on the western side of the Houston Ship Channel, just north of the Fred Hartman Bridge (SH 146 river crossing). The terminal would be on the eastern side of the island with wharf frontage facing the Houston Ship Channel. The terminal would be located within the City of La Porte and Harris County.

All areas of dredging for the Alexander Island alternative would be deepened to –45 feet MLT. The Houston Ship Channel is scheduled to be deepened from –40 feet MLT to –45 feet MLT in this area by late 2003. This alternative would require a new berthing area and entrance channel to be located west of the existing Houston Ship Channel. Due to the configuration of the entrance channel, no turning basin would be required. The estimated 12.4 mcy of material dredged for the berthing area and entrance channel would be used as fill for terminal development and placed into existing upland DMPAs and/or potential Beneficial Use areas. Placement of material in existing DMPAs would result in loss of DMPA capacity currently used for the Houston Ship Channel.

The Alexander Island alternative site is part of an active DMPA, so the change in land use would require that a provision be made to replace the lost dredged material capacity. That requirement would generate the need to prepare a new long-term (50-year) DMMP. During the construction of the terminal, the project site would undergo a consolidation program as described for the Shoal Point alternative.

Mitigation would be required for unavoidable impacts to approximately 6 acres of jurisdictional wetlands located along eastern and southern shorelines. These wetlands are outside of the

levees surrounding the DMPA. Most are salt/brackish marsh and unvegetated shoreline. Natural, brushy areas, a small brackish-to-fresh pond, and a bird rookery also occur in the area to be impacted.

There is no current access to Alexander Island. A new four-lane access roadway with a new multi-span bridge (crossing Upper San Jacinto Bay) would be required for access to the project site. Improvements to existing roadways would also be required where the new roadway would terminate on the mainland.

No intermodal yard would be expected for this alternative. It is anticipated that the majority of rail traffic would use the existing Barbours Cut facility. It is anticipated that two additional intermodal yards in the greater Houston area would experience a minimal amount of rail traffic originating from this terminal location.

ES.3.2.6 Cedar Point Alternative

The alternative site at Cedar Point is located on the northeast shore of Galveston Bay in Chambers County, Texas. The terminal would be located within the corporate limits of the City of Baytown. This alternative would require extensive dredging of new channel and deepening of the existing Cedar Bayou channel to provide deepwater navigation from the project location to the Houston Ship Channel.

All areas of dredging for the Cedar Point alternative would be deepened to –45 feet MLT. Development of a container terminal in this location would require a new berthing area, a new deepwater channel, and a turning basin. The berthing area and turning basin would be located wholly within the mainland of Cedar Point. This footprint was chosen to avoid an active landfill and petroleum pipelines and wells.

It is estimated that approximately 34 mcy of material would be dredged during the development of this alternative. The dredging activity alone would take approximately 4 years to complete. The berthing area would be approximately 6,000 feet in length and 200 feet in width. The estimated 34 mcy of dredged material would be placed into existing DMPAs and/or potential Beneficial Use sites. Placement of material in existing DMPAs would result in loss of DMPA capacity currently used for the Houston Ship Channel. Because it is not a DMPA, the site would not require the consolidation program required for the alternatives on DMPA sites.

Over 550 acres of undeveloped land, including upland and wetland forests, shrublands and grasslands would be converted to the port facility. Approximately 75 acres of primarily freshwater wetlands would be lost, including 6 acres of forested wetlands. However, only the estuarine shoreline wetlands (approximately 1 acre) would be considered jurisdictional under Section 404 regulations and require mitigation.

Roadway access to the site would be available via FM 1405 and Beach Road (FM 2354). Beach Road would need to be realigned to accommodate the terminal location. Both roadways are two-lane arterials. They would both need to be improved to four lanes.

No rail service is currently available at the Cedar Point site. The nearest rail spur is approximately 2.5 miles from the site. In the early years of the project, the container traffic destined for movement by rail would probably be distributed evenly between Barbours Cut, the UPRR intermodal yard, and the BNSF intermodal yard. It is assumed that a separate intermodal yard would be developed in the future.

ES.4 ENVIRONMENTAL ISSUES

The potential impacts of the alternatives to numerous human and natural environmental receptors were investigated and are described in Section 4.0 of the EIS. A comparison of these impacts is summarized below:

Air Quality

The No-Action alternative would mean that any new cargo would be brought in overland by truck or rail, thus increasing truck and rail traffic and associated emissions. For each of the Build alternatives, emissions generated by construction equipment during site development would vary according to the extent and timing of construction activities. These variations in extent and timing of construction activities affect the General Conformity Determination for each alternative. All alternatives would require a General Conformity Determination for Phase I construction activities (i.e., applicable emissions exceed 25 tons per year). In addition, Shoal Point and Cedar Point would require a General Conformity Determination for Phase II construction activities. Generally, truck and rail emissions increase with distance from the terminal to the Houston area and ship emissions increase with distance from the entrance to the Gulf of Mexico to the terminal.

Roadway Traffic

The No Action alternative would mean that cargo would be brought in overland by truck or rail, thus increasing truck and rail traffic for the region. Presumably, for truck traffic under the Build alternatives, IH 10 would be the main corridor impacted. As described above (Air Quality), the closer an alternative is to the Houston area, the less distance required for truck travel. Therefore, Spillman's Island and Alexander Island would add fewer truck miles than Cedar Point and Bayport, while Shoal Point and Pelican Island would add the most. The local impact of increased truck traffic includes impacts to neighborhood streets and access to and from neighborhoods. The residents of El Jardin del Mar have expressed concerns about increased truck traffic associated with a container terminal at Bayport, and Omega Bay residents have expressed concerns about trucks exiting IH 45 en route to a Shoal Point terminal. Alexander Island would require a new bridge, and Pelican Island would require improvements to an existing bridge.

All of the Build alternatives would have impacts to some intersections, but in most cases the project-related impacts do not create an unacceptable level of service (LOS) at affected intersections. Shoal Point is the only alternative that would create an E LOS at the SH 146 at FM 1765 and SH 3 at Loop 197 intersections (i.e., the Texas City Wye) relative to the No-Action scenario. With regard to the main corridor traffic analysis, none of the alternatives would cause the LOS as a result of project-related traffic

to change from an acceptable level in the No-Build scenario to an unacceptable (i.e., E or F) level in the Build scenario.

In response to residents' comments, weaving analyses were performed for the Shoal Point alternative on the IH 45 frontage road at the Omega Bay entrance, the IH 45 frontage road at SH 6, and SH 3/SH 146 from IH 45 to Loop 197 and from Loop 197 to IH 45. Results indicated that improvements would be necessary at two of the three locations to avoid a reduction in LOS between the No-Build and Build scenarios for the year 2025. In addition, the number of potential truck-related and fatal truck-related accidents was determined for the IH 45 at SH 3 and SH 6 interchange. The number of potential truck-related accidents would increase slightly (4.4 to 4.6 accidents in 2005, 4.9 to 5.0 in 2015, and 5.6 to 5.9 accidents in 2025) between the No-Build and Build scenarios. Based on the analysis performed, less than one potential fatal truck-related accident could result from the traffic levels generated in the Build and No-Build scenarios. Continuing traffic safety improvements (vehicle safety standards, safe roadway design, etc.) should reduce the likelihood of fatal accidents.

Area residents recommended building a new interchange north of the IH 45, SH 3, and SH 6 interchange and a new road from the interchange north of Omega Bay approximately 2 miles to the proposed Shoal Point Container Terminal entrance. In response to this request, public officials associated with the applicant for the proposed project have initiated discussions with TxDOT regarding the possibility of developing an alternative truck route.

Noise

Because the No-Action alternative assumes that all cargo would be transported overland, presumably by truck or rail, there would be increased noise levels associated with the increased truck and rail traffic. Generally, for the Build scenarios, most of the representative receptors associated with roadways in the vicinity of the alternative sites already experience noise levels that meet or exceed the Noise Abatement Criteria. One previously unimpacted roadway segment would experience impacts at each of the following alternatives: Shoal Point, Pelican Island, and Cedar Point. These roadway segments are SH 146 from Loop 197 to FM 519 (Shoal Point and Pelican Island alternatives) and SH 146 from Spur 55 to SH 146/Business SH 146 split (Cedar Point alternative). Noise associated with construction and operations would exceed ambient noise levels at the nearest receptors at two alternatives, Bayport and Cedar Point.

In response to resident comments, a detailed noise analysis was performed for the Shoal Point alternative to assess potential impacts to noise receptors in Omega Bay from increased truck traffic on the IH 45 frontage road at the Omega Bay entrance. Results of the analysis indicated that no additional receptors would be impacted by the proposed project relative to the No-Build scenario.

Groundwater Hydrology

No impacts would occur to groundwater hydrology as a result of the No-Action alternative. All Build alternatives except Cedar Point would have similar, minimal impacts to groundwater hydrology and would result in a loss of recharge area and the increased potential for the introduction of hazardous

materials. The new inland channel for the Cedar Point alternative would have a short-term effect on groundwater flow and depth. If the new deepwater channel was constructed, groundwater would tend to flow towards the channel and water levels might be temporarily lowered in the vicinity of the channel. Over time, the groundwater regime would reach equilibrium and be similar to the original conditions. The new channel may increase tidal influence inland and may serve as a discharge point for shallow groundwater during low tide periods.

Hazardous Materials

There would be no impact by the No-Action alternative on hazardous material sites and minimal potential impact for the Build alternatives. All Build alternatives would have the increased potential for hazardous materials impacts during construction, operation, and materials transport. Cedar Point has a somewhat higher potential impact from existing hazardous materials sites because of an unregistered UST within the footprint of the facility (possibly requiring further investigation) and its proximity to a landfill.

Surface Water Quality and Hydrology

Although no project-related effects to surface water would occur for the No-Action alternative, normal dredging activities would continue to effect water quality and the Texas City Channel may still be dredged to –45 feet MSL under a Federal project. For the Build alternatives, dredging/deepening of the ship channel at each alternative site would result in minimal changes to salinity. Variations among the alternatives would primarily depend on whether the channel was existing (deepened) or new. San Jacinto Bay (Alexander Island) and Cedar Bayou (Cedar Point) would experience a slight increase in salinity intrusion from dredging of deep channels. Minimal increases in turbidity, or total suspended solids (TSS), would be short-term and associated with dredging activities (construction and maintenance). Impacts would be related to the duration of dredging activities as well as the volume of material dredged, so Cedar Point's requirement for a 3.6-mile channel would probably have the greatest impact to TSS, while Bayport and Spillman's Island would have the least impact, and the other alternatives would have similar levels of impact to water quality. Greater stormwater runoff associated with an increased area of paved impervious cover would be about the same for all alternatives.

In response to public comments regarding potential circulation and salinity effects, a 2-dimensional model was used to address potential impacts to the Texas City harbor area from the proposed Shoal Point container facility and associated dredging activities. The model indicated that salinity in the harbor would be slightly higher than under the No-Build scenario.

Floodplains

All of the alternative sites are located adjacent to navigable waters. The Bayport site is on a navigation channel and the proposed facilities on Pelican Island, Shoal Point, Spillman's Island and Alexander Island are located on leveed DMPAs. Although none of the alternatives are located on a stream or tributary, Cedar Point may impact Water Oak Gully and an unnamed gully south of Water Oak

Gully that runs adjacent to and north of an existing landfill. No alternative would impinge on or block any floodway that would affect flooding upstream.

The land access corridor for the proposed Shoal Point alternative would run adjacent to the Texas City stormwater/hurricane channel. However, the road would be designed to minimize impingement on the existing channel. The container facilities for all alternatives would be elevated above the 100-year storm surge level or be designed to accommodate storm surges.

Sediment Quality

In terms of adding contaminants to sediment, there are no apparent differences in the potential impacts to sediment quality among the Build alternatives. The No-Action alternative would not impact sediment quality.

Aquatic Ecology

Essential Fish Habitat. There would be no direct impact from the No-Action alternative on Essential Fish Habitat (EFH). All of the Build alternatives would have minimal impacts (associated with increased sedimentation, turbidity and salinity changes) to adult and juvenile fish and shellfish species. However, these species would likely benefit from additional habitat provided by Beneficial Use sites and mitigation activities at any of the alternative sites.

Open-Bay Waters (nekton, plankton). There would be no impact from the No-Action alternative on nekton (including commercial and recreational fishery) and plankton of the open bay. All of the Build alternatives would have similar types of potential impacts, including short-term impacts caused by dredging activities (increased TSS) which could result in loss of productive habitat, and increased risks of chemical and oil spills (associated with increased ship traffic) that could threaten larval and juvenile stages of nekton and plankton assemblages. The impacts associated with dredging activities for each alternative would vary in direct proportion to the quantity of dredged material produced (see Table 2-3) and the time required to complete dredging activities.

Bay Bottom (benthic community, oysters). The No-Action alternative would not directly result in any loss of habitat. All of the Build alternatives would have potential impacts associated with increased runoff. However, benthic communities are generally tolerant of salinity and sedimentation fluctuations and would probably remain largely unaffected by dredging activities. Build alternatives would also have increased potential for chemical or oil spills (associated with increased ship traffic). Disturbance and/or loss of open bay waters (and benthic habitat) would be caused by dredging activities associated with berthing areas, turning basins and channels. No live oyster reefs are known in the areas of Pelican Island, Shoal Point and Alexander Island, although potential habitat is present in the vicinity. Live oyster reefs near Bayport, Spillman's Island, and Cedar Point could be minimally affected by increased TSS associated with dredging activities.

Seagrass/Submerged Aquatic Vegetation (SAV). No impact on SAV from the No-Action alternative would occur. The Build alternatives would likely have little to no impact on seagrass beds

although the presence of widgeongrass in the areas near Bayport, Spillman's Island, Alexander Island and Cedar Point causes slightly higher chances of impacts than the alternatives in the southern part of the Bay. The loss of a freshwater pond on Alexander Island would include the loss of a reported widgeongrass community (Glass, 2001a).

Terrestrial and Emergent Vegetation

No impact on terrestrial and emergent vegetation would arise from the No-Action alternative. In general, less of the facility's footprint would impact terrestrial and emergent habitats at the alternative sites that are currently leveed DMPAs (e.g., Pelican Island, Shoal Point, Spillman's Island and Alexander Island). The Cedar Point and Bayport alternatives would impact larger areas of terrestrial (upland/wetland) habitat compared with the other Build alternatives due in part to the fact that these sites are relatively undisturbed. In addition, impacts from Cedar Point would be greater because of the need to dredge an inland channel, turning basin and berthing area. Spillman's Island would impact 26 acres of uplands (shrubland/grassland), the least amount of impacted vegetated area for all the alternatives. Pelican Island (29 acres), Shoal Point (105 acres, more than one-half of which is a DMPA, but included in this category because it has been inactive long enough to have become heavily vegetated) and Alexander Island (96 acres) impact intermediate values of areas.

Jurisdictional Waters of the U.S. (Wetlands and Open Water)

There would be no direct impact by the No-Action alternative. Among the Build alternatives, Pelican Island would impact the greatest area of potential jurisdictional wetlands (not including open waters), with 96 acres. Cedar Point would impact virtually no jurisdictional wetlands (<0.5 acre) with the rest of the Build alternatives ranging from 15.5 acres of impact at Bayport, 13 acres at Shoal Point, 5 acres at Alexander Island, and 3 acres at Spillman's Island. The acreage of jurisdictional open waters (primarily associated with dredging activities for the berthing areas, turning basins, and channels) impacted for each alternative is as follows: Shoal Point (661 acres), Bayport (245 acres), Cedar Point (202 acres), Pelican Island and Spillman's Island (183 acres each), and Alexander Island (116 acres). In the case of Shoal Point, most of this dredging is in an existing channel, so the impacts should be short-term and minimal.

Terrestrial Habitat – Impacts to Wildlife

The No-Action alternative would have no immediate direct impacts to wildlife habitats or species at the various alternatives. Spillman's Island is probably the least valuable for wildlife habitat. It is largely unvegetated and no known rookeries occur there. Cedar Point and Bayport have the greatest area of relatively undisturbed and varied habitats including forest, shrub/scrub, and grassland (upland and wetland), although the proposed facilities would not impact much tidal wetland at either site. Aside from Spillman's Island, each of the Build alternatives may impact rookeries and/or foraging or loafing habitat for shorebirds and wading birds on or near the proposed facilities.

Endangered and Threatened Species

There would be no impact from the No-Action alternative on any endangered or threatened species. Because no endangered or threatened plant species is known to occur at any alternative site, it is not likely that any listed species would be impacted by any alternative. However, the greater extent of natural areas on Bayport and Cedar Point provide better habitat for a diversity of species and are, thus, more likely to support endangered, threatened or rare species. All Build alternatives would probably have the same relative potential impacts (minor, short-term) to sea turtles. Pelican Island and Shoal Point are loafing areas for brown pelicans (*Pelecanus occidentalis*), and dredging activities could temporarily reduce the food supply for this species, which forages for fish by diving.

Historical/Cultural Resources

There would be no impact by the No-Action alternative to cultural resource sites and little probability of impacts to recorded terrestrial cultural resource sites, National Register of Historic Places (NRHP) or State Archeological Landmark (SAL) properties at Pelican Island or Spillman's Island. Bayport and Cedar Point have high probabilities for containing unrecorded terrestrial cultural resources while the other sites have low or very low probabilities. Due to the historic nature of the areas near Cedar Point, Spillman's Island, and Alexander Island, a possibility exists that unrecorded historic resources are present in the waters surrounding these sites. Numerous potential ship wrecks are documented in the waters surrounding Pelican Island, and some may be historically significant. Shoal Point and Bayport are the least likely of the alternatives to have underwater historical sites in the surrounding waters.

Navigation

As described above (Air Quality), the farther an alternative is from the Houston area, the less distance required for ship travel. Therefore, Shoal Point and Pelican Island would add fewer ship miles. Spillman's Island and Alexander Island would add the most ship miles, and Cedar Point and Bayport would be intermediate. All of the alternatives would have access to an existing deepwater channel (Houston Ship Channel/Bolivar Roads) except Cedar Point which would require a 3.6-mile deepwater channel to connect to the Houston Ship Channel. Delays to existing ship traffic at Bayport and Texas City would be expected as a result of the additional ship traffic at these locations. All of the Build alternatives would have some effect on commercial bay fishing and recreational boating from increased deep-draft vessel traffic in Galveston Bay.

Socioeconomics

The No-Action alternative would have no benefits associated with the container terminal (e.g., employment opportunities, increased revenues to local taxing jurisdictions). Generally, all of the alternatives would create jobs, generate economic benefits, and require additional community services for inmigrant workers and their families. The differences among the alternatives are primarily based on differences in construction-phase activities and costs. With regard to Environmental Justice, the Pelican Island site has the highest potential for disproportionate impact to minority and economically stressed populations.

Port Security

In light of recent world events, global concern regarding acts of international terrorism and organized crime has increased, leading to heightened domestic and international security at U.S. ports. Efforts led by the U.S. Customs Service, U.S. Coast Guard, and World Customs Organization have increased port security by requiring more stringent container inspections, deploying additional monitoring vessels, and increasing terminal owner/operator security measures. Programs such as Operation Noble Eagle, Operation Neptune Shield, and additional Maritime Homeland Security concepts and strategies have been integrated into the daily operations of ports through coordination of U.S. Coast Guard resources and partnerships with the maritime community and local law enforcement agencies. These partnerships are working to increase the local network of and interaction between Federal, state, and local law enforcement and intelligence agencies. Cooperation between international and national agencies and the private business sector contributes to the security of our nation and its ports.

An assessment of security risks related to container cargo indicated that the risk of an accidental or intentional event with the Build alternative would increase proportional to the increased number of containers that enter the Houston area as compared with the No-Build alternative. However, with the increased security measures in place and planned at all U.S. ports, the local Emergency Management Plan, and the coordination of port security among all port users, the potential increased risk of a threat due to the presence of a new marine terminal would be offset.

ES.5 COORDINATION AND PUBLIC INVOLVEMENT

There have been numerous opportunities for the public including public agencies to receive information and give feedback regarding the proposed project. A summary of meetings and other actions follows:

- A Notice of Intent (NOI) to prepare a DEIS for the construction of a containerized cargo terminal on Shoal Point was published on August 31, 2000. Federal, state and local agencies and the public were invited to identify issues that should be addressed in the DEIS. During the scoping period, the USACE received responses from two Federal agencies and one State agency, and many local companies and individuals. The main concerns of area residents were traffic congestion near the site and dredging impacts.
- A meeting with the resource agencies was held on October 3, 2000, at the Charles Doyle Convention Center in Texas City, Texas to provide a project description, present the EIS process/schedule, and open a discussion of issues and comments with the agency representatives.
- On September 1, 2000, the USACE issued a Public Announcement to provide notice of a public open-house and scoping meeting for the project. The Public Open House was held at the Charles Doyle Convention Center in Texas City, Texas, on October 3, 2000. The Open House agenda included a project description, a description of the EIS process/schedule and public involvement opportunities. Directly following the Open House a Public Scoping Meeting was held to provide additional information including an applicant presentation of the purpose and need for the project, a project description, history of the project, previous coordination, and a list of major issues. A court reporter was present to transcribe comments made by the public during the

scoping meeting. Public comments received during the scoping process were incorporated into the work plan for the DEIS.

- A stakeholders' meeting held on February 27, 2001, was designed to gather suggestions, information and concerns from Galveston Bay stakeholder groups that might have an interest in the potential Beneficial Uses of the dredged material from the proposed project. After a brief history of the project, potential Beneficial Use sites were briefly described and comments were invited from the attendees.
- USACE Website (http://www.swg.usace.army.mil/reg/txcity/txcity.htm) for the project came on line in March 2001.
- The USACE Galveston District held a Public Workshop on April 24, 2001, to provide an update to the public on the proposed project and the EIS process. The workshop was set up in an informal "Open House" format, with stations providing information on several topics of interest: project description, alternatives analysis, land transportation, air quality, dredged material management, water transportation and EIS process/schedule.
- An Omega Bay Homeowners' Meeting was held on May 16, 2001, in Hitchcock, Texas. The project team invited homeowners to ask questions regarding the effects of the proposed project on the Omega Bay neighborhood. The majority of the public comments received by the USACE from Omega Bay residents were regarding truck traffic congestion on the frontage road at Exit 7 off IH 45.
- To address the complex issues associated with the proposed project, the following Federal and State agencies were formally invited by the USACE to provide technical advice during the preparation of the DEIS: NMFS, USCG, FWS, EPA, FHWA, TNRCC, GLO, and TxDOT. Written agency responses were received by the USACE from FWS, EPA, and TxDOT. In addition, the agencies responded by having their representatives attend the coordination meetings and offered their technical support, recommendations, reviews and comments.
- Interagency work groups were formed to study the main issues related to the proposed terminal. Groups were formed to study issues related to air quality, land-based and marine traffic, dredged material management and alternative site locations. The following Federal, State and local agencies and groups were involved in the work groups: NMFS, NOAA, USCG, FWS, EPA, FHWA, TNRCC, TPWD, GLO, TxDOT, Galveston County Health Department, H-GAC, Galveston-Texas City Pilots, Port of Texas City, City of Texas City, and Audubon Society.
- Coordination with natural resource agencies regarding regulatory matters associated with the project has occurred throughout the EIS process and has included Texas GLO (TCMP consistency); FWS (endangered and threatened species); EPA, TNRCC, and H-GAC (air quality issues). Additional agency coordination that is in progress and will likely be completed during preparation of the Record of Decision includes coordination with the TNRCC regarding Clean Water Act Section 401 certification and consultation with NMFS regarding potential effects on EFH.
- On December 28, 2001, the USACE issued a Public Notice to announce the release of the DEIS, the Draft General Conformity Determination, and the revised permit application. The Public Notice also provided notification to the public of the comment period on the DEIS and the date and location of the Public Hearing on the DEIS. The Notice of Availability of the DEIS was published in the *Federal Register* on January 4, 2002. This notice initiated a 45-day comment period during which comments were solicited from Federal, State, and local agencies, interest groups, and individuals.

The comment period ended on February 19, 2002. Comments received during the comment period are presented in appendices J-1 through J-3, along with responses to the comments that were prepared as a part of this FEIS.

- The USACE, Galveston District, held a public workshop and hearing for the Shoal Point Container Terminal DEIS on January 29, 2002, at the Charles T Doyle Convention Center in Texas City, Texas. In addition to several comments from private citizens, public officials (or their representatives) provided their input regarding the proposed project. A transcript from the public hearing, as well as responses to those comments, is provided in Appendix J-4 of this document.
- The Notice of Availability of this FEIS in the *Federal Register* initiates a 30-day review period. Comments on the FEIS will be received by the USACE during this period. The USACE will consider all comments received during the review periods in making its decision on the Section 404/10 permit action. A Record of Decision will then be issued which will document the end of the NEPA process and the USACE's final permit decision.

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ACRONYMS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ADT	average daily traffic
AIC	Agency Information Consultants
AIS	Automated Information System
AOI	Area of Influence
AOU	American Ornithologists' Union
AST	aboveground storage tank
ASTM	American Society of Testing and Materials
AWSC	all-way, stop-controlled (roadway traffic intersection)
BEG	Bureau of Economic Geology
BEI	Belaire Environmental, Inc.
bgs	below ground surface
BMP	Best Management Practice
BNSF	Burlington Northern and Santa Fe Railway
BUG	Beneficial Uses Group
ca.	circa (approximately)
CAA	EPA's 1990 Clean Air Act
CAGR	Compound Annual Growth Rate
CAST	Cumulative Analysis Screening Tool
CCC	Coastal Coordination Council
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (1980)
CERCLIS	EPA's Comprehensive Environmental Response, Compensation, and Liability Information System
CESQG	conditionally exempt small quantity generator
CFR	Code of Federal Regulations
cfs	cubic feet per second
cfu/dL	colony forming units per deciliter
CLF	civilian labor force
CMSA	Consolidated Metropolitan Statistical Area
CO	carbon monoxide
CORRACT	RCRIS Corrective Action database
CR	County Road
C-TPAT	Customs Trade Partnership Against Terrorism

ACRONYMS AND ABBREVIATIONS (Continued)

CZM	Coastal Zone Management Program
dB	decibel
dBA	A-weighted decibel
DEIS	Draft Environmental Impact Statement
DIMS	Data and Information Management System
DMMP	Dredged Material Management Plan
DMPA	Dredged Material Placement Area
DVMAV	EPA's Monitoring Status Degree of Vulnerability
DVECO	EPA's Economic Status Degree of Vulnerability
DWT	dead weight tons
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EJ	Environmental Justice
EMS	Emergency Medical Services
ENR	*Engineering News-Record*
EO	Executive Order
EOR	element occurrence record
EPA	U.S. Environmental Protection Agency
ERNS	Emergency Response Notification System
E/SA	endangered due to similarity of appearance
FHWA	Federal Highway Administration
FINDS	EPA's Facility Index System database
FIRE	finance, insurance, and real estate
FM	Farm-to-Market Road
FR	Federal Register
ft/sec	feet per second
FWS	U.S. Fish and Wildlife Service
GBA	Gahaban & Bryant Associates
GBEP	Galveston Bay Estuary Program
GBFIG	Galveston Bay Freshwater Inflows Group
GBF	Galveston Bay Foundation
GBNEP	Galveston Bay National Estuary Program
GIWW	Gulf (of Mexico) Intracoastal Waterway
GLO	Texas General Land Office
GMFMC	Gulf of Mexico Fishery Management Council
gpm	gallons per minute

ACRONYMS AND ABBREVIATIONS (Continued)

HCDR	Harris County Deed Records
HCPR	Harris County Probate Records
HCS	Highway Capacity Software
HCTR	Harris County Tax Rolls
HGA	Houston-Galveston Area
H-GAC	Houston-Galveston Area Council
HGA VEI	Houston-Galveston Area Vessel Emissions Inventory
HGCSD	Harris-Galveston Coastal Subsidence District
HPP	Hurricane Preparedness Plan
ICT	Interagency Coordination Team
IH	Interstate Highway
IOP	Innocent Owner/Operator Program
ISD	Independent School District
JDC	J D Consulting, L.P.
kg	kilogram
kts	knots
L_{eq}	equivalent sound level
LOS	level of service
LPG	liquefied petroleum gas
LPUST	leaking petroleum underground storage tank
LUST	leaking underground storage tank
LQG	large quantity generator
mcy	million cubic yards
MGD	millions of gallons per day
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MLT	mean low tide
MOA	Memorandum of Agreement
MSA	Metropolitan Statistical Area
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MTP	Metropolitan Transportation Plan
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NEPA	National Environmental Policy Act
NFRAP	No Further Remedial Action Planned
NMFS	National Marine Fisheries Service

ACRONYMS AND ABBREVIATIONS (Continued)

NO_2, NO, NO_3, NO_x	Nitrogen dioxide (NO_2), nitric oxide (NO), and nitrate radical (NO_3) are collectively called nitrogen oxides (NO_x)
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTSB	National Transportation Safety Board
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
O_3	ozone
Pb	lead
PCB	polychlorinated biphenyl
pc/mi/ln	passenger cars per mile per lane
PHA	Port of Houston Authority
P.L.	Public Law
$PM_{[n]}$	particulate matter with an aerodynamic diameter of [*n*]
ppm	parts per million
ppt	parts per thousand
PAWSA	Ports and Waterways Safety Assessment
RAZ	Regional Analysis Zone
RCRA	Response Conservation and Recovery Act
RCRA GEN	RCRA Generators Sites
RCRIS	EPA's Resource Conservation and Recovery Information System
RCT	Railroad Commission of Texas
ROD	Record of Decision
ROW	right-of-way
RTG	rubber-tired gantry
SAL	State Archeological Landmark
SAV	submerged aquatic vegetation
SCS	Soil Conservation Service
SH	State Highway
SIP	State Implementation Plan
SO_2	sulfur oxides
SOC	Species of Concern

SPCC	spill prevention, control, and countermeasures
SQG	small quantity generator
SSA	Stevedoring Services of America
SVOC	semivolatile organic compound
SWF	Solid Waste Facility
TAAS	Texas Agricultural Statistics Service
TARL	Texas Archeological Research Laboratory
TCB	Turner Collie & Braden
TCEQ	Texas Commission on Environmental Quality (referred to as TNRCC throughout this document)
TCIT	Texas City International Terminal
TCMP	Texas Coastal Management Program
TCT	Texas City Terminal Railway
TCWNC	Texas Colonial Waterbird Nesting Census
TDH	Texas Department of Health
TDS	total dissolved solids
TEU	twenty-foot equivalent unit
THC	Texas Historical Commission
TMDL	total maximum daily load
TNHP	Texas Natural Heritage Program
TNRCC	Texas Natural Resource Conservation Commission (now TCEQ)
TOES	Texas Organization for Endangered Species
TOS	Texas Ornithological Society
TPDES	Texas Pollution Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
tpy	tons per year
TRIS	EPA's Toxic Release Inventory System database
T/SA	threatened due to similarity of appearance
TSD	Treatment, Storage or Disposal (TSD) database
TSDC	Texas State Data Center
TSS	total suspended solids
TSU	Texas Southern University
TWC	Texas Workforce Commission
TWDB	Texas Water Development Board
TWSC	two-way, stop-controlled (roadway traffic intersection)
TXBCD	Texas Biological and Conservation Data System

TxDOT	Texas Department of Transportation
$\mu g/m^3$	micrograms per cubic meter
UPRR	Union Pacific Railroad
U.S.	United States
USACE	U.S. Army Corps of Engineers
USBOC	U.S. Bureau of the Census
USC	United States Code
USCG	U.S. Coast Guard
USCS	U.S. Customs Service
USGS	U.S. Geological Survey
UST	underground storage tank
VCP	TNRCC's Voluntary Cleanup Program
VOC	volatile organic compound
VTC-VTS	Vessel Traffic Control-Vessel Traffic Service
WCO	World Customs Organization

Soil Series

Map symbol	Name
Ad	Addicks loam
Ak	Addicks-Urban Land complex
Am	Aldine very fine sandy loam
An	Aldine-Urban Land complex
An	Aldine-Urban Land complex
Ap	Aris fine sandy loam
AtB	Atasco fine sandy loam
Ba	Beaumont clay (Harris County)
Bc	Beaumont-Urban Land complex
Bd	Bernard clay loam
Be	Beaumont clay (Chambers County)
Be	Bernard-Edna complex (Harris County)
Bg	Bernard-Urban Land complex
Ed	Edna fine sandy loam
Es	Edna-Aris complex
Fo	Follet loam
Fs	Frost-Morey complex
Ha	Harris clay

ACRONYMS AND ABBREVIATIONS (Continued)

Im	Ijam soils (Chambers County)
ImA	Ijam clay, 0 to 2 percent slopes
ImB	Ijam clay, 2 to 8 percent slopes
Is	Ijam soils (Harris County)
Iu	Ijam-Urban Land complex
Kf	Katy fine sandy loam
Ku	Kemah-Urban Land complex
LaA	Lake Charles clay, 0 to 1 percent slopes (Chambers County)
LaB	Lake Charles clay, 1 to 5 percent slopes (Chambers County)
LcA	Lake Charles clay, 0 to 1 percent slopes (Harris County)
LcB	Lake Charles clay, 1 to 3 percent slopes (Harris County)
Lu	Lake Charles-Urban Land complex
Mb	Morey silty clay, leveled (Chambers County)
Md	Midland silty clay loam
Mn	Mustang fine sand
Mo	Morey silt loam (Harris County)
Mp	Mustang fine sand, saline
Ms	Mustang fine sand, slightly saline
Na	Nahatche loam
SeB	Sievers loam, 0 to 3 percent slopes
Tm	Tracosa mucky clay
Ur	Urban Land
VaA	Vamont clay, 0 to 1 percent slopes
VaB	Vamont clay, 1 to 4 percent slopes
Vn	Vamont-Urban Land complex
W	water

SECTION 1

INTRODUCTION, PURPOSE, AND NEED

1.0 INTRODUCTION, PURPOSE, AND NEED

1.1 INTRODUCTION

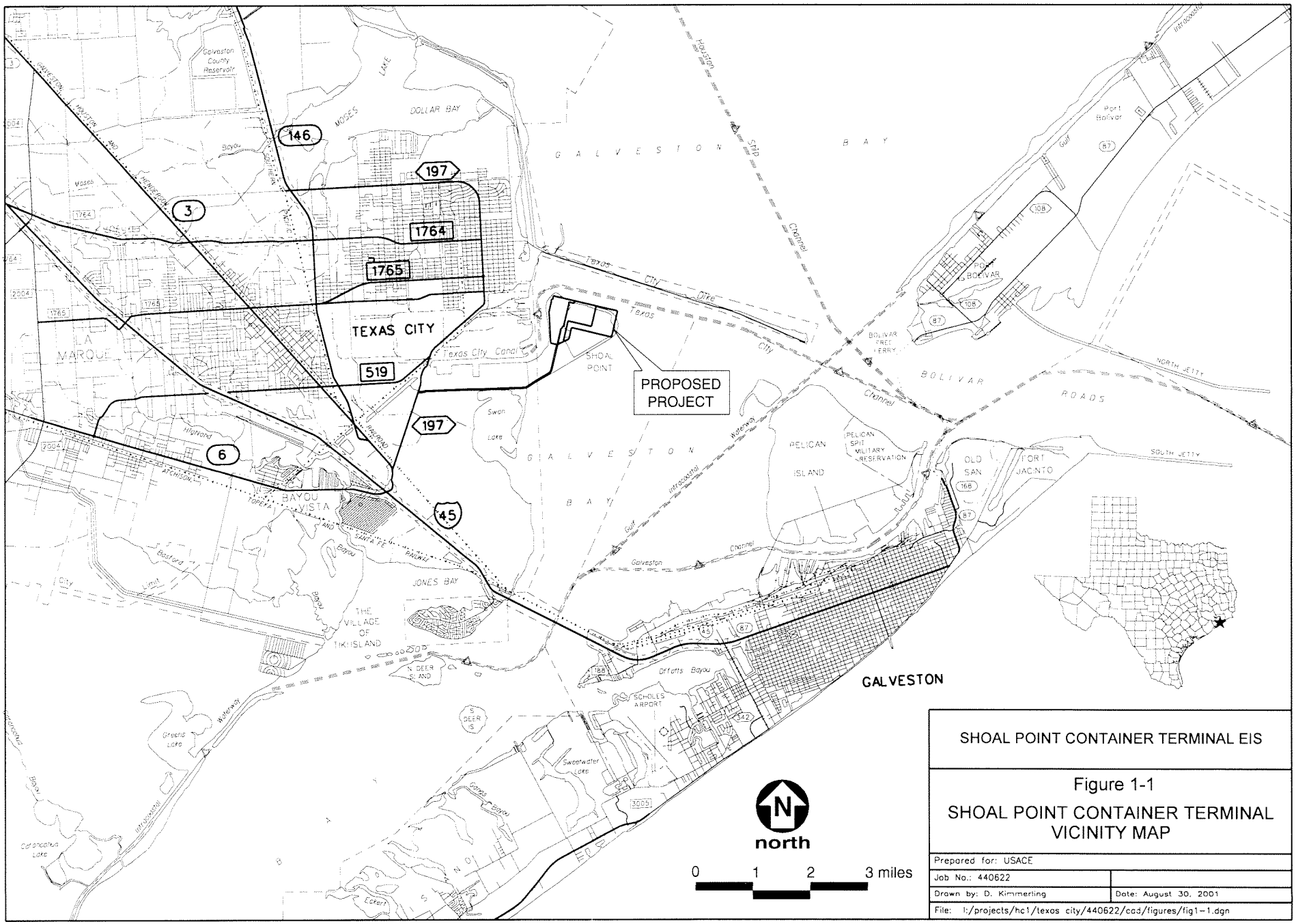
The City of Texas City (the City) has applied to the U.S. Army Corps of Engineers (USACE), Galveston District, for a Clean Water Act Section 404 permit and Rivers and Harbors Act Section 10 permit for dredge and fill activities related to the construction of the proposed Shoal Point Container Terminal in Texas City. The proposed terminal would be located on an approximately 400-acre undeveloped site on Shoal Point in Galveston County, Texas. Activities subject to the jurisdiction of the USACE would include dredging in navigable waters to deepen the Texas City Channel and to construct berthing areas and a turning basin, and placement of fill in waters of the U.S. (including wetlands) to prepare the project site for construction of proposed facilities related to the container terminal. Based on the Section 10/404 permit application submitted by the City to the USACE in July 2000, the USACE determined that the permitting action for the proposed dredge and fill activities constitutes a major Federal action. In accordance with the National Environmental Policy Act (NEPA), this Environmental Impact Statement (EIS) has been prepared to analyze and disclose the potential impacts of the proposed project and reasonable alternatives on the natural and human environment. A revised permit application reflecting the applicant's current plans for the proposed facility is included in this document as Appendix A.

The City proposes to develop the Shoal Point Container Terminal in partnership with Texas City International Terminals (TCIT). TCIT is a joint effort of Stevedoring Services of America (SSA) and Americana Ships (Americana). SSA, which has worldwide operations and is the largest stevedoring operator in North America, will manage the terminal operation. Americana, a major ocean carrier owning such lines as Lykes Brothers and TMM, will provide a base load cargo volume for the project. The City is the permit applicant and will provide the real estate for the project. The City owns approximately 375 acres in the Shoal Point area and is seeking a lease on additional property from the Texas General Land Office (GLO).

The proposed Shoal Point Container Terminal project site is located along the northern shoreline of Shoal Point in Galveston County, Texas, and is located south of the existing Texas City Channel (see Figure 1-1). The City of Texas City borders the project site to the west. The Texas City Channel is currently maintained by the USACE to a depth of –40 feet mean low tide (MLT). The existing channel is approximately 6.8 miles in length and is approximately 400 feet in width. The side slopes of the channel are maintained at approximately 2.5 feet horizontal to 1 foot vertical. The terminal would be developed as a Texas Central Gulf region container port, capable of providing deepwater facilities for Post-Panamax vessels. Additional information regarding the proposed project is presented in Section 2.0.

1.2 PURPOSE AND NEED

The Shoal Point Container Terminal is proposed to meet a regional need for development of a containerized cargo gateway similar to the gateways established for the Pacific Rim at the ports of Los Angeles and Long Beach. The regional need is driven by significant growth in container traffic within the Texas Central Gulf region, as well as projected growth in the Latin American market (VZM/Tran-Systems et al., 1998).



SHOAL POINT CONTAINER TERMINAL EIS

Figure 1-1

SHOAL POINT CONTAINER TERMINAL VICINITY MAP

Prepared for: USACE	
Job No.: 440622	
Drawn by: D. Kimmerling	Date: August 30, 2001
File: I:/projects/hc1/texas city/440622/cad/figures/fig1-1.dgn	

The concept of public and private need for the proposed project is important to the balancing process of the USACE public interest review. A private applicant's proposal frequently satisfies a public as well as a private need (e.g., providing the public with needed goods and services). A public sector applicant's project is presumed to address some public need, such as public recreation. With regards to private projects, Department of the Army regulations state that the USACE will generally not concern itself with the question of whether a proposed project will earn a profit, or become economically viable, nor whether it is needed in the market place. In regards to public projects, the USACE can defer to a State or other government entity decision to spend public money. Regulations indicate that the USACE should make an independent review of the public need for a project from the perspective of the overall public interest. This independent review is relevant to the USACE permit decision. The USACE will question the public need for a project, if the proposed project appears to be unduly speculative. In the public interest review, the USACE has the responsibility to balance public interest need or benefits against public interest detriments. The decision of whether to authorize a proposed project and the conditions under which it will be allowed are determined by the outcome of this general balancing process.

In its 1986 Galveston Bay Area Navigation Study, the USACE recognized that the economy of the U.S. has become increasingly dependent on waterborne transportation of materials. This factor, and the rapid growth of vessel sizes, capacities, and drafts, provided the impetus for studies by the USACE and other public and private entities on the feasibility of developing alternate deepwater port systems. The ports of Galveston, Houston, and Texas City combined, make the Galveston Bay area one of the busiest centers of shipping commerce in the nation (USACE, 1986).

Due to ever-increasing trade with Latin America, it is likely that the Gulf region will continue to experience faster growth than the U.S. as a whole. Over the last decade, total U.S. container growth has increased 4.3 percent per year, while Gulf container growth has increased 10 percent per year. Over the last 30 years, containerized cargo grew faster than the combined annual growth rate for the greater Houston region. Twenty years ago, containers were relatively rare with about 200,000 TEUs (twenty-foot equivalent units) moving through Galveston Bay. By 2000, this volume exceeded 1 million TEUs, and is projected to double by 2010 and triple by 2020 (VZM/TransSystems et al., 1998). Cargo typically transported in containers includes lumber and other building materials; electronics; computer hardware; appliances; housewares; textiles and fibers; clothing; fruits and vegetables; packaged foods; paper products; cleaning supplies; pesticides and other chemicals; machinery and parts.

In 1997, the City of Texas City commissioned VZM/TranSystems, in association with Leeper, Cambridge & Campbell, Inc., and Espey, Huston & Associates, Inc. (now PBS&J), to perform a market assessment and future facility needs assessment for the development of the Shoal Point Container Terminal. The assessment analyzed existing facilities and the regional demand for containerized cargo facilities in light of future national and world demand.

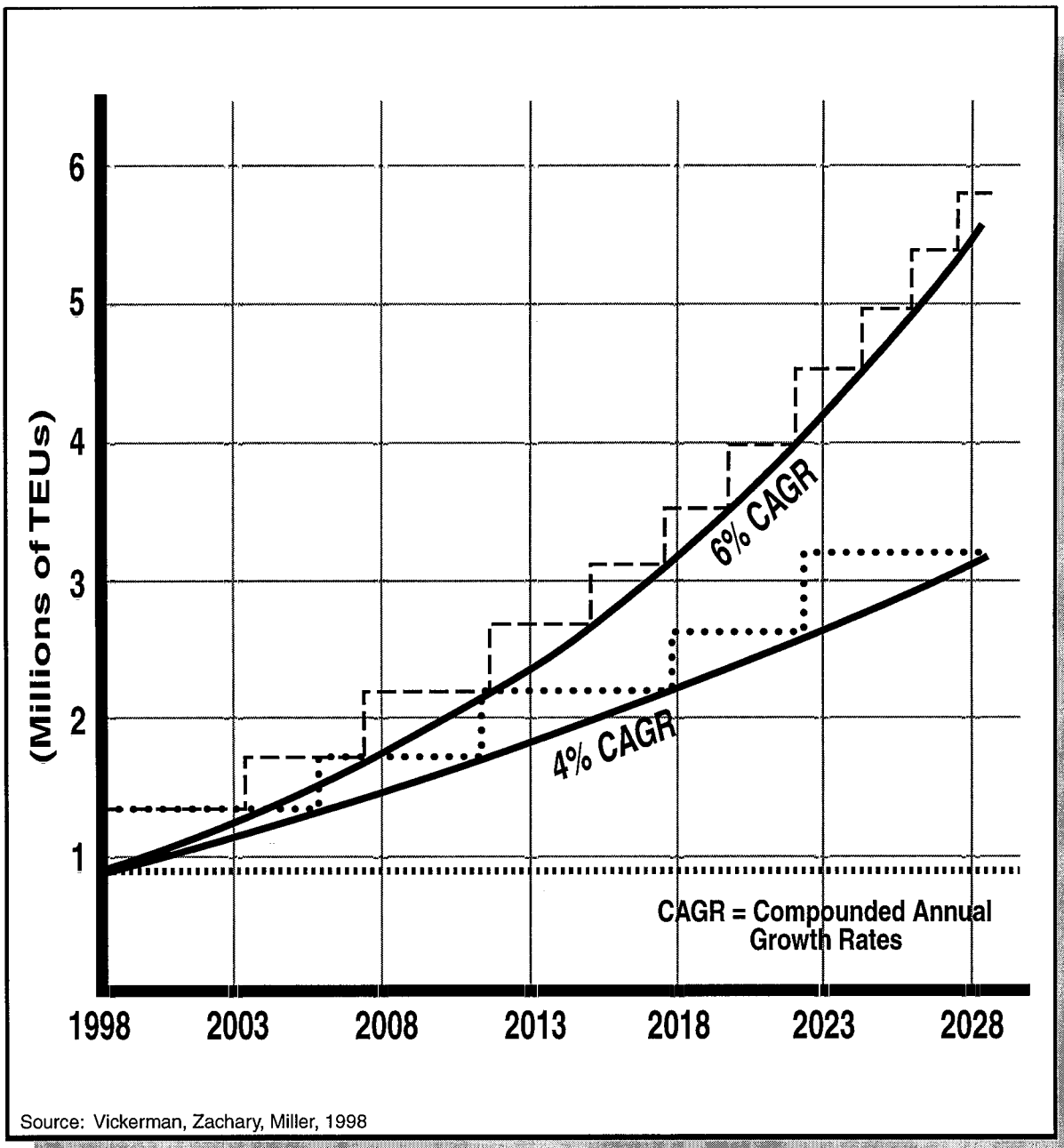
According to the VZM/TranSystems study (1998), between four and eleven new containerized cargo modules will be needed in the Texas Central Gulf region, particularly at the ports of Houston and Texas City between 1998 and 2028. A planning module is two berths plus 100 acres of backland. The estimates show that using a 6 percent Compound Annual Growth Rate (CAGR), the Texas Central Gulf region will exceed its Sustainable Practical Capacity of approximately 3,400,000 TEUs

around the year 2019. These estimates are based on the assumption that existing and proposed container facilities in the region operate at a sustainable Practical Capacity of 75 percent of the Maximum Practical Capacity. However, if the actual CAGRs for the region are higher, or if new container terminal facilities are not built, the shortfall in capacity would occur even sooner. A graphic illustration demonstrating when new terminal development should occur over a 30-year planning horizon is shown in Figure 1-2. Each step in the illustration represents a new two-berth/100-acre containerized cargo planning module.

In addition to the existing and projected growth in container traffic, containership technology has improved significantly over the last few decades. This improvement results in a demand on existing and future port terminals to make substantial changes in their infrastructure. High capacity, largely automated cargo handling equipment is projected to be increasingly used at ports, requiring improvements and upgrades to wharf infrastructure and other terminal features (VZM/Transystems et al., 1998). As a result, many U.S. ports are currently faced with economic decisions affecting their ability to remain viable competitors in an increasingly competitive containerized cargo market.

The proposed Shoal Point Container Terminal has the capability to meet part of the regional capacity demands and to allow the Texas Central Gulf region to remain a viable competitor in the containerized cargo market. In addition, the proposed Shoal Point Container Terminal has the capacity to relieve many of the landside constraints currently experienced by other container facilities in the Houston region and the greater U.S. port system (VZM/TranSystems et al., 1998). The applicant has proposed the Shoal Point site for the terminal because, they have stated, the location offers the following features:

- Easy and direct access to ocean trade routes in the Gulf of Mexico without the expense and potential delays of long channel navigation experienced at Houston or New Orleans
- Direct access to the existing roadway infrastructure network and rail access to the mainlines of the Union Pacific Railroad (UPRR) and Burlington Northern and Santa Fe Railway (BNSF)
- The potential to accommodate Post-Panamax vessels
- Available undeveloped land without the constraints of urban congestion and encroaching development
- Consistent use with neighboring properties
- Capacity to accommodate some of the overflow containerized cargo destined for the Texas Central Gulf region that cannot be accommodated by the Port of Houston, thereby keeping the economic benefits within Texas.



Source: Vickerman, Zachary, Miller, 1998

Existing capacity at Barbours Cut

New 100-acre, 2-berth module (at 6% CAGR)

New 100-acre, 2-berth module (at 4% CAGR)

SHOAL POINT CONTAINER TERMINAL EIS

Figure 1-2

PROJECTED NEED FOR CONTAINER TERMINAL CAPACITY IN CENTRAL TEXAS GULF REGION

Prepared for: USACE	
Job No.: 440622	Scale:
Prepared by. D. Kimmerling	Date: August 27, 2001
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SECTION 2

ALTERNATIVES ANALYSIS

2.0 ALTERNATIVES ANALYSIS

2.1 INTRODUCTION

This section discusses the alternatives considered during the preparation of the EIS, including those that were eliminated from further study, those considered in detail, and the No-Action alternative. The approach that was used to develop the range of alternatives and to eliminate or refine them is also discussed. Descriptions of the environmental impacts of these alternatives in this section are limited to concise summaries for use in the comparison of alternatives. Site-specific descriptions and discussions of potential environmental impacts occur in Section 4.0, Environmental Consequences. In this section, as in Section 4.0, descriptions of potential impacts for each alternative site are based on the City of Texas City's proposed Shoal Point project (i.e., 400-acre terminal with six berths). The relative positive and negative impacts of the seven reasonable alternatives (including the applicant's proposed action and No-Action alternative) are compared in tabular form and in discussion. Although it fails to meet the Purpose and Need of the proposed project, the No-Action alternative always remains as an alternative to the applicant's proposed action (i.e., construction of the proposed container terminal at Shoal Point).

This discussion is intended to form the basis for the USACE's permit decision. As a result of the decision process, the USACE may issue the permit, deny the permit, or issue the permit with modifications or conditions. As discussed in Section 2.4.1, the No-Action alternative is considered to be equivalent to denial of the permit by the USACE.

Many project alternatives initially considered were eliminated during a screening process because they were found to be unreasonable or infeasible and, therefore, did not receive the more rigorous study required for all reasonable alternatives. A more detailed and systematic study was made of all reasonable alternatives before they were evaluated. These two steps of analysis are described below.

An Alternatives Analysis Workgroup, headed by Martin Arhelger (PBS&J) and consisting of representatives from PBS&J, USACE, SSA, Americana, City of Texas City, Berger/Abam, Shiner-Moseley and Associates, and JD Consulting, L.P., provided technical support to the EIS Project Team in the identification of the approach, identification and evaluation of available data, and review of preliminary results for the analysis of alternatives for the Shoal Point Container Terminal Environmental Impact Statement.

2.2 SCREENING CRITERIA

The range of reasonable alternatives includes all that are technically and economically practical or feasible. The critical values that define the limits of practicality and feasibility are not limited to those within the capability of the applicant. The workgroup developed a list of screening criteria to establish the range of alternatives. It is possible for the same factor to be used both as a screening criterion and as an evaluation criterion (i.e., there could be a maximum or minimum value that makes a factor a screening criterion, but as long as the value is within an acceptable range, an alternative is not eliminated and the same criterion may also be used as an evaluation criterion). The alternatives that were not eliminated by the screening criteria were evaluated in more detail.

Screening criteria used in this alternatives analysis are as follows:

- **Protected Water**. The site must be in protected water (natural or constructed breakwater). If it is feasible to build a breakwater, then an existing lack of protection is not a fatal flaw.
- **Wharf/Shoreline Requirements**. A minimum of 6,000 feet of wharf frontage is required to support six berths.
- **Minimum Acreage Requirements**. The minimum acreage requirement is 400 acres. Based on information provided to the workgroups, the efficiencies of a six-berth system are very good. Since efficiency drops considerably with smaller numbers of berths, combined sites with greater than six total berths would be required to match efficiencies (and meet practical needs) of one six-berth site. Combination sites (more than one site with less than six berths each) would require duplicate facilities and may result in greater total impacts. The workgroup agreed that, for the project as proposed, enough potential sites were available to meet the acreage requirement for a six-berth system (400 acres), so combination sites and sites that would support fewer than six berths did not need to be considered.
- **Time Constraints**. This criterion represents an absolute time constraint that would make the project infeasible. The applicant considered 4 years from the date of the issuance of a permit as a make-or-break point (i.e., the applicant would likely lose partners and financial backing for the project if the preparation of the site and construction of Phase I at a given alternative site took more than 4 years from the date of the issuance of the permit).
- **Ship Access**. This criterion includes anything that physically restricts ship access to an alternative site. It includes a minimum possible channel depth (45 feet) and bridge clearance (150 feet).
- **Geographic Limitations**. Any location more than 5 miles from an existing deepwater channel was eliminated from further consideration. The workgroup determined that a number of potential sites within the region are within 5 miles of an existing deepwater channel, so the additional environmental impacts and costs associated with dredging longer distances made sites outside this distance unreasonable. A minimum possible channel depth limitation was used to eliminate areas that could not be dredged to the required 45-foot depth due to obstructions such as pipelines or tunnels.

2.3 SCREENING PROCESS

The restrictions indicated by the criteria described above combined to form a geographic range beyond which any alternative site would trigger some screening criterion that would make it infeasible. These limitations were transferred to a basemap to produce an outline of the feasible geographic range of alternatives. Sites that would potentially meet the screening criteria within the geographic limitations were considered in the screening process. Many areas within the geographic range were excluded because the 400-acre footprint required to meet the minimum acreage requirement would impinge on areas of high density residential and/or industrial land uses or high concentrations of petroleum wells and/or pipeline crossings.

A potential alternative site at Virginia Point was eliminated because of a combination of environmental concerns and time constraints (requirements to dredge a new channel, acquire a permit to fill extensive areas of wetlands, mitigate those losses, and prepare the site for construction). As an

indication of the environmental issues that could be associated with this site, concerns at this site, the site has been targeted for conservation (with Federal funding from the National Oceanic and Atmospheric Administration's (NOAA) Coastal Impact Assistance Program (CIAP) (Mason, 2001)). In addition, the Virginia Point site is adjacent to Scenic Galveston's John M. O'Quinn Interstate Highway 45 (IH 45) Estuarial Corridor conservation preserve.

Under the geographic limitations criterion, the upstream limit for channel dredging on the San Jacinto River would be approximately one-half mile downstream from the Beltway 8 bridge, near the Shell Oil facility. Geographic limitations also eliminated alternative sites in West Bay (due to the bridge clearance of the IH 45 causeway). East Bay and the eastern shoreline of Trinity Bay were eliminated due to the need to dredge more than 5 miles of new channel. Bolivar Peninsula was eliminated from further consideration because of the combined environmental impacts and costs of building a bridge to Galveston Island and dredging a new channel.

The sites identified through the screening process as reasonable alternatives and carried forward for further evaluation, along with the No-Action alternative, are as follows (see Figure 2.4-1):

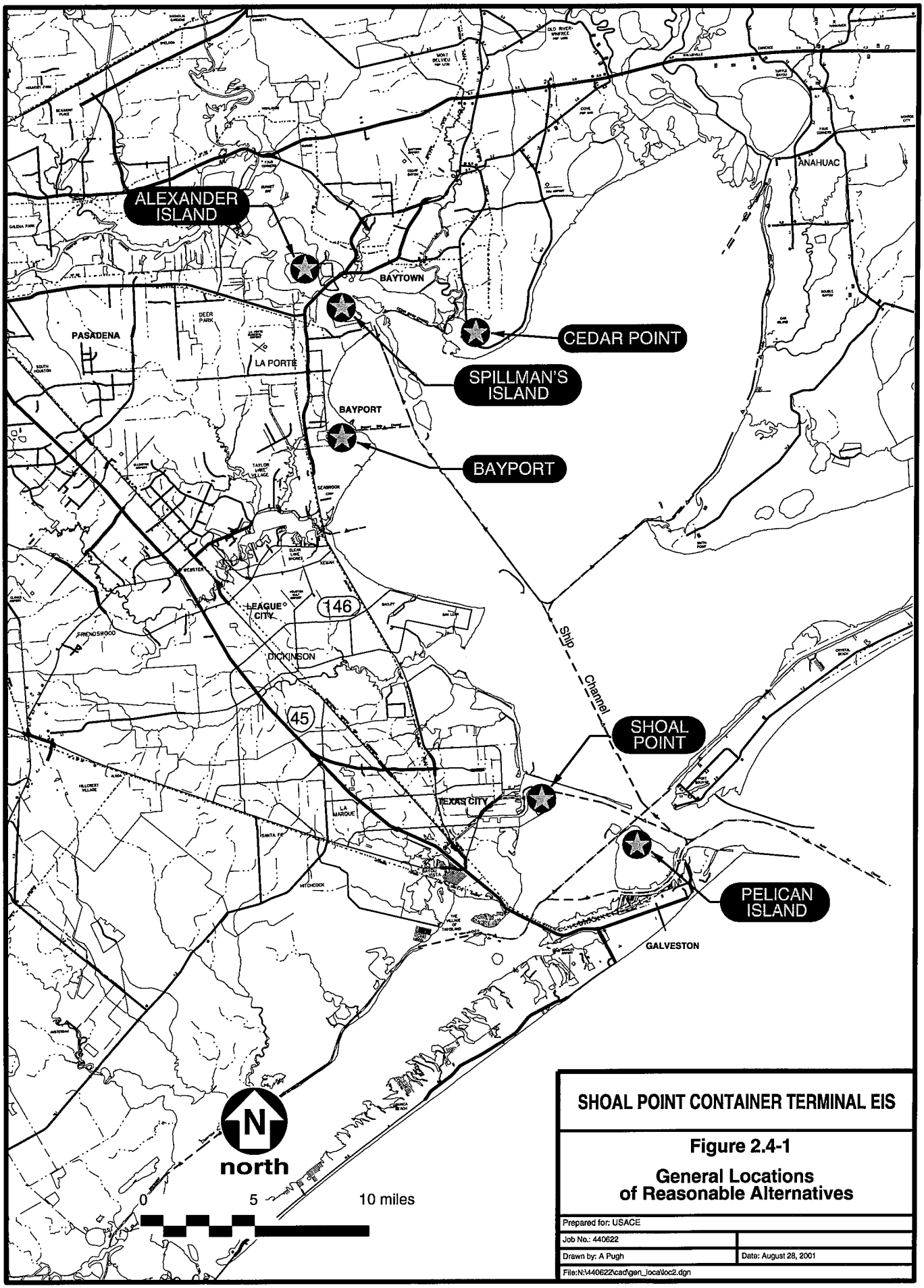
- No Action
- Shoal Point (the applicant's proposed alternative)
- Pelican Island
- Bayport
- Spillman's Island
- Alexander Island
- Cedar Point

2.4 DESCRIPTION OF ALTERNATIVES, INCLUDING THE PROPOSED ACTION

The proposed project at Shoal Point, or at any of the alternative sites, would involve construction of the terminal in three independent phases. Each phase of the project would include two berths, and each berth would be 1,000 feet in length, for a total of 6,000 feet of wharf accommodating six berths. The design vessel for the container terminal is a Post-Panamax vessel with a beam width of 135 feet and a length of approximately 900 to 1,000 feet.

Each phase of construction would be dependent on the market share of anticipated container moves. The cargo forecast for the proposed project by phase and approximate year is presented in Table 2-1. Phase I of the proposed project is expected to be a 125-acre terminal; Phase II would be another 125-acre terminal; and the third and final phase would be a 150-acre terminal. This would bring the proposed terminal footprint to 400 acres.

The layout of facilities at each site (the footprint) was selected to minimize negative environmental impacts and conflicts with the existing land use while serving the needs of the applicant.



SHOAL POINT CONTAINER TERMINAL EIS

Figure 2.4-1

General Locations of Reasonable Alternatives

Prepared for: USACE	
Job No.: 440622	
Drawn by: A Pugh	Date: August 28, 2001
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TABLE 2-1

PROPOSED CONTAINER TERMINAL
CARGO FORECAST

Container Moves	TEU	Approximate Year	Description
315,000	504,000	2004	**Phase I Operational**
330,000	528,000	2005	
345,000	552,000	2006	
360,000	576,000	2007	
375,000	600,000	2008	**Phase II Operational**
400,000	640,000	2009	
425,000	680,000	2010	
450,000	720,000	2011	
475,000	760,000	2012	
500,000	800,000	2013	
525,000	840,000	2014	
550,000	880,000	2015	
575,000	920,000	2016	**Phase III Operational**
600,000	960,000	2017	
708,000	1,132,800	2018	
816,000	1,305,600	2019	
924,000	1,478,400	2020	
1,032,000	1,651,200	2021	
1,140,000	1,824,000	2022	
1,250,000	2,000,000	2023	
1,529,000	2,446,400	Unknown	**Ultimate Design**

Assumptions:
1 container move = 1.6 twenty-foot equivalent units (TEU)

The 400-acre footprint of the terminal yard is based on a design that uses operational parameters set by the terminal operator. In the proposed container configuration, the yard is sized using combinations of container stacks that are serviced either by rubber-tired gantries (RTGs), top handlers, or sidepicks. In general, this arrangement provides a relatively dense stacking configuration to optimize utilization of the yard space, thereby minimizing the overall size of the facility. Other specialized zones within the yard would accommodate refrigerated containers, parking for bare chassis, and equipment storage. The total storage space has been laid out using estimated throughput volumes for the terminal, estimated dwell times for the containers, plus reserve space for peak operating months.

The design project includes provisions for on-site fueling of land-based equipment and water-based fueling (i.e., bunkering) of vessels at the berth. Federal, State, and local guidelines will be followed in the final design phase of the project in order to ensure proper handling of construction and operation stormwater as well as any accidental spills of hazardous or toxic substances. The facility would be designed with oil-water separators built into the site drainage system. A facility emergency response plan that includes appropriate procedures for each type and location of event would be completed prior to facility operation.

The operational component of the proposed container terminal would be expected to handle some hazardous cargo. With regard to commodities shipped as cargo, hazardous materials are classified by the Hazardous Materials Transportation Act, and/or the International Maritime Dangerous Goods Code, as materials, articles, or substances capable of posing an unreasonable risk to health, safety, property or the environment when transported or used in commerce. Regulations regarding hazardous materials (also known as "dangerous goods") are administered by various agencies, including the U.S. Coast Guard (USCG) and U.S. Department of Transportation. Hazardous cargo is required to be property documented, marked, packaged, and segregated on the terminal and on vessels. Based on information provided by the Port of Houston Authority, approximately 4.35 percent of all trips through the gate at Barbours Cut Terminal carry hazardous materials. This equates to approximately 7-8 percent of the total Barbours Cut cargo. The types of hazardous materials transported through Barbours Cut include compressed gas, flammable liquids, flammable solids, oxidizers, poisons, and corrosive liquids. For purposes of this EIS, it is assumed that similar types and quantities of hazardous cargo would be transported through the Shoal Point container terminal. Spill prevention, control, and countermeasures (SPCC) plans would be implemented to minimize impacts of hazardous material spills on the terminal site.

Information developed for description and evaluation of the existing conditions, or Affected Environment (Section 3.0), and potential impacts, or Environmental Consequences (Section 4.0), was gathered, summarized, and evaluated for the proposed project and for each of the reasonable alternatives and the No-Action (or No-Build) alternative. This information is presented in detail in the pertinent sections of the EIS and summarized in Table 2-2. Sections 2.4.1 through 2.4.7 describe each alternative, with specific reference to project activities and facilities at that site. Table 2-3 presents assumptions and construction data for project activities (e.g., land stabilization, dredging, and access road construction) at Shoal Point and at each alternative site. (Note: See Acronyms and Abbreviations at the beginning of this document for definition of abbreviations used in tables 2-2 and 2-3.)

TABLE 2-2

ALTERNATIVES ANALYSIS MATRIX – POTENTIAL IMPACTS TO EVALUATION CRITERIA

Evaluation Criteria / Receptors	*ALTERNATIVES*						
	No-Action	**Shoal Point**	**Pelican Island**	**Bayport**	**Spillman's Island**	**Alexander Island**	**Cedar Point**
Air Quality		• Increased Fugitive PM emissions generated during construction activities • Total annual operating emissions would contribute <1% of existing emissions for HGA area					
Land-side Mobile (Truck and Rail) Emissions (Year of Maximum Operation: 2026)	• Increased mobile emissions relative to baseline conditions, proportional to increased container movements to and from Houston Area via truck and train to meet market demands.	NO_x 865.2 tpy VOC 295.6 tpy CO 659.5 tpy SO_2 195.3 tpy PM_{10} 102.1 tpy Total 2,117.7 tpy	NO_x 905.2 tpy VOC 312.0 tpy CO 675.2 tpy SO_2 204.5 tpy PM_{10} 107.9 tpy Total 2,204.8 tpy	NO_x 677.5 tpy VOC 215.8 tpy CO 580.1 tpy SO_2 151.2 tpy PM_{10} 77.6 tpy Total 1,702.2 tpy	NO_x 671.5 tpy VOC 203.8 tpy CO 570.2 tpy SO_2 151.1 tpy PM_{10} 73.8 tpy Total 1,670.4 tpy	NO_x 677.2 tpy VOC 220.0 tpy CO 584.9 tpy SO_2 151.2 tpy PM_{10} 77.1 tpy Total 1,710.4 tpy	NO_x 772.6 tpy VOC 220.6 tpy CO 596.3 tpy SO_2 177.1 tpy PM_{10} 78.6 tpy Total 1,845.2 tpy
Ocean-Going Transit (Ships, Tugs, Bunkering Support) Emissions (Year of Maximum Operation: 2026)	• Increased emissions proportional to normal growth in ship traffic.	NO_x 1,267.0 tpy VOC 23.8 tpy CO 260.3 tpy SO_2 1,211.9 tpy PM_{10} 27.4 tpy Total 2,790.4 tpy	NO_x 1,116.0 tpy VOC 20.9 tpy CO 228.8 tpy SO_2 1,067.4 tpy PM_{10} 24.2 tpy Total 2,457.3 tpy	NO_x 1,686.5 tpy VOC 31.8 tpy CO 347.9 tpy SO_2 1,613.5 tpy PM_{10} 36.3 tpy Total 3,716.0 tpy	NO_x 1,758.4 tpy VOC 33.1 tpy CO 363.0 tpy SO_2 1,682.4 tpy PM_{10} 37.8 tpy Total 3,874.7 tpy	NO_x 1,834.5 tpy VOC 34.6 tpy CO 378.8 tpy SO_2 1,755.4 tpy PM_{10} 39.5 tpy Total 4,042.8 tpy	NO_x 1,827.9 tpy VOC 34.5 tpy CO 377.5 tpy SO_2 1,748.9 tpy PM_{10} 39.3 tpy Total 4,028.1 tpy
Construction Emissions		• Total Peak annual construction emissions would contribute <1% of existing emissions in Galveston County. Elevated short-term PM_{10} emissions contribution (≈2%) relative to existing Galveston County emissions. Other air contaminants would contribute <1%.	• Total Peak annual construction emissions would contribute <1% of existing emissions in Galveston County. Elevated short-term PM_{10} emissions contribution (≈2%) relative to existing Galveston County emissions. Other air contaminants would contribute <1%.	• Total Peak annual construction emissions would contribute <1% of existing emissions in Harris County. Elevated short-term PM_{10} emissions contribution (≈0.1%) relative to existing Harris County emissions. Other air contaminants would contribute <1%.	• Total Peak annual construction emissions would contribute <1% of existing emissions in Harris County. Elevated short-term PM_{10} emissions contribution (≈0.3%) relative to existing Harris County emissions. Other air contaminants would contribute <1%.	• Total Peak annual construction emissions would contribute <1% of existing emissions in Harris County. Elevated short-term PM_{10} emissions contribution (≈0.3%) relative to existing Harris County emissions. Other air contaminants would contribute <1%.	• Total Peak annual construction emissions would contribute <1% of existing emissions in Chambers County. Elevated SO_2 and PM_{10} emissions contribution (≈3% and ≈2%, respectively) relative to existing Chambers County Emissions. Other air contaminants would contribute <1%.

TABLE 2-2

ALTERNATIVES ANALYSIS MATRIX – POTENTIAL IMPACTS TO EVALUATION CRITERIA

Evaluation Criteria / Receptors	*ALTERNATIVES*						
	No-Action	**Shoal Point**	**Pelican Island**	**Bayport**	**Spillman's Island**	**Alexander Island**	**Cedar Point**
Operating Emissions (Year of Maximum Operation: 2026)		• Total annual operating emissions would contribute <1% of existing emissions in Galveston County. Individual emissions would contribute <1% increase over existing Galveston County emissions. NO_x 45.8 tpy VOC 137.3 tpy CO 43.6 tpy SO_2 56.1 tpy PM_{10} 50.2 tpy Total 333.0 tpy	• Total annual operating emissions would contribute <1% of existing emissions in Galveston County. Individual emissions would contribute <1% increase over existing Galveston County emissions. NO_x 45.8 tpy VOC 137.3 tpy CO 43.6 tpy SO_2 56.1 tpy PM_{10} 50.2 tpy Total 333.0 tpy	• Total annual operating emissions would contribute <1% of existing emissions in Harris County. Individual emissions would contribute <1% increase over existing Harris County Emissions. NO_x 45.8 tpy VOC 137.3 tpy CO 43.6 tpy SO_2 56.1 tpy PM_{10} 50.2 tpy Total 333.0 tpy	• Total annual operating emissions would contribute <1% of existing emissions in Harris County. Individual emissions would contribute <1% increase over existing Harris County Emissions. NO_x 45.8 tpy VOC 137.3 tpy CO 43.6 tpy SO_2 56.1 tpy PM_{10} 50.2 tpy Total 333.0 tpy	• Total annual operating emissions would contribute <1% of existing emissions in Harris County. Individual emissions would contribute <1% increase over existing Harris County Emissions. NO_x 45.8 tpy VOC 137.3 tpy CO 43.6 tpy SO_2 56.1 tpy PM_{10} 50.2 tpy Total 333.0 tpy	• Total annual operating emissions would contribute <1% of existing emissions in Chambers County. Elevated SO_2, PM and VOC emissions contribution relative to existing Chambers County Emissions. Other air contaminants would contribute <1%. NO_x 45.8 tpy VOC 137.3 tpy CO 43.6 tpy SO_2 56.1 tpy PM_{10} 50.2 tpy Total 333.0 tpy
General Conformity		• For Phase I& II, NO_x emissions from project construction would exceed 25 tpy and require General Conformity Determination. • For Phase III, VOC and NO_x emissions from project construction would not exceed 25 tpy.	• For Phase I, NO_x emissions from project construction would exceed 25 tpy and require General Conformity Determination. • For Phase II and Phase III, VOC and NO_x emissions from project construction would not exceed 25 tpy.	• For Phase I, NO_x emissions from project construction would exceed 25 tpy and require General Conformity Determination. • For Phase II and Phase III, VOC and NO_x emissions from project construction would not exceed 25 tpy.	• For Phase I, NO_x emissions from project construction would exceed 25 tpy and require a General Conformity Determination. • For Phase II and Phase III, VOC and NO_x emissions from project construction would not exceed 25 tpy.	• For Phase I, NO_x emissions from project construction would exceed 25 tpy and require General Conformity Determination. • For Phase II and Phase III, VOC and NO_x emissions from project construction would not exceed 25 tpy.	• For Phases I and II, NO_x emissions from project construction would exceed 25 tpy and require General Conformity Determination. • For Phase III, VOC and NO_x emissions from project construction would not exceed 25 tpy.

TABLE 2-2

ALTERNATIVES ANALYSIS MATRIX – POTENTIAL IMPACTS TO EVALUATION CRITERIA

Evaluation Criteria / Receptors	*ALTERNATIVES*						
	No-Action	**Shoal Point**	**Pelican Island**	**Bayport**	**Spillman's Island**	**Alexander Island**	**Cedar Point**
Roadway Traffic							
Intersection and Main Corridor Analysis	• Normal growth in region would increase traffic at intersections and on corridors, in some cases resulting in poor level of service.	• Impact to the Loop 197 at SH 3 intersection (LOS from B to D relative to No-Build in 2015 and from B to E in 2025). • Impact to SH 146 at FM 1765 (LOS from D to E relative to No-Build in 2025) and FM 519 at SH 146 (LOS from B to C relative to No-Build in 2015 and 2025). • Minor impact to IH 45 from FM 518 for FM 646 and from FM 1765 to FM 519 relative to No-Build. • Impact to weaving at IH 45 at SH 3/SH 6 interchange (LOS from B to D relative to No-Build in 2015 and from B to F in 2025). • Impact to weaving at IH 45/Loop 197 interchange (LOS from B to D relative to No-Build in 2025).	• Major impact to the Pelican Island Causeway bridge (requires new 4-lane bridge). • Impacts to Harborside at IH 45 (LOS from C to D relative to No-Build in 2025) and to Harborside at 51st St. (LOS from B to C relative to No-Build in 2025). • Minor impact to IH 45 from FM 517 to FM 1764 (LOS C to D relative to No-Build) in 2015 and from FM 518 to FM 646 (LOS E to F relative to No-Build) and FM 1765 to FM 519 (LOS B to C relative to No-Build in 2025).	• Impact to the SH 146 at Port Road intersection (LOS from A to B relative to No-Build in 2015). • On freeway section of SH 146 and SH 225, increased ADT, but no change in LOS relative to No-Build.	• Impact to Barbours Cut at SH 146 (east side) (LOS from A to B relative to No-Build in 2015 and 2025). • On SH 225 and freeway section of SH 146, increased ADT, but no change in LOS relative to No-Build.	• Requires new multi-span bridge to access project site (no existing bridge). • Impact to SH 225 at Miller's Cutoff (south side) (LOS from B to C relative to No-Build in 2025) and to Miller's Cutoff at Battleground Road (LOS from A to B relative to No-Build in 2025). • On SH 225, increased ADT, but no change in LOS relative to No-Build.	• Delays at intersections with poor level of service increase. • Impact to SH 146 from Spur 55 to SH 146/Bus. SH 146 split (LOS from A to B relative to No-Build in 2025).

TABLE 2-2

ALTERNATIVES ANALYSIS MATRIX – POTENTIAL IMPACTS TO EVALUATION CRITERIA

Evaluation Criteria / Receptors	*ALTERNATIVES*						
	No-Action	**Shoal Point**	**Pelican Island**	**Bayport**	**Spillman's Island**	**Alexander Island**	**Cedar Point**
Noise	• Impacts related to increased truck traffic for transporting container cargo from terminal(s) outside the region.	• One previously unimpacted roadway segment (SH 146 from Loop 197 to FM 519) would experience impact from traffic noise under absolute criterion relative to No-Build Conditions, and noise level increases of 1 dBA over the No-Build scenario would occur at some segments. • Construction noise levels (dredging 26 to 46 dBA; construction 35 to 62 dBA) and operational noise levels (59 dBA at 2,000 ft) would not exceed ambient noise levels (64 to 65 dBA) at nearest receptors (4,500 ft). • No additional impacts to noise levels in Omega Bay above predicted No-Build conditions.	• One previously unimpacted roadway segment (SH 146 from Loop 197 to FM 519) would experience impact from traffic noise under absolute criterion relative to No-Build Conditions, and noise level increases of 1 dBA over the No-Build scenario would occur at some segments. • Construction noise levels (dredging 21 to 41 dBA; construction 30 to 57 dBA) and operational noise levels (56.7 dBA at 1,500 ft) would not exceed ambient noise levels (58 to 66 dBA) at nearest receptors (8,000 ft).	• No new noise level impacts (existing conditions already impacted); however, noise level increases of 1 dBA over the No-Build scenario would occur at some segments. • Construction (dredging 50 to 70 dBA; construction 59 to 86 dBA) and operational (73 dBA) noise levels would exceed ambient noise levels (51 to 67 dBA) at nearby receptors (200 ft), resulting in an impact.	• No new noise level impacts (existing conditions already impacted); however, noise level increases of 1 dBA over the No-Build scenario would occur at some segments. • Construction (dredging 21 to 41 dBA; construction 35 to 62 dBA) and operational (57 dBA at 1,500 ft) noise levels would not exceed ambient noise levels (56 to 74 dBA) at nearest receptors (4,500 ft).	• No new noise level impacts (existing conditions already impacted) ; however, noise level increases of 1 dBA over the No-Build scenario would occur at some segments. • Construction (dredging 26 to 46 dBA; construction 35 to 62 dBA) and operational (59 dBA at 2,000 ft) noise levels would not exceed ambient noise levels (not available) at nearest receptors (5,000 ft).	• One previously unimpacted roadway segment (SH 146 from Spur 55 to SH 146/Bus. SH 146 Split) would experience impact from traffic noise under absolute criterion relative to No-Build Conditions, and noise level increases of 1–2 dBA over the No-Build scenario would occur at two segments. • Construction (dredging 40 to 60 dBA at 1,000 ft; construction 49 to 76 dBA) and operational (61.3 dBA at 380 ft) noise levels would exceed ambient noise levels (50 to 62 dBA) at nearby receptors (500 ft), resulting in an impact.
Groundwater	• No impact to groundwater recharge.	• All alternatives will reduce local groundwater recharge in the area of impervious cover.					

TABLE 2-2

ALTERNATIVES ANALYSIS MATRIX – POTENTIAL IMPACTS TO EVALUATION CRITERIA

Evaluation Criteria / Receptors	ALTERNATIVES						
	No-Action	Shoal Point	Pelican Island	Bayport	Spillman's Island	Alexander Island	Cedar Point
	• Alternative is not expected to result in impacts to groundwater hydrology, quantity, or quality • Any groundwater quality impacts are contingent upon the amount and type of development that would take place in lieu of a marine cargo terminal on the alternate sites.	• Alternative is not expected to result in impacts to groundwater hydrology, quantity, or quality.	• Alternative is not expected to result in impacts to groundwater hydrology, quantity, or quality.	• Alternative is not expected to result in impacts to groundwater hydrology, quantity, or quality.	• Alternative is not expected to result in impacts to groundwater hydrology, quantity, or quality.	• Alternative is not expected to result in impacts to groundwater hydrology, quantity, or quality.	• Minimal increases in groundwater turbidity (TSS) would be short-term, localized, and associated with dredging activities (construction and maintenance). Impacts would be related to duration of dredging activities more than the volume of dredged material.
Hazardous Material	• No impacts on Hazardous Material sites within Chambers, Harris, and Galveston counties.	• Closest documented Hazardous Material sites are located adjacent to existing roadway near terminus of proposed Access Corridor, along proposed access corridor in northern Swan Lake, and along the Texas City Harbor. These sites present minimal potential for impact to the project. • Risk of spill from construction and operation of facility. • Increased risk of spill from transport of hazardous materials.	• Closest documented Hazardous Material sites are located adjacent to existing roadways along the proposed alignment of the Access Corridor. These sites present minimal potential for impact to the project. • Risk of spill from construction and operation of facility. • Increased risk of spill from transport of hazardous materials.	• Closest documented Hazardous Material sites are located adjacent to existing roadways along the proposed alignment of the Access Corridor. These sites present minimal potential for impact to the project. • Risk of spill from construction and operation of facility. • Increased risk of spill from transport of hazardous materials.	• Closest documented Hazardous Material sites are located adjacent to existing roadways along the proposed alignment of the Access Corridor. These sites present minimal potential for impact to the project. • Risk of spill from construction and operation of facility. • Increased risk of spill from transport of hazardous materials.	• Closest documented Hazardous Material sites are located adjacent to existing roadways along the proposed alignment of the Access Corridor. These sites present minimal potential for impact to the project. • Risk of spill from construction and operation of facility. • Increased risk of spill from transport of hazardous materials.	• An active municipal landfill is located approximately 2,000 ft from site boundary. An unregistered underground storage tank (UST) site is located within the project boundary. This UST site would require further investigation if this alternative was selected. • Risk of spill from construction and operation of facility. • Increased risk of spill from transport of hazardous materials.
Surface Water							
Water Column Effects	• No impact	• Minimal increases in turbidity (TSS) would be short-term and associated with dredging activities (construction and maintenance). Impacts would be related to duration of dredging activities as well as the volume of dredged material. • All alternatives will introduce substantial area of paved impervious cover that will lead to more rain runoff.					

TABLE 2-2

ALTERNATIVES ANALYSIS MATRIX – POTENTIAL IMPACTS TO EVALUATION CRITERIA

Evaluation Criteria / Receptors	*ALTERNATIVES*						
	No-Action	**Shoal Point**	**Pelican Island**	**Bayport**	**Spillman's Island**	**Alexander Island**	**Cedar Point**
Salinity	• Slight salinity increase from deepening the Texas City Channel to –45 ft MLT.	• Slight salinity increases in the Texas City Harbor from deepening channels and facility areas.	• No changes in salinity are anticipated.	• Slight salinity increase from deepening of channel to –45 ft MLT.	• Slight salinity increases from deeper water at the berthing areas.	• No changes in salinity are anticipated.	• Slight salinity increase from deepening of channel to –45 ft MLT from HSC to facility.
Sediment Quality	• No impacts.	• No known sediment quality problems would affect water column organisms during maintenance dredging. USACE regularly tests all maintenance material. • No expectation of contaminants in virgin material. • Minimal possibility of spills of fuel and oil during dredging, leading to impacts to sediment quality. • All required procedures will be in place to prevent a spill at the terminal after construction, which should minimize the chance of a contaminant spill, possibly resulting in sediment contamination.					
Habitat Effects - Aquatic Open Bay waters (nekton, plankton)	No dredging activities associated with construction of the terminal would occur, so no effects to open-bay waters are expected.	• Nekton (including commercial and recreational fishery) and plankton could be affected short-term by dredging activities (increased TSS) which could result in loss of productive habitat. • Increased risks of chemical and oil spills (associated with increased ship traffic) could threaten larval and juvenile stages of nekton and plankton assemblages. • Slight increase in habitat available for deep-water nekton species in channel and berthing areas.					
Bay bottom (benthic community, oysters)	• No loss of habitat. • No dredging activities associated with construction of the terminal would occur, so no effects to benthic community or oyster reefs are expected.	• Increased runoff from the terminal could cause potential adverse water quality impacts to infaunal organisms. • Benthic communities are tolerant of salinity and sedimentation fluctuations and are likely to remain unaffected by dredging activities. • Increased potential for chemical or oil spills (associated with increase ship traffic) could impact benthic fauna. • Temporary potential impacts to aquatic organisms from elevated turbidities during dredging activities. • Creation of Beneficial Use areas would result in conversion of open bay bottom habitat to wetlands and upland habitats.					
	• No dredging activities associated with construction of the terminal would occur, so no effects to oyster reefs expected.	• No live oyster reefs occur in the area; however, potential habitat in the vicinity could be minimally affected by increased TSS associated with dredging activities.	• No live oyster reefs occur in the area; however, potential habitat in the vicinity could be minimally affected by increased TSS associated with dredging activities.	• Live oyster reefs near this area would be minimally affected by increased TSS associated with dredging activities.	• Live oyster reefs near this area would be minimally affected by increased TSS associated with dredging activities.	• No live oyster reefs occur in the area; however, potential habitat in the vicinity could be minimally affected by increased TSS associated with dredging activities.	• Live oyster reefs near this area would be minimally affected by increased TSS associated with dredging activities.
Essential Fish Habitat (EFH)	• No loss of habitat, so no effect to EFH is expected.	• Negative impacts could occur since species for which Galveston Bay has been designated as EFH may be found in the area.					

TABLE 2-2

ALTERNATIVES ANALYSIS MATRIX – POTENTIAL IMPACTS TO EVALUATION CRITERIA

Evaluation Criteria / Receptors	*ALTERNATIVES*						
	No-Action	**Shoal Point**	**Pelican Island**	**Bayport**	**Spillman's Island**	**Alexander Island**	**Cedar Point**
Freshwater ponds and wetlands *(Information on acreage of freshwater wetlands appears under 'Terrestrial and Emergent Vegetation')*	• No impacts.	• Freshwater ponds lie within this area and would probably be filled during construction which would result in loss of habitat to waterfowl and other wildlife.	• Freshwater wetlands along land access corridor would be lost.	• Freshwater wetlands lie within this area and would probably be filled during construction which would result in loss of habitat to waterfowl and other wildlife.	• No freshwater habitats occur within or near this site.	• Freshwater pond within area would be excavated during construction which would result in loss of habitat to waterfowl and other wildlife.	• Freshwater man-made pond within this area used for recreational activities would probably be filled during construction resulting in loss of aquatic resources.
Seagrass / Submerged Aquatic Vegetation (SAV)	• No loss of jurisdictional waters due to construction and operations; no chance of loss of seagrass/SAV.	• No true seagrass known to occur near any alternative site. • No widgeongrass observed during field visits.					
		• No seagrass (including widgeongrass) known to occur in the area.	• No seagrass (including widgeongrass) known to occur in the area.	• Widgeongrass may possibly occur within the vicinity of the site, especially north of the Bayport Ship Channel entrance.	• Widgeongrass may possibly occur near the site.	• Widgeongrass may possibly occur in the bay near the site and has been reported in a pond that occurs within the footprint.	• Widgeongrass may possibly occur in the bay near the site and in an inland pond within the footprint.
Habitat Effects – Terrestrial and Emergent Vegetation Habitat Descriptions	• No loss of habitats due to construction and operations.	Loss of: • 109 acres active leveed DMPA. • 13 acres tidal low salt/brackish marshes/flats. • 92 acres – Upland shrubland/grass-land on roadsides, levee slopes, (disturbed/ regenerative areas). • Note: Interior of DMPA cell C (inactive >20 years) supports 38 acres of isolated, non-jurisdictional wetlands.	Loss of: • 288 acres active, leveed DMPA. • 96 acres nontidal intermediate-to-high salt marsh and flats. • 29 acres upland shrubland/ grassland on shoreline ridge, roadside and levees. • 7 acres freshwater wetlands in land access corridor.	Loss of: • 320 acres upland forests, shrublands/ grasslands. • 38 acres freshwater wetlands including 24 acres wooded wetland. • 3 acres brackish/ freshwater (tidal inlet) wetlands.	Loss of: • 411 acres active, leveed DMPA. • 23 acres levee and slopes (road, roadside, upland shrubland/ grassland). • 3 acres intermediate-to-high salt marsh along slopes of shoreline levee.	Loss of: • 360 acres active, leveed DMPA. • 91 acres shrubland/ grassland. • 5 acres low/high salt/brackish marsh. • <1 acre low brackish to fresh marsh and pond.	Loss of: • 245 acres upland forest/woodland, 142 acres upland shrub/scrub, 165 acres upland grassland. • 6 acres forested wetlands. • 37 acres shrub/scrub wetlands. • 31 acres freshwater marshes. • <1 acre estuarine (low to salt or brackish) marshes.

TABLE 2-2

ALTERNATIVES ANALYSIS MATRIX – POTENTIAL IMPACTS TO EVALUATION CRITERIA

Evaluation Criteria / Receptors	*ALTERNATIVES*						
	No-Action	**Shoal Point**	**Pelican Island**	**Bayport**	**Spillman's Island**	**Alexander Island**	**Cedar Point**
Jurisdictional Waters of the U.S. Section 404/Section 10	• No loss of jurisdictional waters and wetlands due to construction and operations.	• Loss of: 13 acres wetlands tidal saline/brackish marshes/flats. • Alteration of 661 acres of open water from dredging activities in open water (651 acres) (terminal, berthing area, turning basin, channel), primarily in existing, deepwater channel, and construction of the access corridor (10 acres).	• Loss of: 96 acres– nontidal, saline/ brackish marshes/ flats. • Alteration of 183 acres from dredging activities in open water (terminal, berthing area, channel).	• Loss of: 16 acres - freshwater and brackish wetlands. • Alteration of 245 acres from dredging activities in open water (terminal, berthing area, turning basin, channel), primarily in existing channel.	• Loss of: 3 acres – intermediate-high salt marsh. • Alteration of 183 acres from dredging activities in open water (terminal, berthing area, turning basin, channel)	• Loss of: 5 acres marshes and unconsolidated shoreline. • Alteration of 116 acres from dredging activities in open water (terminal, berthing area, channel).	• Loss of: <1 acre estuarine (low to high salt or brackish) marshes. • Alteration of 202 acres from dredging activities in open water, mostly for new channel and to deepen small, shallow channel.

TABLE 2-2

ALTERNATIVES ANALYSIS MATRIX – POTENTIAL IMPACTS TO EVALUATION CRITERIA

Evaluation Criteria / Receptors	*ALTERNATIVES*						
	No-Action	**Shoal Point**	**Pelican Island**	**Bayport**	**Spillman's Island**	**Alexander Island**	**Cedar Point**
Habitat Effects – Wildlife	• No immediate direct impacts to wildlife habitats or species. Some habitats may change over time on some of the active DMPAs (including loss and creation of habitats).	• Loss of estuarine marsh/flats that serve as nesting and loafing habitat for Forster's terns and loafing areas for many shorebirds. • Loss of wintering waterfowl habitat (two ponds). • Construction/ operation of the access road may disturb nesting Forster's terns and loafing/foraging seabirds/shorebirds at estuarine marsh/flats near Swan Lake and birds foraging in the stormwater canal. • Introduce risk of bird strikes from construction and operation of new transmission line to project site. • The following habitats would be impacted: shrublands, grasslands, wetlands, and open water.	• Loss of nesting and loafing habitat for Forster's terns and laughing gulls. • Loss of loafing areas and foraging habitat for many shorebirds and wading birds. • Some of this loafing and foraging habitat may be used by birds from the Pelican Spit rookery. • Intermediate-to-high salt marsh, upland shrubland/grass-land, beach, and open water would be lost.	• No known bird rookeries occur at the site. • Upland forest, shrubland, grassland, and wetland habitat would be lost. • Introduce risk of bird strikes from construction and operation of new transmission line to project site.	• No known bird rookeries occur at the site. • Largely unvegetated active DMPA.	• Loss of a pond utilized by and part of a heron and wading bird rookery. • The following habitats within the footprint would be lost: upland shrub-land/ grassland; freshwater, brackish, and salt marshes; and tidal flats and beach.	• No known bird rookeries occur at terminal, but a bird rookery, apparently inactive during June 2001 field visit, occurs within 2,000 ft of the proposed channel, on Boaz Island. • A freshwater pond, habitat for waterfowl, also occurs at the site and would be lost. • Upland forest, shrub/scrub, grassland, and wetland habitat would be lost.
Endangered and Threatened (E&T) Species							

TABLE 2-2

ALTERNATIVES ANALYSIS MATRIX – POTENTIAL IMPACTS TO EVALUATION CRITERIA

Evaluation Criteria / Receptors	*ALTERNATIVES*						
	No-Action	**Shoal Point**	**Pelican Island**	**Bayport**	**Spillman's Island**	**Alexander Island**	**Cedar Point**
E&T Plant Species	• No direct negative impacts to Federally listed endangered, threatened or species of concern (SOC) plants from loss or disturbance of habitat.	• No Federally listed endangered, threatened, or SOC plant species are known to occur near (< 2 mile) from site. • No Federally listed endangered, threatened, or SOC plant species observed during field visits. • Upland shrubland/grassland/roadside occur at all alternative sites and provide possible habitat/range for Texas windmillgrass (SOC).					
E&T Terrestrial Wildlife Species	• No impacts	• Loafing areas for the brown pelican occur within the footprint. • Dredging activities may temporarily reduce the food supply for brown pelicans currently feeding in the general area. • Some potential minor loss of foraging habitat for the white-faced ibis and wood stork may occur.	• Loafing areas for the brown pelican occur within the footprint. • Dredging activities may temporarily reduce the food supply for brown pelicans and white-faced ibises nesting on Pelican Spit.	• No E&T species are known to occur in the area.	• No E&T species are known to occur in the area.	• No E&T species are known to occur in the area.	• No E&T species are known to occur in the area; however, suitable habitat for the American alligator may occur at this site.
E&T Aquatics Species	• No impacts	• No fish E&T species known to occur in this area. • If sea turtles occur in the area, minor, short-term impacts could result from dredging activities					

TABLE 2-2

ALTERNATIVES ANALYSIS MATRIX – POTENTIAL IMPACTS TO EVALUATION CRITERIA

Evaluation Criteria / Receptors	*ALTERNATIVES*						
	No-Action	**Shoal Point**	**Pelican Island**	**Bayport**	**Spillman's Island**	**Alexander Island**	**Cedar Point**
Historical / Cultural Resources Known terrestrial sites	• No impacts to cultural resource sites.	• No impacts to known terrestrial cultural resource sites, NRHP or SAL properties within the 400-acres • Site 41GV117 recorded along the Access Corridor has been previously impacted by the construction of the existing levee and levee road (a determination of NRHP or SAL status has not been made).	• No impacts to recorded terrestrial cultural resource sites, NRHP or SAL properties.	• No recorded NRHP or SAL properties were identified. • Two known cultural resource sites are located within the 400-acre boundaries of this alternative. Sites 41HR832 and 41HR833 are both historic farmsteads. The recording archaeologists did not recommend these sites for further work, it is not known if THC concurred with this finding.	• No impacts to recorded terrestrial cultural resource sites, NRHP or SAL properties.	• No impacts to recorded terrestrial cultural resource sites, NRHP or SAL properties within the 400-acre alternative location. • Previously recorded site 41HR73 is located along a portion of the Access Corridor. Site 41HR73 not currently listed on the NRHP or designated a SAL. A determination of NRHP or SAL status has not been made of this site by the THC.	• No impacts to recorded terrestrial cultural resource sites, NRHP or SAL properties within the 400-acre alternative location. • Five known sites: 41CH282, 41CH283, and 41CH284 appear to be within 1,000 feet of the Access Corridor route and site 41CH285 and 41CH307 appear to be within the Access Corridor alignment. None of these sites are listed as NRHP or SAL properties. A determination of NRHP or SAL status has not been made.
Unrecorded sites	• No impacts to cultural resources sites.	• Low probability for containing unrecorded cultural resource sites because Shoal Point has been an active DMPA since early 1900s.	• Low probability of impacting unrecorded terrestrial cultural resource sites because of placement of dredged materials since the early 1900s.	• High probability for containing unrecorded terrestrial cultural resource sites because it is a natural landmass that has had relatively little disturbance.	• Low probability of impacts to unrecorded terrestrial cultural resource sites because of use as DMPA.	• Low probability of impacts to unrecorded terrestrial cultural resource sites because of use as DMPA.	• High probability for containing unrecorded cultural resources because it is a natural landmass that has had relatively little disturbance.

TABLE 2-2

ALTERNATIVES ANALYSIS MATRIX – POTENTIAL IMPACTS TO EVALUATION CRITERIA

Evaluation Criteria / Receptors	*ALTERNATIVES*						
	No-Action	**Shoal Point**	**Pelican Island**	**Bayport**	**Spillman's Island**	**Alexander Island**	**Cedar Point**
Underwater sites	• No impacts to cultural resources sites.	• Two of the eleven underwater potential cultural resource sites identified by remote-sensing surveys may be affected by placement of levees for BU sites and two sites may be affected by dredging activities.	• Numerous potential shipwrecks documented in the waters surrounding Pelican Island, some may be historically significant.	• No previously recorded shipwrecks identified in waters surrounding this site.	• No known shipwrecks in the waters surrounding this alternative. • Due to the historic nature of the area, a possibility exists that significant underwater resources may be present in the surrounding waters.	• No previously recorded shipwrecks in the waters surrounding Alexander Island • Due to the historic nature of the area, a possibility exists that unrecorded historic resources are present in the waters surrounding this site.	• Based on information received from the State Marine Archeologist, the water surrounding Cedar Point is considered to have a high probability for containing significant unrecorded cultural resources.
Navigation (Commercial and Recreational)	• Normal growth in ship traffic, but no project-related impacts.	• The design vessel for the container terminal is a Post-Panamax vessel (beam width is 135 ft and length approx. 900-1000 ft). • Slightly increased conflict between small (commercial and recreational) craft and deep-draft vessels.					
		• Terminal located south of Texas City Channel (currently maintained to –40 ft MLT). Existing channel is 6.8 miles long by 400 ft wide • Delays to existing ship traffic due to additional container ship traffic.	• Terminal located along Bolivar Roads (currently maintained to –45 ft MLT in this area).	• Terminal located along Bayport Ship Channel, which joins a section of the Houston Ship Channel that is soon to be maintained to –45 ft MLT. Existing channel is 3.6 miles long by 400 ft in width. • Delays to existing ship traffic due to additional container ship traffic.	• Terminal located along the Houston Ship Channel, which is currently maintained to –40 ft MLT in this area, but soon to be maintained to –45 ft MLT.	• Terminal located along the Houston Ship Channel, which is currently maintained to –40 ft MLT in this area, but soon to be maintained to –45 ft MLT.	• No current deepwater navigation exists to proposed terminal site. A 3.5-mile deepwater access from the project location to the existing HSC by dredging existing barge channel would be needed.

TABLE 2-2

ALTERNATIVES ANALYSIS MATRIX – POTENTIAL IMPACTS TO EVALUATION CRITERIA

Evaluation Criteria / Receptors	*ALTERNATIVES*						
	No-Action	**Shoal Point**	**Pelican Island**	**Bayport**	**Spillman's Island**	**Alexander Island**	**Cedar Point**
Land Use/Recreation/ Aesthetics Land Use	• Regional land uses would convert to more urbanized uses with projected growth, but project-related land use conversions would not occur.	• Approximately 116.5 acres of urban land uses needed to sustain inmigrant workers; does not present new incompatible activity for land uses along transport routes.	• Approximately 116.5 acres of urban land uses needed to sustain inmigrant workers; limited access may cause traffic congestion which adversely affects enjoyment of commercial and office uses in area.	• Approximately 128.3 acres of urban land uses needed to sustain inmigrant workers; does not present new incompatible activity for land uses along transport routes.	• Approximately 127.9 acres of urban land uses needed to sustain inmigrant workers; does not present new incompatible activity for land uses along transport routes.	• Approximately 127.6 acres of urban land uses needed to sustain inmigrant workers; does not present new incompatible activity for land uses along transport routes.	• Approximately 151.5 acres of urban land uses needed to sustain inmigrant workers; removal of homes and businesses in project site area; transportation activities may adversely affect enjoyment of rural residential use.
Recreation	• Need for recreation facilities will increase regionally with projected growth, but no project-related impacts on recreational resources in the study area would occur.	• Possible birding impacts.	• Possible birding impacts.	• Possible birding impacts.	• Possible birding impacts	• Possible birding impacts.	• Possible birding impacts; possible adverse impacts to enjoyment of private docks and piers; possible loss of freshwater pond used for recreational activities.
Aesthetics	• No change in the aesthetic environment relative to the project.	• View from Texas City Dike more industrial.	• View from Texas City Dike more industrial.	• View from Shoreacres more industrial.	• No significant adverse aesthetic impacts.	• No significant adverse aesthetic impacts.	• Qualitative aesthetic change from largely natural landscape to industrial viewscape.
Socioeconomics Population	• Regional population growth is projected to continue, but no project-related population changes would occur.	• Inmigration of 890 workers.	• Inmigration of 890 workers.	• Inmigration of 981 workers.	• Inmigration of 978 workers.	• Inmigration of 975 workers	• Inmigration of 1,158 workers

TABLE 2-2

ALTERNATIVES ANALYSIS MATRIX – POTENTIAL IMPACTS TO EVALUATION CRITERIA

Evaluation Criteria / Receptors	*ALTERNATIVES*						
	No-Action	**Shoal Point**	**Pelican Island**	**Bayport**	**Spillman's Island**	**Alexander Island**	**Cedar Point**
Environmental Justice (EJ)	• No environmental justice effects.	• EPA's EJ Index: 4 • African-Americans 12.8% (17.2% in county, 11.7% in state). • Hispanics 4.2% (13.9% in county, 25.2% in state). • Other races 2.2% (2.0% in county, 2.2% in state). • Below poverty 14.2% (15.3% in county, 17.6% in state).	• EPA's EJ Index: 24 • African-Americans 38.2% (17.2% in county, 11.7% in state). • Hispanics 18.8% (13.9% in county, 25.2% in state). • Other races 4.0% (2.0% in county, 2.2% in state). • Below poverty 34.9% (15.3% in county, 17.6% in state).	• EPA's EJ Index: 2 • African-Americans 2.5% (18.9% in county, 11.7% in state). • Hispanics 5.8% (22.5% in county, 25.2% in state). • Other races 1.4% (4.1% in county, 2.2% in state). • Below poverty 6.5% (15.5% in county, 17.6% in state).	• EPA's EJ Index: 8 • African-Americans 20.8% (18.9% in county, 11.7% in state). • Hispanics 15.7% (22.5% in county, 25.2% in state). • Other races 0.3% (4.1% in county, 2.2% in state). • Below poverty 17.0% (15.5% in county, 17.6% in state).	• EPA's EJ Index: 8 • African-Americans 16.0% (18.9% in county, 11.7% in state). • Hispanics 54.0% (22.5% in county, 25.2% in state). • Other races 0.3% (4.1% in county, 2.2% in state). • Below poverty 22.9% (15.5% in county, 17.6% in state).	• EPA's EJ Index: 1 • African-Americans 4.6% (12.1% in county, 11.7% in state). • Hispanics 4.3% (5.0% in county, 25.2% in state). • Other races 0.6% (1.5% in county, 2.2% in state). • Below poverty 5.3% (12.3% in county, 17.6% in state).
Community Values	• Inconsistent with community values in Texas City Vision 2020, a comprehensive planning effort with development of a Mega-Port and an intra-modal shipping center as 2 major goals.	• Consistent with community values in Texas City Vision 2020.	• Consistent with Galveston Comprehensive Plan.	• Inconsistent with La Porte Comprehensive Master Plan. Cities of Shoreacres, Seabrook, and Pasadena oppose a marine terminal at site.	• Consistent with La Porte land use map.	• Baytown Comprehensive Plan does not address.	• Beach City has no official position. Somewhat inconsistent with Baytown land use map which places residential uses in vicinity.
Housing	• Housing needed to meet projected population growth in the region, but no project-related housing impacts would occur.	• Approximately 318 housing units needed for inmigrant workers.	• Approximately 318 housing units needed for inmigrant workers.	• Approximately 350 housing units needed for inmigrant workers.	• Approximately 349 housing units needed for inmigrant workers.	• Approximately 348 housing units needed for inmigrant workers.	• Approximately 413 housing units needed for inmigrant workers.

TABLE 2-2

ALTERNATIVES ANALYSIS MATRIX – POTENTIAL IMPACTS TO EVALUATION CRITERIA

Evaluation Criteria / Receptors	*ALTERNATIVES*						
	No-Action	**Shoal Point**	**Pelican Island**	**Bayport**	**Spillman's Island**	**Alexander Island**	**Cedar Point**
Residential Property Values	• Reduction in property value by 0.2–4.5% for residences within the vicinity of major roadways.	• No impact from construction or operation. • Some residences may experience a 0.2–1.5% decrease in property value above that expected from the No-Build scenario, caused by traffic noise.	• No impact from construction or operation. • Some residences may experience a 0.2–1.5% decrease in property value above that expected from the No-Build scenario, caused by traffic noise.	• Potential property value reduction for some residences caused by construction and operation noise. • Some residences may experience a 0.2–1.5% decrease in property value above that expected from the No-Build scenario, caused by traffic noise.	• Potential temporary impacts to property values during construction. No impact from operations. • Some residences may experience a 0.2–1.5% decrease in property value above that expected from the No-Build scenario, caused by traffic noise.	• No impact from construction or operation. • Some residences may experience a 0.2–1.5% decrease in property value above that expected from the No-Build scenario, caused by traffic noise.	• Potential property value reduction for some residences caused by construction and operation noise. • Some residences may experience a 0.2–1.5% decrease in property value above that expected from the No-Build scenario, caused by traffic noise.
Economics: Total Demand (Construction and Operations)	• No project-related economic benefits to the region or state would occur.	• Construction-related direct and indirect Texas effect of $1.029 billion. • Operations-related direct and indirect effect of $186.8 million annually.	• Construction-related direct and indirect Texas effect of $1.061 billion. • Operations-related direct and indirect effect of $186.8 million annually.	• Construction-related direct and indirect Texas effect of $737.0 million. • Operations-related direct and indirect effect of $186.8 million annually.	• Construction-related direct and indirect Texas effect of $996.5 million. • Operations-related direct and indirect effect of $186.8 million annually.	• Construction-related direct and indirect Texas effect of $1.153 billion. • Operations-related direct and indirect effect of $186.8 million annually.	• Construction-related direct and indirect Texas effect of $950.5 million. • Operations-related direct and indirect effect of $186.8 million annually.
Employment (Construction and Operations)	• No additional project-related employment would occur.	• During 10 years of construction for three phases, 285 total direct temporary construction-related jobs, with 53 in peak year; and 4,988 indirect construction-related jobs. • 1,248 operations-related jobs at full buildout, including 452 direct jobs.	• During 10 years of construction for three phases, 290 total direct temporary construction-related jobs, with 70 in peak year; and 5,284 indirect construction-related jobs. • 1,248 operations-related jobs at full buildout, including 452 direct jobs.	• During 10 years of construction for three phases, 202 total direct temporary construction-related jobs, with 58 in peak year; and 3,673 indirect construction-related jobs. • 1,248 operations-related jobs at full buildout, including 452 direct jobs.	• During 10 years of construction for three phases, 272 total direct temporary construction-related jobs, with 59 in peak year; and 4,969 indirect construction-related jobs. • 1,248 operations-related jobs at full buildout, including 452 direct jobs.	• During 10 years of construction for three phases, 315 total direct temporary construction-related jobs, with 60 in peak year; and 5,737 indirect construction-related jobs. • 1,248 operations-related jobs at full buildout, including 452 direct jobs.	• During 10 years of construction for three phases, 260 total direct temporary construction-related jobs, with 58 in peak year; and 4,740 indirect construction-related jobs. • 1,248 operations-related jobs at full buildout, including 452 direct jobs.

TABLE 2-2

ALTERNATIVES ANALYSIS MATRIX – POTENTIAL IMPACTS TO EVALUATION CRITERIA

Evaluation Criteria / Receptors	*ALTERNATIVES*						
	No-Action	**Shoal Point**	**Pelican Island**	**Bayport**	**Spillman's Island**	**Alexander Island**	**Cedar Point**
Community Infrastructure and Services	• Utility expansions would be needed to accommodate projected growth, but no project-related impacts to public utilities would occur.	• Community services for 890 inmigrant workers plus utilities for project site.	• Community services for 890 inmigrant workers plus utilities for project site.	• Community services for 981 inmigrant workers plus utilities for project site.	• Community services for 978 inmigrant workers plus utilities for project site.	• Community services for 975 inmigrant workers plus utilities for project site.	• Community services for 1,158 inmigrant workers plus utilities for project site; local infrastructure not currently available for most services.
Neighborhood Streets	No project-related impacts.	• Moderate impact to the Omega Bay subdivision IH 45 Frontage Road.	• Minimal impact to existing neighborhood streets.	• Moderate impact to El Jardin Del Mar neighborhood streets.	• Minimal impact to existing neighborhood streets.	• Minimal impact to existing neighborhood streets.	• Minimal impact to existing neighborhood streets.
Local Tax Revenues	• No project-related local, state or federal tax revenues would be generated.	• Local tax revenues of $0.2 million annually from operation	• Local tax revenues of $0.2 million annually from operation.	• Local tax revenues of $0.2 million annually from operation.	• Local tax revenues of $0.2 million annually from operation	• Local tax revenues of $0.2 million annually from operation.	• Local tax revenues of $0.2 million annually from operation.

TABLE 2-3

ALTERNATIVES ANALYSIS - CONSTRUCTION DATA [1,2]

	Shoal Point	Pelican Island	Bayport	Spillman's Island	Alexander Island	Cedar Point
LAND STABILIZATION						
Area Coverage	Phase I - 125-ac site Phase II - 125-ac site Phase III - 150-ac site	Phase I - 125-ac site Phase II - 125-ac site Phase III - 150-ac site	Phase I - 125-ac site Phase II - 125-ac site Phase III - 150-ac site	Phase I - 125-ac site Phase II - 125-ac site Phase III - 150-ac site	Phase I - 125-ac site Phase II - 125-ac site Phase III - 150-ac site	Phase I - 125-ac site Phase II - 125-ac site Phase III - 150-ac site
Clear & Grub	Total - 400 ac Ph I - 125 ac Ph II - 125 ac Ph III - 150 ac	Total - 400 ac Ph I - 125 ac Ph II - 125 ac Ph III - 150 ac	Total - 400 ac Ph I - 125 ac Ph II - 125 ac Ph III - 150 ac	Total - 400 ac Ph I - 125 ac Ph II - 125 ac Ph III - 150 ac	Total - 400 ac Ph I - 125 ac Ph II - 125 ac Ph III - 150 ac	Total - 400 ac Ph I - 125 ac Ph II - 125 ac Ph III - 150 ac
Land Stabilization	Mine site, raise grade from +13 to +15 0.40 mcy	Mine site, raise grade from +5 to +15 1.8 mcy	Mine site, raise grade from +10 to +13 0.60 mcy	Mine site, raise grade from +5 to +13 1.5 mcy	Mine site, raise grade from +5 to +12 1.3 mcy	No land stabilization required
DREDGING[3]						
Berthing Area	6,000 x 825 ft 8.7 mcy	6,000 x 200 ft 2.4 mcy	6,000 x 200 ft 2.4 mcy	6,000 x 200 ft 2.0 mcy	6,000 x 200 ft 2.4 mcy	6,000 x 200 ft 3.3 mcy
Turning Basin	10 acres 0.75 mcy	Not required	25 acres 0.40 mcy	25 acres 1.9 mcy	Not required	25 acres 3.1 mcy
Channel	7.5 miles x 400 ft 2.4 mcy	2.2 miles x 400 ft 10.7 mcy	3.6 miles x 400 ft 3.9 mcy	1.2 miles x 400 ft 5.7 mcy	1.8 miles x 400 ft 10.0 mcy	4.4 miles x 400 ft 27.6 mcy
Total Dredged Material Produced	11.85 mcy	13.1 mcy	6.7 mcy	9.6 mcy	12.4 mcy	34.0 mcy
DREDGED MATERIAL PLACEMENT						
Stockpiling	1.8 mcy	4.8 mcy	2.5 mcy	3.9 mcy	3.4 mcy	Not required
Beneficial Use Sites or Dredged Material Placement Areas	10.1 mcy	8.3 mcy	4.2 mcy	5.7 mcy	9.0 mcy	34 mcy
ACCESS CORRIDOR						
Clear & Grub (acres)	29	14	6	16	24	18
Length (miles)	3.2	2.0	2.1	2.2	3.3	2.2
Width (lf)	60	60	exist 36 new 28	60	60	60
Bridge (sf)	Not required	170,500	Not required	Not required	328,600	Not required

[1]Data provided by Berger/ABAM.

[2]Land facility footprints for all alternatives = 400 acres. Size and need for turning basins and entrance channels varies.

[3]Dredge quantities assume that -45 feet MLT depths will be increased by the standard allowable: 2 feet for advanced maintenance and 2 feet for overdredging.

2.4.1 No-Action (No-Build) Alternative

The No-Action alternative for this project is one which would result in no construction requiring a USACE permit. Since the proposed project, a container terminal, requires dredging activities in navigable waters to accommodate the necessary facilities (i.e., berthing areas, sufficient channel depth, and sufficient area for turning ships), it could not be constructed without a permit from the USACE. Thus, the No-Action alternative is equivalent to USACE denial of the permit for the facility. In the event of permit denial, no container terminal would be built at Shoal Point, and it is assumed for this EIS that no new container terminal facilities would be built to serve the Houston area. As discussed in Section 1.0, the market for containerized cargo in this region is expected to rise steadily over the next several years. While it is possible that other container terminal facilities would be constructed to meet this regional need, the uncertainties related to the size, location, and timing of such facilities lead to the approach used to evaluate the No-Action alternative in this EIS (i.e., that no such facilities would be constructed). Under the No-Action assumption that no new container terminal facilities would be constructed in the Galveston Bay area, it is further assumed that the additional containerized cargo would most likely be transported into and out of the Houston area from other container terminals (e.g., New Orleans) via truck or rail.

Under the No-Action alternative, the Shoal Point site would likely continue to serve as a dredged material placement area (DMPA) for the foreseeable future. While other types of industrial development on Shoal Point may be possible, large quantities of fill material would most likely be needed to prepare the property for development. Without a USACE permit for dredging, these quantities of material may be difficult to obtain. Because it is an active DMPA, development of Shoal Point would require that provisions be made to replace any lost dredged material capacity. In addition, it may be necessary to prepare a 50-year Dredged Material Management Plan (DMMP) to address replacement of lost capacity on Shoal Point and to address the placement requirements for material dredged during maintenance activities under the existing Federal navigation project on the Texas City Channel. Securing other lands to serve as DMPA sites in place of Shoal Point may be uneconomical for many potential developers of the site. These factors are the basis for the assumption used in this EIS that the most likely use of the site under the No-Action alternative is a DMPA.

A Federal feasibility study is currently planned to address deepening of the entire Texas City Channel. If this study indicates that deepening of the channel is justified as a Federal project (previous studies have found deepening to be justified), this dredging activity would likely proceed, regardless of the outcome of the current USACE permit process for the Shoal Point Container Terminal. Thus, many of the dredging impacts for the proposed container terminal would also take place in the No-Action scenario under the Federal project.

With the exception of the impacts related to the Federal channel deepening project discussed above, many of the impacts associated with development of the Shoal Point site as a container terminal would not occur under the No-Action scenario. In addition, any benefits that may be gained from the project (e.g., employment opportunities, increased revenues to local taxing jurisdictions) would also not be realized.

2.4.2 Shoal Point

The Shoal Point site (applicant's proposed alternative) is located in the southwestern part of Galveston Bay, south of the Texas City Dike and south of the Texas City Channel (see Figure 2.4.2-1). Shoal Point is an active USACE DMPA for maintenance of the Texas City Channel, Texas City Turning Basin, Industrial Canal, Industrial Canal Turning Basin, and other areas maintained by the Port of Texas City Users Group. Historical information regarding the authorization of the ship channel and maintenance dredging and placement on Shoal Point is provided in the DMMP in Appendix B.

The proposed container terminal footprint would cover 400 acres. Part of the area corresponds to a 100-acre site originally known as Snake Island, but most of the area was built up as part of the USACE's placement of dredged material on the area referred to as Shoal Point. It is connected to the mainland just north of Swan Lake and south of the Port of Texas City. Current access is by levee road to Loop 197.

2.4.2.1 Navigation

The proposed Shoal Point Container Terminal site is located south of the existing Texas City Channel. Wharf frontage would be along the ship channel. The Texas City Channel is currently maintained to a depth of –40 feet MLT. The existing channel is approximately 6.8 miles in length and approximately 400 feet in width. The side slopes of the channel are maintained at approximately 2.5-horizontal to 1-vertical.

The project includes a provision in the second phase to allow private deepening of the Federal channel from 40 to 45 feet from the confluence with Bolivar Roads to the container facility. That deepening would not include further widening. A parallel Federal feasibility study is planned to address the deepening of the entire Texas City Channel. A previous Federal study had concluded that deepening was economically justified, and in 1986 a 50-foot-draft by 600-foot-wide channel was authorized. Because work on the Federal 45-foot project on the Houston Ship Channel is well underway, and the entrance channel is complete, it seems likely that the Texas City Channel will be deepened to –45 feet MLT at some point. Because it is now a Federal project and no interest has been expressed in changing that status, it is likely that the deepening would be done under the Federal process. Nevertheless, the permit application includes a provision for deepening in the event that the Federal deepening project on the Texas City Channel does not proceed.

2.4.2.2 Dredging

All areas of dredging for the proposed project would be to a depth of –45 feet MLT. Development of a container terminal in this location would require a new berthing area. The berthing area would be approximately 6,000 feet in length, approximately 825 feet in width, and located south of the Texas City Channel. It is likely that each phase of development would involve dredging one two-berth slip. The berthing area for each phase would be approximately 2,000 feet in length. It is estimated that approximately 8.7 million cubic yards (mcy) of material would be dredged for the berthing areas.

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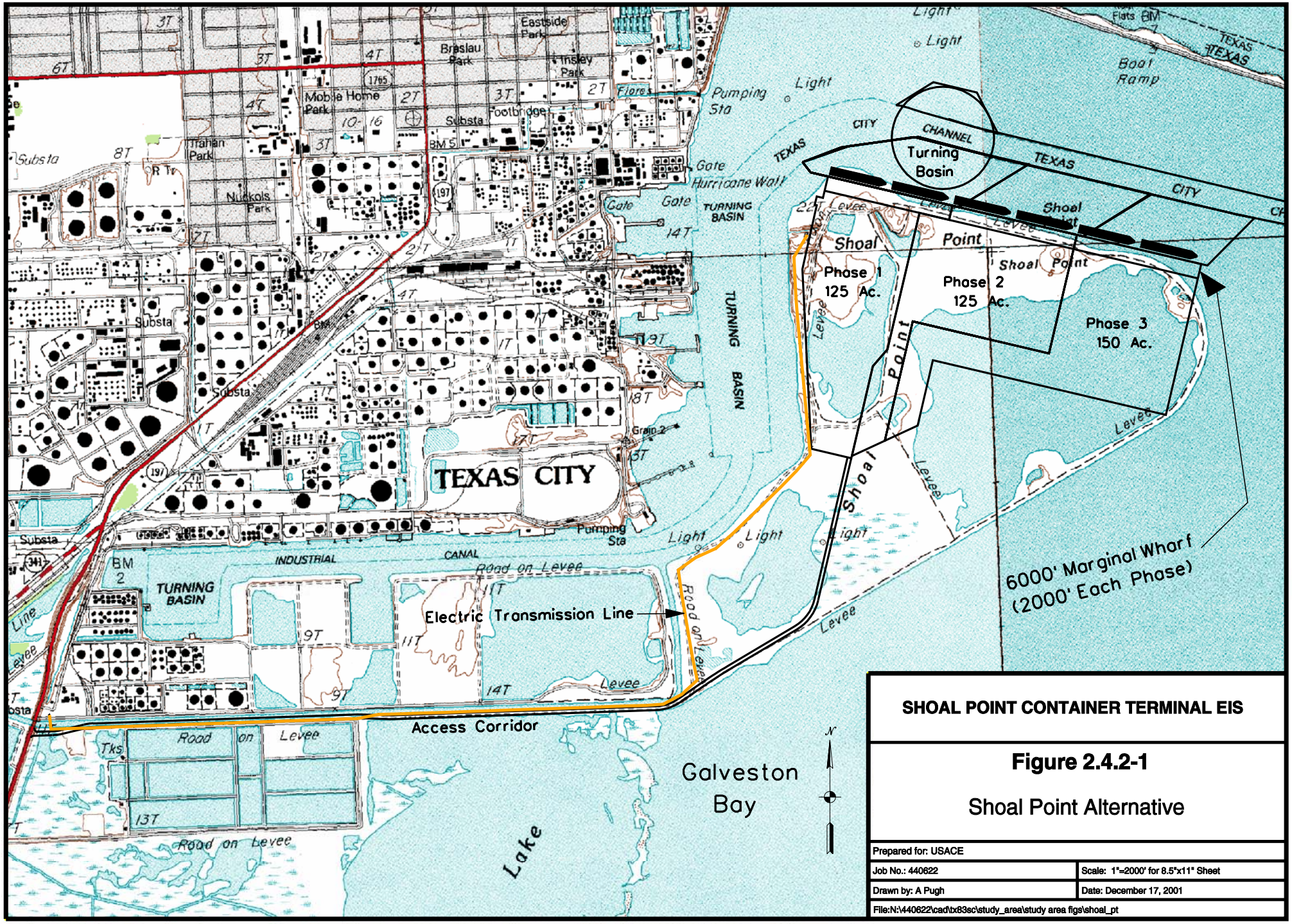

SHOAL POINT CONTAINER TERMINAL EIS

Figure 2.4.2-1

Shoal Point Alternative

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Job No.: 440622	Scale: 1"=2000' for 8.5"x11" Sheet
Drawn by: A Pugh	Date: December 17, 2001
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The proposed turning basin would be located within and north of the existing Texas City Channel. It is estimated that approximately 750,000 cubic yards of material would be dredged during the construction of the turning basin. The current geometry of the Texas City Channel would not be changed during the construction of the terminal.

It is estimated that an additional 2.4 mcy of material would be generated during the deepening of the Texas City Channel to –45 feet MLT, which is proposed to occur during Phase II of the project. The total, approximately 11.9 mcy of dredged material, would be placed into a combination of existing upland DMPAs and Beneficial Use sites (see Draft DMMP in Appendix B). Slope protection in the form of rip-rap would be placed along the affected slopes of the berthing area to ensure that surge from ship bow thrusters would not erode the embankment. As mitigation for unavoidable impacts to jurisdictional wetlands, the proposed project plans include construction of approximately 45 acres of marsh habitat using dredged material in the northern portion of Swan Lake during Phase I. Coordination with state and Federal natural resource agencies indicated that Swan Lake is a high-priority site for mitigation and/or beneficial uses.

The Shoal Point project site is part of a DMPA that currently supports the existing Federal navigation project for the Texas City channel. While part of the site is owned by the City of Texas City and part is State-owned land, converting the land from its existing use to that of container terminal operations would require that a provision be made to replace the lost dredged material capacity. That requirement has generated the need to prepare a new long-term (50-year) DMMP that partly deals with the actions of the applicant and partly deals with the routine maintenance dredging activities of the USACE. The dredged material management responsibilities associated with the proposed project are limited to replacement of the lost capacity at Shoal Point and identification of the location and method of placement of the dredged material resulting from project construction and maintenance activities. Thus, although the entire 50-year DMMP is included in this EIS (Appendix B), only that part of the DMMP which relates to these responsibilities is attributable to the proposed project.

In addition, although the proposed actions of the applicant in the DMMP are a factor in the overall decision of whether to issue a permit, the applicant's DMMP does not become a requirement imposed on the USACE for existing or future Federal dredging projects at Texas City. The USACE would undertake an evaluation of the DMMP prior to adopting any part of it. Agreements with the local sponsor (City of Texas City) for the existing Federal project govern the USACE's dredged material placement activities in the Texas City area.

2.4.2.3 Backland

Shoal Point is an active DMPA. Prior to placement of dredged material, the area was named Snake Island. Snake Island was approximately 100 acres. Over the course of the last 20 years, the USACE has used the site as an active DMPA. Shoal Point is currently estimated at approximately 700 acres in size. The City of Texas City and the GLO each own portions of Shoal Point. The site currently consists of poorly consolidated dredged material. During the construction of the terminal, the project site would undergo a consolidation program to minimize the amount of settlement that could occur

after the terminal is in operation. The consolidation program would likely consist of the installation of wick drains, along with soil surcharge.

2.4.2.4 Roadway Access

A new access corridor would provide access from the terminal location to Loop 197. Loop 197 is 82 feet in width and consists of four 12-foot lanes, two 10-foot shoulders, and one 14-foot interior turning lane. The proposed access corridor would consist of four 12-foot lanes and two 6-foot shoulders, resulting in a 60-foot roadway prism. The access corridor would originate south of the existing Loop 197 bridge crossing the Galveston County Discharge Canal. The access road would follow the southern side of the canal right-of-way (ROW) to the Shoal Point DMPA. To ensure that the roadway prism fits within the Galveston County ROW, the roadway would have a structural wall along the north face bordering the canal. The wall would minimize the disturbance to the existing canal. In the vicinity of Swan Lake, the structural wall on the south side would be terminated and the roadway would consist of a typical embankment section, resulting in the toe of the roadway slope projecting into Swan Lake approximately 120 feet south of the existing shoreline.

2.4.2.5 Rail Access

Initially, rail traffic is expected to be distributed evenly between the UPRR, BNSF and Barbours Cut intermodal yard. A new intermodal yard, not part of this project, is expected to be constructed at a later date when justified by the growth of the terminal. The proposed intermodal yard would be located within approximately 5 miles of the project site. No rail access would be provided at the proposed project site.

2.4.2.6 Terminal Development

Existing Utilities

Five known monitoring wells in the area north of the Gulf Coast Waste Disposal Authority properties would need to be adjusted as a result of interference with the proposed access corridor.

An abandoned 8-inch-diameter wastewater line located along the northern fringe of the Union Carbide Corporation property near Loop 197 would likely be removed. The Motco Trust currently owns this line.

A 16-inch-diameter wastewater line traversing the proposed project site would need to be relocated. The pipeline is owned by Gulf Coast Waste Disposal Authority and maintained by Sterling Chemicals.

A pipeline bridge crosses the Galveston County Discharge Canal near the Gulf Coast Waste Disposal Authority's property. This pipeline bridge would likely be adjusted as a result of the proposed access corridor.

A new high-voltage overhead transmission line would be required at the terminal. The proposed routing of the transmission line would be along the southern fringe of the Galveston County Discharge Canal, within the footprint of the proposed access road (Figure 2.4.2-1), and along the existing levee road. The transmission line would be above grade. The terminal substation would likely be located in the rear of the yard. This location would cause the least operational impact to the container terminal. Once power is terminated within the yard, the power would be distributed throughout the site via below-grade access.

Potable water would be piped to the proposed terminal site via existing supply mains located in the project vicinity. An analysis to determine whether the existing network would have the capacity to handle the increased demand from the proposed terminal has not been performed. This analysis would be performed at a later date. Alternatively, other sources of drinking water (e.g., groundwater wells) may be used.

Stormwater would be treated on site in accordance with a stormwater management plan to be developed during final design. Storm sewer effluent generated from the container yard would likely be treated by means of oil-water separators prior to discharge into Galveston Bay.

Telephone and fiber optic cabling would be required at the proposed terminal location.

Sanitary sewage would likely be collected and piped from the various buildings located within the terminal footprint to Gulf Coast Waste Disposal Authority for treatment.

A water pumping and distribution system would be required for fire protection at the project site. Seawater is assumed to be the preferred source for a facility at this location.

Hazardous Material

No known existing hazardous material disposal areas are located within the terminal footprint boundaries; however, hazardous material sites are documented near the terminus of the proposed access corridor at Loop 197 and along the Industrial Canal.

Demolition

No demolition is expected to be required within the project site.

2.4.3 Pelican Island

Pelican Island is located in the southern part of Galveston Bay, just north of and separated from Galveston Island by the Galveston Ship Channel. The alternative site on Pelican Island is located within an active USACE DMPA that is currently divided into three cells. The 400-acre footprint for the proposed terminal would be located on the northeastern corner of the island, with wharf frontage on the north side of the island, facing the Bolivar Roads channel (see Figure 2.4.3-1). Part of this footprint would be located outside of the leveed placement areas in a lagoonal area that has no tidal inlet (the only apparent tidal influence occurs during seasonal events). Road access to Pelican Island from Galveston Island is by the Pelican Island Causeway.

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SHOAL POINT CONTAINER TERMINAL EIS

Figure 2.4.3-1

Pelican Island Alternative

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Job No.: 440622	Scale: 1"=2450' for 8.5"x11" Sheet
Drawn by: A Pugh	Date: December 17, 2001
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2.4.3.1 Navigation

The alternative site at Pelican Island is located along the southern portion of the Houston Ship Channel (known as Bolivar Roads). Bolivar Roads is currently maintained to a depth of –45 feet MLT in this area. The side slopes of the channel are maintained at approximately 2.5-horizontal to 1-vertical.

2.4.3.2 Dredging

All areas of dredging for the Pelican Island alternative would be deepened to –45 feet MLT. Development of a container terminal in this location would require a new berthing area and entrance channel. No turning basin would be needed because of the configuration of the proposed entrance channel. The berthing area would be approximately 6,000 feet in length and 200 feet in width. The berthing area and entrance channel would be located south of Bolivar Roads. An estimated 13.1 mcy of material would be dredged for the berthing area and entrance channel. This material would be used as fill for the terminal and placed into existing upland DMPAs or used in the creation of Beneficial Use areas. Placement of material in existing DMPAs would result in loss of DMPA capacity currently used for Bolivar Roads and the Gulf Intracoastal Waterway (GIWW). Slope protection in the form of rip-rap would be placed along the affected slopes of the berthing area to ensure that surge from ship bow thrusters would not erode the embankment.

2.4.3.3 Backland

Approximately 1,600 acres of available land is located at the Pelican Island site, which is an active DMPA. Dredged material capacity used for development of this site would have to be replaced. The site currently consists of poorly consolidated dredged material. During the construction of the terminal, the project site would undergo a consolidation program to minimize the amount of settlement that could occur after the terminal is in operation. The consolidation program would likely consist of the installation of wick drains, along with soil surcharge. It is estimated that the surcharge program would take upwards of 2 years prior to construction of the terminal.

2.4.3.4 Roadway Access

An existing two-lane bascule bridge provides access to Pelican Island. The existing roadway and bascule bridge is owned and maintained by Galveston County. This alternative would likely require the development and construction of a new four-lane bascule bridge as well as the widening of the existing two-lane roadway to accommodate a four-lane facility.

2.4.3.5 Rail Access

Initially, rail traffic would be expected to be distributed evenly between the UPRR, BNSF, and Barbours Cut intermodal yard. A new intermodal yard, not part of this project, is expected to be constructed at a later date when justified by the growth of the terminal. The proposed intermodal yard would be located on Galveston Island approximately 10 miles from the project site at an existing rail siding. No rail access would be provided at the project site.

2.4.3.6 Terminal Development

Existing Utilities

Several pipelines in the area may require movement, depending on the exact location of the terminal. A minimal level of effort would be required to relocate the existing utilities.

A new high-voltage transmission substation would be required at the project site. Due to the presence of substantial industrial activity on Pelican Island, the impacts of this type of facility would likely be minimal.

Potable water would be piped to the terminal site via existing supply mains located in the project vicinity. An analysis to determine whether the existing network would have the capacity to handle the increased demand from the terminal has not been performed. This analysis would be performed at a later date if needed.

Stormwater would be treated on site in accordance with a stormwater management plan to be developed during final design. Storm sewer effluent would be treated by means of oil-water separators prior to discharge into Galveston Bay.

Telephone and fiber optic cabling would be required at the proposed terminal location.

Sanitary sewage would be collected and piped from the various buildings located within the terminal footprint to the existing sanitary sewer network currently in the proposed project vicinity. An analysis to determine whether the existing network would have the capacity to handle the increased demand from the terminal has not been performed. This analysis would be performed at a later date if needed.

A water pumping and distribution system would be required for fire protection at the project site. Seawater is assumed to be the preferred source for a facility at this location.

Hazardous Material

No known existing hazardous material disposal areas are located within the terminal footprint boundaries; however, hazardous materials sites are located adjacent to existing roadways along the alignment of the access corridor proposed for this site.

Demolition

Demolition would be needed to remove a series of small existing structures from the Pelican Island site.

2.4.4 Bayport

The Bayport alternative site is located on the southern side of the Bayport Ship Channel, an existing channel cut into the mainland just north of Red Bluff to serve existing industry (see

Figure 2.4.4-1). The site is located along the western shore of Galveston Bay in Harris County, Texas, within the City of Pasadena's corporate boundaries. The City of Pasadena borders the City of Seabrook to the south and the City of Shoreacres to the north.

2.4.4.1 Navigation

The Bayport alternative site is located along the Bayport Ship Channel. The Bayport Ship Channel is currently maintained to a depth of –40 feet MLT. The existing channel is approximately 3.6 miles in length and is approximately 300 feet in width. The side slopes of the channel are maintained at approximately 2.5-horizontal to 1-vertical. The Bayport Ship Channel joins a section of the Houston Ship Channel that is scheduled to be deepened to –45 feet MLT by late 2003.

2.4.4.2 Dredging

All areas of dredging for the Bayport alternative would be deepened to –45 feet MLT. Development of a container terminal in this location would require a new berthing area approximately 6,000 feet in length and 200 feet in width. The berthing area would be located south of the existing Bayport Ship Channel. It is estimated that approximately 2.4 mcy of material would be dredged for the berthing area. The proposed turning basin would be 1,200 feet in diameter. It is estimated that approximately 0.4 mcy of material would be dredged during the construction of the turning basin. The current geometry of the Bayport Ship Channel would not be changed during the construction of the terminal. It is estimated that approximately 3.9 mcy of material would be generated during the deepening of the channel.

The total, 6.7 mcy of dredged material, would be used as fill for the terminal and placed into existing upland DMPAs or used in the creation of Beneficial Use areas. Placement of material in existing DMPAs would result in loss of DMPA capacity currently used for the Houston Ship Channel. Slope protection in the form of rip-rap would be placed along the affected slopes of the berthing area to ensure that surge from ship bow thrusters would not erode the embankment.

2.4.4.3 Backland

The terminal location is situated on undeveloped land north and south of the existing Port Road. The Port of Houston Authority (PHA) currently owns approximately 1,086 acres at and near the Bayport site. The site consists of historical upland areas. No undesirable geotechnical phenomena would be expected at this site. Minimal surcharge conditions, if any, would be expected to be encountered during the development of this site.

2.4.4.4 Roadway Access

Port Road would provide access from the terminal location to State Highway 146 (SH 146). Port Road is an existing two-lane collector street. The existing interchange located at the intersection of SH 146 and Port Road would remain unchanged as a result of the proposed project. This interchange would be studied at a later date by TxDOT to determine whether the current configuration would remain acceptable with the increased traffic generated by the terminal. Port Road would likely be

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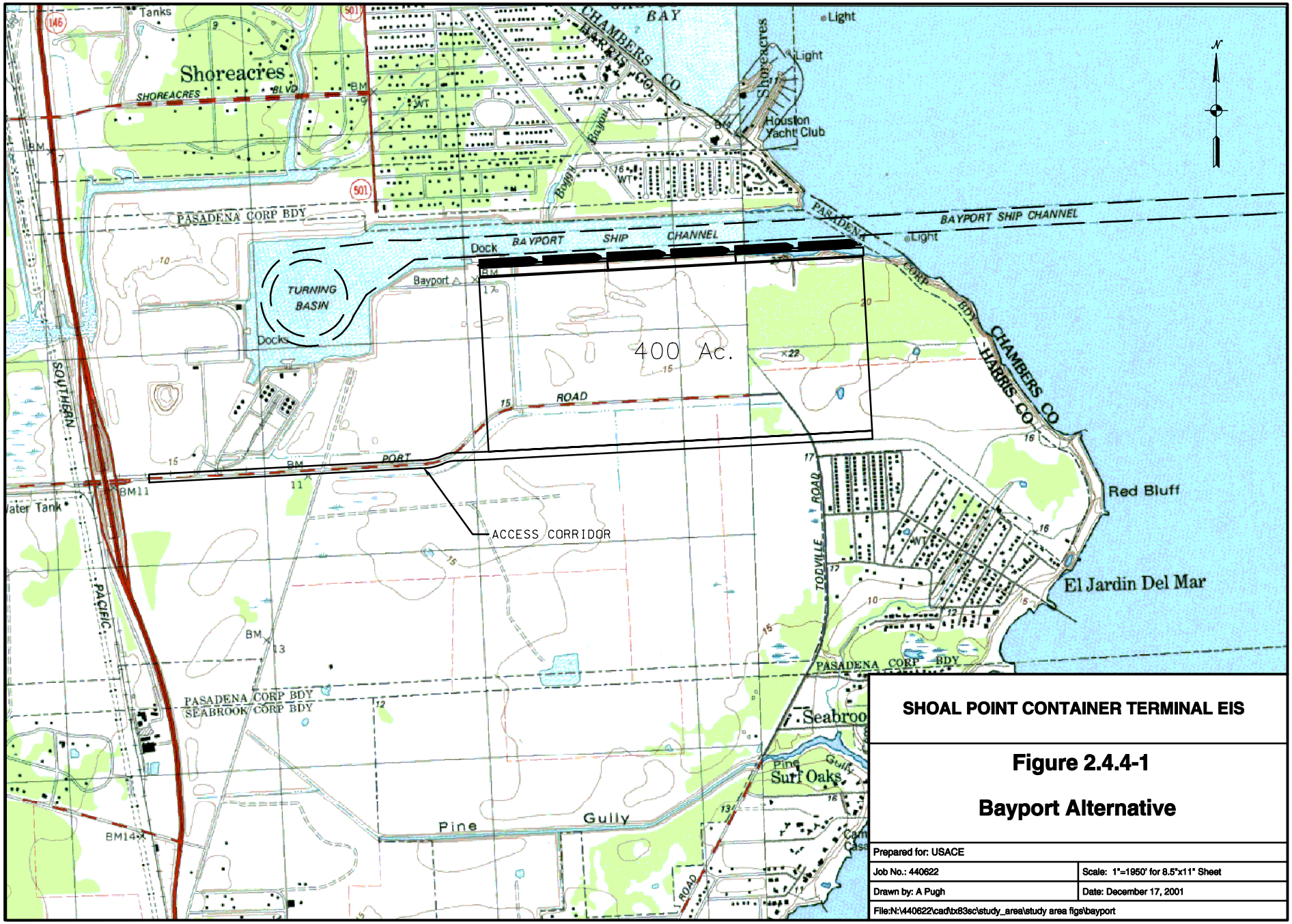

SHOAL POINT CONTAINER TERMINAL EIS

Figure 2.4.4-1

Bayport Alternative

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Job No.: 440622	Scale: 1"=1950' for 8.5"x11" Sheet
Drawn by: A Pugh	Date: December 17, 2001
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reclassified as a principal arterial in this location due to the large amount of truck traffic associated with the container terminal. It is expected that the existing roadway would be widened to accommodate four lanes of traffic at 12 feet per lane with two 6-foot shoulders. The roadway would be designed for heavy truck traffic. The existing Todville Road, which serves the residents of El Jardin Del Mar, would remain at its current state of two lanes at the initial construction of Phase I. As increased truck traffic occurs at the terminal, Todville Road would be reanalyzed to address the impacts of increased truck traffic.

2.4.4.5 Rail Access

No intermodal yard would be expected for this alternative. It is anticipated that the majority of rail traffic would use the existing Barbours Cut intermodal yard facility, which is within 10 miles of the alternative site location. Two additional intermodal yards are located in the greater Houston area. It is anticipated that these additional yards would experience a minimal amount of rail traffic originating from this terminal location.

2.4.4.6 Terminal Development

Existing Utilities

A minimal level of effort is expected to be required to relocate the existing utilities within the terminal footprint.

A new high-voltage transmission line would be required at the terminal. Several substations are located within a 5-mile radius of the proposed site and are assumed to be viable electrical supply options for this alternative. It would be likely that these transmission lines would be above ground and would consist of a series of high-voltage power poles or towers.

Potable water would be piped to the proposed terminal site via existing supply mains located in the project vicinity. An analysis to determine whether the existing network would have the capacity to handle the increased demand from the proposed terminal has not been performed. This analysis would be performed at a later date if needed.

Stormwater would be treated on site in accordance with a stormwater management plan to be developed during final design. Storm sewer effluent would be treated by means of oil-water separators prior to discharge into Galveston Bay.

Telephone and fiber optic cabling would be required at the proposed terminal location.

Sanitary sewage would be collected and piped from the various buildings located within the terminal footprint to the existing sanitary sewer network currently in the project vicinity. An analysis to determine whether the existing network would have the capacity to handle the increased demand from the terminal has not been performed. This analysis would be performed at a later date if needed.

A water pumping and distribution system would be required for fire protection at the project site. Seawater is assumed to be the preferred source for a facility at this location.

Hazardous Material

No known existing hazardous material disposal areas are located within the terminal footprint boundaries; however, hazardous material sites are located adjacent to existing roadways along the access corridor proposed for this site.

Demolition

Demolition would be needed to remove a series of small existing structures from the site.

2.4.5 Spillman's Island

Spillman's Island is located on the shoreline along the San Jacinto River on the western side of the Houston Ship Channel (see Figure 2.4.5-1). No longer an island, Spillman's Island is located just south of the Fred Hartman Bridge (SH 146 river crossing). It is an active USACE DMPA.

The site is located along the west shore of Galveston Bay in Harris County, Texas. The terminal would be located within the City of La Porte and Harris County boundaries. The City of La Porte borders the City of Morgan's Point to the south.

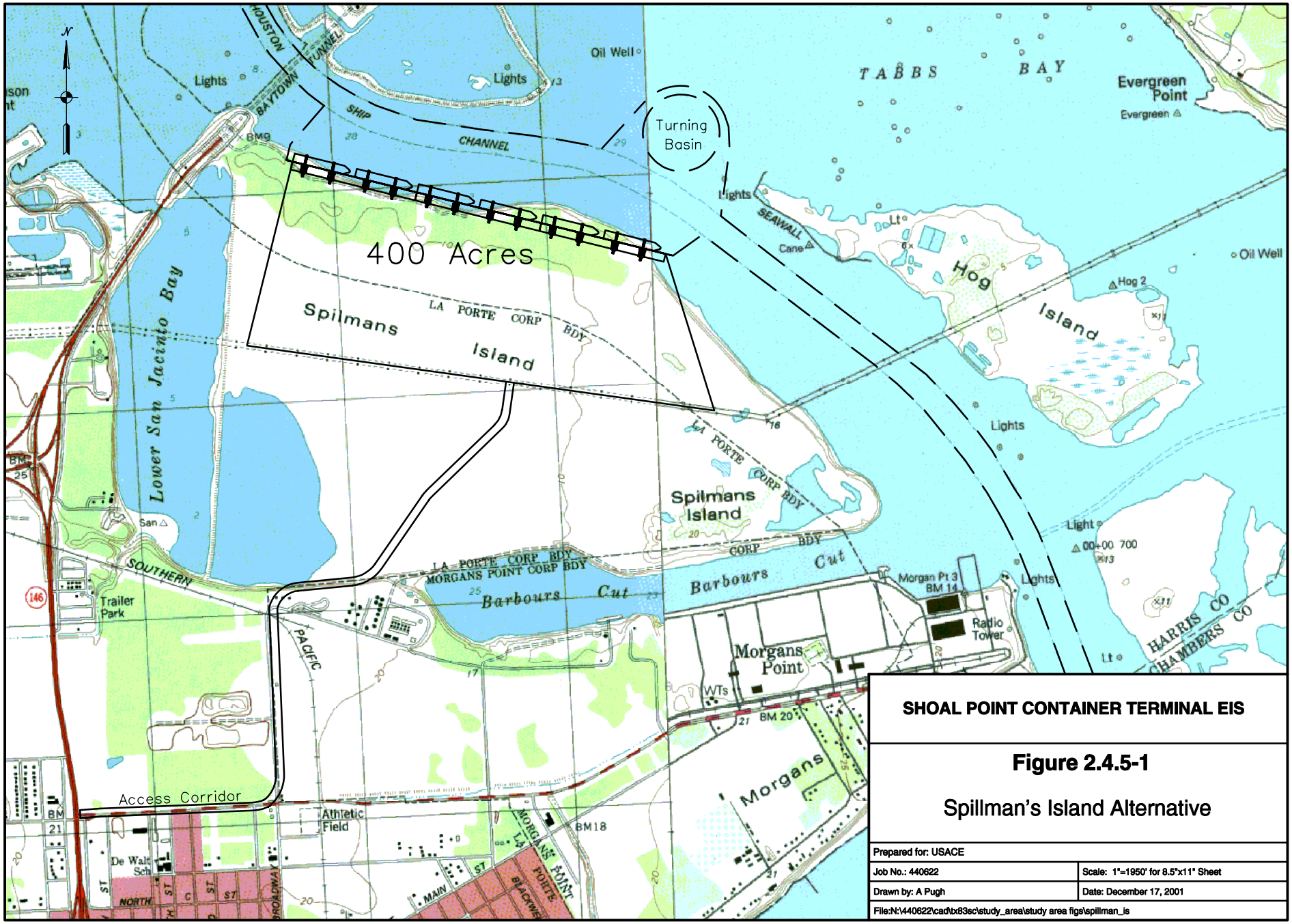
2.4.5.1 Navigation

The Spillman's Island alternative site is located along the Houston Ship Channel. The Houston Ship Channel is scheduled to be deepened from –40 feet MLT to –45 feet MLT in this area by late 2003. The side slopes of the channel are maintained at approximately 2.5-horizontal to 1-vertical.

2.4.5.2 Dredging

All areas of dredging for the Spillman's Island alternative would be deepened to –45 feet MLT.

Development of a container terminal in this location would require a new berthing area. The berthing area would be approximately 6,000 feet in length and 200 feet in width. The berthing area would be located southwest of the existing Houston Ship Channel. It is estimated that approximately 7.7 mcy of material would be dredged for the berthing area and channel. The proposed turning basin would be 1,200 feet in diameter. It is estimated that approximately 1.9 mcy of material would be dredged during the construction of the turning basin. The total, 9.6 mcy of dredged material, would be used as fill for terminal development and placed into existing upland DMPAs and/or Beneficial Use areas. Placement of material in existing DMPAs would result in loss of DMPA capacity currently used for the Houston Ship Channel. Slope protection in the form of rip-rap would be placed along the affected slopes of the berthing area to ensure that surge from ship bow thrusters would not erode the embankment.



SHOAL POINT CONTAINER TERMINAL EIS

Figure 2.4.5-1

Spillman's Island Alternative

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Job No.: 440622	Scale: 1"=1950' for 8.5"x11" Sheet
Drawn by: A Pugh	Date: December 17, 2001
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2.4.5.3 Backland

Approximately 975 acres of available land is located at the alternative site, which is an active DMPA. Dredged material capacity used for development of this site would have to be replaced. The site currently consists of poorly consolidated dredged material. During the construction of the terminal, the project site would undergo a consolidation program to minimize the amount of settlement that could occur after the terminal is in operation. The consolidation program would likely consist of the installation of wick drains, along with soil surcharge. It is estimated that the surcharge program would take upwards of 2 years prior to construction of the terminal.

2.4.5.4 Roadway Access

Roadway infrastructure is available at the project site. It is assumed that the project would tie in with the existing network of roadway systems at the Barbours Cut terminal.

2.4.5.5 Rail Access

No intermodal yard is expected for this alternative. It is anticipated that the majority of rail traffic would use the existing Barbours Cut facility. Two additional intermodal yards are located in the greater Houston area. It is anticipated that these additional yards would experience a minimal amount of rail traffic originating from this terminal location.

2.4.5.6 Terminal Development

Existing Utilities

An existing high-voltage transmission line occurs in the vicinity. The terminal would likely be situated to avoid disruption to this line. Several pipelines located in the area may require movement depending on the exact location of the terminal. A minimal level of effort would be required to relocate the existing utilities.

A new high-voltage transmission substation would be required at the project site. Due to the proximity of the Barbours Cut Terminal and the presence of the existing high-voltage transmission line, this is unlikely to be an extensive effort.

Potable water would be piped to the proposed terminal site via existing supply mains located in the project vicinity. An analysis to determine whether the existing network would have the capacity to handle the increased demand from the proposed terminal has not been performed. This analysis would be performed at a later date if needed.

Stormwater would be treated on site in accordance with a stormwater management plan to be developed during final design. Storm sewer effluent would be treated by means of oil-water separators prior to discharge into Galveston Bay.

Telephone and fiber optic cabling would be required at the terminal location.

Sanitary sewage would be collected and piped from the various buildings located within the terminal footprint to the existing sanitary sewer network currently in the vicinity. An analysis to determine whether the existing network would have the capacity to handle the increased demand from the terminal has not been performed. This analysis would be performed at a later date if needed.

A water pumping and distribution system would be required for fire protection at the project site. Seawater is assumed to be the preferred source for a facility at this location.

Hazardous Material

No known existing hazardous material disposal areas are located within the terminal footprint boundaries; however, hazardous material sites are located adjacent to existing roadways along the alignment of the access corridor proposed for this site.

Demolition

No demolition would be expected to occur as a result of this alternative.

2.4.6 Alexander Island

Alexander Island (approximately 800 acres) is located along the San Jacinto River on the western side of the Houston Ship Channel (see Figure 2.4.6-1). This island (no bridge), located just north of the Fred Hartman Bridge (SH 146 river crossing), is an active USACE DMPA. The footprint would be on the eastern side of the island with wharf frontage facing the Houston Ship Channel.

The Alexander Island alternative site is located along the eastern shoreline of Alexander Island in Harris County, Texas. The terminal would be located within the City of La Porte and Harris County boundaries.

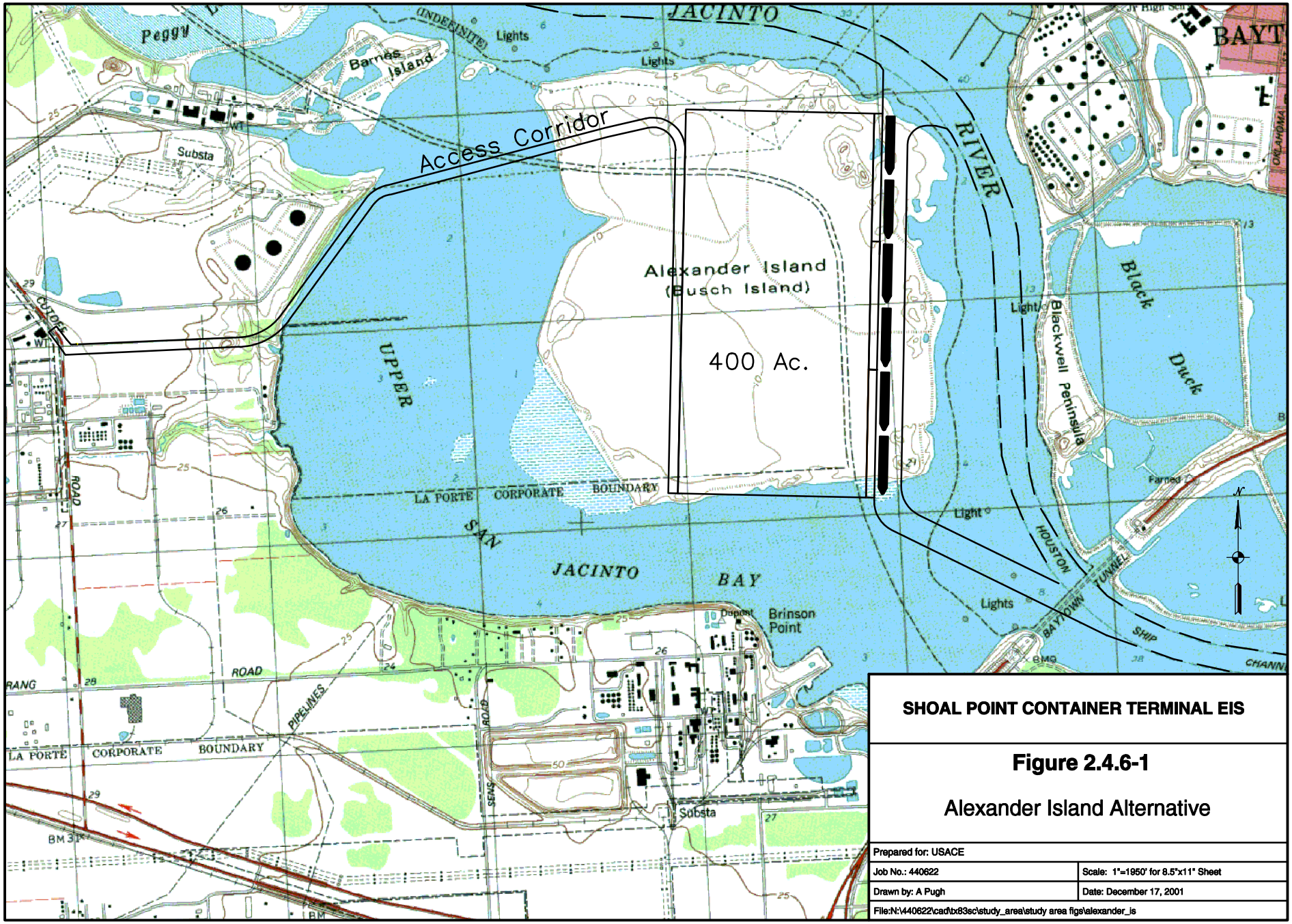
2.4.6.1 Navigation

The Alexander Island alternative site is located along the Houston Ship Channel, which is scheduled to be deepened from –40 feet MLT to –45 feet MLT in this area by late 2003. The side slopes of the channel are maintained at approximately 2.5-horizontal to 1-vertical.

2.4.6.2 Dredging

All areas of dredging for the Alexander Island alternative would be deepened to –45 feet MLT.

Development of a container terminal in this location would require a new berthing area and entrance channel to be located west of the existing Houston Ship Channel. Due to the configuration of the entrance channel, no turning basin would be required. The berthing area would be approximately 6,000 feet in length and 200 feet in width. The estimated 12.4 mcy of material dredged for the berthing area and entrance channel would be used as fill for terminal development and placed into existing upland DMPAs and/or potential Beneficial Use areas. Placement of material in existing DMPAs would result in



SHOAL POINT CONTAINER TERMINAL EIS

Figure 2.4.6-1

Alexander Island Alternative

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Drawn by: A Pugh	Date: December 17, 2001
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loss of DMPA capacity currently used for the Houston Ship Channel. Slope protection in the form of rip-rap would be placed along the affected slopes of the berthing area to ensure that surge from ship bow thrusters would not erode the embankment.

2.4.6.3 Backland

Approximately 800 acres of available land is located at the Alexander Island site, which is an active DMPA. Dredged material capacity used for development of this site would have to be replaced. The site currently consists of poorly consolidated dredged material. During construction of the terminal, the project site would undergo a consolidation program to minimize the amount of settlement that could occur after the terminal is in operation. The consolidation program would likely consist of the installation of wick drains, along with soil surcharge. It is estimated that the surcharge program would take upwards of 2 years prior to construction of the terminal.

2.4.6.4 Roadway Access

There is no current access to Alexander Island. A new four-lane access roadway with a new multi-span bridge would be required for access to the project site. Improvements to existing roadways would also be required where the new roadway would terminate on the mainland.

2.4.6.5 Rail Access

No intermodal yard would be expected for this alternative. It is anticipated that the majority of rail traffic would use the existing Barbours Cut facility. Two additional intermodal yards are located in the greater Houston area. It is anticipated that these additional yards would experience a minimal amount of rail traffic originating from this terminal location.

2.4.6.6 Terminal Development

Existing Utilities

Several pipelines in the area may require movement depending on the exact location of the terminal. It is expected that a minimal level of effort would be required to relocate the existing utilities.

A new high-voltage transmission substation would be required at the project site. An existing transmission corridor that currently passes in proximity to the project site may have the capacity to handle the demand for the terminal.

Potable water would be piped to the proposed terminal site via existing supply mains located in the project vicinity. An analysis to determine whether the existing network would have the capacity to handle the increased demand from the proposed terminal has not been performed. This analysis would be performed at a later date if needed.

Stormwater would be treated on site in accordance with a stormwater management plan to be developed during final design. Storm sewer effluent would be treated by means of oil-water separators prior to discharge into Galveston Bay.

Telephone and fiber optic cabling would be required at the project site.

Sanitary sewage would be collected and piped from the various buildings located within the terminal footprint to the existing sanitary sewer network currently in the project vicinity. An analysis to determine whether the existing network would have the capacity to handle the increased demand from the terminal has not been performed. This analysis would be performed at a later date if needed.

A water pumping and distribution system would be required for fire protection at the project site. Seawater is assumed to be the preferred source for a facility at this location.

Hazardous Material

No known existing hazardous material disposal areas are located within the terminal footprint boundaries; however, hazardous material sites are located adjacent to existing roadways along the alignment of the access corridor proposed for this site.

Demolition

No demolition would be expected as a result of the project at this location.

2.4.7 Cedar Point

The alternative site at Cedar Point is located along the east shore of Galveston Bay in Chambers County, Texas (see Figure 2.4.7-1). The terminal would be located within the City of Baytown.

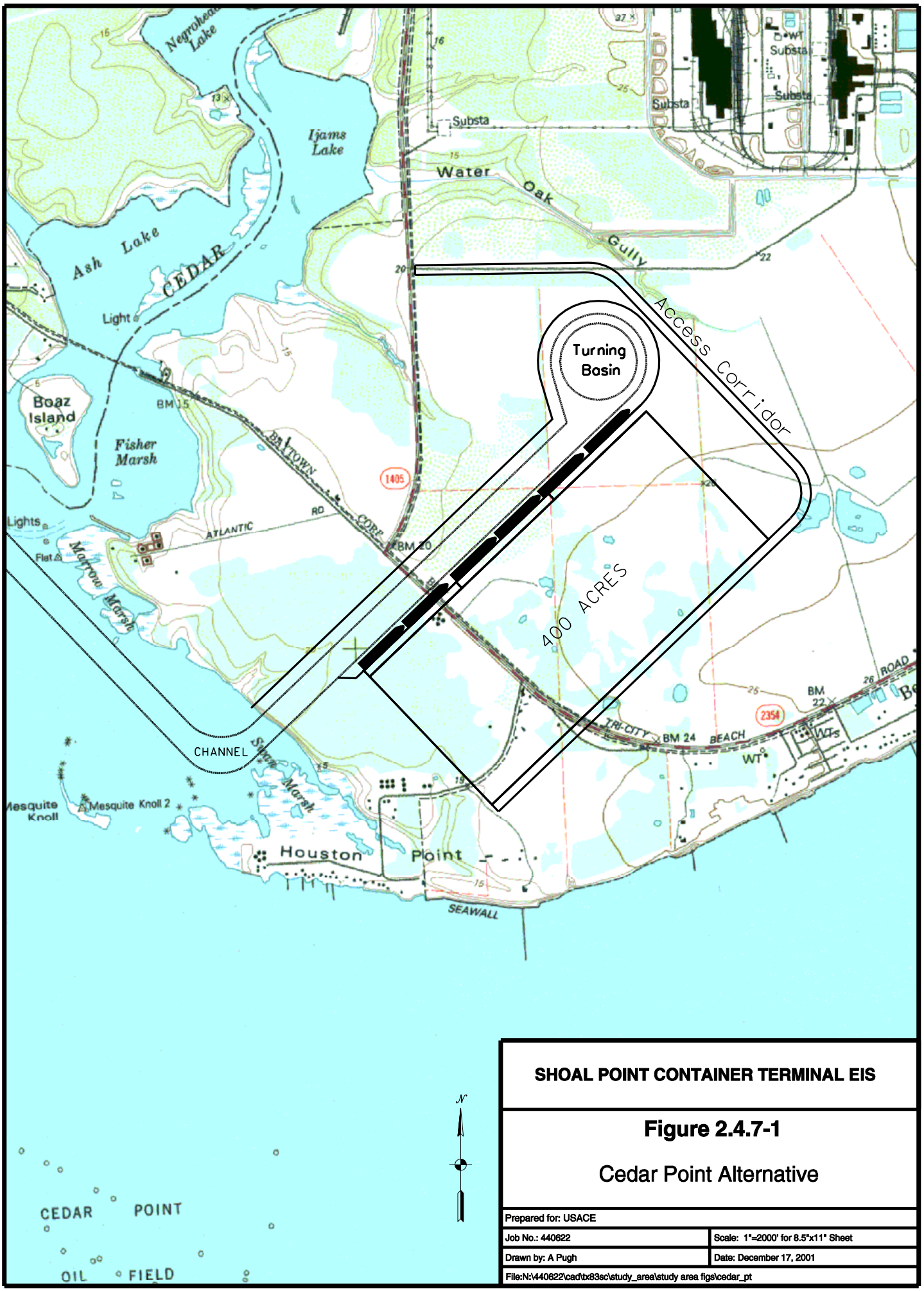
2.4.7.1 Navigation

No current deepwater navigation is available to the project site. The development of the terminal at this location would require deepwater access from the project location to the existing Houston Ship Channel.

2.4.7.2 Dredging

All areas of dredging for the Cedar Point alternative would be deepened to –45 feet MLT.

Development of a container terminal in this location would require a new berthing area, a new deepwater channel, and a turning basin. It is estimated that approximately 34 mcy of material would be dredged during the development of this alternative. It is estimated that the dredging activity alone would take approximately 4 years to complete. The berthing area would be approximately 6,000 feet in length and 200 feet in width. It would be located southwest of the existing Houston Ship Channel. The estimated 34 mcy of dredged material would be placed into existing DMPAs and/or potential Beneficial Use sites. Placement of material in existing DMPAs would result in loss of DMPA capacity currently used



SHOAL POINT CONTAINER TERMINAL EIS

Figure 2.4.7-1

Cedar Point Alternative

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for the Houston Ship Channel. Slope protection in the form of rip-rap would be placed along the affected slopes of the berthing area to ensure that surge from ship bow thrusters would not erode the embankment.

2.4.7.3 Backland

Several thousand acres of land tracts are available at this location, providing that Beach Road (Farm-to-Market Road 2354 (FM 2354)) is relocated. Due to the nature of the site, it is not anticipated that a surcharge program would be developed with the exception of possibly some isolated areas.

2.4.7.4 Roadway Access

Roadway access to the site would be available via FM 1405 and Beach Road. Both roadways are two-lane arterials. They would both likely need to be improved to four lanes as a result of the project. Beach Road would have to be realigned to account for the terminal location. It is assumed that the access corridor alignment would also serve as a permanent realignment for Beach Road.

2.4.7.5 Rail Access

No rail service is currently available at the Cedar Point site. The nearest rail spur is approximately 2.5 miles from the project site. In the early years of the project, the container traffic destined for movement by rail would be expected to be distributed evenly between Barbours Cut, the UPRR intermodal yard, and the BNSF intermodal yard. It is assumed that a separate intermodal yard would be developed in the future. This intermodal yard is not part of this proposed project alternative.

2.4.7.6 Terminal Development

Existing Utilities

There are no known utilities in the area.

A new high-voltage transmission substation would be required at the project site. An existing substation is located within approximately 3 miles of the project site. An analysis to determine whether the existing network would have the capacity to handle the increased demand has not been performed. This analysis would be performed at a later date if necessary.

Potable water would be piped to the terminal site via existing supply mains located in the project vicinity. An analysis to determine whether the existing network would have the capacity to handle the increased demand from the proposed terminal has not been performed. This analysis would be performed at a later date if needed.

Stormwater would be treated on site in accordance with a stormwater management plan to be developed during final design. Storm sewer effluent would be treated by means of oil-water separators prior to discharge into Galveston Bay.

Telephone and fiber optic cabling would be required at the terminal location.

Sanitary sewage would be collected and piped from the various buildings located within the terminal footprint to the existing sanitary sewer network currently in the project vicinity. An analysis to determine whether the existing network would have the capacity to handle the increased demand from the terminal has not been performed. This analysis would be performed at a later date if needed.

A water pumping and distribution system would be required for fire protection at the project site. Seawater is assumed to be the preferred source for a facility at this location.

Hazardous Material

An active municipal landfill is located approximately 2,000 feet from the site boundary. An unregistered underground storage tank (UST) site is located within the project boundary and would require further investigation.

Demolition

Demolition would be expected as a result of the project at this location.

2.5 COMPARISON OF REASONABLE ALTERNATIVES

The method used to identify the reasonable alternatives was developed by the Alternatives Analysis Workgroup to allow for a systematic and objective approach to selection. This discussion focuses on the issues that best differentiate the alternatives. Table 2-2, also referred to as the matrix, provides brief descriptions of the relative impacts by each alternative on each of the environmental receptors (i.e., evaluation criteria). Table 2-3 provides background information specific to construction activities (e.g., dredging volumes). Comparisons of the potential impacts on each of the environmental receptors for all of the alternatives are discussed in more detail below.

Although it fails to meet the Purpose and Need of the proposed project, the No-Action alternative always remains as an alternative to the applicant's proposed action (i.e., construction of the proposed container terminal at the Shoal Point site). In general, the No-Action alternative would have no direct impact to the existing conditions of most of the receptors. However, if the container port is not built at Shoal Point, the deepening of the ship channel would probably become a Federal project and so, the dredging effects (direct impacts to open bay habitat and Section 10 jurisdictional areas) would be similar to the Shoal Point alternative (excluding the turning basin and berthing area). The No-Action alternative would mean that cargo would be brought in overland by truck or rail, thus increasing truck and rail traffic and associated noise levels and air emissions relative to the baseline conditions. In comparison with the Build alternatives, the No-Action alternative would also have no benefits associated with the container terminal (e.g., employment opportunities, increased revenues to local taxing jurisdictions). The No-Action alternative is described in Section 2.4.1.

The following sections provide a summary comparison of potential impacts on specific environmental receptors which are analyzed in more detail in Section 4.0.

Air Quality. The No-Action alternative would mean that any new cargo would be brought in overland by truck or rail, thus increasing truck and rail traffic and associated emissions. Emissions generated by construction equipment during site development for each alternative vary according to the extent and timing of construction activities. These variations in extent and timing of construction activities affect the General Conformity Determination for each alternative. All alternatives would require a General Conformity Determination for Phase I construction activities (i.e., applicable emissions exceed 25 tons per year (tpy)). In addition, Shoal Point and Cedar Point would require a General Conformity Determination for Phase II construction activities. Generally, truck and rail emissions increase with distance from the terminal to the Houston area and ship emissions increase with distance from the entrance to the Gulf of Mexico to the terminal. The alternatives located farther south (closer to the Gulf of Mexico) have lower levels of ship emissions due to the shorter travel distance for the ships, but have higher levels of truck emissions because of the need to transport a greater distance overland to serve the Houston area. The opposite is true of the alternatives located farther north, i.e., more ship emissions related to greater travel distance, but lower truck emissions due to proximity to Houston.

Roadway Traffic. As described above (Air Quality), the closer an alternative is to the Houston area, the less distance required for truck travel. Therefore, Spillman's Island and Alexander Island would add fewer truck miles than Cedar Point and Bayport, while Shoal Point and Pelican Island would add the most. The local impact of increased truck traffic includes impacts to neighborhood streets and access to and from neighborhoods. The residents of El Jardin del Mar have expressed concerns about increased truck traffic associated with a container terminal at Bayport, and Omega Bay residents have expressed concerns about trucks exiting IH 45 en route to a Shoal Point terminal. Alexander Island would require a new bridge, and Pelican Island would require improvements to an existing bridge.

All of the Build alternatives would have impacts to some intersections, but in most cases the project-related impacts do not create an unacceptable level of service at affected intersections. Shoal Point is the only alternative that would create an E level of service at the SH 146 at FM 1765 and SH 3 at Loop 197 intersections (i.e., the Texas City Wye) relative to the No-Build scenario. With regard to the main corridor traffic analysis, none of the alternatives would cause the level of service as a result of project-related traffic to change from an acceptable level in the No-Build scenario to an unacceptable (i.e., E or F) level in the Build scenario.

The No-Action alternative would mean that cargo would be brought in overland by truck or rail, thus increasing truck and rail traffic for the region. Presumably, for truck traffic, IH 10 would be the main corridor impacted.

Noise. Because the No-Action alternative assumes that all cargo would be transported overland, presumably by truck or rail, there would be increased noise levels associated with the increased truck and rail traffic. Generally, most of the representative receptors associated with roadways in the vicinity of the alternatives sites already experience noise levels that meet or exceed the Noise Abatement Criteria. One previously unimpacted roadway segment would experience impacts at each of the following alternatives: Shoal Point, Pelican Island, and Cedar Point. These roadway segments are SH 146 from Loop 197 to FM 519 (Shoal Point and Pelican Island alternatives) and SH 146 from Spur 55 to SH 146/Business SH 146 split (Cedar Point alternative).

Groundwater Hydrology. All build alternatives except Cedar Point have similar, minimal impacts to groundwater hydrology. The new inland channel for the Cedar Point alternative would have a short-term effect on groundwater flow and depth. If the new deepwater channel was constructed, groundwater would tend to flow towards the channel and water levels might be temporarily lowered in the vicinity of the channel. Over time, the groundwater regime would reach equilibrium and be similar to the original conditions. The new channel may increase tidal influence inland and may serve as a discharge point for shallow groundwater during low tide periods.

Hazardous Materials. There would be no impact by the No-Action alternative on hazardous material sites and minimal potential impact for the Build alternatives. Cedar Point has a somewhat higher potential impact because of an unregistered UST within the footprint of the facility (possibly requiring a Phase II investigation) and its proximity to a landfill.

Surface Water Quality and Hydrology. Dredging/deepening of the ship channel at each alternative site would result in minimal changes to salinity. Variations among the alternatives would primarily depend on whether the channel was existing (deepened) or new. San Jacinto Bay (Alexander Island) and Cedar Bayou (Cedar Point) would experience a slight increase in salinity intrusion from dredging of deep channels. Minimal increases in turbidity, or total suspended solids (TSS), would be short-term and associated with dredging activities (construction and maintenance). Impacts would be related to the duration of dredging activities as well as the volume of material dredged, so Cedar Point's requirement for a 3.6-mile channel would probably have the greatest impact to TSS, while Bayport and Spillman's Island would have the least impact, and the other alternatives would have similar levels of impact to water quality. Greater stormwater runoff associated with an increased area of paved impervious cover would be about the same for all alternatives.

Floodplain. All of the alternative sites are located adjacent to navigable waters. The Bayport site is on a navigation channel and the proposed facilities on Pelican Island, Shoal Point, Spillman's Island and Alexander Island are located on leveed DMPAs. Although none of the alternatives are located on a stream or tributary, Cedar Point may impact Water Oak Gully and an unnamed gully south of Water Oak Gully that runs adjacent to and north of an existing landfill. No alternative would impinge on or block any floodway that would affect flooding upstream.

The land access corridor for the proposed Shoal Point alternative would run adjacent to the Texas City stormwater/hurricane channel. However, the road would be designed to minimize impingement on the existing channel. The container facilities for all alternatives would be elevated above the 100-year storm surge level or be designed to accommodate storm surges.

Sediment Quality. In terms of adding contaminants to sediment, there are no apparent differences in the potential impacts to sediment quality among the Build alternatives. The No-Action alternative would not impact sediment quality.

Essential Fish Habitat. There would be no direct impact from the No-Action alternative on Essential Fish Habitat (EFH). However, if the container port is not built at Shoal Point, the deepening of the Texas City Channel would probably become a Federal project, and the dredging effects (impacts to

open-bay habitat) would be similar to those of the Shoal Point alternative (excluding the turning basin and berthing area). All of the Build alternatives would have minimal impacts (associated with increased sedimentation, turbidity and salinity changes) to adult and juvenile fish and shellfish species.

Open-Bay Waters (nekton, plankton). There would be no impact from the No-Action alternative on nekton (including commercial and recreational fishery) and plankton of the open bay. All of the Build alternatives would have similar types of potential impacts, including short-term impacts caused by dredging activities (increased TSS) which could result in loss of productive habitat, and increased risks of chemical and oil spills (associated with increased ship traffic) that could threaten larval and juvenile stages of nekton and plankton assemblages. The impacts associated with dredging activities for each alternative would vary in proportion to the quantity of dredged material produced (see Table 2-3) and the time required to complete dredging activities.

Bay Bottom (benthic community, oysters). The No-Action alternative would not result in any loss of habitat. Also, because there would be no dredging activities associated with construction or increased ship traffic (with possible increased probabilities of chemical or oil spills), no impacts to the benthic community or oyster reefs would be expected. All of the Build alternatives would have potential impacts associated with increased runoff. However, benthic communities are generally tolerant of salinity and sedimentation fluctuations and would probably remain unaffected by dredging activities. Build alternatives would also have increased potential for chemical or oil spills (associated with increased ship traffic). Disturbance and/or loss of open bay waters (and benthic habitat) would be caused by dredging activities associated with berthing areas, turning basins and channels (acreages listed under Jurisdictional Waters). No live oyster reefs are known in the areas of Pelican Island, Shoal Point and Alexander Island; however, potential habitat in the vicinity could be minimally affected by increased TSS associated with dredging activities. Live oyster reefs near Bayport, Spillman's Island, and Cedar Point, however, could be minimally affected by increased TSS associated with dredging activities.

Freshwater Ponds and Wetlands. No impact on wetlands would result from the No-Action alternative. Cedar Point would have the most area of impact with approximately 74 acres (including 6 acres of forested wetlands, 37 acres of shrub/scrub wetlands and 31 acres of freshwater marsh). Bayport would be second in the total area of freshwater ponds and wetlands impacted with 38 acres (including 24 acres wooded), followed by Pelican Island (7 acres), Shoal Point (4 acres), and Spillman's Island and Alexander Island with one acre or less each.

Seagrass/Submerged Aquatic Vegetation (SAV). No impact on SAV from the No-Action alternative would occur. The Build alternatives would likely have little to no impact on seagrass beds although the presence of widgeongrass in the areas near Bayport, Spillman's Island, Alexander Island and Cedar Point causes slightly higher chances of impacts than the alternatives in the southern part of the Bay. The loss of a freshwater pond on Alexander Island would include the loss of a reported widgeongrass community (Glass, 2001a).

Terrestrial and Emergent Vegetation. Although all sites have the same 400-acre footprint for the terminal facility itself, the total acreage values for each of the alternative sites are not equal due to differences among the land access corridors and impacted areas not strictly within the footprint, as well as

the dredging activities required for the berthing area, turning basins and channels. The specific acreage values for the vegetation communities potentially impacted by each alternative are listed in Table 2-2. These values were determined by a combination of field visits and aerial photograph interpretation by PBS&J staff and Charlie Belaire of Belaire Environmental, Inc. (BEI). Additionally, information on the wetlands at Shoal Point and Bayport was gathered from wetland delineation reports: PBS&J (Shoal Point) and Berg-Oliver Associates (Bayport).

No impact on terrestrial and emergent vegetation would arise from the No-Action alternative. In general, less of the facility's footprint would impact terrestrial and emergent habitats at the alternative sites that are currently leveed DMPAs (e.g., Pelican Island, Shoal Point, Spillman's Island and Alexander Island). The Cedar Point and Bayport alternatives would impact larger areas of terrestrial (upland/wetland) habitat compared with the other Build alternatives due in part to the fact that these sites are not on DMPAs. In addition, impacts from Cedar Point would be greater because of the need to dredge an inland channel, turning basin and berthing area. Spillman's Island would impact 23 acres of uplands (shrubland/grassland), the least amount of impacted vegetated area for all the alternatives. Pelican Island (29 acres), Shoal Point (92 acres, more than half of which is a DMPA, but included in this category because it has been inactive long enough to have become heavily vegetated) and Alexander Island (91 acres) would impact intermediate values of areas. Pelican Island would impact the most total wetlands with 103 acres of primarily nontidal, saline flats and marsh. Cedar Point would affect 75 acres of wetlands, but these are higher value habitats because they are in less-disturbed areas and are primarily fresh water (forested, shrub/scrub and marsh). Shoal Point would impact 51 acres of wetlands. Bayport would impact freshwater and brackish wooded wetlands and marsh (41 acres). Alexander Island would impact about 5 acres and Spillman's Island would impact about 3 acres. See the discussion below regarding acreage of these areas that are jurisdictional.

Terrestrial Habitat – Impacts to Wildlife. The No-Action alternative would have no immediate direct impacts to wildlife habitats or species at the various alternatives. Some habitats may change over time on some of the active DMPAs (including loss and creation of habitats). Spillman's Island is probably the least valuable for wildlife habitat. It is largely unvegetated and no known rookeries occur there. Cedar Point and Bayport have the greatest area of relatively undisturbed and varied habitats including forest, shrub/scrub, and grassland (upland and wetland), although the proposed facilities would not impact much tidal wetland at either site. Aside from Spillman's Island, each of the Build alternatives may impact rookeries and/or foraging or loafing habitat for shorebirds and wading birds on or near the proposed facilities.

Jurisdictional Waters of the U.S. (wetlands and open water). There would be no direct impact by the No-Action alternative. However, if the container terminal is not built at Shoal Point, the deepening of the Texas City Channel would probably become a Federal project, and the dredging effects to Section 10 jurisdictional areas would be similar to those of the Shoal Point alternative (excluding the turning basin and berthing area). Among the Build alternatives, Pelican Island would impact the greatest area of jurisdictional wetlands (not including open waters), with 96 acres. This acreage has not been delineated or verified by the USACE, therefore it may include wetlands that would not qualify as jurisdictional due to the recent Supreme Court ruling and USACE-Galveston guidance. Cedar Point would impact virtually no jurisdictional wetlands (<1 acre) with the rest of the Build alternatives ranging from

15.5 acres of impact at Bayport, 13 acres at Shoal Point, 5 acres at Alexander Island, and 3 acres at Spillman's Island. The jurisdictional open-waters acreage (primarily associated with dredging activities for the berthing areas, turning basins, and channels) impacted for each alternative is as follows: Shoal Point (661 acres), Bayport (245 acres), Cedar Point (202 acres), Pelican Island and Spillman's Island (183 acres each), and Alexander Island (116 acres). In the case of Shoal Point, most of this dredging is in an existing channel, so the impacts should be short-term and minimal.

Endangered and Threatened Species. There would be no impact from the No-Action alternative on any endangered or threatened species. Because no endangered or threatened plant species is known to occur at any alternative site, it is not likely that any listed species would be impacted by any alternative. However, the greater extent of natural areas on Bayport and Cedar Point provide better habitat for a diversity of species and are, thus, more likely to support endangered, threatened or rare species. All Build alternatives would probably have the same relative potential impacts (minor, short-term) to sea turtles. Pelican Island and Shoal Point are loafing areas for brown pelicans (*Pelecanus occidentalis*), and dredging activities could temporarily reduce the food supply for this species, which forages for fish by diving.

Historical/Cultural Resources. There would be no impact by the No-Action alternative to cultural resource sites and little probability of impacts to recorded terrestrial cultural resource sites, National Register of Historic Places (NRHP) or State Archeological Landmark (SAL) properties at Pelican Island or Spillman's Island. Bayport and Cedar Point have high probabilities for containing unrecorded terrestrial cultural resources while the other sites have low or very low probabilities. Due to the historic nature of the areas near Cedar Point, Spillman's Island, and Alexander Island, a possibility exists that unrecorded historic resources are present in the waters surrounding these sites. Numerous potential ship wrecks are documented in the waters surrounding Pelican Island, and some may be historically significant. Shoal Point and Bayport are the least likely of the alternatives to have underwater historical sites in the surrounding waters.

Navigation. As described above (Air Quality), the farther an alternative is from the Houston area, the less distance required for ship travel. Therefore, Shoal Point and Pelican Island would add fewer ship miles. Spillman's Island and Alexander Island would add the most ship miles, and Cedar Point and Bayport would be intermediate. All of the alternatives would have access to an existing deepwater channel (Houston Ship Channel/Bolivar Roads) except Cedar Point which would require a 3.6-mile deepwater channel to connect to the Houston Ship Channel. Delays to existing ship traffic at Bayport and Texas City would be expected as a result of the additional ship traffic at these locations.

Socioeconomics. The No-Action alternative would have no benefits associated with the container terminal (e.g., employment opportunities, increased revenues to local taxing jurisdictions). Table 2-2 provides a summary of the impacts of each alternative on Land Use, Recreation, Aesthetics, Population, Community Values, Housing, Economics (Total Demand), Employment, Community Infrastructure, Local Tax Revenue, and Environmental Justice. Generally, all of the alternatives would create jobs, generate economic benefits, and require additional community services for inmigrant workers and their families. The differences among the alternatives are primarily based on differences in construction-phase activities and costs. With regard to Environmental Justice, the Pelican Island site has

the highest potential for disproportionate impact to minority and economically stressed populations relative to the other alternatives; however, none of the alternatives appear to exhibit a high probability for such impacts.

2.6 DETERMINATION OF ENVIRONMENTALLY PREFERABLE ALTERNATIVE(S)

The goal of the Alternatives Analysis is to identify the environmentally preferable alternative(s), i.e., the one(s) with the least overall negative impacts to the environment. According to NEPA, the "environmentally preferable" alternative(s) promote(s) the national environmental policy. In general, the selected alternative(s) should minimize damage to the biological and physical environment while protecting, preserving, and enhancing historic, cultural, and natural resources. NEPA requires that impacts to the human environment be disclosed. Human Environment "shall be interpreted comprehensively to include the natural and physical environment and the relationship of people to that environment" (40 CFR 1508.14). The environmentally preferable alternative(s) will be identified in the Record of Decision (ROD).

2.7 PERMITS AND APPROVALS REQUIRED

A list of permits and approvals that may be required for the proposed project is presented in Table 2-4. This EIS was initiated as a result of the City of Texas City's application to the USACE for a Section 10/404 permit for dredge and fill activities. This application also initiates the permitting process for Clean Water Act Section 401 Water Quality Certification by the Texas Natural Resource Conservation Commission (TNRCC) and a Texas Coastal Management Program (TCMP) Consistency Determination (described below). As of September 1, 2002, the TNRCC has formally changed its name to the Texas Commission on Environmental Quality (TCEQ). However, to maintain consistency, the agency is referred to as TNRCC throughout this document.

The Coastal Zone Management Program (CZM) was created by the Coastal Zone Management Act of 1972. The TCMP is a State entity that participates in the Federal CZM. The TCMP coordinates local, State, and Federal programs for the management of Texas coastal resources. The Coastal Coordination Council (CCC), composed of several State agencies and local officials, administers the TCMP. The TCMP reviews all Federal actions that may affect any natural resource in the coastal zone for consistency with the Federal goals and objectives of the Federal CZM. Federal actions include direct Federal actions (i.e., performed by or for a Federal agency) and indirect Federal actions (i.e., activities requiring Federal permits, approval, or financial assistance). The responsibility for these reviews belongs to the lead agency – the GLO. A Section 404 or Section 10 permit application will automatically trigger a review by the GLO for consistency with TCMP. As part of the original permit application to the USACE, the permittee would submit a TCMP consistency statement. Any concerns expressed by the GLO would be addressed before the permit is granted.

TABLE 2-4

PERMITS/APPROVALS POSSIBLY REQUIRED
SHOAL POINT CONTAINER TERMINAL

Activity Permitted	Permitting Authority	Name of Permit or Filing	When Required
AIR			
Air emissions - construction	TNRCC	State air permit, New Source Review (NSR)	Pre-construction
Air emissions - construction	TNRCC	Federal New Source Review (PSD and/or Nonattainment) Permit	Pre-construction
Air emissions - operating permit	TNRCC	Federal CAA Title V Permit	Before startup
Air emissions for activities subject to USACE jurisdiction	USACE (consultation w/ TNRCC & EPA)	Conformity ruling as part of USACE permit	Prior to issuance of USACE permit
New source performance standards	TNRCC	NSPS Notice; Test; Recordkeeping	Startup
National emission standards for hazardous air pollutants	TNRCC	NESHAP Notice; Test; Recordkeeping	Startup
WASTEWATER			
Sanitary and process wastewater	TNRCC	State TPDES wastewater permit; New Source Determination; Finding of No Significant Impact (FONSI)	Prior to discharge (shield if submitted 180 days before startup)
Construction permit for offsite wastewater forcemain	Local	Construction of City ROW	Pre-construction
STORMWATER			
Construction stormwater discharges	TNRCC	NOI for general permit; construction SWPPP	2 days prior to any work on site
Operations stormwater discharges	TNRCC	NOI for general permit; construction SWPPP	2 days prior to discharge
Construction within floodplain	Galveston County & FEMA	Floodplain development permit; conditional letter of map revision	Pre-construction
Construction within floodplain	FEMA	Letter of map revision	Post-construction
WATER			
Water supply	Local	Water system connection/tap fee	Prior to construction
Placement of fill or dredged material in waters of U.S.	USACE	Section 404 permit of CWA	Pre-construction
Construction and operation in waters of U.S.	TNRCC	Section 401 certification (to show compliance with TX surface water quality standards)	Prior to issuance of USACE permit

TABLE 2-4

PERMITS/APPROVALS POSSIBLY REQUIRED
SHOAL POINT CONTAINER TERMINAL

Activity Permitted	Permitting Authority	Name of Permit or Filing	When Required
WATER (cont'd)			
Work, including dredging, in navigable waters of U.S.	USACE	Rivers and Harbors Act Section 10 permit	Pre-construction
Operation of terminal	GLO	OSPRA Discharge Prevention & Response Plan and Certificate	Pre-operation
Construction on State of Texas property	GLO	GLO easement	Pre-construction
Construction in State of Texas owned water bodies	TPWD	Sand, gravel and marl permit	Pre-construction
Operation of onshore facility	EPA	OPA Facility Response Plan and Certificate of Financial Responsibility	Pre-operation
SOLID WASTE			
Solid waste generation	TNRCC	Notice of registration	90 days after waste generation
Hazardous waste generation	TNRCC	Facility registration	90 days after waste generation
Aboveground storage tanks	TNRCC	30 TAC 334.123 registration	30 days after initial operation
OTHER			
Aids to navigation	USCG	Permitting of private ATN	Prior to construction
Communications tower	FAA	Permit to construct above certain height	Prior to construction
EPCRA reporting	EPA	Form Rs	Annual reporting
Hazardous Substances Community Right-to-Know Communication	EPA / TDH	Notification to State/Local Emergency Planning Committees and Fire Dept.	After startup
Heliport	FAA	Private aviation facility	Prior to operation
Road construction	TxDOT	Approval to tie into Loop 197	Prior to construction
Spill prevention	EPA	Spill Prevention Control and Countermeasures Plan (SPCC)	6 months after beginning operations
Spill response	Dept. of Labor	HAZWOPER training	Pre-operation
Texas Tier II reporting	TDH	Tier II Reports	Annual reporting

SECTION 3

AFFECTED ENVIRONMENT

3.0 AFFECTED ENVIRONMENT

Section 3.0 presents information regarding the existing environment of the study region for each technical discipline addressed in this EIS. The purpose of this description of baseline conditions is to provide a basis for the discussion of environmental consequences that follows in Section 4.0. In some instances, detailed information regarding existing conditions at each alternative site is presented under the appropriate technical discussion in Section 4.0 in order to facilitate comparison of existing conditions and project-related impacts. Section 3.0 also includes information regarding the regulatory context in which the environmental resources and potential environmental consequences are discussed.

3.1 AIR QUALITY

3.1.1 Regulatory Context

The Clean Air Act (CAA), which was last amended in 1990, regulates air emissions from area, stationary, and mobile sources. The CAA requires the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The CAA establishes two types of national air quality standards. Primary standards define the maximum levels of air quality which the EPA judges necessary, with an adequate margin of safety, to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards define the maximum levels of air quality which the EPA judges necessary to protect public welfare, including protection against decreased visibility, and damage to animals, crops, vegetation, and buildings. Air quality is generally considered acceptable if pollutant levels are less than or equal to established standards on a continuing basis.

The EPA Office of Air Quality Planning and Standards has set NAAQS for seven principal pollutants, called "criteria" pollutants, in 40 CFR, Part 50. They are carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), lead (Pb), inhalable particulates with an aerodynamic diameter less than or equal to a nominal 10 microns (PM_{10}), fine particulates with an aerodynamic diameter less than or equal to a nominal 2.5 microns ($PM_{2.5}$), and sulfur oxides (SO_2). These standards are summarized in Table 3.1.1-1.

CO is a colorless and practically odorless gas primarily formed when carbon in fuels is not burned completely (Lewis, 1998). It may temporarily accumulate at harmful levels, especially in calm weather during winter and early spring, when fuel combustion may reach a peak and CO is chemically more stable due to the low temperatures. Transportation activities, indoor heating, industrial processes, and open burning are among the anthropogenic (man-made) sources of CO.

NO_2, nitric oxide (NO), and other oxides of nitrogen are collectively called nitrogen oxides (NO_x). These species are interrelated, often changing from one form to another in chemical reactions. NO_2 is the species commonly measured in ambient air monitors. NO_x is generally emitted in the form of NO, which is oxidized to NO_2. The principal anthropogenic sources of NO_x are fuel combustion in motor vehicles and stationary sources, such as boilers and power plants. Reactions of NO_x with other atmospheric chemicals can lead to the formation of O_3.

Ground level O_3 is a secondary pollutant, formed from daytime reactions of NO_x and volatile organic compounds (VOCs) rather than being directly emitted by natural and anthropogenic sources. VOCs, which have no NAAQS, are released in industrial processes and from evaporation of organic liquids such as gasoline and solvents. Ozone contributes to the formation of photochemical smog.

TABLE 3.1.1-1
NATIONAL AMBIENT AIR QUALITY STANDARDS

Air Constituent	Averaging Time	NAAQS Primary	NAAQS Secondary
Sulfur Oxides (SO_2)	3-hr	--	0.5 ppm
	24-hr	0.14 ppm	
	Annual Arithmetic Mean	0.030 ppm	
Particulate Matter (PM_{10})	24-hr	150 $\mu g/m^3$	150 $\mu g/m^3$
	Annual Arithmetic Mean	50 $\mu g/m^3$	50 $\mu g/m^3$
Particulate Matter ($PM_{2.5}$)	24-hr	65 $\mu g/m^3$	65 $\mu g/m^3$
	Annual Arithmetic Mean	15 $\mu g/m^3$	15 $\mu g/m^3$
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.053 ppm	0.053 ppm
Carbon Monoxide (CO)	1-hr	35 ppm	---
	8-hr	9 ppm	---
Lead (Elemental) (Pb)	Calendar Quarter Arithmetic Mean	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$
Ozone (O_3)	1-hr*	0.12 ppm	0.12 ppm
	8-hr	0.08 ppm	0.08 ppm

--- = An ambient air quality standard has not been promulgated.
ppm = parts per million.
$\mu g/m^3$ = micrograms per cubic meter.
* The ozone 1-hr standard applies only to areas designated nonattainment when the ozone 8-hr standard was adopted in July 1997.
Source: 40 CFR, Part 50, National Primary and Secondary Ambient Air Quality Standards.

Pb is a heavy metal which may be present as dust or as a fume. Dominant industrial sources of Pb emissions include waste oil and solid waste incineration, iron and steel production, lead smelting, and battery and lead alkyl manufacturing. The lead content of motor vehicle emissions, which was the major source of lead in the past, has significantly declined with the widespread use of unleaded fuel.

The NAAQS for particulate matter are based on two different particle diameter sizes: PM_{10} and $PM_{2.5}$. PM_{10} are small particles that are likely to reach the lower regions of the respiratory tract by inhalation. $PM_{2.5}$ is considered to be in the respirable range, meaning these particles can reach the alveolar region of the lungs and penetrate deeper than PM_{10}. There are many sources of particulate

matter, both natural and anthropogenic, including dust from natural wind erosion of soil, construction activities, industrial activities, and combustion of fuels.

SO_2 is a colorless gas with a sharp, pungent odor (Lewis, 1998). SO_2 is emitted in natural processes, such as volcanic activity, and by anthropogenic sources such as combustion of fuels containing sulfur and the manufacture of sulfuric acid.

The Clean Air Act requires the EPA to assign a designation of each region of the U.S. regarding compliance with the NAAQS. The EPA categorizes the level of compliance or noncompliance with each criteria pollutant as follows:

- Attainment – area currently meets the NAAQS
- Maintenance – area currently meets the NAAQS, but has previously been out of compliance
- Nonattainment – area currently does not meet the NAAQS

Ozone nonattainment areas are further classified as extreme, severe, serious, moderate, or marginal depending on the severity of nonattainment.

The project area is located in the Houston-Galveston Air Quality Control Region, also referred to as the Houston-Galveston Area (HGA). This area includes Harris County and the seven surrounding counties of Montgomery, Liberty, Chambers, Galveston, Brazoria, Fort Bend, and Waller.

Ozone is the only criteria pollutant from which the HGA fails to meet the NAAQS. As a result, the HGA has been classified as "Severe-17" nonattainment with the 1-hour NAAQS for ozone. Under current regulations, the HGA has until 2007 to attain the NAAQS for ozone. The TNRCC has the responsibility for developing a plan for attaining the air quality standard in the HGA. This plan, which was submitted to and approved by the EPA, is called the State Implementation Plan (SIP). The SIP describes how the area will reach attainment of the air quality standard for ozone. The SIP sets emissions budgets for point sources such as power plants and manufacturers, area wide sources such as dry cleaners and paint shops, off-road mobile sources such as boats and lawn mowers, and on-road sources such as cars, trucks, and motorcycles.

Since the promulgation of the current 1-hour standard, new studies show that ozone can cause adverse health effects at levels below the 1-hour primary standard. For this reason, in July 1997, EPA established a new ozone standard to provide a higher level of protection than the current standard. The new standard is based on air quality measurements over an 8-hour average, instead of the 1-hour average required by the current standard (EPA, 2001a). Eight-hour averaging is more consistent with the health information that prompted EPA to propose revisions to the standard. Also, by averaging over 8 hours, the standard helps protect people who spend a significant amount of time working or playing outdoors – a group that is particularly vulnerable to the effects of ozone.

The existing 1-hour NAAQS for ozone will continue to apply to the HGA as it was not in attainment of that standard in July 1997 when the 8-hour standard was established. The recent SIP revisions adopted by the TNRCC on December 6, 2000, for the HGA proposed to implement emission

controls so as to demonstrate attainment with the 1-hour standard by the year 2007. The 1-hour standard will no longer apply to an area once the EPA determines that the area has reached the 1-hour standard (i.e., has demonstrated attainment). Once this area meets the 1-hour standard, the EPA will judge the area by the new, 8-hour standard which will be used to determine the air quality status of the area. TNRCC monitoring of ozone concentrations in this area over the previous 3 years indicates levels above the 8-hour standard, as well as above the 1-hour standard (TNRCC, 2001a). The controls proposed in the December 2000 SIP revisions are expected to significantly reduce emissions of ozone precursors and provide attainment with the 1-hour standard. If the resulting improvements do not also provide attainment with the 8-hour standard, then additional controls may be necessary.

In July 1997, the EPA also revised the PM standards. The EPA's revision to the primary standards consisted of adding a new annual $PM_{2.5}$ standard set at 15 $\mu g/m^3$ and a new 24-hour $PM_{2.5}$ standard set at 65 $\mu g/m^3$. The EPA retained the annual PM_{10} standard of 50 $\mu g/m^3$ and adjusted the 24-hour PM_{10} standard of 150 $\mu g/m^3$ by changing its form. Additionally, the EPA revised the secondary standards by making them identical to the primary standards.

Although the standards were challenged, on March 26, 2002, the courts upheld the new 1-hour ozone and revised PM standards. As a result of the Supreme Court's decision, the EPA will move forward with implementation of these standards and the development of plans to meet these standards. EPA's first step in implementing the new standards will be the designation of an area's attainment status based on the review of 3 years of monitoring data. Because the new PM standard ($PM_{2.5}$) is based on a different measure than the previous standard (PM_{10}), EPA and the states must collect 3 years of monitoring data before they can determine which areas are not attaining the standards. Attainment designations for the 8-hour ozone and $PM_{2.5}$ standards are not expected to be determined in most areas until 2004 or 2005. Once the nonattainment status of an area is decided, the states will have up to 3 years to develop plans for meeting the new standards.

The TNRCC is responsible for monitoring air and water quality within the state and for reporting that information to the public. The staff examines and interprets the causes, nature, and behavior of air pollution in Texas. The TNRCC also operates central and mobile laboratories based in Austin and a laboratory in Houston that provide analytical services for air, water, and waste samples. Numerous monitors are located in the HGA that are operated by TNRCC, the City of Houston, and the Houston Regional Monitoring Network in cooperation with TNRCC.

Most of the monitoring stations measure the concentrations of the criteria pollutants, including ozone, in the air, as well as air temperature, wind velocity, and other meteorological parameters (TNRCC, 2001b). Some of the monitoring stations also measure the levels of selected chemicals and some measure pollen and mold spores. The ozone monitors operate continuously (24 hours a day, 7 days a week), and are checked by technicians who perform equipment maintenance and conduct quality assurance checks.

As required by the Clean Air Act, the EPA has also promulgated rules to ensure that Federal actions conform to the appropriate SIP. Two rules were promulgated: 1) the Transportation Conformity Rule (40 CFR Part 93); and 2) the General Conformity Rule (40 CFR 51, Subpart W). The

Transportation Conformity Rule applies to Federal Highway Administration (FHWA)/Federal Transit Authority projects within maintenance or nonattainment areas. The General Conformity Rule applies to Federal actions, except FHWA and Transit Authority actions, within maintenance or nonattainment areas.

Section 176(c) of the CAA under 42 U.S.C. 7506(c)(1), prohibits Federal agencies from funding, permitting, or licensing any project that does not conform to an applicable SIP. The purpose of this General Conformity requirement is to guarantee that Federal agencies consult with State and local air quality districts to assure these regulatory entities know about the expected impacts of the Federal action and can include expected emissions in their SIP emissions budget.

In order to implement this requirement, the EPA promulgated General Conformity regulations in 40 CFR, Part 51, Subpart W and in 40 CFR Part 93, "Determining Conformity of Federal Actions to State or Federal Implementation Plans." The TNRCC has promulgated its own corresponding regulations at 30 TAC 101.30, "Conformity of General Federal Actions to State Implementation Plans." Pursuant to these regulations, a Federal agency must make a General Conformity Determination for all Federal actions in nonattainment or maintenance areas where the total of direct and indirect emissions caused by a Federal action of a nonattainment pollutant or its precursors would equal or exceed emission rates established by the regulations. A Federal action is defined as any activity engaged in or supported in any way by any department, agency, or instrumentality of the Federal government. Federal actions include providing Federal financial assistance or issuing a Federal license, permit, or approval. Where the Federal action is a permit, license, or other approval for a project, the activity that is considered a Federal action is the portion of the project that requires the Federal permit, license, or approval.

In an ozone nonattainment area classified as severe, such as the HGA, if the total emissions of either NO_x or VOCs related to the Federal action would equal or exceed 25 tpy, the Federal agency undertaking the action must issue a General Conformity Determination, stating how the project conforms or will conform with the SIP for that pollutant, prior to undertaking the action. A General Conformity Determination is not required for a Federal action where the total of NO_x or VOC emissions are below these levels. Even if the emissions of NO_x or VOCs are below 25 tpy, a conformity determination is also required if the increase in emissions due to the project would equal or exceed 10 percent of the total emissions of those pollutants for the entire nonattainment area (i.e., the project is considered a regionally significant action).

There are various ways to demonstrate that a project conforms to the SIP, including the following:

- For NO_2, the total of direct and indirect emissions from the Federal action may be fully offset within the same nonattainment area through a revision of the applicable SIP or a measure similarly enforceable under State and Federal law that affects emission reductions such that there are no increases in emissions. All of the emissions, not just those above the threshold level, must be offset.
- Where the total of direct and indirect emissions from the Federal action is determined by the TNRCC to result in a level of emissions which, together with all other emissions in the nonattainment or maintenance area, would exceed an emissions budget specified in the applicable SIP, the TNRCC makes a written commitment to

the EPA to apply for a revision to the SIP which would achieve the needed reductions prior to the time the Federal action will occur.

- The TNRCC makes a determination that the total of direct and indirect emissions from the Federal action, along with all the other emissions in the nonattainment area, will not exceed the emission budgets in the SIP.

Prior to issuing a permit, the USACE must determine whether the General Conformity requirements apply. The USACE has reviewed the proposed project description and determined that the activities associated with the project that fall under the definition of Federal action include construction of the access road, the wharf, and the portion of the container yard constructed over jurisdictional wetlands, and the dredging of the berthing areas, channel, and turning basin. For purposes of the General Conformity Determination, the Federal action does not encompass other construction activities or terminal operating activities. Therefore, the relevant emissions to consider are only those directly related to construction of a portion of the site access road, some terminal construction, dredging, dredge support, and employee access. The emission decisions made regarding which sources would be subject to the USACE program responsibility were consistent with the following guidance documents:

- USACE Memorandum, 20 April 1994, related to the EPA's Clean Air Act General Conformity Rule.
- 40 CFR Part 51, Subpart W (58 FR 63,214), Preamble to the adoption of the Federal conformity requirements, 30 November 1993.
- 30 TAC 101.30 (19 Texas Register 9515), Preamble to the adoption of the TNRCC conformity requirements, 2 December 1994.

Although the total emissions from the project are considered in this EIS, only those related to the Federal action should be considered for the General Conformity Determination.

Based on several meetings with the TNRCC and the EPA, both agencies have informally agreed that a General Conformity review only applies to emissions subject to USACE program responsibility, as discussed above. The emissions budget for General Conformity purposes is defined in the TNRCC General Air Quality Rules §101.30 (8). The budget is established by the allowable emissions allocated to a subcategory of the emissions inventory in the applicable SIP revision. The applicable SIP is the most recent revision which has been approved under the Federal Clean Air Act, §110. For the HGA, the most recently approved SIP is the Post-1999 Rate of Progress and Attainment Demonstration SIP adopted by EPA in October 2001. According to information provided by the TNRCC, the construction budgets in this SIP are 5.5 tons per day, or 1,512.2 tpy, for VOCs and 32.1 tons per day, or 8,827.5 tpy, for NO_x (see TNRCC letter to USACE in Appendix H-9).

In the impacts discussion for each alternative site (Section 4.0), project emissions are estimated for each year of each of three phases of the project. Emissions subject to USACE action are broken out from the total emissions for the project for evaluation in the context of General Conformity.

The Houston-Galveston Area Council (H-GAC) staff has agreed that the Houston-Galveston Area SIP incorporates transportation-related operating emissions due to projected growth in container traffic. The H-GAC is designated as the Air Quality Planning Agency for the HGA and is

responsible for reviewing transportation plans and determining their conformity with the SIP. According to a letter from the H-GAC (see H-GAC letter to USACE in Appendix H-9), the project is accounted for in the region's currently approved Metropolitan Transportation Plan (MTP) and associated conformity analysis. Vision 2022, the MTP for the Houston-Galveston Region, was adopted by the Transportation Policy Council in April 2000 and the associated conformity analysis was approved by FHWA in May of 2000. The analyses conducted in support of the development of the MTP did include the assumption that a container terminal would be in operation at Shoal Point. As discussed in the letter, the conformity analysis was performed in 1999 and used the latest information concerning the terminal's proposed truck-related operations. Although the current projections for truck activity are more than assumed in the conformity determinations, it is the H-GAC's opinion that the additional truck trips would be unlikely to result in emissions exceeding conformity budgets.

3.1.2 Climatology and Topography

The primary factors affecting local air quality are the locations of air pollutant sources and the amounts of pollutants emitted, but the meteorological and topographical conditions are also important. Atmospheric conditions such as wind speed, wind direction, and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants. Another important factor is the proximity to the Gulf of Mexico, which moderates temperatures and helps create consistent wind gradients.

The climate of the HGA is predominantly marine (SCS, 1976b). Prevailing winds are from the southeast and south, except in January when frequent high-pressure areas bring in polar air and prevailing northerly winds. Temperatures are moderated by the influence of the winds from the Gulf of Mexico, which results in mild winters and relatively cool summer nights. Another effect of the nearness of the Gulf is abundant rainfall, except for rare extended dry periods.

Mean daily temperatures range from the mid-forties in December and January to above 90°F in the summer months. Minimum temperatures reach 32°F or lower 7 to 15 days per year. Most freezing temperatures last only a few hours because they are usually accompanied by clear skies.

Monthly rainfall is evenly distributed throughout the year. Annual rainfall has varied from 72.86 inches in 1900 to 17.66 inches in 1917. Monthly precipitation averages from about 2.7 inches to about 4.4 inches. Because thundershowers are the main source of rainfall, precipitation may vary substantially in different sections of the region on a day-to-day basis.

About one-fourth of the days each year are clear, with the most clear days occurring in October. Cloudy days are relatively frequent from November to May, and partly cloudy days are more frequent from June through September. Sunshine averages near 60 percent of the possible amount for the year, ranging from 46 percent in winter to 69 percent in summer. Snow is rare; however, in an occasional year, several inches may fall in January or February.

Heavy fog occurs on an average of 16 days per year, and light fog occurs about 62 days per year. Destructive windstorms are fairly infrequent, but both thunder squalls and tropical storms, including hurricanes, occasionally pass through the area.

The average date of the last frost (≤32°F) in spring is March 2; the average date of the first frost (≤32°F) in fall is November 28. The growing season, or the average period from the last frost in spring to the first frost in fall, is about 271 days.

Topography and meteorology of the general area in which the project is located will not seriously restrict dispersion of air pollutants. However, there can be a significant amount of year-to-year variability in ozone levels. This year-to-year variability is generally considered to be the result of the important role that weather conditions play in ozone formation. In the HGA, as in many other coastal communities, a "sea breeze-land breeze" effect is caused by temperature differences between the land and the Gulf of Mexico (H-GAC, 2000). This effect moves air from the land out over the Gulf during the night, and moves it back over the land as temperatures rise the following day, effectively recirculating polluted air. During years when there are a high number of sunny days combined with either stagnant wind conditions or winds that blow out into the Gulf of Mexico in the morning and then back onto the land in the afternoon, the eight-county area sees higher ozone levels and more potential exceedances of the 1-hour standard.

3.1.3 Air Quality Baseline Condition

Based on the most recently available air emissions inventory information provided by EPA (2002a), the following Table 3.1.3-1 is a summary of emissions for the HGA. The emissions information for each pollutant is broken out by category: area source, non-road mobile, on-road mobile, and point source emissions based on emissions inventory information for 1999. In assimilating data for $PM_{2.5}$ emissions, the EPA database was accessed. As this database appears to provide more current and comprehensive emissions information, the database was used as a basis for emissions information in the EIS. Although this emissions inventory is not current, it is the most recent data available, and it provides a base from which to compare the proposed project emissions.

TABLE 3.1.3-1
SUMMARY OF AIR EMISSIONS FOR THE
HOUSTON-GALVESTON AREA (1999)
BY SOURCE CATEGORY

Air Contaminant	Area (tpy)	Non-Road Mobile (tpy)	On-Road Mobile (tpy)	Point Source (tpy)	Total (tpy)
NO_x	8,120	217,008	123,653	214,716	563,497
VOC	67,510	40,885	76,831	84,619	269,845
CO	102,284	492,853	556,105	77,394	1,228,636
SO_2	179	29,109	5,689	126,833	161,810
PM_{10}	323,582	7,590	4,607	11,069	346,848
$PM_{2.5}$	64,993	6,931	3,575	8,548	84,047

Source: EPA, 2002a.

Available monitoring data for several counties in the HGA for 1995 through 2001 are presented in Table 3.1.3-2. Based on the results of ambient air monitoring for the area, the EPA has determined that Harris and Galveston County and the surrounding 6 counties are in severe nonattainment for the 1-hour ozone air quality standard.

TABLE 3.1.3-2
MONITORED VALUES[1] COMPARED WITH NAAQS
HOUSTON-GALVESTON AREA[2] (1995-2001)[3]

Year	24-hr Value for PM_{10} ($\mu g/m^3$)	Annual Mean Value for PM_{10} ($\mu g/m^3$)	1-hr Value for O_3 (ppm)	4th Highest 8-hr Value for O_3 (ppm)	24-hr value for SO_2 (ppm)	Annual Mean Value for SO_2 (ppm)	1-hr Value for CO (ppm)	8-hr Value for CO (ppm)	Annual Mean Value for NO_2 (ppm)	Quart-erly Mean Value for Pb ($\mu g/m^3$)	24-hr Value for $PM_{2.5}$ ($\mu g/m^3$)	Annual Mean Value for $PM_{2.5}$ ($\mu g/m^3$)
Harris County												
1995	92	42.3	0.204	--	0.053	0.006	11.1	5.2	0.026	0.02	--	--
1996	68	40.4	0.18	--	0.046	0.006	11.7	7	0.023	0.02	--	--
1997	134	43.4	0.21	0.124	0.025	0.004	9.2	6.7	0.025	0	--	--
1998	126	54.7	0.203	0.117	0.024	0.004	7.8	5.2	0.023	--	--	--
1999	115	45.2	0.203	0.124	0.019	0.005	6.3	4.1	0.024	0.02	38.3	17.1
2000	102	49.6	0.194	0.117	0.028	0.005	5.5	3.3	0.019	0.01	43.3	14.3
2001	--	--	--	0.110	--	--	--	--	--	--	53.7	13.8
Galveston County												
1995	78	28.3	0.198	--	0.089	0.006	--	--	--	0.03	--	--
1996	52	21.5	0.107	--	0.067	0.013	--	--	0.005	0.02	--	--
1997	82	23.4	0.175	0.103	0.053	0.006	--	--	0.005	--	--	--
1998	68	25.6	0.168	0.113	0.039	0.003	--	--	0.003	--	--	--
1999	44	25.8	0.176	0.120	0.04	0.007	--	--	0.005	--	36.5	14.6
2000	53	28.6	0.141	0.093	0.025	0.004	--	--	0.004	--	46.8	12.1
2001	--	--	--	0.083	--	--	--	--	--	--	32.7	11.4
Brazoria County												
1995	--	--	0.148	--	--	--	--	--	--	--	--	--
1996	--	--	0.11	--	--	--	--	--	--	--	--	--
1997	--	--	0.137	0.084	--	--	--	--	--	--	--	--
1998	--	--	0.111	0.090	--	--	--	--	--	--	--	--
1999	--	--	0.161	0.112	--	--	--	--	--	--	7.7	7.7
2000	--	--	0.109	0.079	--	--	--	--	--	--	27.6	10.5
2001	--	--	--	0.086	--	--	--	--	--	--	36.9	10.3
Montgomery County												
1999	--	--	0.117	0.085	--	--	--	--	0.009	--	14.3	11.1
2000	--	--	0.123	0.100	--	--	--	--	0.006	--	24.3	13.7
2001	--	--	--	0.090	--	--	--	--	--	--	31.4	13.0
NAAQS	150	50	0.12	0.080	0.14	0.03	35	9	0.053	1.5	65	15

-- Not available.

[1] Selection of monitored values is based on criteria established in 40 CFR, Part 50. Parameters and data reported here represent those available in EPA's Aerometric Information Retrieval database: "Air Data-Monitor Values Report."

[2] Data for Chambers, Fort Bend, Liberty, and Waller counties not available in EPA Air Data Report.

[3] 2001 available data to date.

Source: EPA, 2001d; TNRCC, 2001b and 2001g.

Under the Clean Air Act, U.S. Fish and Wildlife Service (FWS), Forest Service, and National Park Service wilderness areas are designated "Class I air quality areas" and receive special protections against air pollution. The Act gives the Federal Land Manager for the Class I areas responsibility for protecting wildlife, vegetation, visibility, and other sensitive resources. The nearest Class I areas to this region are Breton Wildlife Refuge, located in southeast Louisiana; Wichita Mountains Wildlife Refuge, located in southwest Oklahoma; and Big Bend National Park located in west Texas. The approximate distance of each Class I area from the proposed alternatives is shown in Table 3.1.3-3.

TABLE 3.1.3-3
APPROXIMATE DISTANCE (MILES) FROM
ALTERNATIVE SITES TO CLASS I AREAS

	Breton Wildlife Refuge	Big Bend National Park	Wichita Mountains Wildlife Refuge
Alexander Island	349	481	455
Spillman's Island	347	484	418
Bayport	346	484	405
Shoal Point	338	490	482
Pelican Island	332	495	437

3.2 ROADWAY TRAFFIC

3.2.1 Existing Conditions

Existing conditions for the intersections and corridors evaluated for the proposed project site and the alternative sites are presented in the appropriate impacts discussion in Section 4.0 in order to facilitate comparison of existing conditions to the projected conditions under the Build and No-Build scenarios. The following section describes the data collection and analysis methods used to generate information for the evaluation of existing conditions and projected impacts for the proposed site and each alternative site.

3.2.2 Data Collection and Analysis Methods

As the basis for analyses on key intersections potentially impacted by the proposed Shoal Point Container Terminal at Shoal Point and at alternative sites, PBS&J collected vehicle turning movement counts, 24-hour counts, and UPRR data. The intersections analyzed were selected by their proximity to the proposed project site and to each alternative project site and the relative level of impact anticipated. Specific locations studied in each type of analysis are listed in the following sections. Maps included in Section 4.0 depict the locations of the intersections and corridors studied.

3.2.2.1 Traffic Counts

The intersections studied for the proposed and alternative sites are listed below. All intersections are signalized unless noted as TWSC (Two-Way Stopped Controlled) or AWSC (All-Way Stopped Controlled).

Proposed Site: Shoal Point

Major Intersections:	Minor Intersections:
1) FM 519 at Loop 197	8) SH 146 at FM 2094
2) FM 519 at SH 3	9) SH 146 at 6th Street
3) FM 519 at SH 146	10) SH 146 at FM 518
4) SH 146 at FM 1765	11) SH 146 at El Mar
5) SH 3 at Loop 197	12) SH 146 at Red Bluff Road
6) SH 146 at Loop 197	13) SH 146 at Shoreacres
7) SH 146 at NASA Road 1	

Alternative Sites:

Pelican Island

1) Harborside at 51st Street
2) Harborside at IH 45 (AWSC)
3) Broadway at 51st Street

Bayport

1) SH 146 at Port Road (TWSC)

Spillman's Island

1) Barbours Cut Boulevard at SH 146
2) Barbours Cut Boulevard at Broadway (AWSC)

Alexander Island

1) SH 225 at Battleground
2) SH 225 at Miller's Cut Off
3) Miller's Cut Off at Battleground Road

Cedar Point

1) SH 146 at FM 1405 (TWSC)
2) Business SH 146 at Spur 55 (TWSC)

3.2.2.2 Railroad Crossings

The railroad crossings studied were:

1) NASA Road 1, east of SH 3
2) FM 518, east of SH 3
3) FM 517, east of SH 3
4) FM 1765, east of SH 3

3.2.2.3 Main Corridors

The main corridors analyzed were:

1) IH 45, Beltway 8 to Harborside (Galveston)
2) SH 146, IH 45 to Spur 55 (Baytown)
3) SH 225, Beltway 8 to SH 146

3.2.2.4 24-Hour Counts

Twenty-four-hour counts were performed on the following roads:

1) IH 45 Southbound Frontage Road, North of SH 6 (near residential subdivision)
2) Loop 197, North of SH 3/SH 146 (northbound and southbound)
3) SH 146 south of NASA Road 1
4) SH 146 north of FM 518

The 24-hour count data are included in Appendix C. Schematics for each of the key intersections potentially affected by the proposed Shoal Point Container Terminal and by the alternative sites are included in Appendix C.

Morning and afternoon peak period turning movement counts for each intersection were acquired during the hours of 7:00 A.M. to 8:00 A.M. and 5:00 P.M. to 6:00 P.M., respectively. These hours were selected to represent the times of the day when the highest traffic volume occurs, as determined from the 24-hour counts.

The system peak hour used in the computer program Synchro Traffic Coordination Software Version 4.0 and SimTraffic Software Version 4.0 was 5:00 P.M. to 6:00 P.M. Data for this system peak hour were used to simulate the highest traffic volume throughout the entire transportation system for the proposed site and all the alternative sites. The turning movement count data for each intersection are included in Appendix C.

3.2.2.5 Trip Generation

PBS&J, Berger/Abam Engineers, and H-GAC worked in conjunction to develop truck trip generation tables, truck traffic movement tables, and rail traffic movement tables for the proposed site and for the alternative sites for the years 2005, 2015, and 2025. The documents referenced to obtain the trip generation tables were Texas Southern University (TSU), 1999; URS Corporation, 2001; and Berger/Abam, 2000. The trip tables provide data to the EMME-2 transportation demand model, maintained by H-GAC to develop future year vehicular traffic projections. The assumptions made and the truck trip spreadsheets are included in Appendix C.

The data from the H-GAC EMME-2 transportation model was used by PBS&J to develop growth factors. The growth factors were used to project the intersection turning movement count information to reflect the 2005, 2015, and 2025 traffic conditions for Build and No-Build scenarios. The projected turning movement count data were then used in the Synchro Traffic Coordination Software

Version 4.0 to generate a level of service (LOS) for each intersection potentially impacted by the proposed site and the alternative sites for the Build and No-Build scenarios.

The UPRR data, H-GAC EMME-2 and growth factor data, and the main corridor data are included in the traffic study report that supports this analysis (PBS&J, 2001a).

3.2.2.6 Analysis Methods

A combination of Synchro Traffic Coordination Software Version 4.0, SimTraffic Software Version 4.0, Highway Capacity Software (HCS), H-GAC EMME-2 traffic model, the Highway Capacity Manual, and the Trip Generation Manual were used to analyze the potential impacts of the proposed container terminal. The results presented in Section 4.0 address the LOS, intersection analysis, major corridor analysis, railroad crossing delay analysis, container distribution, truck movement summary, and residential area analysis (for area of concern identified during scoping) for the proposed site and the alternative sites for 2005, 2015, and 2025.

Existing intermodal railway facilities were considered in the analysis. The locations of these intermodal yards (UPRR, BNSF, and Barbours Cut) are indicated on Figure 3.2.2-1.

Maps depicting the existing conditions (2001) and the projected future conditions (2025 Build/No-Build) of the intersections potentially affected by the container terminal at the proposed project site and at the alternative sites are included in Section 4.0. The LOS for the impacted intersections close to each alternative is indicated on these maps as well as in the tables in Section 4.0.

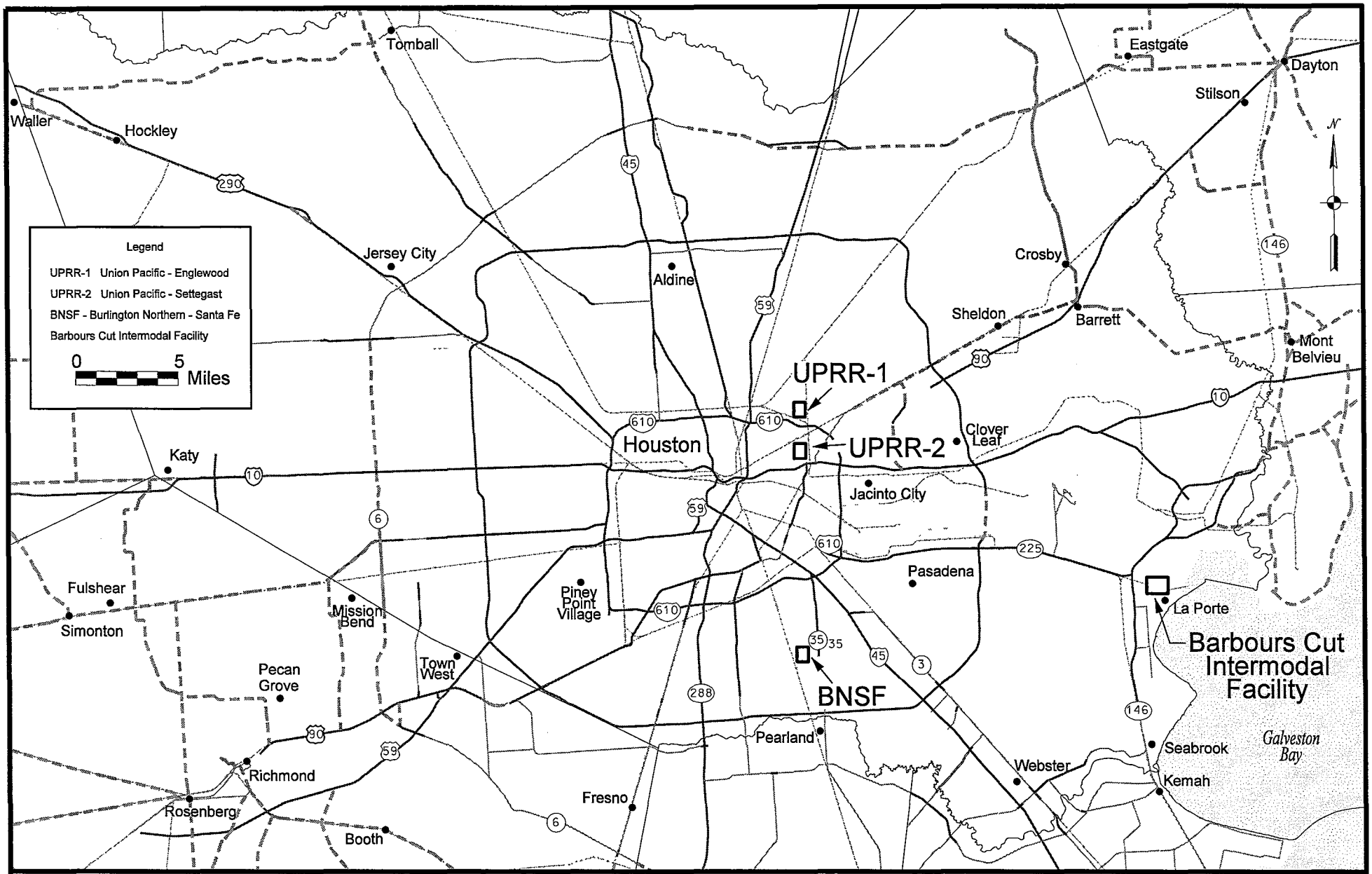
In the intersection analysis, LOS criteria are given in terms of the average stopped delay per vehicle during an analysis period of 15 minutes. Six LOSs, designated A through F, and the criteria for each are shown below. LOS A designates the best service, and LOS F designates the worst service. Acceptable LOS in a metropolitan area is D.

The criteria for Signalized and Two-Way or All-Way Stopped Controlled Intersections is as listed in Table 3.2.2-1.

TABLE 3.2.2-1
INTERSECTION LOS CRITERIA

LOS	Signalized Intersections (seconds/vehicle)	Two-Way Stopped Control (TWSC) and All-Way Stopped Control (AWSC) Intersections (seconds/vehicle)
A	≤10.0	≤10.0
B	>10.0 and ≤20.0	>10.0 and ≤15.0
C	>20.0 and ≤35.0	>15.0 and ≤25.0
D	>35.0 and ≤55.0	>25.0 and ≤35.0
E	>55.0 and ≤80.0	>35.0 and ≤50.0
F	>80.0	>50.0

Source: Highway Capacity Software, Version 3.1b.



Shoal Point Container Terminal EIS

Prepared for: USACE	
Job No.: 440622	Scale: 1"= 6.6 miles for 8.5x11 Sheet
Drawn by: G. Rockley	Date: Aug 2002
File: N:440622\cad\tsms27\fig3-2-2-1.dgn	

Figure 3.2.2-1
Existing Intermodal Railway Facilities

In the main corridor analysis, LOS criteria are given in terms of density (passenger cars per mile per lane [pc/mi/ln]), which is derived from Average Daily Traffic (ADT) data. Six LOSs, designated A through F, and the criteria for each are shown below. As with the intersection LOS criteria, LOS A designates the best service and LOS F designates the worst service, with LOS D representing an acceptable level in a metropolitan area. The LOS criteria for basic freeway segments are in Table 3.2.2-2.

TABLE 3.2.2-2
LOS CRITERIA FOR BASIC FREEWAY SEGMENT

Level of Service	Maximum Density (pc/mi/ln)
A	10
B	16
C	24
D	32
E	45
F	>45.0

Source: Highway Capacity Manual.

3.2.3 Traffic Safety

According to the American Association of State Highway and Transportation Officials (AASHTO), the 1991 national accident rate average was 201 accidents per 100 million vehicle miles. According to the Texas Department of Transportation (TxDOT), the state of Texas accident rate has been below the national average, with rates of 58.1 in 1997, 51.6 in 1998, and 50.6 in 1999.

According to the Federal Motor Carrier Safety Administration (2001), available evidence does not suggest that trucks are more dangerous than other vehicles in general. While the fatal crash rate for trucks involved in crashes is slightly higher than it is for other vehicles, the injury rates and property damage-only rates are lower.

The National Transportation Safety Board (NTSB) (1999) recorded that large trucks composed 3.5 percent of the total vehicles registered in 1997. In 1997, there were 37,280 fatal accidents on the nation's highways. Assuming the number of accidents is evenly distributed among vehicle classes, 3.5 percent of 37,280 is approximately 1,305 accidents. There were 4,572 fatal accidents involving large trucks in 1997. Based on this interpretation of these data, if a person is involved in an accident with a truck, there is a four times greater chance the accident would be fatal compared with an accident with other motor vehicles. The traffic accident data from the NTSB is included in Appendix C.

3.3 NOISE

Noise is defined as unwanted sound that disrupts or interferes with normal activities or that diminishes the quality of the environment. Noise is usually caused by human activity and is added to the natural, or ambient, acoustic setting of an area. Exposure to high levels of noise over an extended

period can cause health hazards such as hearing loss; however, the most common human response to environmental noise is annoyance. Individuals respond to similar noise events differently based upon various factors that may include the existing background level, noise character, level fluctuation, time of day, the perceived importance of the noise, the appropriateness of the setting, and the sensitivity of the individual.

Sound is sensed by the human ear when a source emits oscillations through an elastic medium, such as air. The vibrations produce alternating bands of dense and sparse particles of air. This movement of the particles creates a fluctuation in the normal atmospheric pressure known as sound waves. Sound is characterized by two magnitudes; frequency and amplitude. The frequency of a sound corresponds to the human sensation of pitch and is measured in Hertz (Hz). The amplitude of a sound corresponds to the human sensation of loudness. Human reaction to loudness, or sound pressure, is measured in terms of sound pressure levels, and expressed in terms of decibels (dB). Decibels are measured on a logarithmic scale in order to compress the wide range between the human threshold of hearing and the threshold of pain. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels of approximately 120 dB begin to be felt inside the ear as discomfort and increases to pain at higher levels.

Sounds of the same pressure but different frequencies are not perceived by the human ear as equally loud. The human ear is less sensitive to low frequencies and extremely high frequencies, and most sensitive to the mid-range frequencies that correspond with human speech. Therefore, in order to measure sound in a manner similar to human perception, an adjustment known as "A" weighting is used. All regulatory agencies require that measurements be taken using the A-weighted sound level (dBA). Examples of common sounds and their associated noise levels (in dBA) are provided in Table 3.3-1.

Although A-weighted sound measurements indicate the level of environmental noise at any given moment in time, community noise levels vary constantly. Typical noise environments consist of numerous noise sources that vary and fluctuate over time. Because of the varying noise levels within a community, it is necessary to use a descriptor called the equivalent sound level (L_{eq}). L_{eq} is the average A-weighted sound level, in decibels, for any specific time period under consideration.

The U.S. Environmental Protection Agency (EPA) has developed the day-night level (L_{dn}) which is defined as the A-weighted average sound level for a 24-hour period. It is calculated by adding a 10 dBA penalty to nighttime (10 P.M. to 7 A.M.) sound levels to account for increased sensitivity to noise during the evening hours.

TABLE 3.3-1
RANGE OF COMMON SOUND LEVELS ON AN A-WEIGHTED DECIBEL SCALE

COMMON SOUND/NOISE LEVELS		
OUTDOOR	**dBA**	**INDOOR**
Pneumatic hammer	100	Subway train
Gas lawn mower at 1 meter		
	90	Food blender at 1 meter
Downtown (large city)	80	Garbage disposal at 1 meter
		Shouting at 1 meter
Lawn mower at 30 meters	70	Vacuum cleaner at 3 meters
Commercial area		Normal speech at 1 meter
Air conditioning unit	60	Clothes dryer at 1 meter
Babbling brook		Large business office
Quiet urban (daytime)	50	Dishwasher (next room)
Quiet urban (nighttime)	40	Library

Source: TxDOT, 1996.

3.3.1 Regulatory Context

3.3.1.1 Community Regulations

There are no noise limit regulations or laws dictated by the State of Texas, nor are there any dictated by any county located within the State of Texas.

No noise limit regulations or ordinances that dictate specific noise levels were found in association with any of the communities in the Galveston Bay area except for the City of Seabrook's Code of Ordinances.

The City of Seabrook's Code of Ordinances dictates in Ordinance No. 95-09, §1, 8-15-95, that the sound pressure level of any operation of a facility shall not exceed 65 decibels, at 125 cycles.

3.3.1.2 Federal Regulations

U.S. Department of Housing and Urban Development (HUD). HUD will not provide assistance, subsidy or insurance for the new construction of housing, manufactured home parks, nursing homes, hospitals, or programs providing assistance or insurance for land development, redevelopment or any other provision of facilities and services that are directed to making land available for housing for areas that have unacceptable noise levels as directed by 24 CFR 58.

HUD also recognizes that high noise levels negatively affect the marketability of real estate and takes noise levels into consideration when determining the amount of insurance or assistance for a property.

HUD has set forth regulations for the construction of new structures. They are:

- 65 L_{dn} or less is considered acceptable
- Noise levels greater than 65 L_{dn} but not exceeding 75 L_{dn} are normally unacceptable, and
- Noise levels exceeding 75 L_{dn} are considered unacceptable

Therefore, the construction of a site with noise levels of 65 L_{dn} or lower is considered acceptable. If the noise levels are greater than 65 L_{dn} but lower than 75 L_{dn}, alternate locations or adequate attenuation must be used. HUD considers noise levels of 75 L_{dn} or greater unacceptable.

Federal Highway Administration (FHWA). The FHWA provides procedures for noise studies and noise abatement measures for the protection of public health and welfare, to supply noise abatement criteria and to establish requirements and provide information to public officials to use for the planning of highways as dictated by Title 23, United States Code (U.S.C.). The 23 Code of Federal Regulations (CFR) 772 in its entirety serves as the noise standard promulgated by the FHWA. Under 23 CFR §772, Procedures for Abatement of Highway Traffic Noise and Construction Noise, analysis of noise levels for highway projects must include a comparison of the existing levels to those predicted to occur at some point in the future as a result of the implementation of the proposed action. To apply these procedures to the proposed project and alternatives, various major arterial roadways that are likely to be affected have been identified. For each section of roadway identified, a randomly placed representative receptor was used for noise modeling. The results of the modeling, performed according to TxDOT's "Guidelines for Analysis and Abatement of Highway Traffic Noise," reveal existing and predicted noise levels (Leq).

The FHWA has established Noise Abatement Criteria (NAC) for various land use activity areas (see Table 3.3-2). The NAC are used as one of two means to determine whether a traffic noise impact will occur. A noise impact occurs when either the absolute or relative criterion is met:

Absolute criterion: the predicted noise level at a receiver approaches, equals, or exceeds the NAC. "Approach" is defined as one dBA below the NAC. For example, a noise impact would occur at a Category B residence if the noise level is predicted to be 66 dBA or above.

Relative criterion: the predicted noise level substantially exceeds the existing noise level at a receiver even though the predicted noise level does not approach, equal, or exceed the NAC. Substantially exceeds is defined as 10 dBA or more. For example, a noise impact would occur at a Category B residence if the existing level is 55 dBA and the predicted level is 65 dBA (10 dBA increase).

TABLE 3.3-2
FHWA NOISE ABATEMENT CRITERIA (NAC)

Activity Category	Leq (dBA)	Description of Land Use Activity Areas
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	Developed lands, properties or activities not included in categories A or B above.
D	--	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: TxDOT, 1997.

3.3.2 Analysis Methodology

3.3.2.1 Noise Generation of Port Facilities

To determine the potential noise effects of the proposed facility, PBS&J reviewed data collected for the USACE at the existing Barbours Cut Terminal. These data quantified noise levels associated with the operations of the existing terminal facility based on the results of a noise monitoring program conducted at the facility. The monitoring program consisted of six separate data collection sessions at a total of 18 locations within and around the perimeter of the terminal facility. The monitoring locations included areas adjacent to the terminal's main gate, docks and berths in order to determine the range of noise levels associated with specific operations and equipment. Additional monitoring locations beyond the property line of the terminal were included to determine noise propagation and drop-off levels in the surrounding area.

Truck traffic, operations associated with the loading/unloading of vessels, and rail traffic were identified as major noise sources within the terminal facility. The noise levels within the terminal facility were found to be as high as 81.1 dBA L_{dn} but dropped to typical residential levels as the distance between the terminal facility and surrounding area increased (USACE, 2001a).

3.3.2.2 Noise Generation by Traffic

TxDOT recommends that existing and predicted noise levels be determined by using computer modeling when assessing noise levels generated by traffic. The use of computer modeling and

the study of existing and predicted noise levels would "ensure a direct comparison of noise levels obtained by the same methodology" (TxDOT, 1996). In accordance with TxDOT's recommendations, the FHWA traffic noise modeling software STAMINA was used to calculate existing and predicted traffic noise levels. The model primarily considers the number, type, and speed of vehicles; highway alignment and grade; cuts, fills, and natural berms; surrounding terrain features; and the locations of activity areas likely to be impacted by the associated traffic noise.

Existing and predicted traffic noise levels were modeled for a scenario using Category B receivers that represent residential structures located adjacent to highways that serve the alternative sites.

Traffic noise analysis typically includes the following elements:

- Identification of land use activity areas that might be impacted by traffic noise
- Determination of existing noise levels
- Prediction of future noise levels
- Identification of possible noise impacts
- Consideration and evaluation of measures to reduce noise impacts

Traffic noise modeling analyses were performed on eighteen segments of three main roadways (IH 45, SH 225, and SH 146) that could potentially be affected by building the container terminal on Shoal Point, the proposed alternative. Additionally, analyses were performed on segments of main roadways potentially affected by the operation of the proposed project at five alternative sites. Results of these analyses are presented in Section 4.0 for the proposed site and each alternative site.

An additional detailed noise study was conducted in response to comments received from the residents of Omega Bay during the public comment period on the Draft EIS. Predicted traffic noise levels were calculated using the FHWA's approved STAMINA noise modeling software. STAMINA takes into account the following criteria to predict the potential noise levels: road width, number of lanes, levels of predicted traffic, vehicle mix (cars, light trucks, and heavy trucks), grade of the road, and posted speed. A sample of 24 residences was used as representative receivers for the community. The twenty-four residences were chosen based on their various distances from IH 45. All areas within Omega Bay are represented by the chosen receivers (see Section 4.2.3). As-built plans provided by TxDOT and aerial photography were used to determine the profile elevation of the highway and the distances between the highway and the representative receivers. Noise was modeled based on traffic volumes for the years 2001 and 2025. A value of 8 feet was used as an average hearing height based on the approximate mean sea level of the community (approximately 3 feet) plus an additional 5 feet (as dictated by STAMINA).

3.3.3 Ambient Noise Levels

To quantify the existing noise environment within the project area, PBS&J reviewed the results of an ambient noise monitoring program that was conducted for the USACE (USACE, 2001a). The noise level and distance of the nearest residential areas in relation to each of the alternative sites are summarized in Table 3.3-3. The following section discusses the ambient levels and associated land use of each alternative site.

TABLE 3.3-3
AMBIENT NOISE ENVIRONMENT WITHIN PROJECT AREA

Location	Range of Ambient Noise Measurements	Approximate Distance from Nearest Noise Sensitive Receptors
Shoal Point	63.8 dBA L_{dn} and 64.9 dBA L_{dn}	4,500 ft
Pelican Island	58.3 dBA L_{dn} and 65.8 dBA L_{dn}	8,000 ft
Bayport	51.3 dBA L_{dn} and 67.2 dBA L_{dn}	600 ft
Spillman's Island	56.2 dBA L_{dn} and 74.0 dBA L_{dn}	4,500 ft
Alexander Island	Industrial noise is not expected to reach the residential areas. Noise in residential areas is expected to remain within the parameters of typical residential areas.	5,000 ft
Cedar Point	49.9 dBA L_{dn} and 61.5 dBA L_{dn}	2,000 ft

Source: USACE, 2001a.

3.3.3.1 Shoal Point

The Shoal Point site is a DMPA bordered by the Texas City Channel and turning basin to the north and west, and by Galveston Bay to the east and southeast. Located immediately adjacent to the west and northwest of the site is a large area of heavy industrial land use consisting of chemical refineries and storage facilities, and transportational land use that includes rail and port facilities.

The nearest noise sensitive receptors are located at a residential area lying approximately 4,500 feet from the site on the northwest side of the industrial facilities (Figure 2.4.2-1). Ambient noise measurements within the residential area were recorded at 63.8 dBA L_{dn} and 64.9 dBA L_{dn}. Although the noise environment of the residential area was influenced by the nearby industrial facilities, the recorded noise levels remained typical of residential areas (USACE, 2001a).

3.3.3.2 Pelican Island

The Pelican Island alternative site lies on the northeast shore of the island. This alternative site and adjacent areas within 1 mile consist primarily of transitional areas in DMPAs. The undeveloped Pelican Spit Military Reservation borders the site to the southeast. The Texas City Channel parallels the site to the northeast, and the GIWW separates the site from a small undeveloped island to the northwest. Facilities located beyond the 1 mile boundary of the proposed alternative site include Seawolf Park located on the far northeastern point of the island, Texas A&M University-Galveston located on the southeastern corner of the island, and maritime industries located along the southern coast.

The nearest noise sensitive receptors are located at the Texas A&M University-Galveston Campus located more than 8,000 feet to the south of the alternative site (Figure 2.4.3-1). Ambient noise measurements taken at the campus ranged from a low of 58.3 dBA L_{dn} to a high of 65.8 dBA L_{dn}. Noise levels at this location reflect a typical rural environment. Prominent noise sources at this location included wind, insects and road traffic. Distant ship traffic (horns) also contributed to the ambient noise levels (USACE, 2001a).

3.3.3.3 Bayport

The Bayport alternative site lies on shrub/brush rangeland on the southern shoreline of the Bayport Ship Channel. This alternative site is bordered on the north by the ship channel. Residential subdivisions associated with the communities of Shoreacres and La Porte lie to the north of the ship channel. The residential subdivision of El Jardin del Mar, which is part of the City of Pasadena, and the subdivision of Surf Oaks, which is part of the city of Seabrook, lie to the southeast. A large undeveloped shrub/brush rangeland lies to the south of the site. An industrial area that contains oil and gas storage facilities lies to the south and southwest of the site.

The nearest noise sensitive receptors are located in the residential subdivisions of Shady Oaks and Bay Colony lying approximately 600 feet to the north of this alternative site. Numerous residences extend to the north within the communities of Shoreacres and La Porte. The residential subdivision of El Jardin del Mar is located approximately 200 feet south of the alternative site's boundary, which is approximately 3,000 feet south of the channel where the majority of operational activity would occur. Residences located within the subdivision of Surf Oaks, located south of El Jardin del Mar, fall within the 1-mile boundary of the alternative site (Figure 2.4.4-1). Ambient noise measurements taken within these residential communities ranged from a low of 51.3 dBA L_{dn} to a high of 67.2 dBA L_{dn}. Noise levels within these communities were consistent with typical rural/suburban areas (USACE, 2001a).

3.3.3.4 Spillman's Island

The Spillman's Island alternative site lies on an active DMPA within an undeveloped area along the of the City of La Porte's southern boundary. The Houston Ship Channel and turning basin lie to the north and east. Transportation and industrial land uses lie beyond the Lower San Jacinto Bay to the west. Industrial and existing container port docking and storage facilities lie to the south at the Barbours Cut Terminal.

The nearest noise sensitive receptors are located in a residential area lying approximately 4,500 feet to the south of this alternative site, within the City of Morgan's Point. The Barbours Cut Terminal and facilities border the northern edge of the residential area (Figure 2.4.5-1). Ambient noise measurements recorded within the community ranged from a low of 56.2 dBA L_{dn} to a high of 74.0 dBA L_{dn}. Noise levels within the community remained typical of residential areas; however, heavy truck traffic and other activities associated with the Barbours Cut Terminal influence the nearest receptors (USACE, 2001a).

3.3.3.5 Alexander Island

The Alexander Island alternative site lies on an undeveloped island in the Upper San Jacinto Bay. The island is an active DMPA with no roadway access. Heavy industrial land use dominates the shoreline surrounding the island. A residential area lies approximately 5,000 feet to the east within the city limits of Baytown, adjacent to the industrial uses.

The nearest noise sensitive receptors are located within the residential area that is located approximately 5,000 feet from this alternative site. It is expected that the ambient noise levels

within this community would be influenced by the adjacent heavy industrial use, but remain within the parameters of typical residential areas.

3.3.3.6 Cedar Point

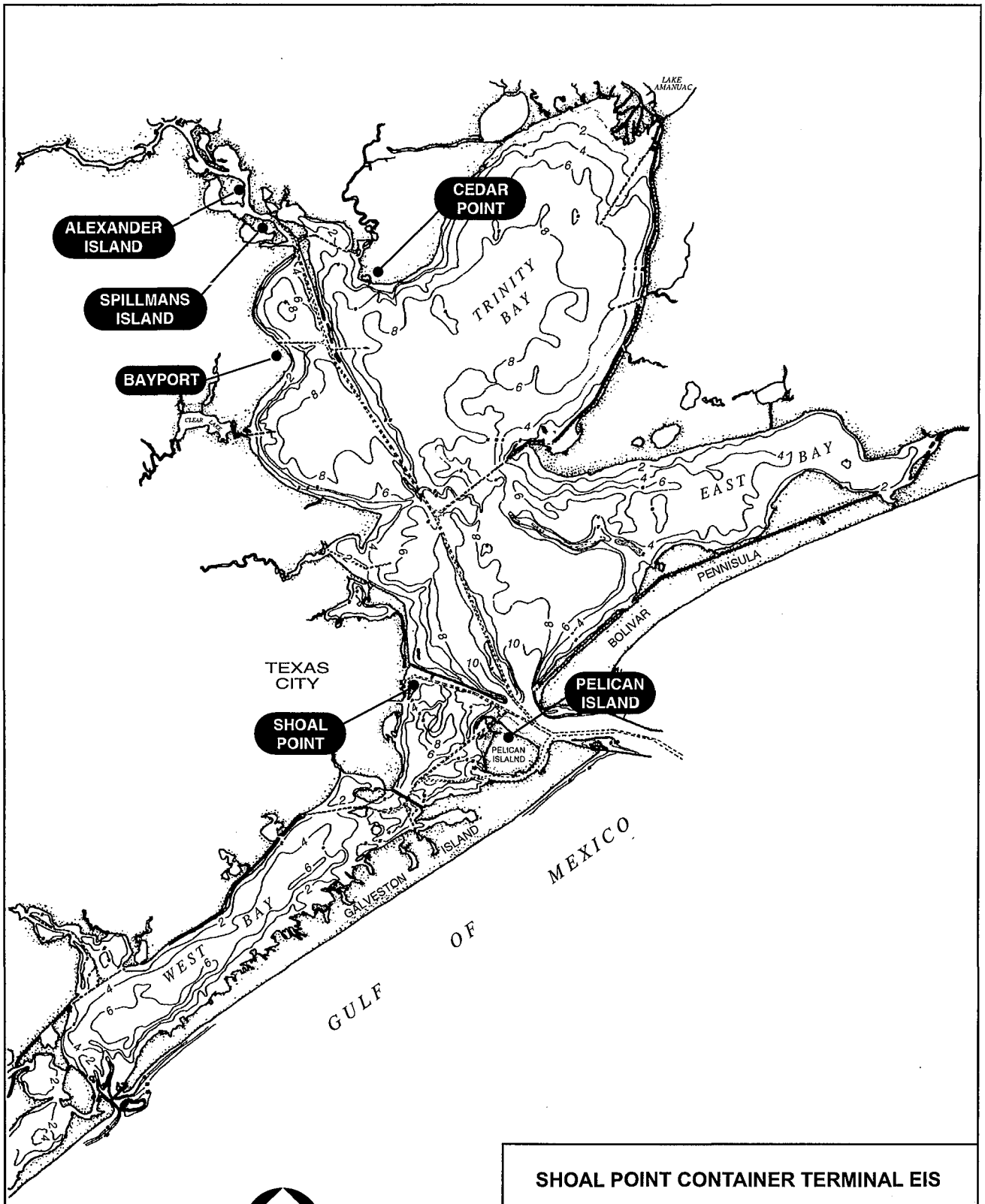
The Cedar Point alternative site lies on a relatively undeveloped area composed of pastureland, shrub/brush rangeland, mixed forest, and forested wetlands. Several homes are located along Cedar Point Road within the alternative site boundary. A large industrial facility lies to the north beyond the mixed forest and wetlands that surround the site. Numerous residences are located to the south, west, and southeast of the site.

The nearest noise sensitive receptors are located in the residential area lying approximately 500 feet to the southwest of this alternative site. Numerous residences are located along the south shoreline within 2000 feet of the site (Figure 2.4.7-1). Ambient noise measurements recorded within the area ranged from a low of 49.9 dBA L_{dn} to a high of 61.5 dBA L_{dn}. Noise levels within the area were typical of rural/ suburban areas (USACE, 2001a).

3.4 PHYSIOGRAPHY, TOPOGRAPHY, AND BATHYMETRY

Galveston Bay is a lagoonal estuary of some 600 square miles in surface area, and is generally shallow, with typical depths in the interior of the Bay ranging from 5 to 12 feet (Figure 3.4-1) (McGowen and Morton, 1979; White et al., 1985; Wermund et al., 1989). Dredged navigation channels, whose depths range from 12 to 45 feet, transect the Bay system. Physiographically, Galveston Bay consists of several subsystems: Trinity Bay, East Bay, the confined portion of the Houston Ship Channel above Morgan's Point, San Jacinto Bay, upper Galveston Bay (consisting of the area north of the Texas City Dike and west of the Houston Ship Channel), and West Bay. Figure 3.4-2 depicts physiographic features discussed in this section. East and West bays constitute a coastal lagoon approximately 55 miles long and from 1 to 4 miles wide (Lankford and Rehkemper, 1969). Maximum depths of Trinity, East, and West bays are between about 6 and 9 feet (McGowen and Morton, 1979; White et al., 1985). The other bays are approximately 3 to 4 feet deep at their centers. Depths in parts of East Bay and central Galveston Bay are variable because of the presence of oyster reefs. One of the important physiographic features of the Bay complex is the mid-bay constriction at Red Fish Bar, which functions hydrologically as a gigantic weir, reducing the coupling between the upper and lower segments of Galveston Bay. An additional physiographic feature of note is the Texas City Dike along the west shore of Galveston Bay. This structure, which has existed in the Bay system in various forms since 1915, exerts an influence on the currents in the Bolivar Roads area.

The San Jacinto River is present in the northern portion of the project area and flows southward into Galveston Bay. The Houston Ship Channel follows the San Jacinto River northward from the Galveston Bay until the confluence of Buffalo Bayou, where the ship channel veers westward along Buffalo Bayou and towards the City of Houston. Several small bays and lakes, including Burnett Bay, Scott Bay, San Jacinto Bay, Tabbs Bay, and Peggy Lake, are located along the San Jacinto River near its confluence with Galveston Bay. The river is a fine-grained meanderbelt system characterized by a highly sinuous course, abundant cutoff and abandoned channel courses, relatively high mud load, and broad to



north

0 1 2 3 4 5 6 7

(nautical miles)

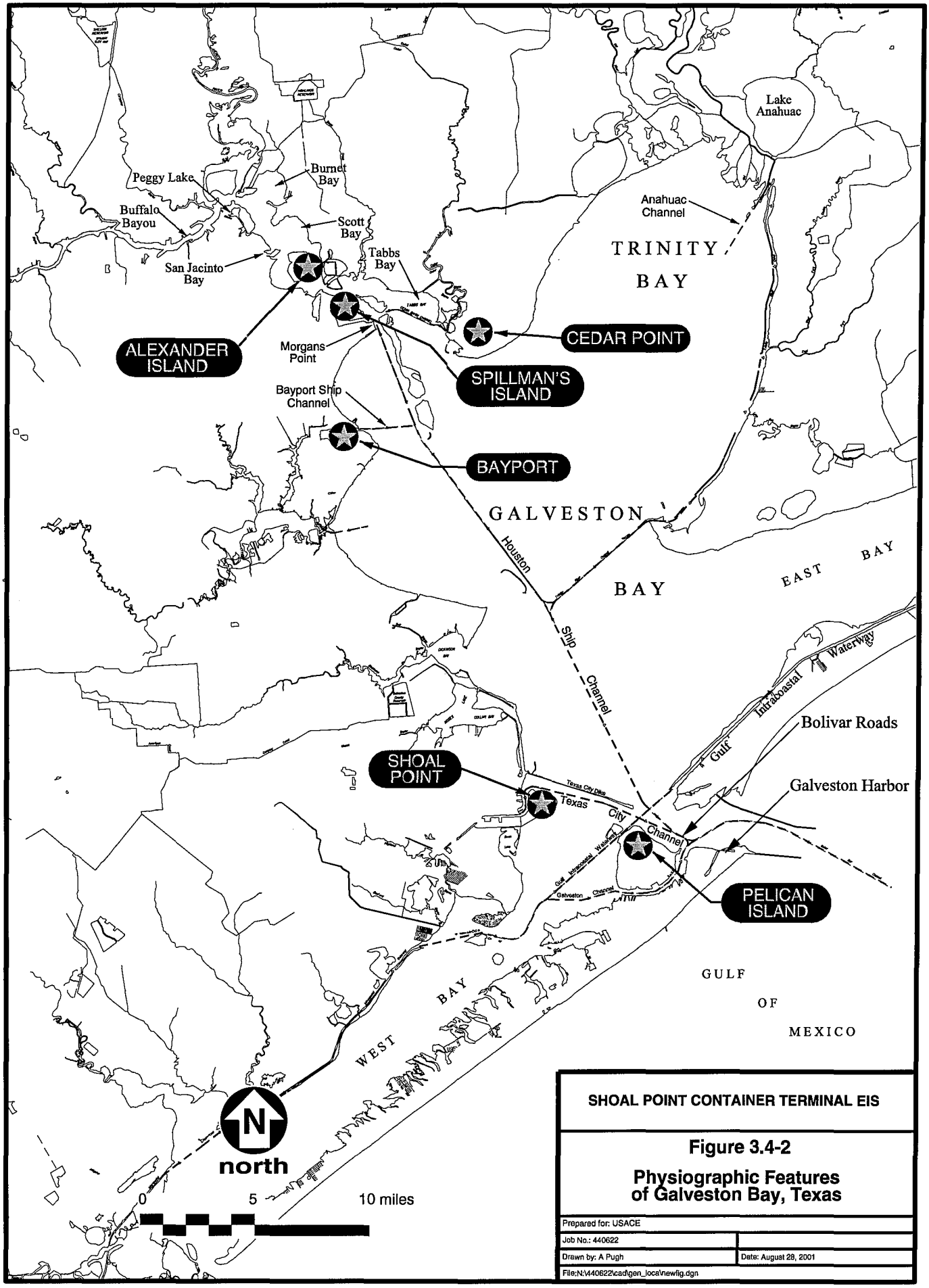
CONTOURS IN FEET BELOW MLW

SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.4-1

General Bathymetry of Galveston Bay, Texas

Prepared for: USACE	
Job No.: 440622	Scale:
Prepared by. D. Kimmerling	Date: August 27, 2001
File: m:/hg1/projects/440622/eis_geo-gw/cad/fig3_4-1.ai	



SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.4-2

Physiographic Features of Galveston Bay, Texas

Prepared for: USACE	
Job No.: 440622	
Drawn by: A Pugh	Date: August 28, 2001
File:N:\440622\cad\gen_loca\newfig.dgn	

moderately broad floodplains. The floodplain ranges 1 to 3 miles wide at its lower end. The San Jacinto River has not formed a delta in the classic sense, although there has been subaqueous sedimentation and shoaling in San Jacinto Bay (Lankford and Rehkemper, 1969).

The portion of the Gulf of Mexico pertinent to the project area is confined to the shelf area and is largely devoid of significant physiographic features. The shelf slopes fairly uniformly in this area at a rate of approximately 5:10,000, except within approximately 3,000 feet of the beach where the slope is steeper, more on the order of 5:1,000. Galveston Bay and associated bays are separated from the Gulf of Mexico by a system of barrier islands and peninsulas.

The main navigation channels in Galveston Bay include Galveston Harbor (the channel complex composed of the Entrance Channel, the Outer Bar Channel, and the Inner Bar Channel), Galveston Channel between Pelican Island and Galveston Island, the Texas City Channel, the Houston Ship Channel which crosses the lower and upper Galveston Bays, and the Gulf Intracoastal Waterway (GIWW). Dredged material has been placed along most of these channels.

The coastal plain in the project area consists of a series of coastal terraces dipping gently seaward, with surface gradients ranging from less than 1 foot per mile near the coast to about 10 feet per mile along the inland margin to the coastal plain (Lankford and Rehkemper, 1969). These terraces are transversed by modern floodplains of the San Jacinto and Trinity River valleys. The land surface of the Quaternary coastal plain typically has low relief and is featureless. Topographic maps for each alternative site are presented in Section 2.0.

The bathymetry of the Galveston Bay complex has been partially modified by human activity, mainly by channel dredging and subsequent formation of DMPAs. The flat bottom basin of Galveston Bay averages 7 to 9 feet deep and typically becomes shallow rather abruptly near the bay margins (Lankford and Rehkemper, 1969). The bathymetry of the Galveston Bay complex is presented in Figure 3.4-1.

3.5 GEOLOGY

The project area is situated near the seaward margin of the west Gulf Coastal Plain Physiographic Province (Bureau of Economic Geology (BEG), 1977). The region is characterized by nearly continuous series of marginal marine embayments separated from the Gulf of Mexico by a system of barrier islands and peninsulas (Lankford and Rehkemper, 1969). The nature and distribution of these features along the coastline are a result of several active, geologic processes including long shore drift, beach swash, wind deflation and deposition, tidal currents and waves, delta outbuilding, and river point bar and flood deposits. The coastal zone is entirely underlain by sedimentary deposits that originated in ancient, but similar, coastal systems (Fisher et al., 1972).

The coastal plain near the Gulf is underlain by tens of thousands of feet of Jurassic to Pleistocene sedimentary rock strata that dip toward the Gulf. In the late Triassic and Jurassic periods of the Mesozoic Era, the area became isolated and water inflow was restricted, resulting in the deposition of evaporite sections dominated by salt (Wermund et al., 1989). Since salt deposition, the area has been

overlain principally by prograding sands and muds. Recent, or Holocene deposits, overlie the Pleistocene sediments principally along the coast and alluvial floodplains of river systems. This regional, gulfward dip is interrupted locally by salt domes that penetrate the underlying strata to within a few thousand feet of land surface. Regional dip is also interrupted by belts of arcuate growth faults that are typically downthrown to the Gulf, or by faults in the proximity of salt domes (Wesselman, 1971).

The modern Galveston Bay is an area of interaction between marine and fluvial environments. The bay has formed by a combination of estuarine flooding during postglacial sea level rise and barrier island construction after sea level stillstand was reached (Lankford and Rehkemper, 1969). The extent of the embayment is controlled by topography, tectonic uplift or downwarp, and the amount of sediment deposited in the bay.

Pleistocene age sediments crop out inland from Galveston Bay in much of the project area and extend to a depth of approximately 600 feet (Wesselman, 1971; Baker, 1979). Pleistocene formations occur at the surface between the Recent sediments near the coast and Tertiary formations inland. The formations crop out in belts that become progressively older away from the coast and are nearly parallel to the shoreline of the Gulf of Mexico. The units dip generally southeastward, become progressively deeper, and thicken towards the coast (William F. Guyton & Associates, 1972). In descending order (youngest to oldest), the strata are assigned to the Beaumont, Lissie, and Willis formations (Fisher et al., 1982). The Lissie Formation has been further divided in some areas of the coastal plain into the Montgomery Formation and underlying Bently Formation. The Pleistocene formations are composed of unconsolidated clays, silts, sands, and minor gravels deposited in fluvial and fluvial-deltaic environments by meandering rivers during one or more interglacial episodes. The result is a laterally and vertically complex sequence of meanderbelt sands and associated floodbasin deposits of ancient rivers; distributary channel sands and silts, with associated interdistributary muds of ancient delta plains; and marine deltaic sands. Only Recent and Beaumont sediments are exposed within the project area.

Modern-Holocene age sediments overlie the Pleistocene sediments and are present at the surface in areas of active deposition associated with modern fluvial-deltaic, barrier-strandplain, marsh-swamp, and bay-estuary-lagoon systems. The San Jacinto River valley was entrenched into the coastal plain surface during the last Pleistocene glacial period, and it has subsequently been partially filled with Holocene and Modern fluvial-deltaic deposits (i.e., alluvium). Depositional facies associated with the San Jacinto River fluvial-deltaic system include point bar sands; meanderbelt sands; levee deposits of silt, mud, and sand; and marsh and swamp deposits of mud and localized sand. Numerous abandoned channels are present along San Jacinto River and form topographic lows on the river floodplains. Small bodies of water parallel the San Jacinto River near its confluence with Galveston Bay. These water bodies receive suspended load material mainly from overbank flow from the river.

The barrier-strandplain system is found along Galveston Island and the Bolivar Peninsula in the southern portion of the project area, along the interface of land and ocean. The main components of the system include beaches consisting of sand and shell, ridges and barrier flats consisting predominantly of sand, tidal flats, and salt marshes composed of sand and mud.

Lower parts of the coastal areas within the project area and the San Jacinto River valley support marsh-swamp systems. Marshes and swamps are associated with a variety of landforms, including flood-tidal and bay head deltas, backsides of barrier islands, mainland shorelines, abandoned stream courses and cutoffs, and floodplains of rivers. Salt water, brackish, and freshwater marshes, coastal lakes and ponds, and freshwater swamps are common components of the system within the project area.

The bays, estuaries, and lagoons within the project area are generally low-energy environments protected on the seaward side by the Galveston Island and Bolivar Peninsula barrier island system. Sediment is contributed to the bay system by the San Jacinto and Trinity rivers and several bayous which discharge at the head of the bay and by the Gulf of Mexico through tidal inlets and across the barrier islands and peninsulas during storms (McGowen and Morton, 1979). The submerged portion of the bay system consists mainly of mud with shell and areas occupied by active and inactive oyster reefs. Sand with shell and mud is found predominantly along the bay margins. The coarsest grained sediment is found at river mouths, along bay margins where erosion of Pleistocene deposits is prevalent, near tidal inlets, and adjacent to barrier islands and peninsulas, and finest grained material is found in the deeper bay-center areas (McGowen and Morton, 1979). At the mouth of the Trinity River, a relatively large delta has developed at the head of Trinity Bay, with fringing subaqueous delta-front sands.

Dredged material from navigation channels, drainage channels, and irrigation channels cover subaerial and submerged portions of the project area. Major placement areas flank the land cuts and intrabay dredged channels. These anthropogenic deposits occur along the Houston Ship Channel, in the San Jacinto River floodplain, along the Texas City Dike, in much of Pelican Island, and behind the northeast end of Galveston Island. The composition of the material at these locations is dictated by origin of the material; however, dredging and disposal usually render the material less coherent and more permeable. Shoal Point, Alexander Island, Spillman's Island, and Pelican Island consist predominantly of dredged material and are current DMPAs.

The Galveston Bay area experienced land subsidence on the order of 2 to 4 feet between the 1940s and 1970s, primarily due to historic oil and gas production and heavy groundwater withdrawal. However, since the 1970s, groundwater usage in the area has largely been replaced by surface water usage, with a subsequent decrease in subsidence. In fact, it has been reported that virtually no subsidence occurred in the Galveston Bay area between 1978 and 1987 (O'Neal and Holzschuh, 1990). Currently, the conversion from groundwater to surface water has successfully controlled most subsidence in the area.

Surface faults are relatively common in parts of the coastal zone. A number of these surface faults have been activated as a result of subsidence in the area. Most surface faults are likely related to long-trending coastal fault systems extending upwards from several thousand feet below surface and/or to faults associated with the numerous salt domes in the area (Brown et al., 1974). Faults of the coastal zone have been explained by a number of natural geologic processes, including deposition and differential compaction of sediment, upward movement of salt masses to form salt domes, gulfward creep of coastal landmass, and bending of landmass due to regional tectonics. Faults in the region can be differentiated into two categories: growth faults and salt dome faults. Growth faults form by

subsurface slumping, creep, and consolidation of thick sections of relatively young sediments contemporaneously with sediment deposition. These faults are confined entirely to sediments of Cenozoic age and are typically regional, extending over long distances (>6 miles). The surface traces of growth faults are broadly arcuate and typically parallel to the Gulf Coast. Salt dome faults occur in distinctive patterns over and around domes. Both radial faults and crestal graben structures are common. These faults are typically localized (<3 miles long) and numerous. Their surface traces are often curved, and the faults frequently intersect.

3.6 ENERGY AND MINERAL RESOURCES

Resources produced in the project area include extensive oil and natural gas production, sulfur, brine, sand, clay, and shell for the production of lime and other materials. Chief among these resources is oil and natural gas (discussed below). Sulfur is an important industrial mineral in the area principally used in the manufacture of sulfuric acid. Sulfur occurs in the region primarily in the cap rock of certain salt domes. The numerous salt domes in the region are also the source of high-grade sodium chloride. Shell material dredged from the Galveston Bay system has been used as a locally available substitute for constructional aggregate and limestone. The physical properties of the shell material are suitable for use as aggregate and road base and the chemical properties are suitable for lime, cement, and other chemical uses. Sand deposits of the region have potential industrial or specialty uses, and clays of the area are used in the manufacture of certain clay products, including brick and tile. Oil and gas fields are densely distributed throughout the project area, but none are within the boundaries of the proposed project or alternative sites (see sections 3.6.1 through 3.6.6). A major oil and gas reservoir within the project area, the deep-seated Frio salt dome reservoir, occurs in an area of deeply buried salt diapirs surrounded by shallow piercement domes (Wermund et al., 1989). Goose Creek, Cedar Point, and Trinity oil fields underlie the Galveston Bay system and have produced millions of barrels of oil. On the west side of Galveston Bay, Clear Lake, Gillock, South Gillock, East Gillock, and Webster are onshore oil fields producing from the same reservoir. In addition, several other productive fields occur in smaller reservoirs formed in faulted zones and deformed strata associated with salt domes.

Permitted oil/gas wells and pipelines were identified within a 1-mile radius of Shoal Point and the alternative sites. Well-bore and pipeline information was obtained from the electronic database maintained by the Railroad Commission of Texas (RCT) (RCT, 2001) and was not verified. Oil and gas location maps provided in the following sections show the surface location of both vertical and horizontal wells. The following presents the results of the oil/gas well and pipeline review.

3.6.1 Shoal Point

Fifteen oil and gas well sites were identified within a 1-mile radius of the Shoal Point site. None of these sites occur within the footprint for the proposed project. Of the fifteen wells, twelve were identified as dry holes, two were identified as former gas wells, and one was listed as an abandoned location where no well was drilled. The database indicates that boreholes were drilled to depths ranging from 7,012 to 12,400 feet bgs. No actively producing oil or gas wells were identified and former oil/gas wells and dry holes have been plugged and abandoned. Table 3.6.1-1 presents summary information for the oil/gas wells and Figure 3.6.1-1 shows their location.

TABLE 3.6.1-1

SUMMARY OF OIL AND GAS WELL SITES WITHIN A ONE-MILE RADIUS OF EACH ALTERNATIVE SITE

Map ID No.	Operator Name	Lease Name	Well No.	Completion Date	Plug Date	T. D.	Type	API Number	Latitude	Longitude	Status/Comments
Shoal Point Alternative											
1	---	---	---	---	---	---	Dry Hole	---	29.3693977	-94.8546729	Currently Plugged and Abandoned
2	Florida Gas Exploration Co.	Univ. of Texas	1	---	4/3/1978	10500'	Dry Hole	167-80918	29.3604271	-94.9208721	Currently Plugged and Abandoned
3	Duer Wagner & Co	Texas City Terminal	1	---	12/16/1981	Unknown	Dry Hole	167-30834	29.3708492	-94.9044231	Currently Plugged and Abandoned
4	Monsanto Company	Texas City Terminal	1	---	10/5/1979	10683'	Dry Hole	167-30688	29.3661349	-94.8973997	Currently Plugged and Abandoned
5	Monsanto Company	Texas City - University	1	---	---	---	Location	167-30729	29.3632897	-94.8938218	Well Never Drilled
6	Brewster-Bartle	Univ. of Texas	1	---	5/9/1961	11700'	Dry Hole	---	29.3540778	-94.8931977	Currently Plugged and Abandoned
7	Brewster-Bartle	St. Tract 99-A	1	---	1/5/1952	12080'	Dry Hole	167-01066	29.3634160	-94.8775428	Currently Plugged and Abandoned
8	---	---	---	---	---	---	Dry Hole	---	29.3775173	-94.8589732	Currently Plugged and Abandoned
9	Monsanto Company	St. Tract 92-A	1	---	8/31/1976	10748'	Dry Hole	167-30283	29.3836181	-94.8799514	Currently Plugged and Abandoned
10	Monsanto Company	St. Tract 92-A	2	---	5/30/1970	12400'	Dry Hole	167-30297	29.3788438	-94.8804494	Currently Plugged and Abandoned
11	Houston Oil & Minerals Corp.	---	1	---	10/16/81	11195'	Dry Hole	167-30815	29.3603016	-94.8560246	Currently Plugged and Abandoned
12	---	---		---	---	---	Dry Hole	---	29.3596091	-94.9378096	Currently Plugged and Abandoned
13	AMOCO Oil Company	Univ. of Texas	1	---	03/02/83	7012'	Dry Hole	167-01148	29.3640596	-94.9358361	Currently Plugged and Abandoned
14	Mitchell Energy Offshore Corp.	St. Tract 113-A	1 U	---	02/08/83	10366'	Gas	167-30247	29.3868534	-94.8587850	Currently Plugged and Abandoned
15	Houston Oil & Minerals Corp.	Texas City Dike 10200 SD G.U.	4	---	10/07/82	10700'	Gas	167-30252	29.3870457	-94.8641719	Currently Plugged and Abandoned
Pelican Island Alternative											
1	Hamman Oil & Refining Company	State Tract	1	---	5/6/1987	11375'	Dry Hole	167-31126	29.35992216	-94.8222779	Currently Plugged and Abandoned
2	Houston Oil & Minerals Corp.	St. Tract 131-A	2	---	---	---	Location	167-31157	29.3651619	-94.8099394	Well Never Drilled
3	Tenneco Oil Company	St. Tract 131-A	2	---	---	---	Location	167-31089	29.3644153	-94.8087311	Well Never Drilled

TABLE 3.6.1-1

SUMMARY OF OIL AND GAS WELL SITES WITHIN A ONE-MILE RADIUS OF EACH ALTERNATIVE SITE

Map ID No.	Operator Name	Lease Name	Well No.	Completion Date	Plug Date	T. D.	Type	API Number	Latitude	Longitude	Status/Comments
4	Tenneco Oil Company	St. Tract 131-A	1	---	---	---	Dry Hole	167-31083	29.3614878	-94.8039772	Currently Plugged and Abandoned
5	Tenneco Oil Company	St. Tract 131-A	3	---	1/16/1986	10300'	Dry Hole	167-31087	29.3613216	-94.8024977	Currently Plugged and Abandoned
6	Houston Oil & Minerals Corp.	St. Tract 132-A	1	7/30/1961	8/9/1970	9230'	Oil	167-30011	29.354253	-94.8047253	Currently Plugged and Abandoned
7	Hamman Oil & Refining Company	Mitchell Development	1	12/30/1977	5/18/1990	12202'	Oil	167-30591	29.3496199	-94.8201362	Currently Plugged and Abandoned
8	Hamman Oil & Refining Company	Mitchell Development	2	6/15/1978	4/14/1990	12497'	Oil	167-30619	29.3514702	-94.82248	Currently Plugged and Abandoned
9	Sandefer Petroleum	Mitchell Development	1	---	9/24/1991	12906'	Dry Hole	167-31188	29.3370463	-94.8156431	Currently Plugged and Abandoned
10	Houston Oil & Minerals Corp.	State Tr. 132-A	2	---	10/13/1963	12900'	Dry Hole	167-30022	29.3513184	-94.8088607	Currently Plugged and Abandoned
11	Mitchell Energy Corporation	State Tr. 132-A	2	6/5/1985	3/14/1992	13303'	Gas	167-31014	29.3432308	-94.8075878	Currently Plugged and Abandoned
12	Wainoco Oil & Gas	State Tr. 132-A	1	---	---	---	Location	167-30900	29.3472169	-94.8030667	Well Never Drilled
13	Mitchell Energy Corporation	State Tr. 132-A	1	2/27/1984	2/19/1992	13156'	Gas	167-30969	29. 3474296	-94.8024632	Currently Plugged and Abandoned
14	Gulf Oil Corporation	St. Tract 133-A	1	---	5/21/1967	13383'	Dry Hole	---	29.3441991	-94.7945694	Currently Plugged and Abandoned
15	Sandefer Petroleum	St. Tract 133	1	---	12/19/87	14000'	Dry Hole	167-31116	29.3439018	-94.8001634	Currently Plugged and Abandoned
16	Mitchell Entergy Corp.	Galveston Townsite Unit 1	2	---	12/16/98	8438'	---	167-30074	29.2970942	-94.8262629	Currently Plugged and Abandoned
17	Mitchell Entergy Corp.	Galveston Townsite Unit 3	2	09/14/81	04/21/92	9720'	Oil	167-30804	29.2955779	-94.8197667	Currently Plugged and Abandoned
18	---	---	---	---	---	---	---	167-30186	29.2966093	-94.8283604	---
19	Mitchell Entergy Corp.	Galveston Townsite Unit 4	1	01/14/73	---	10484'	Oil	167-30091	29.2957198	-94.8199443	---
20	Mitchell Entergy Corp.	Galveston Townsite Unit 1	4 U	09/17/75	10/18/99	9059'	Gas	167-30185	29.2957532	-94.8199560	Currently Plugged and Abandoned
21	Mitchell Entergy Corp.	Galveston Townsite Unit 5	1LT	---	10/04/88	9900'	Gas	167-30092	29.2957552	-94.8198177	Currently Plugged and Abandoned
22	Mitchell Entergy Corp.	Galveston Townsite Unit 4	3	---	---	11218"	Oil	167-30187	29.2958200	-94.8199853	---

TABLE 3.6.1-1

SUMMARY OF OIL AND GAS WELL SITES WITHIN A ONE-MILE RADIUS OF EACH ALTERNATIVE SITE

Map ID No.	Operator Name	Lease Name	Well No.	Completion Date	Plug Date	T. D.	Type	API Number	Latitude	Longitude	Status/Comments
23	Mitchell Entergy Corp.	Galveston Townsite Unit 1	1	10/24/55	—	8805'	Gas	167-02096	29.2971779	-94.8227692	—
24	Mitchell Entergy Corp.	Galveston Townsite Unit 3	3	—	—	8785'	Gas	167-31176	29.2961706	-94.8195604	—
25	Mitchell Entergy Corp.	Galveston Townsite Unit 4	2	06/23/73	—	—	Gas	167-30108	29.2957887	-94.8200553	—
26	Mitchell Entergy Corp.	St. Tract 122-A	1	—	02/1682	—	—	167-30797	29.2961763	-94.8290120	Currently Plugged and Abandoned
27	Mitchell Entergy Corp.	Galveston Townsite Unit 3	1	—	—	9606'	—	167-30026	29.2985717	-94.8130031	—
Bayport Alternative											
1	Bersheeba Oil	E.P. Segurego	1	—	Prior to 1950	Unknown	Dry Hole	—	29.6077052	-95.0170354	Currently Plugged and Abandoned
2	Bersheeba Oil	E.P. Segurego	2	—	Prior to 1950	Unknown	Dry Hole	—	29.6006569	-95.0170103	Currently Plugged and Abandoned
3	Red Bluff Oil Corp.	E.P. Segurego	1	—	Prior to 1950	6020'	Dry Hole	—	29.5995018	-95.0126127	Currently Plugged and Abandoned
4	Ocean Energy, Inc.	GNRC - Exxon Fee	1	1/11/1993	—	11965'	Gas	201-32300	29.5936626	-95.006401	Producing Gas Well
5	Ocean Energy, Inc.	GNRC - Exxon Fee	2	12/22/1993	—	10103'	Gas	201-32321	29.5959902	-95.99756	Producing Gas Well
6	Ocean Energy, Inc.	El Jardin	1	10/24/1994	—	10351'	Gas	201-32400	29.5976809	-95.9947756	Producing Gas Well
7	—	—	—	—	—	—	Dry Hole	—	29.6004390	-95.0409918	Currently Plugged and Abandoned
8	—	—	—	—	—	—	Dry Hole	—	29.5906742	-95.0284039	Currently Plugged and Abandoned
9	Seagull Energy E&P Inc.	GA 256/294	1	—	—	12147'	Gas	201-32327	29.5949764	-94.9976047	—
10	Seagull Energy E&P Inc.	Interfinancial Corp.	1	09/06/86	—	11099'	Gas	201-32036	29.5955708	-95.0235683	—
11	Global Natural Resources Corp.	Interfinancial Corp.	2	—	—	11632'	Gas	201-32335	29.5955045	-95.0234178	—
12	Seagull Energy E&P Inc.	Bracewell Estate	2	—	—	12890'	Gas	201-32522	29.5952367	-95.0236108	—
13	Seagull Energy E&P Inc.	Clear Creek	1	11/11/88	—	12145'	Gas	201-32113	29.5915902	-95.0266102	—
14	Seagull Energy E&P Inc.	El Lago	1	—	—	12764'	Gas	201-32377	29.5915183	-95.0265540	—

TABLE 3.6.1-1

SUMMARY OF OIL AND GAS WELL SITES WITHIN A ONE-MILE RADIUS OF EACH ALTERNATIVE SITE

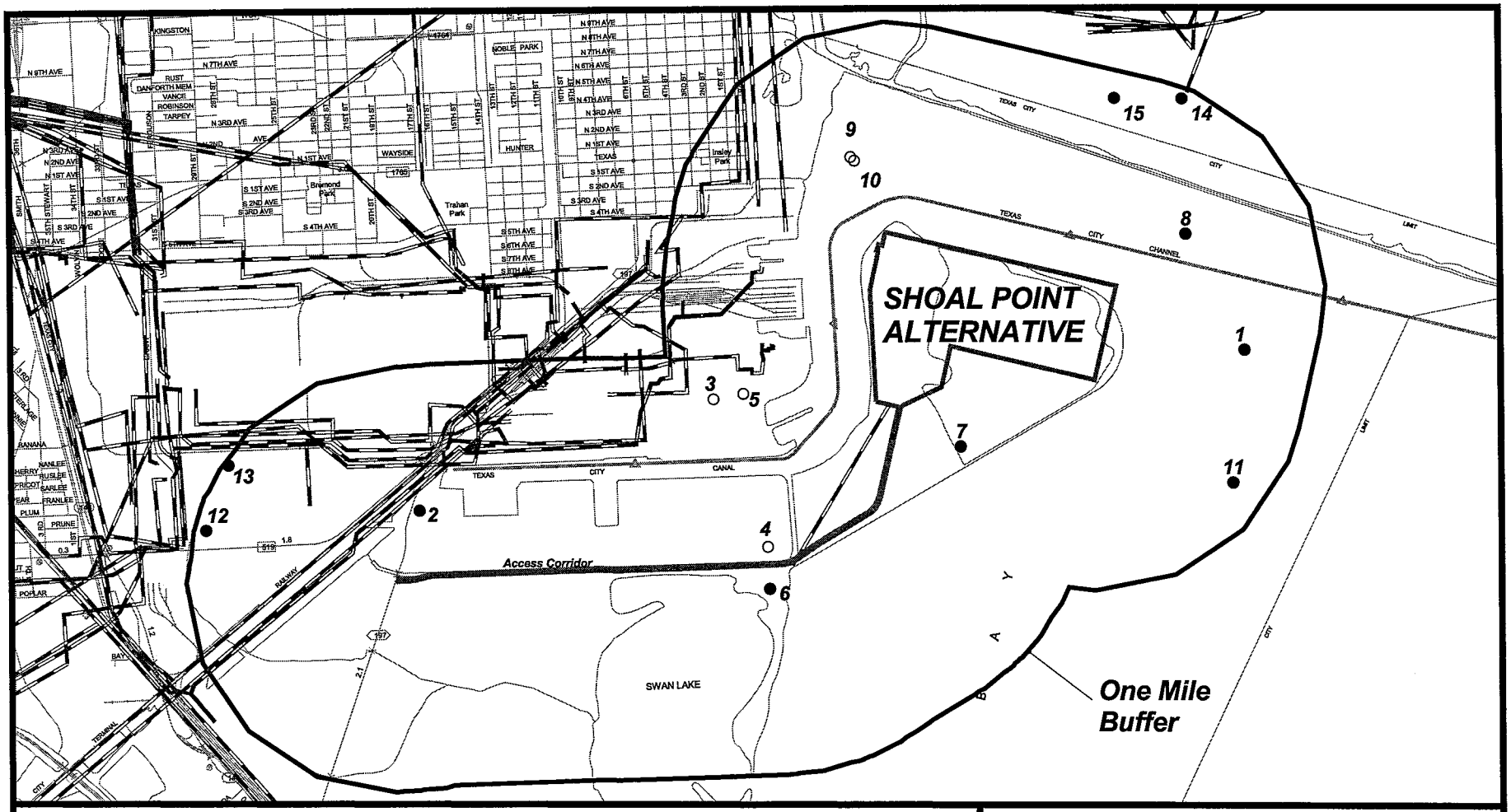
Map ID No.	Operator Name	Lease Name	Well No.	Completion Date	Plug Date	T. D.	Type	API Number	Latitude	Longitude	Status/Comments
15	Global Natural Resources Corp.	City of Seabrook	1	—	03/22/91	10600'	Gas	201-32208	29.5914290	-95.0255405	Currently Plugged and Abandoned
16	Seagull Energy E&P Inc.	City of Seabrook	1R	—	—	12900'	Gas	201-32231	29.5910632	-95.0265690	—
Spillman's Island Alternative (within a 0.5-mile radius)											
1	Gulf Oil Corp.	Hirsch State	2	10/00/50	Prior to 1970	5020'	Oil	—	29.7036779	-94.9988562	Currently Plugged and Abandoned
2	Gulf Oil Corp.	Hirsch State	4	6/00/60	Prior to 1970	4613'	Oil	—	29.7028407	-94.9981727	Currently Plugged and Abandoned
3	Exxon Corp.	Hogg Island Fee	5	5/00/51	Prior to 1970	4635'	Oil	201-80753	29.7021428	-94.9974050	Currently Plugged and Abandoned
4	Gaither Petroleum	Hirsch State	11	9/00/50	Prior to 1970	5018'	Oil	201-06899	29.7011389	-94.9943823	Currently Plugged and Abandoned
5	Gulf Oil Corp.	Hogg Island Fee	3	6/00/51	Prior to 1970	4653'	Oil	—	29.6994239	-94.9952676	Currently Plugged and Abandoned
6	Gulf Oil Corp.	Hogg Island Fee	10	7/00/50	Prior to 1970	5018'	Oil	—	29.7003786	-94.9935219	Currently Plugged and Abandoned
7	Gulf Oil Corp.	Hogg Island Fee	6	—	6/00/51	4653'	Dry Hole	—	29.6985609	-94.9944416	Currently Plugged and Abandoned
8	Gulf Oil Corp.	Hirsch State	7	1951	Prior to 1970	4632'	Oil	—	29.6990176	-94.9927352	Currently Plugged and Abandoned
9	Gulf Oil Corp.	Hogg Island Fee	2	3/00/51	Prior to 1970	4625'	Oil	201-80752	29.6992007	-94.9920006	Currently Plugged and Abandoned
10	Gulf Oil Corp.	Hogg Island Fee	8	6/00/55	Prior to 1970	4645'	Oil	—	29.6983293	-94.9919026	Currently Plugged and Abandoned
11	Gulf Oil Corp.	Hirsch State	15	4/00/51	Prior to 1970	4628'	Oil	—	29.6983689	-94.9909968	Currently Plugged and Abandoned
12	Gulf Oil Corp.	Hogg Island Fee	15	Prior to 1960	Prior to 1970	4607'	Oil	—	29.6972554	-94.9909998	Currently Plugged and Abandoned
13	Sinclair-Gulf	W.O. Fitzgerald	1	Prior to 1960	Prior to 1970	Unknown	Oil	—	29.6955553	-94.0076882	Currently Plugged and Abandoned
14	Crown Central et al	Eugenia Bray	1	—	9/01/61	9610'	Dry Hole	—	29.6868329	-94.0029745	Currently Plugged and Abandoned
15	—	—	—	Prior to 1960	Prior to 1970	—	Oil	—	29.7055568	-95.0002949	Currently Plugged and Abandoned
16	Cheveron U. S. A. Inc.	Texas State #30413	2	10/16/50	11/27/88	4800'	Oil	201-06087	29.7071344	-95.0012684	Currently Plugged and Abandoned

TABLE 3.6.1-1

SUMMARY OF OIL AND GAS WELL SITES WITHIN A ONE-MILE RADIUS OF EACH ALTERNATIVE SITE

Map ID No.	Operator Name	Lease Name	Well No.	Completion Date	Plug Date	T. D.	Type	API Number	Latitude	Longitude	Status/Comments
Alexander Island Alternative											
1	Humble Oil & Gas	Davis	1	—	6/00/50	7523'	Dry Hole	—	29.7348497	-95.0213843	Currently Plugged and Abandoned
2	—	—	—	—	—	—	Dry Hole	—	29.7293414	-95.0732504	Currently Plugged and Abandoned
3	—	—	—	—	—	—	Dry Hole	—	29.7234417	-95.0791916	Currently Plugged and Abandoned
4	—	—	—	—	—	—	Dry Hole	—	29.7098065	-95.0052166	Currently Plugged and Abandoned
5	—	—	—	—	—	—	Oil	—	29.6955553	-95.0076882	Currently Plugged and Abandoned
Cedar Point Alternative											
1	Energy Reserves Group, L.L.C.	Cedar Point SWD	1	9/25/2000	—	3500'	Disposal	071-32183	29.6734204	-94.9230537	Commercial Disposal Well
2	W.A. Stevens	Jones Steel	1	—	3/00/1963	8553'	Dry Hole	—	29.6604198	-94.9295225	Currently Plugged and Abandoned
3	J.H. Fisher	George Anderson	1	—	Prior to1950	6800'	Dry Hole	—	29.6615853	-94.9192776	Currently Plugged and Abandoned
4	Scurlock Oil Company	L.D. Wilburn	1	—	7/00/1957	9003'	Dry Hole	—	29.6585746	-94.9200273	Currently Plugged and Abandoned
5	Vintage Petroleum	Cedar Point SWD	1	12/18/1998	—	5620'	Disposal	071-32076	29.6608537	-94.9160121	Commercial Disposal Well
6	Halbouty Energy Company	U.S. Steel -D-	1	—	11/15/1985	13350'	Dry Hole	071-31726	29.6769342	-94.9121861	Currently Plugged and Abandoned
7	J.M. Fisher	Rucker	1	—	Prior to1950	3318'	Dry Hole	—	29.6674436	-94.9080756	Currently Plugged and Abandoned
8	Pete Murphy	Fisher Heirs Unit	1	—	1/21/1978	2462'	Dry Hole	071-30783	29.6637323	-94.9053789	Currently Plugged and Abandoned
9	C.T. Rucker	George Anderson	1	—	Prior to1950	5130'	Dry Hole	—	29.6771739	-94.8887696	Currently Plugged and Abandoned
10	Julia Casey	George Anderson	1	—	1/00/1961	7215'	Dry Hole	—	29.6770195	-94.8864418	Currently Plugged and Abandoned
11	Michael T. Halbouty Energy	HEC US Steel	1	3/30/1983	3/21/1984	11602'	Gas	071-31415	29.6806133	-94.8826553	Currently Plugged and Abandoned

— Data not available.



○ *Horizontal Well*

● *Vertical Well*

Pipelines

N

2000 0 2000 4000 Feet

Shoal Point Container Terminal EIS

Figure 3.6.1-1

Summary of Oil/Gas Wells & Pipelines Shoal Point Alternative

Prepared for:USACE	
Job No.:440622	Scale:1:48000
Prepared by:Matthew Qualls	Date:11/27/01
File: N:\\440622\av\shoal_point.apr	

Railroad Commission of Texas, Oil and Gas Division, Galveston County Texas, 1999.

Ten petroleum pipeline systems were identified within a 1-mile radius of the Shoal Point site. The pipeline systems are listed as active and may contain more than one pipeline/pipeline segment. The pipeline systems are reported to transport a variety of materials including natural gas, refined products, propanes, ethylene, liquefied petroleum gas (LPG), and crude oil. Table 3.6.1-2 presents summary information for the petroleum pipeline systems and Figure 3.6.1-1 shows their location.

3.6.2 Pelican Island

The RCT database identified a total of twenty-seven oil and gas well sites located within a 1-mile radius of the Pelican Island site. Five of these are located within the footprint for the Pelican Island site. Of the twenty-seven wells, seven were identified as dry holes, six were listed as oil producing wells, seven as gas wells, three were listed as abandoned locations where no wells were drilled, and the well type at four well sites was unknown. No actively producing wells were identified and former oil/gas wells and dry holes have been plugged and abandoned. Wells were drilled to depths ranging from 8,438 to 14,000 feet below ground surface (bgs). Table 3.6.1-1 presents summary information for the oil/gas wells and Figure 3.6.2-1 shows their location.

One petroleum pipeline system was identified within a 1-mile radius of the Pelican Island site. The pipeline system contains two active pipelines, reported to transport natural gas. Table 3.6.1-2 presents summary information for the petroleum pipeline system and Figure 3.6.2-1 shows its location.

3.6.3 Bayport

The RCT database identified sixteen oil and gas well sites located within a 1-mile radius of the Bayport site. None of these occur within the footprint. Of these, five were identified as dry holes that have been plugged and abandoned and eleven were listed as gas producing wells. Gas wells were drilled to depths ranging from 10,103 to 12,900 feet bgs. Three of the gas wells were listed as active; one had been plugged and abandoned; and the status of the remaining gas wells was unknown. Table 3.6.1-1 presents summary information for the oil/gas wells and Figure 3.6.3-1 shows their location.

Twelve petroleum pipeline systems were identified within a 1-mile radius of the Bayport site. The pipeline systems may contain more than one pipeline/pipeline segment. Of these, three were listed as active and the status of the remaining nine was unknown. The type of material transported was not reported for the majority of the pipeline systems in the area. For the ones listed, the pipeline systems transported nitrogen and crude oil. Table 3.6.1-2 presents a summary information for the petroleum pipelines and Figure 3.6.3-1 shows their location.

3.6.4 Spillman's Island

The RCT database identified several hundred oil and gas well sites located within a 1-mile radius of the Spillman's Island alternative site. Almost all these sites are related to the Goose Creek oil and gas field located approximately 0.5 mile northeast of Spillman's Island. Because of the large number of oil and gas sites, only sites within a 0.5-mile buffer of the Spillman's Island site were identified and presented on Table 3.6.1-1. Figure 3.6.4-1 shows the location of all well sites within a 1-mile radius.

TABLE 3.6.1-2

SUMMARY OF OIL AND GAS PIPELINE SYSTEMS WITHIN A 1-MILE RADIUS OF EACH ALTERNATIVE SITE

Pipeline System	Pipeline Operator	RRC Permit No.	Fluids	Status
Shoal Point Alternative				
3019	Houston Pipe Line Company	00749	Natural Gas	Active
Hull-Mont Belvieu-Ethyl Corp	Mobil Pipe Line Co.	00936	Refined Products	Active
Huntsman Pipeline	Buckeye Gulf Coast Pipelines Llc	02694	Propanes	Active
MC-42C	Mobil Chemical Company	05838	Ethylene	Active
ME-3578	Mitchell Energy Offshore Corp.	---	Natural Gas	Active
ME-84-063	Gulf Coast Waste Disposal	---	Natural Gas	Active
Seaway Crude Pipeline System	Arco Pipe Line Company	05162	Crude	Active
Texas Pipeline System	Coastal States Crude Gath. Co.	00655	LPG	Active
Warren Gathering (5)	Chevron Pipe Line Company	00204	LPG	Active
Webster - Texas City	Genesis Pipeline Texas, L.P.	04971	Crude	Active
Pelican Island Alternative				
1386	Houston Pipe Line Company	00749	Natural Gas	Active
Bayport Alternative				
ME-81-074	Vintage Petroleum, Inc.	---	Crude	Active
ME-3800	Exxon Corp.	---	Crude	Active
ME-83-022	Praxair, Inc.	---	Nitrogen	Active
---	---	04445	---	---
---	---	04541	---	---
---	---	05901	---	---
---	---	04669	---	---
---	---	01033	---	---
---	---	05901	---	---
---	---	00762	---	---
---	---	00285	---	---
---	---	00960	---	---
Spillman's Island Alternative				
30" Channel Gas Line	El Paso Energy Intrastate Comp.	00654	Natural Gas	Active
3053	Houston Pipe Line Company	00749	Natural Gas	Active
Baytown-Bayport Industrial Area	Exxon Pipeline Company	04669	Nitrogen	Active
Chocolate Bayou Pipeline	Oxy Petrochemicals Inc.	04677	Ethylene and Natural Gas Liquids	Active
Dean System & Laterals	TEPPCO Crude Oil, Llc	00583	Natural Gas Liquids	Active
Houston Pipeline 3071	Houston Pipe Line Company	00749	Natural Gas	Active
Hull-Mont Belvieu-Ethyl Corp	Mobil Pipe Line Company	00936	Ethylene and Refined Products	Active
MC-42	---	05838	Ethylene	Active
Mt Belvieu-Dickinson	Seadrift Pipeline Corporation	00287	LPG	Active
Mt Belview - Barbours Cut	---	05843	Propanes	Active
Pasadena P/L System	Enterprise Products Co.	03645	Refined Products	Active
Webster to Baytown	Exxon Pipeline Company	00488	Crude	Idle
Alexander Island Alternative				
3018/3023	Houston Pipe Line Company	00749	Natural Gas	Active

TABLE 3.6.1-2

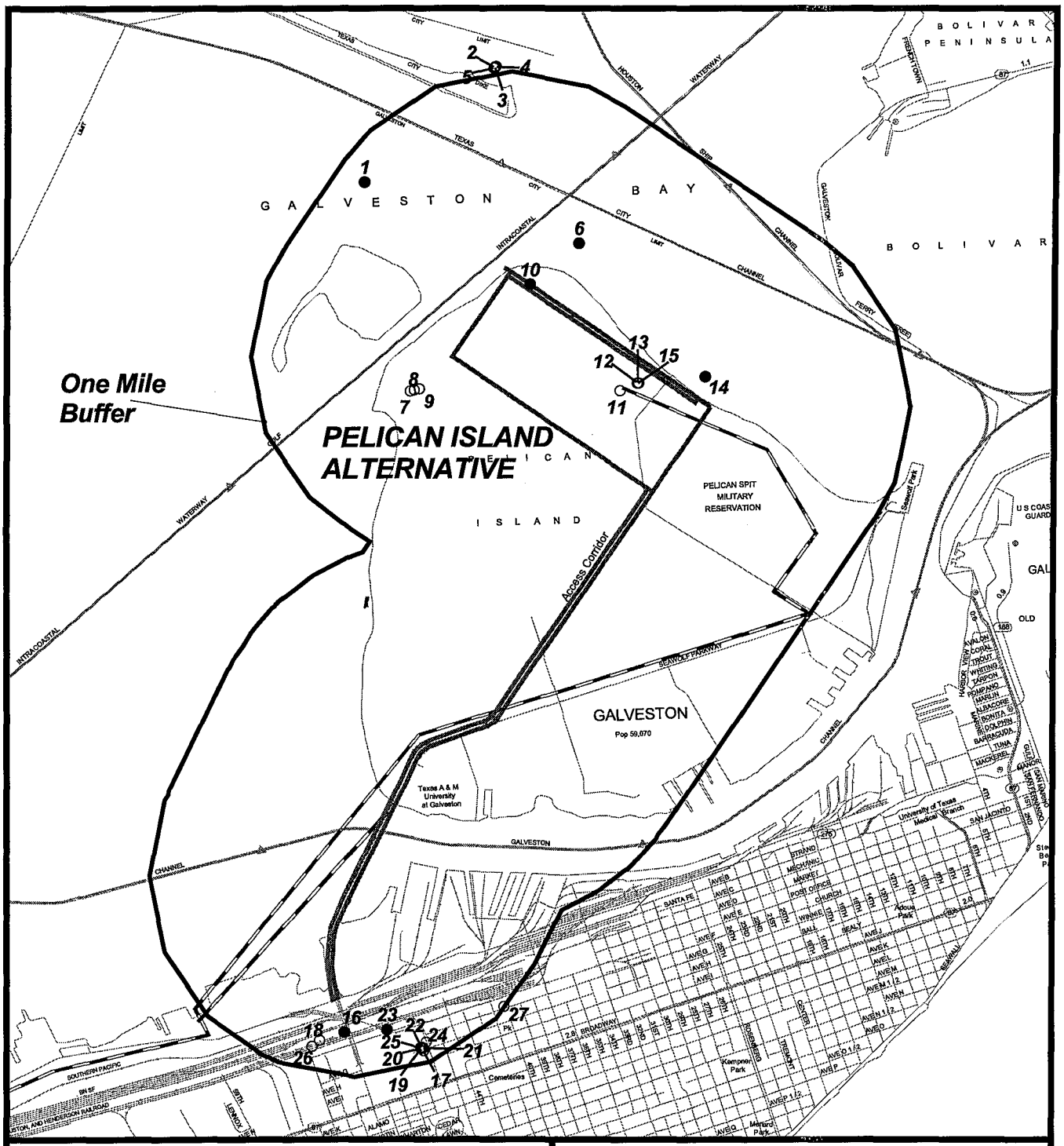
SUMMARY OF OIL AND GAS PIPELINE SYSTEMS WITHIN A 1-MILE RADIUS OF EACH ALTERNATIVE SITE

Pipeline System	Pipeline Operator	RRC Permit No.	Fluids	Status
6" Baytown to Texas City	Praxair, Inc.	04966	Refined Products	Active
A	---	05878	Ethanes	Idle
Air Products	Air Products Manufacturing Corp.	04575	Hydrogen Gas	Active
Arco Chem. Co. to Baytown Exxon	Exxon Pipeline Company	04669	LPG	Active
Arco Pipeline	Arco Pipe Line Company	00579	Ethylene, Propanes, and Butanes	Active
B	Conoco Inc.	05694	Carbon Dioxide	Active
Baytown Bop to Corridor Junction	Exxon Pipeline Company	04669	Ethylene	Active
Baytown Prod. 3 to Pasadena	Exxon Pipeline Company	00941	Refined Products	Active
Baytown Products to No.2 Texas City	Exxon Pipeline Company	04669	Refined Products	Active
Baytown to Mont Belvieu	Exxon Pipeline Company	04669	Propanes	Active
Baytown to Pierce Jct.	Exxon Pipeline Company	00941	Refined Products	Active
Baytown-Bayport Industrial Area	Exxon Pipeline Company	04669	Nitrogen	Active
BPU to Petro-Tex	Exxon Pipeline Company	04669	Butanes	Active
Channel P/L System	Enterprise Products Co.	02833	Refined Products	Active
Corridor Jct. to Baytown	Exxon Pipeline Company	04669	Refined Products	Active
D	Conoco Inc.	05692	Acetylene	Active
Dupont Laporte Lat	Chevron Pipe Line Company	01033	Butanes	Idle
Enterprise to Tenneco Jct.	Arco Pipe Line Company	00884	Butanes	Active
Exxon Co. -Baytown Facilities	Midcon Texas Pl Operator, Inc.	00762	Natural Gas	Active
Exxon Gas Sys.	Tejas Gas Pipeline, L.P.	00774	Natural Gas	Active
Houston Lighting & Power	Reliant Energy Power Operations	03655	Fuel Oil	Active
Jct Air Products-Mobay - Baytown	Exxon Pipeline Company	00488	Crude	Active
Laporte Tx.Plant From 128-12-3	Midcon Texas Pl Operator, Inc.	00762	Natural Gas	Active
Line 1, 7715 Lease	Buckeye Gulf Coast Pipelines LLC	04322	Ethylene	Active
Line 2, 7712 Lease	Buckeye Gulf Coast Pipelines LLC	04323	E/P Mix	Active
Line 3, 7713 Lease	Buckeye Gulf Coast Pipelines LLC	04324	Butanes	Active
Line 4, 7714 Lease	Buckeye Gulf Coast Pipelines LLC	04325	Propanes	Active
Mont Belvieu to Victoria	Exxon Pipeline Company	00941	Propanes	Active
Mustang System	Tejas Gas Pipeline, L.P.	00774	Natural Gas	Active
O	Conoco Inc.	05692	Acetylene	Active
PCU to Corridor Junction	Exxon Pipeline Company	04669	Propanes	Active
Permian Basin Crude System	Chevron Pipe Line Company	00247	Crude	Idle
R	---	05879	Hydrogen Gas	Active
S	Conoco Inc.	05696	Refined Products	Active
Shell Deer Park Plant	Equilon Pipeline Co LLC	00734	Propanes and Ethylene	Active
Shell Deer Park to Mont Belvieu	Exxon Pipeline Company	04669	Propanes and Ethylene	Active
Texas City to Lake Charles	UCAR Pipeline Incorporated	00285	Ethylene	Active
Texas Eastern Products Pipeline	Texas Eastern Products Pipeline Co.	00187	Refined Products	Active
Texas-Baytown	Amoco Pipeline Company	00401	Crude	Active
Warren Gathering	Chevron Pipe Line Company	00204	LPG	Idle
Warren Gathering (5)	Chevron Pipe Line Company	00204	LPG	Active
Webster to Baytown	Exxon Pipeline Company	00488	Crude	Idle

TABLE 3.6.1-2

SUMMARY OF OIL AND GAS PIPELINE SYSTEMS WITHIN A 1-MILE RADIUS OF EACH ALTERNATIVE SITE

Pipeline System	Pipeline Operator	RRC Permit No.	Fluids	Status
Cedar Point Alternative				
Cedar Point Gathering Line	Cedar Point Oil Company	00893	Natural Gas	Active
Cedar Point to Baytown	Exxonmobil Pipeline Company	00488	Crude	Idle
Cedar Point to Baytown-Location 330	Exxonmobil Pipeline Company	00488	Crude	Active
Equity Drilling Gas Line	Ecc Energy Corporation	04144	Natural Gas	Active
Galveston Bay Gath. System	Vintage Petroleum, Inc.	04445	Natural Gas	Active
Galveston Bay St 128	Claron Corporation	03613	Natural Gas	Active
ME-82-020	Vintage Petroleum, Inc.	---	Natural Gas	Active
ME-82-074	Vintage Petroleum, Inc.	---	Natural Gas	Active
ME-82-219	Texas Crude, Inc.	---	Natural Gas	Active
ME-85-021	Claron Corporation	---	Crude	Active
ME-86-045	Felmont Oil Corp.	---	Natural Gas	Active
ME-87-197	Vintage Petroleum, Inc.	---	Natural Gas	Active
ME-89-200	Panaco Production Co	---	Crude	Active
P & P Gpc	Prize Operating Company	04339	Natural Gas	Active
Torch Gas Line	Claron Corporation	03603	Natural Gas	Active
Torch Oil Line	Claron Corporation	03613	Natural Gas	Active
Umbrella Point System	Vintage Petroleum, Inc.	05320	Natural Gas	Active



○ *Horizontal Well*

● *Vertical Well*

Pipelines

N

2000 0 2000 4000 Feet

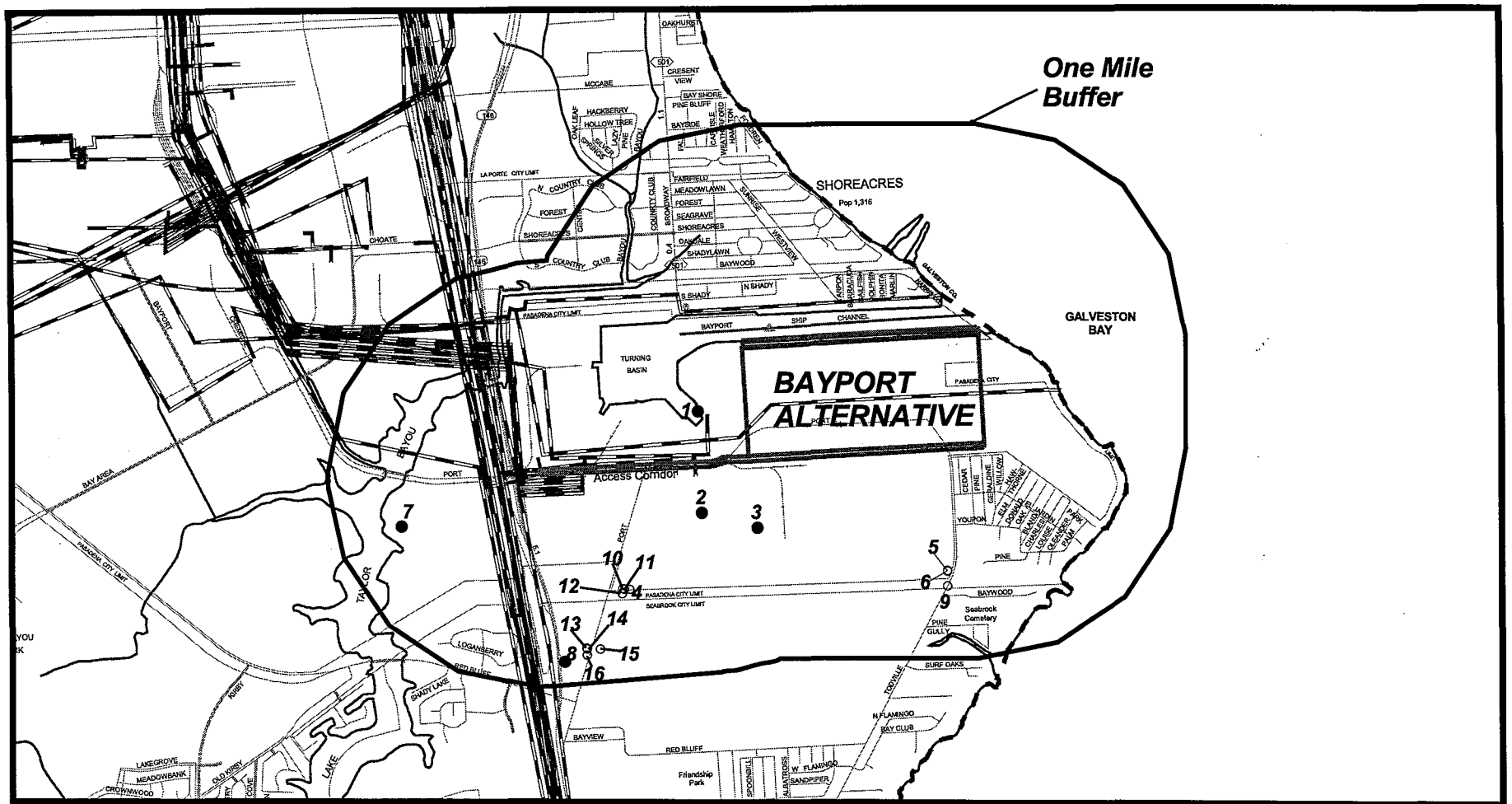
Shoal Point Container Terminal EIS

Figure 3.6.2-1

Summary of Oil/Gas Wells & Pipelines Pelican Island Alternative

Prepared for:USACE	
Job No.:440622	Scale:1:48000
Prepared by:Matthew Qualls	Date:11/27/01
File: N:\\440622\av\shoal_point.apr	

Railroad Commission of Texas, Oil and Gas Division, Galveston County Texas, 1999.



○ *Horizontal Well*

● *Vertical Well*

Pipelines

County Line

N

2000 0 2000 4000 Feet

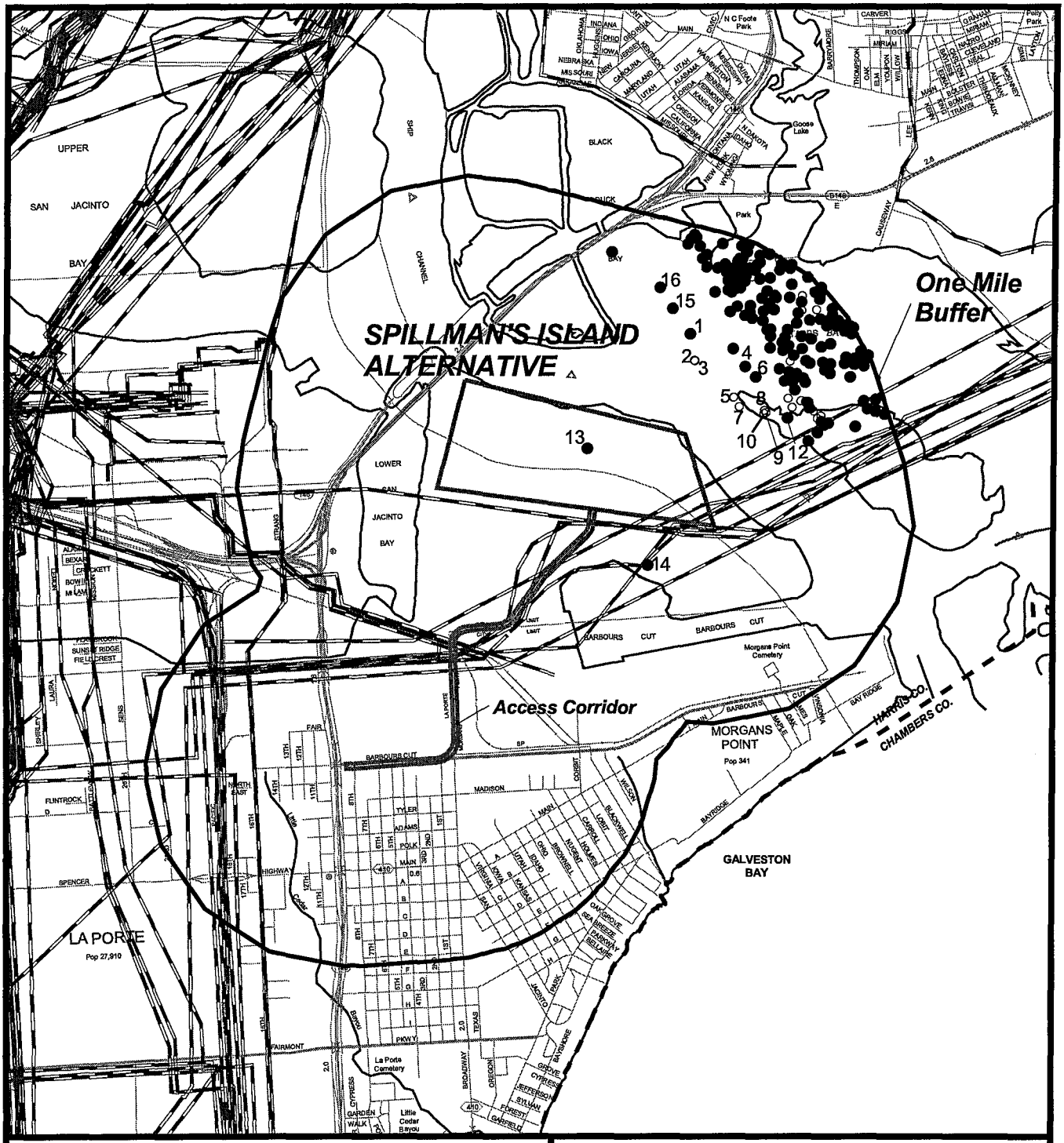
Shoal Point Container Terminal EIS

Figure 3.6.3-1

Summary of Oil/Gas Wells & Pipelines
Bayport Alternative

Prepared for:USACE	
Job No.:440622	Scale:1:48000
Prepared by:Matthew Qualls	Date:08/28/01
File: N:\\440622\av\shoal_point.apr	

Railroad Commission of Texas, Oil and Gas Division, Harris County Texas, 1999.



- ○ *Horizontal Well*
- ● *Vertical Well*
- *Pipelines*
- *County Line*

N

2000 0 2000 4000 Feet

Shoal Point Container Terminal EIS

Figure 3.6.4-1

Summary of Oil/Gas Wells & Pipelines
Spillman's Island Alternative

Prepared for:USACE	
Job No.:440622	Scale:1:48000
Prepared by:Matthew Qualls	Date:11/27/01
File: N:\\440622\av\shoal_point.apr	

Railroad Commission of Texas, Oil and Gas Division, Galveston County Texas, 1999.

Sixteen oil and gas well sites were located within the 0.5-mile buffer of the Spillman's Island site, one of which occurs within the Spillman's Island facility footprint. Of the sixteen sites, fourteen were identified as former oil producing wells and two were listed as dry holes. No actively producing wells were identified, and the former oil wells and dry holes have been plugged and abandoned. Oil wells were drilled to depths ranging from 4,613 to 5,020 feet bgs.

Twelve petroleum pipeline systems were identified in the RCT database within a 1-mile radius of the Spillman's Island site. The pipeline systems may contain more than one pipeline/pipeline segment. Of these, eleven are listed as active and one as idle. The pipeline systems are reported to transport a variety of materials, including natural gas, refined products, propanes, ethylene, LPG, nitrogen, and crude oil. Table 3.6.1-2 presents summary information for the petroleum pipelines and Figure 3.6.4-1 shows their location.

3.6.5 Alexander Island

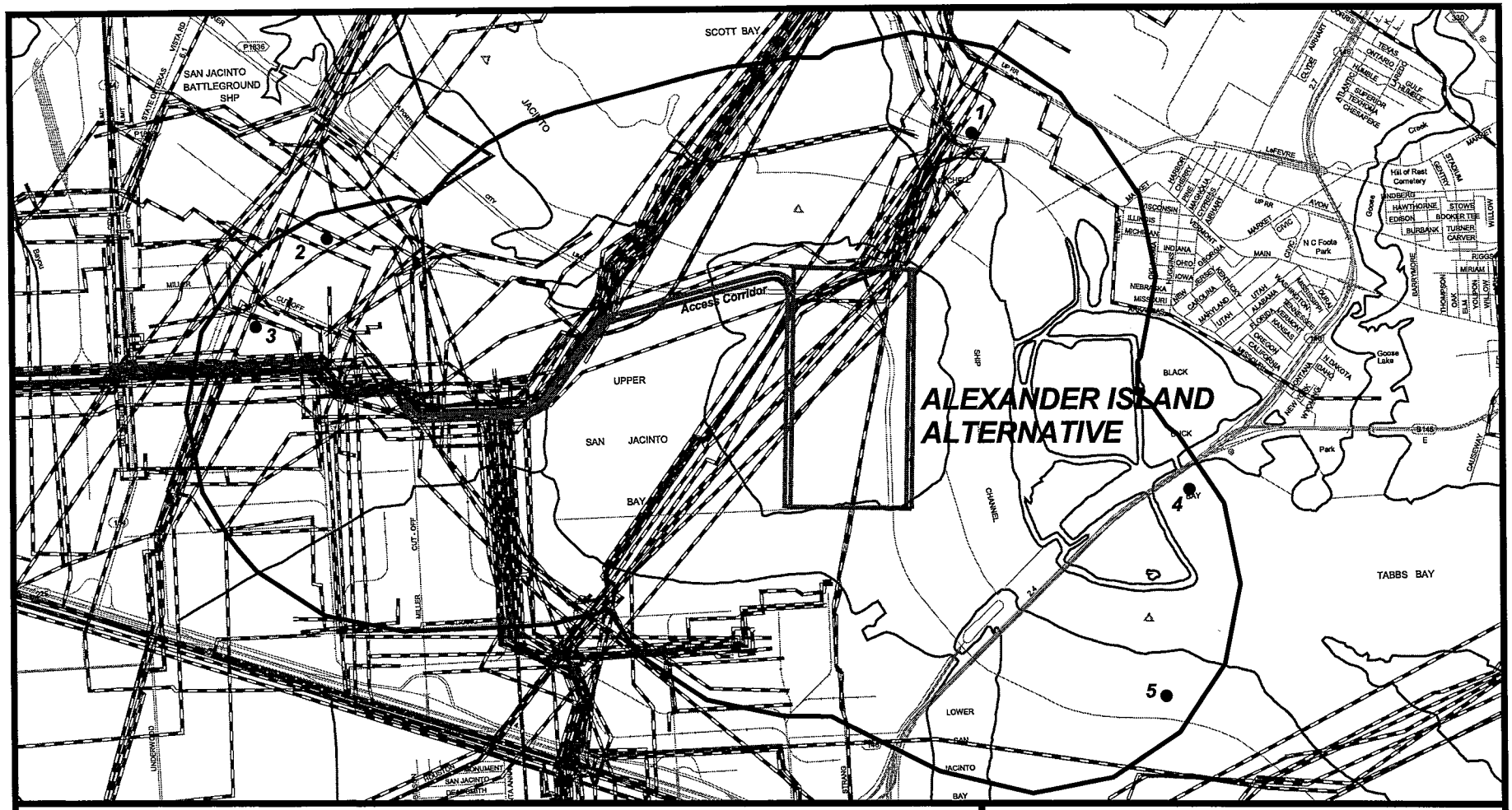
Five oil and gas well sites were identified within a 1-mile radius of the Alexander Island site. None of these sites occur within the project footprint. Of the five sites, four were identified as dry holes and one as a former oil well. The oil well and dry holes have been plugged and abandoned. No actively producing oil or gas wells were identified within 1 mile of the Alexander Island site. Further to the east, approximately 1.5 miles from this site, several oil/gas wells associated with the Goose Creek oil and gas field have been drilled. Table 3.6.1-1 presents the summary information for the oil/gas wells within 1 mile of the site, and Figure 3.6.5-1 shows their location.

Forty-three petroleum pipeline systems were identified within a 1-mile radius of the Alexander Island site. The pipeline systems may contain more than one pipeline/pipeline segment. Of these, thirty-eight are listed as active and five as idle. The pipeline systems are reported to transport a variety of materials, including natural gas, hydrogen gas, carbon dioxide, refined products, acetylene, propanes, ethanes, butanes, ethylene, LPG, nitrogen, fuel oil, and crude oil. Table 3.6.1-2 presents summary information for the petroleum pipelines and Figure 3.6.5-1 shows their location.

3.6.6 Cedar Point

Eleven oil and gas well sites were located within a 1-mile radius of the Cedar Point site. Two of these sites occur within the Cedar Point facility footprint. Of the eleven sites, eight were identified as dry holes, one was listed as a former gas well, and two were identified as active salt water disposal wells. The gas well was drilled to a depth of 11,602 feet bgs and disposal wells were completed to depths of 3,500 feet bgs and 5,620 feet bgs. No actively producing wells were identified within 1 mile of the site and the former gas well and dry holes have been plugged and abandoned. Further to the southwest, approximately 1.5 miles from the Cedar Point site, several oil/gas wells associated with the Cedar Point oil and gas field have been drilled. Table 3.6.1-1 presents summary information for the oil/gas wells within 1 mile of this site, and Figure 3.6.6-1 shows their location.

Seventeen petroleum pipeline systems were identified within a 1-mile radius of the Cedar Point site. The pipeline systems may contain more than one pipeline/pipeline segment. Of these, sixteen



● *Vertical Well*

Pipelines

N

2000 0 2000 4000 Feet

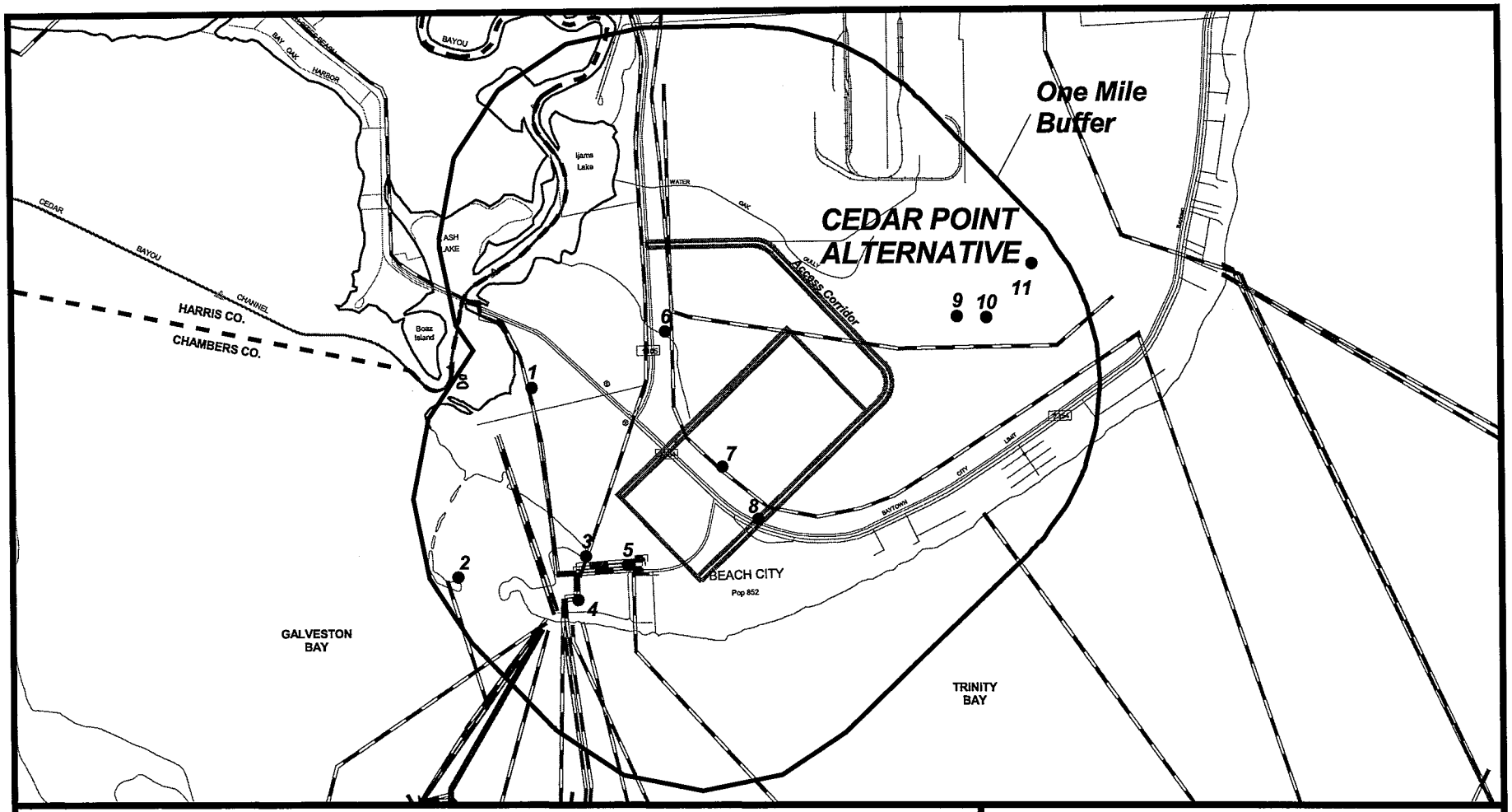
Shoal Point Container Terminal EIS

Figure 3.6.5-1

Summary of Oil/Gas Wells & Pipelines Alexander Island Alternative

Prepared for:USACE	
Job No.:440622	Scale:1:48000
Prepared by:Matthew Qualls	Date:11/27/01
File: N:\\440622\av\shoal_point.apr	

Railroad Commission of Texas, Oil and Gas Division, Harris County Texas, 1999.



● Vertical Well

Pipelines

County Line

N

2000 0 2000 4000 Feet

Shoal Point Container Terminal EIS

Figure 3.6.6-1

Summary of Oil/Gas Wells & Pipelines Cedar Point Alternative

Prepared for:USACE	
Job No.:440622	Scale:1:48000
Prepared by:Matthew Qualls	Date:11/27/01
File: N:\\440622\av\shoal_point.apr	

Railroad Commission of Texas, Oil and Gas Division, Chambers County Texas, 1999.

are listed as active and one as idle. The pipeline systems are reported to transport natural gas and crude oil. Table 3.6.1-2 presents a summary information for the petroleum pipelines and Figure 3.6.6-1 shows their location.

3.7 SURFACE SOILS

Soils associated with the Shoal Point site and alternative sites range from clay, sand, and sandy and clayey loams. Much the soil is formed in dredged material from the bays and canals in the project area. The following sections describe the different soil types associated with the proposed site and each alternative site based on information provided by the Natural Resource Conservation Service (NRCS). This information was not verified for this study.

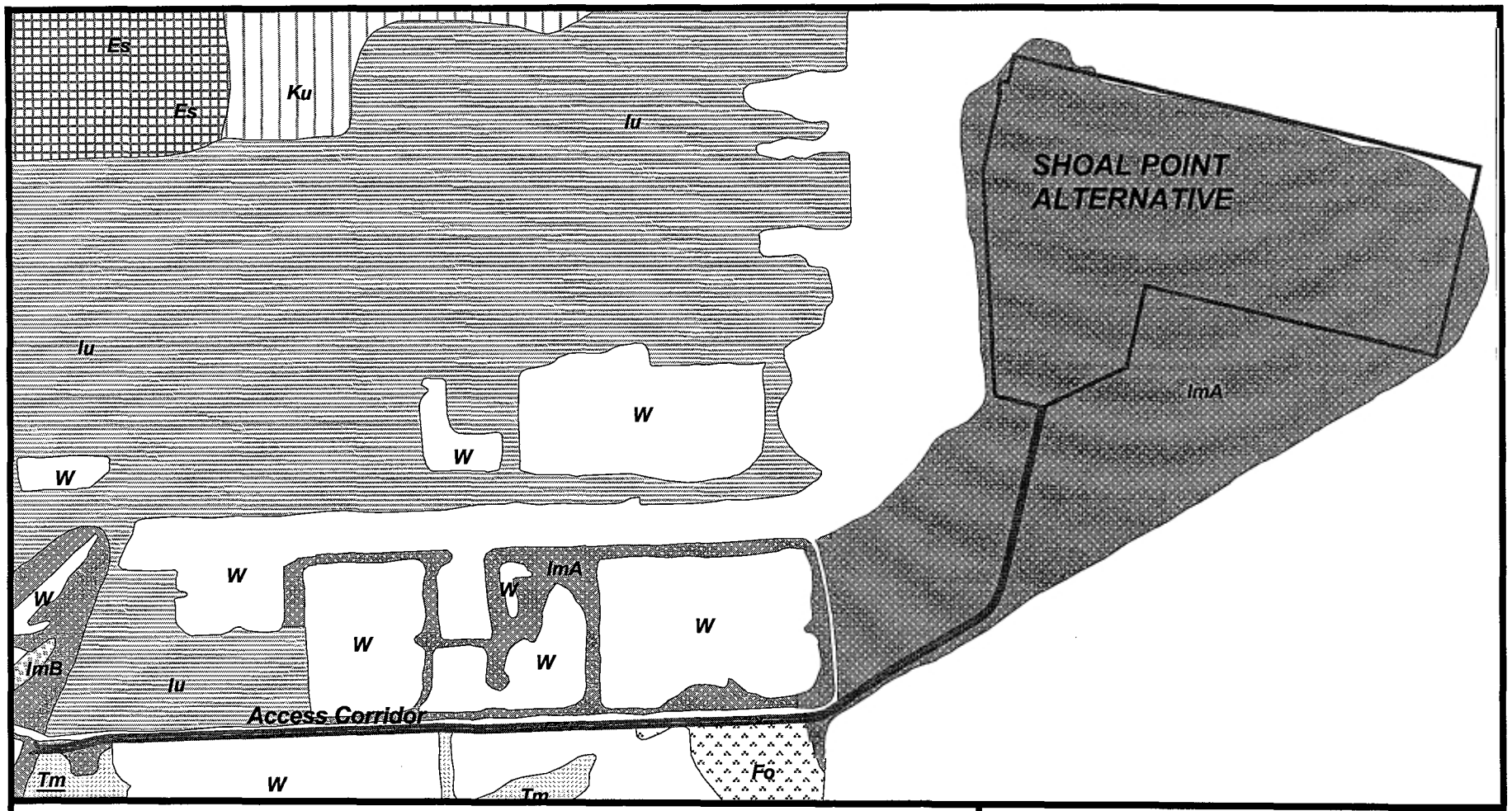
3.7.1 Shoal Point

Figure 3.7.1-1 presents a soils map for the proposed project site at Shoal Point. Soils at the site consist of Ijam clay (0 to 2 percent slopes) (ImA). This soil is a nearly level to gently sloping, poorly drained, moderately saline, clayey soil that has a clayey subsoil (Soil Conservation Service (SCS, now the NRCS), 1988). Permeability and surface runoff are very slow, and shrink-swell potential is high. This soil is found in coastal marshes and has formed in material dredged from bays and canals in the project area. Typically, this soil consists of calcareous, moderately alkaline, dark grayish brown to gray clay. In addition to Ijam clay, the access corridor for the Shoal Point site also consists of Follet loam (Fo) and Tracosa mucky clay (Tm). The Follet loam is a nearly level, very poorly drained, saline, loamy soil with a loamy subsoil (SCS, 1988). Permeability and surface runoff are very slow, and shrink-swell potential is high. It occurs in broad tidal marshes with average slopes of 0.1 percent. At the Shoal Point site, the Follet loam occurs in the Swan Lake area and is associated with the marshes and open water.

The Tracosa mucky clay is associated with the brackish tidal marshes west of Swan Lake and east of Loop 197. A small area of Tracosa clay is located adjacent to Loop 197, south of its intersection with the proposed access road. The Tracosa mucky clay is a nearly level, very poorly drained, saline, clayey soil with a clayey subsoil (SCS, 1988). Permeability and surface runoff are very slow, and shrink-swell potential is high. The soil remains saturated throughout the year and is generally under 2 to 12 inches of water during daily high tide as well as seasonal and storm tides.

3.7.2 Pelican Island

Figure 3.7.2-1 presents a soils map for the Pelican Island alternative. The majority of the site consists of Ijam clay (0 to 2 percent slopes) (ImA) as described above. This soil is formed from dredged material and occupies coastal marshes and flats. Higher sloping Ijam clay (2 to 8 percent slopes) (ImB) are found in long narrow bands seaward. An area in the northern corner of the site along the island's coast consists of Mustang fine sand, saline (Mp). This soil is nearly level, poorly drained, moderately to strongly saline, and sandy (SCS, 1988). Permeability is rapid; surface runoff is very slow; and shrink-swell potential is low to moderate. This soil is found in coastal areas and typically consists of neutral to moderately alkaline, light gray fine sand.



Soils

- **Es** Edna-Aris Complex
- **Fo** Follet Loam
- **ImA** Ijam Clay(0-2% slopes)
- **ImB** Ijam Clay(2-8% slopes)
- **Iu** Ijam-Urban Land Complex
- **Ku** Kemah-Urban Land Complex
- **Tm** Tracosa Mucky Clay
- **W** Water

N

2000 0 2000 Feet

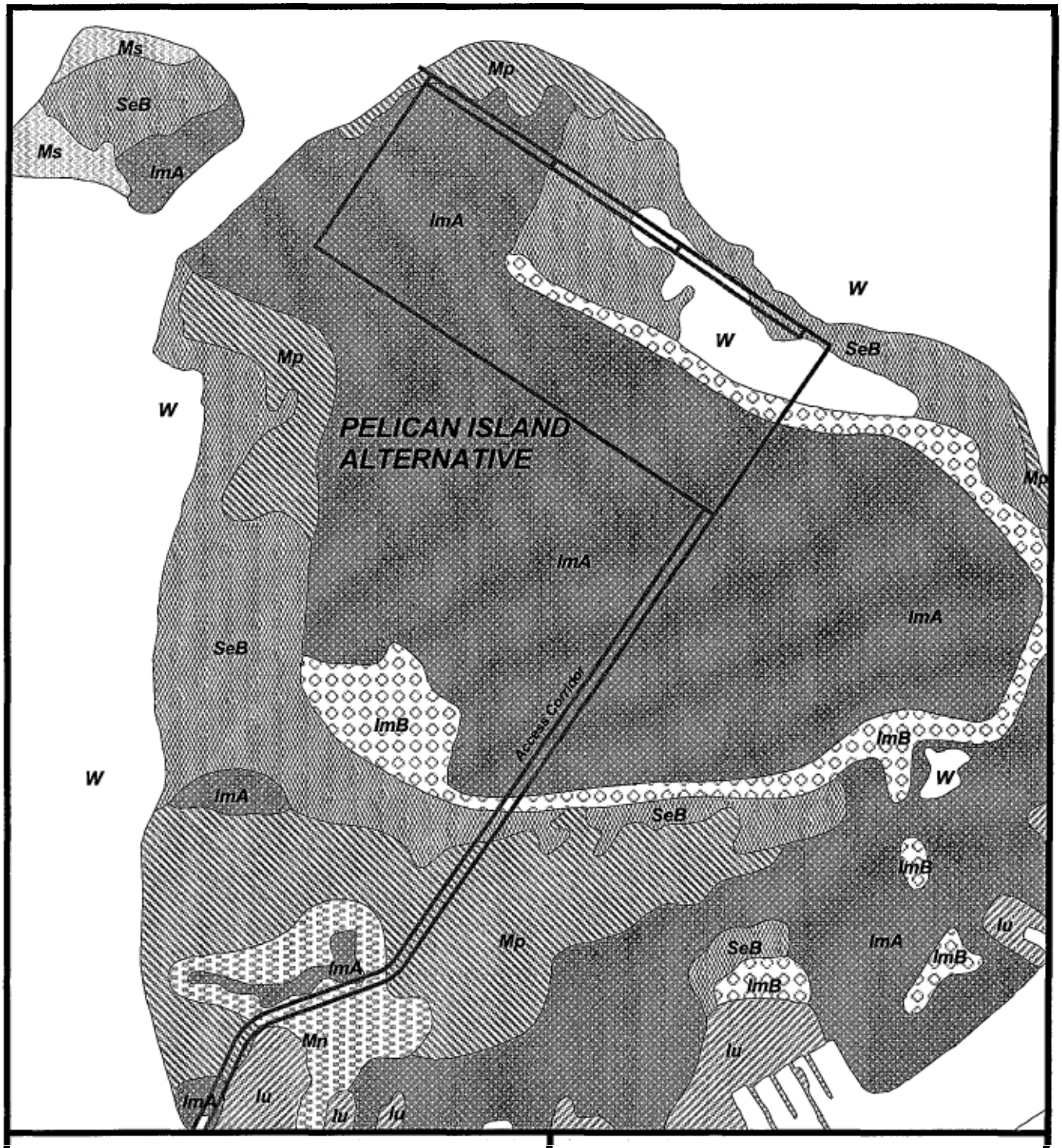
Shoal Point Container Terminal EIS

Figure 3.7.1-1

Soils Map
Shoal Point Alternative

Prepared for:USACE	
Job No.:440622	Scale:1:24000
Prepared by:Matthew Qualls	Date:12/13/01
File: N:\\440622\av\shoal_point.apr	

U.S. Department of Agriculture, Natural Resources Conservation Service, Galveston County Texas, 1999.



Soils

- ***ImA*** *Ijam Clay(0-2% slopes)*
- ***ImB*** *Ijam Clay(2-8% slopes)*
- ***Iu*** *Ijam-Urban Land Complex*
- ***Mn*** *Mustang Fine Sand*
- ***Mp*** *Mustang Fine Sand, Saline*
- ***Ms*** *Mustang Fine Sand, Slightly Saline*
- ***SeB*** *Sievers Loam(0-3% slopes)*
- ***W*** *Water*

N

2000 0 2000 Feet

Shoal Point Container Terminal EIS

Figure 3.7.2-1
Soils Map
Pelican Island Alternative

Prepared for:USACE	
Job No.:440622	Scale:1:24000
Prepared by:Matthew Qualls	Date:12/13/01
File: N:\\440622\av\shoal_point.apr	

U.S. Department of Agriculture, Natural Resources Conservation Service, Galveston County Texas, 1999.

Areas in the eastern coastal portions of the site consist of Sievers loam (0 to 3 percent slopes) (SeB). This soil is a nearly level to gently sloping, somewhat poorly drained, moderately saline, loamy soil that has a loamy subsoil (SCS, 1988). Permeability is moderately slow; surface runoff is slow; and shrink-swell potential is high. The soil is found in coastal marshes and formed from loamy material dredged from canals and waterways in the project area. Typically, this soil consists of moderately alkaline, grayish brown stratified loam.

The majority of the access corridor also consists of Ijam clay. The remaining portions are occupied by Mustang fine sand and Sievers loam.

3.7.3 Bayport

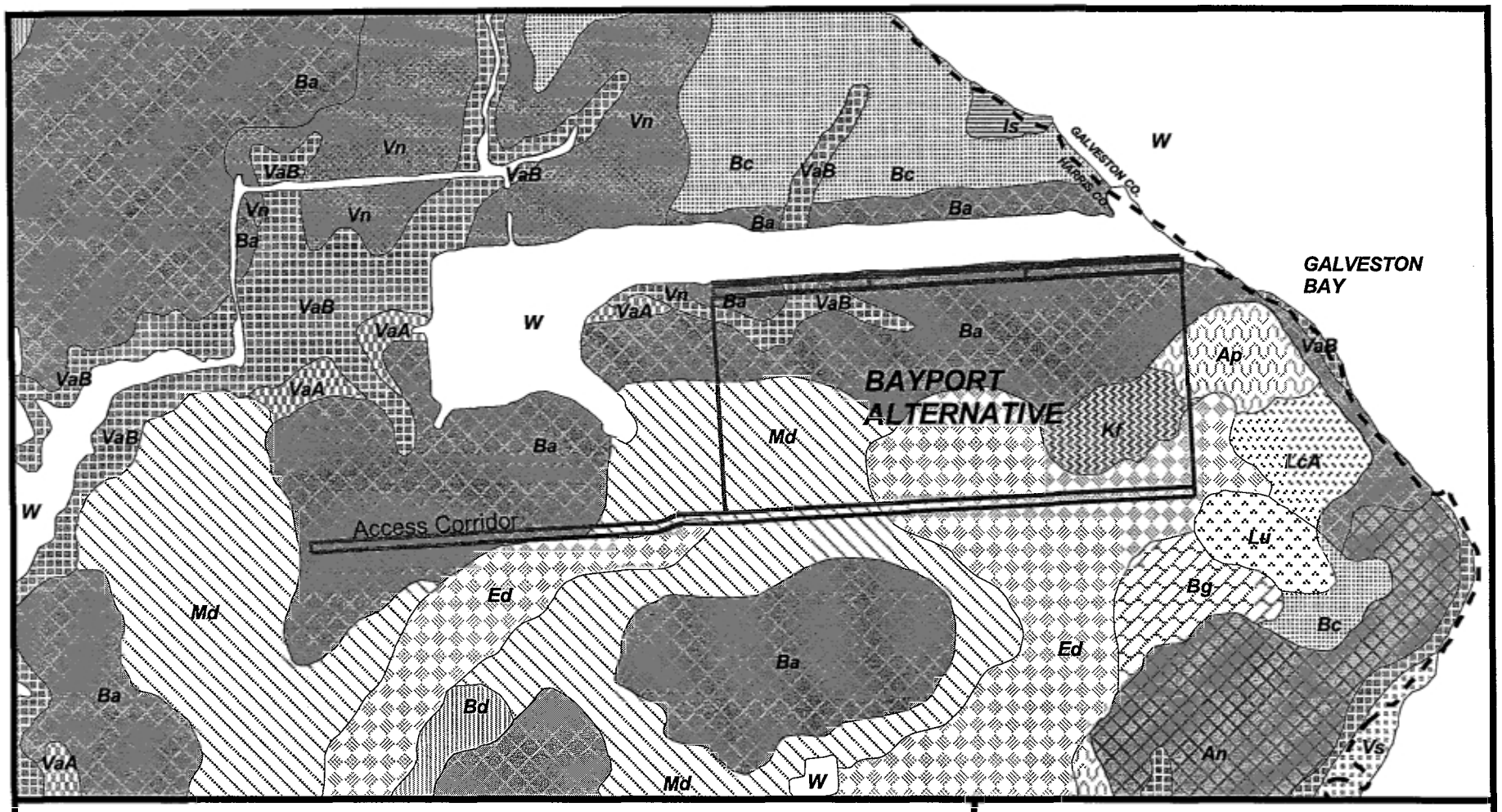
Figure 3.7.3-1 presents a soils map for the Bayport alternative. The majority of the site is situated on undisturbed land. A portion of the area in the northwestern section of the Bayport alternative site was used for placement of dredged material when the Bayport Ship Channel was originally constructed (USACE, 1964). Soils at the Bayport site and access corridor consist of Midland silty clay loam (Md), Edna fine sandy loam (Ed), Katy fine sandy loam (Kf), Beaumont clay (Ba), and Vamont clay (VaB) (1 to 4 percent slopes) (SCS, 1976a). The southwestern portion of the site is occupied by Midland silty clay loam. This soil is nearly level, poorly drained, and loamy. Permeability and surface runoff are very slow, and shrink-swell potential is moderate to high. The soil formed in clayey and silty sediment on coastal prairies. Typically this soil consists of firm, medium acid, gray to grayish brown silty clay loam and clay.

Edna fine sandy loam is present in the south central and southeastern portions of the Bayport site. This soil is a nearly level, poorly drained, sandy loam. Permeability and surface runoff are very slow, and shrink-swell potential ranges from low to high. The soils occupy upland prairies and were formed in thick loamy and clayey unconsolidated sediments of marine origin. Typically, this soil consists of a friable, neutral, grayish brown fine sandy loam underlain by a firm, moderately alkaline, gray to olive gray clay and sandy clay loam.

Katy fine sandy loam is found in the eastern portion of the site. This soil is nearly level and somewhat poorly drained. Permeability and surface runoff are very slow and shrink-swell potential is low to moderate. This soil is found on coastal prairies where it was formed in thick loamy and clayey unconsolidated sediments. Typically, the soil consists of medium acid, grayish brown to brown sandy loam.

Beaumont clay is present in the northern portions of the site. This clay soil is equivalent to the Beaumont clay (Be) of Chambers County (Spillman's Island and Cedar Point alternatives) and consists of nearly level, poorly drained clays. Permeability and surface runoff are very slow, and the shrink-swell potential is high. The soil is found on coastal prairies where it was formed in thick beds of alkaline marine clay. Typically, it consists of very firm, acid, gray clay.

A small band of Vamont clay is present in the northwestern portion of the Bayport site. The soil is composed of nearly level to gently sloping, somewhat poorly drained clays. Permeability is very



2000 0 2000 Feet

N

— — County Line

Soils

- An Aldine-Urban Land Complex
- Ap Aris Fine Sandy Loam
- Ba Beaumont Clay
- Bc Beaumont-Urban Land Complex
- Bd Bernard Clay Loam
- Bg Bernard-Urban Land Complex
- Ed Edna Fine Sandy Loam
- Is Ijam Soils
- Kf Katy Fine Sandy Loam
- LcA Lake Charles Clay(0-1% slopes)
- Lu Lake Charles-Urban Land Complex
- Md Midland Silty Clay Loam (Verland)
- VaA Vamont Clay(0-1% slopes)
- VaB Vamont Clay(1-4% slopes)
- Vn Vamont-Urban Land Complex
- W Water

U.S. Department of Agriculture, Natural Resources Conservation Service, Harris County Texas, 1999.

Shoal Point Container Terminal EIS

Figure 3.7.3-1

Soils Map
Bayport Alternative

Prepared for:USACE	
Job No.:440622	Scale:1:24000
Prepared by:Matthew Qualls	Date:12/13/01
File: N:\\440622\av\shoal_point.apr	

slow; surface runoff is rapid; and the shrink-swell potential is high. The soils occupy areas leading to the low terraces and floodplains of streams and drainageways, and formed in thick beds of alkaline marine clay. Typically, the soil consists of a firm, medium to strongly acid, grayish brown clay.

3.7.4 Spillman's Island

Figure 3.7.4-1 presents a soils map for the Spillman's Island alternative. Soil at the site consists of Ijam soils (Is) (SCS, 1976a). This soil is previously described as Ijam clay (ImA and ImB). This soil formed from dredged material and currently occupies coastal marshes and flats.

In addition to Ijam soils, the proposed access corridor for the site crosses Beaumont clay (Ba) and Bernard urban land complex (Bg). Beaumont soils consist of nearly level, clayey soils on upland prairies. The soil is poorly drained; surface runoff and permeability are very slow; and shrink-swell potential is high. The Bernard urban complex consists of urban land where the soils have been disturbed or covered by buildings or other structures. The Bernard soil series consists of nearly level loamy soils. The soil is somewhat poorly drained; surface runoff and permeability are very slow; and shrink-swell potential is high.

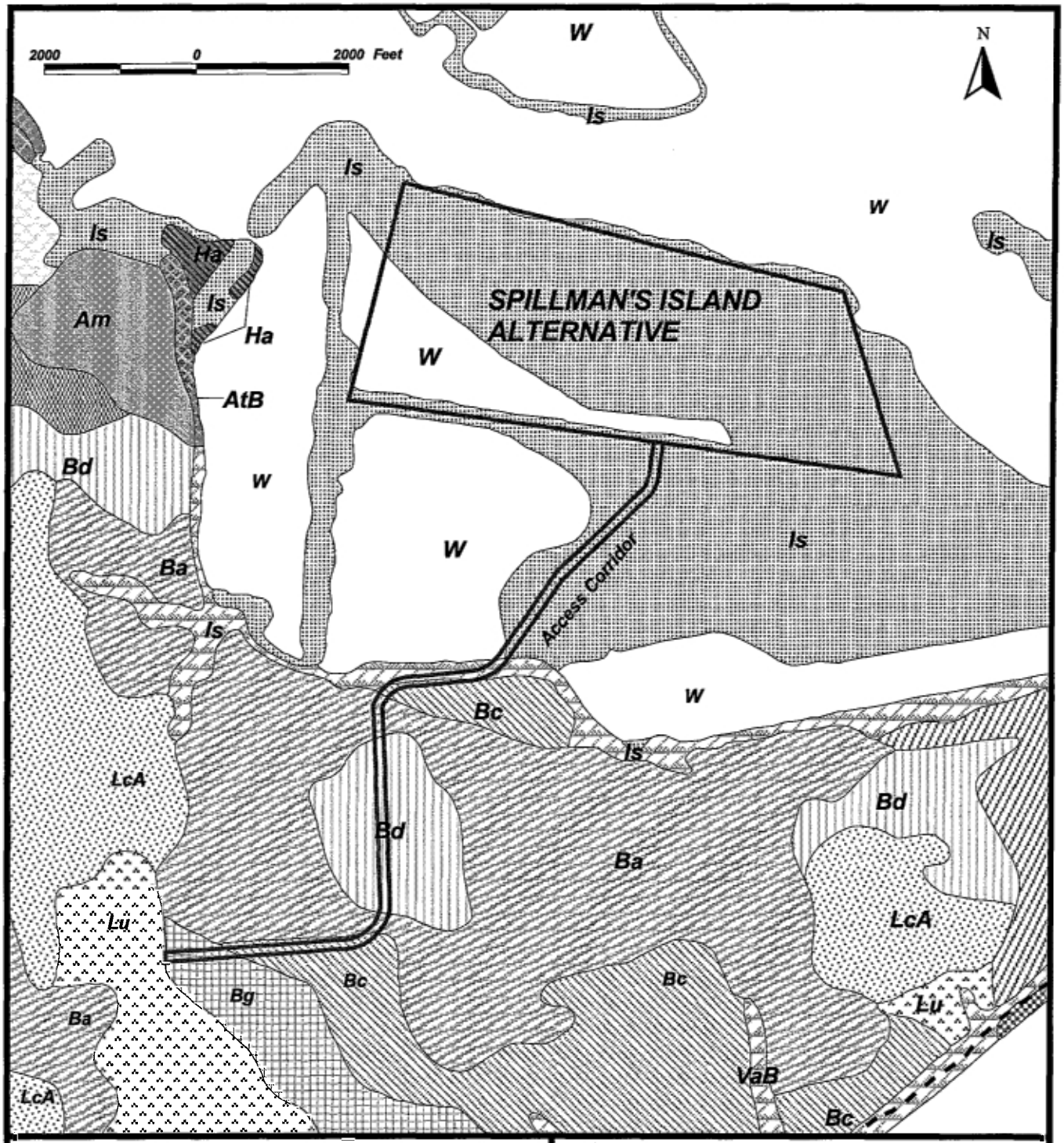
3.7.5 Alexander Island

Figure 3.7.5-1 presents a soils map for the Alexander Island alternative. Soils at the site consist of Ijam soils (Is) as described above (SCS, 1976a). The soil occupies coastal marshes and was formed from material dredged or pumped from the floor of nearby waterways. Ijam soils are poorly drained to ponded. The slope of this clayey soil ranges from 0 to 1 percent.

The proposed access corridor for the site is situated over Atasco fine sandy loam (AtB), Aldine very fine sand (Am), Midland silty clay loam (Md), and Addicks loam (Ad). The Atasco fine sandy loam typically consists of gently sloping, loamy soils formed on clayey sediments, mainly along natural drainageways. The soil is moderately well drained; surface runoff is medium; and permeability is very slow. Aldine very fine sand typically consists of nearly level to gently sloping loamy soils formed on uplands. The soil is somewhat poorly drained; surface runoff is slow; and permeability is very slow. Midland silty clay loam consists of nearly level loamy soils on coastal prairies. This soil is poorly drained, and surface runoff and permeability are very slow. Addicks loam consists of nearly level, loamy soils on upland prairies. The soil is poorly drained; surface runoff is slow; and permeability is moderate.

3.7.6 Cedar Point

Figure 3.7.6-1 presents a soils map for the Cedar Point alternative. The site is situated on undisturbed land. Soils at the site consist mainly of Frost-Morey complex (Fs) with lesser amounts of Morey silt loam (Mo) and Beaumont clay (Be), described above (SCS, 1976b). The Frost-Morey complex occupies much of the northern and central portions of the site and consists of Frost silt loam and Morey silt loam. Frost soil is a nearly level or depressional, poorly drained, loamy soil formed in thick beds of loamy and clayey material under prairie grasses. Permeability is slow; surface runoff is very slow; and shrink-swell potential is low to moderate. Typically, this soil consists of acid, gray, silt loam and silty clay loam.



- - County Line

Soils

- Ak Addicks-Urban Land Complex
- Am Aldine Very Fine Sandy Loam
- An Aldine-Urban Land Complex
- AtB Atasco Fine Sandy Loam
- Ba Beaumont Clay
- Bc Beaumont-Urban Land Complex
- Bd Bernard Clay Loam
- Be Bernard-Edna Complex
- Bg Bernard-Urban Land Complex
- Ha Harris Clay
- LcA Lake Charles Clay (0-1% slopes)
- Lu Lake Charles-Urban Land Complex
- Is Ijam Soils
- Na Nahatche Loam
- Ur Urban Land
- VaA Vamont Clay (0-1% slopes)
- VaB Vamont Clay (1-4% slopes)
- W Water

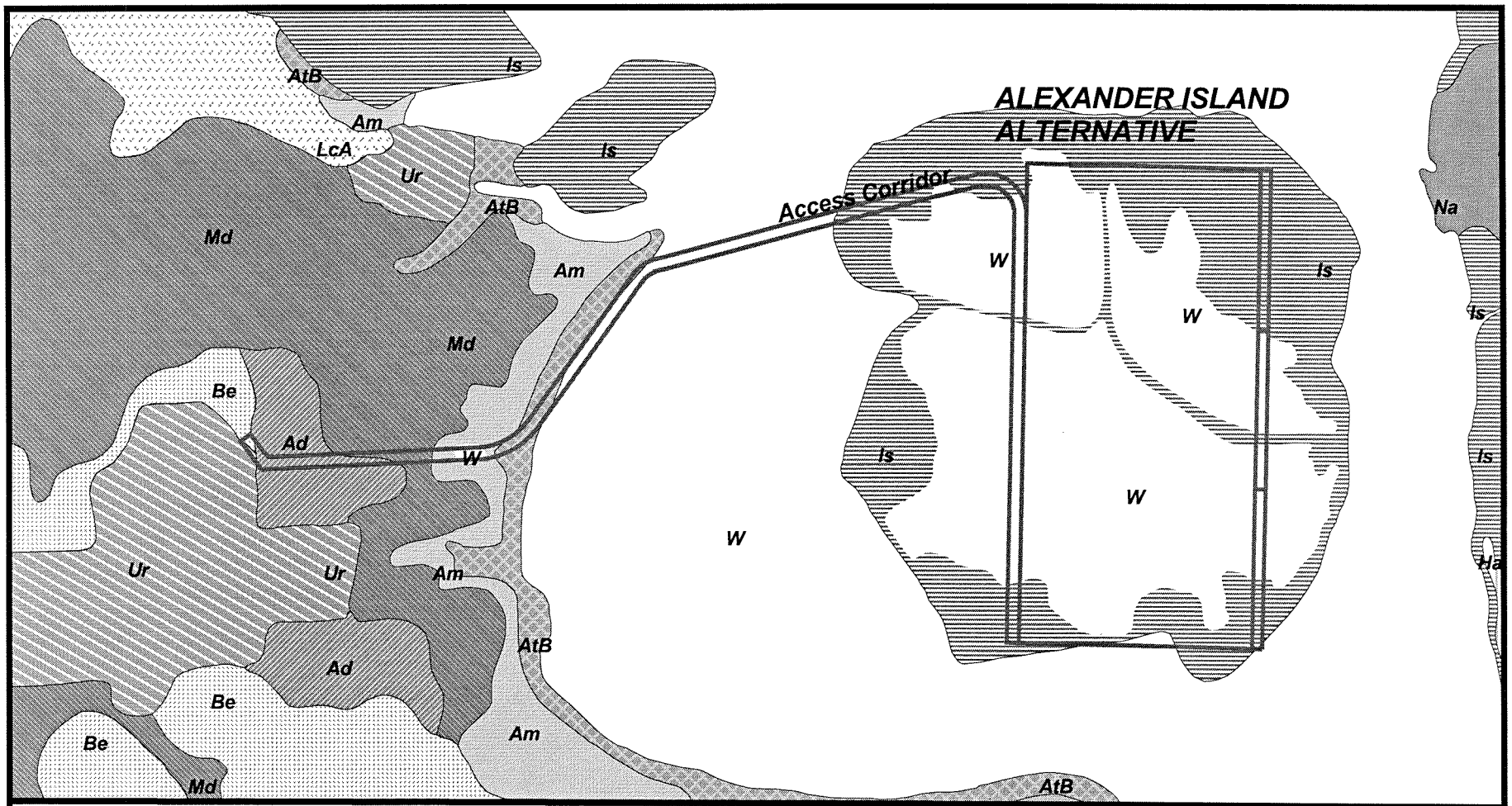
Shoal Point Container Terminal EIS

Figure 3.7.4-1

Soil Map
Spillman's Island Alternative

Prepared for:USACE	
Job No.:440622	Scale:1:24000
Prepared by:Matthew Qualls	Date:12/13/01
File: N:\\440622\av\shoal_point.apr	

U.S. Department of Agriculture, Natural Resources Conservation Service, Harris County Texas, 1999.



Soils
Ad Addicks Loam
Am Aldine Very Fine Sand
AtB Atasco Fine Sandy Loam
Be Bernard-Edna Complex
Is Ijam Soils
LcA Lake Charles Clay(0-1% slope)
Md Midland Silty Clay Loam (Verland)
Na Nahatche Loam
Ur Urban Land
W Water

N

2000 0 2000 Feet

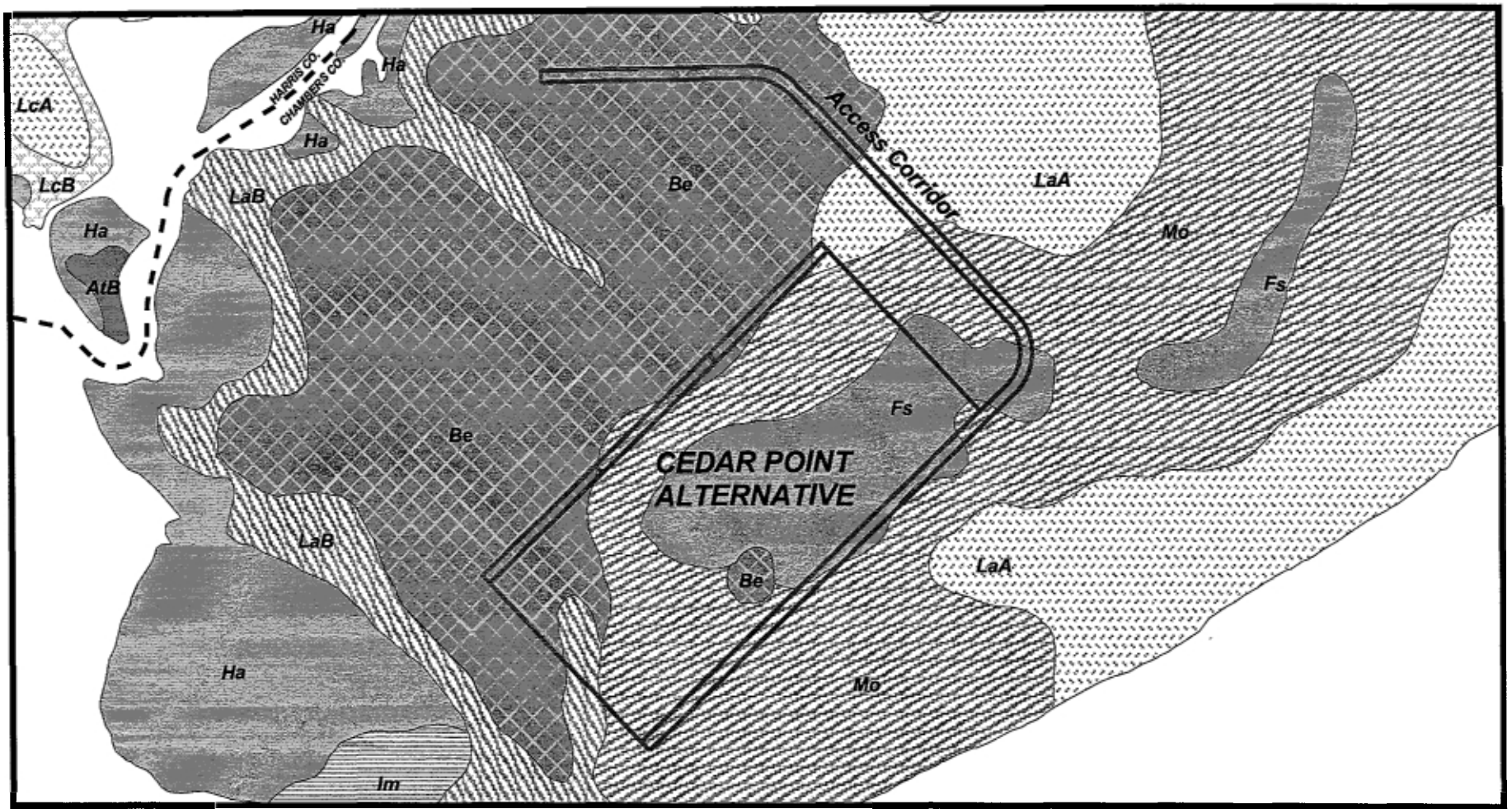
Shoal Point Container Terminal EIS

Figure 3.7.5-1

Soils Map
Alexander Island Alternative

Prepared for:USACE	
Job No.:440622	Scale:1:24000
Prepared by:Matthew Qualls	Date:12/13/01
File: N:\\440622\av\shoal_point.apr	

U.S. Department of Agriculture, Natural Resources Conservation Service, Harris County Texas, 1999.



- - County Line

Soils

AtB Atasco Fine Sandy Loam
Be Beaumont Clay
Fs Frost-Morey Complex, Levelled
Ha Harris Clay
Im Ijam Soils
LaA Lake Charles Clay(0-1% slopes)
LaB Lake Charles Clay(1-5% slopes)
LcA Lake Charles Clay(0-1% slopes)
LcB Lake Charles Clay(1-3% slopes)
Mo Morey Silty Clay, Levelled
W Water

N

2000 0 2000 Feet

Shoal Point Container Terminal EIS

Figure 3.7.6-1

Soils Map
Cedar Point Alternative

Prepared for:USACE	
Job No.:440622	Scale:1:24000
Prepared by:Matthew Qualls	Date: 12/13/01
File: N:\\440622\av\shoal_point.apr	

U.S. Department of Agriculture, Natural Resources Conservation Service, Chambers County Texas, 1999.

Morey soil is composed of nearly level, poorly drained, loam formed in deltaic alluvium under prairie grasses and sedges. Permeability and surface runoff are very slow, and shrink-swell potential is low to high. Typically, the soil consists of acid, gray silt loam and silty clay loam.

In addition to the Morey silt loam, Frost-Morey complex, and Beaumont clay, the proposed access corridor for the site crosses Lake Charles clay (LaA). This soil is a nearly level, somewhat poorly drained clayey soil formed in alkaline and calcareous clay. Permeability and surface runoff are very slow, and the shrink-swell potential is high. Typically, the soil consist of slightly acid, dark gray clay.

3.8 GROUNDWATER QUALITY AND HYDROLOGY

Groundwater in the project area is predominantly withdrawn from the Gulf Coast Aquifer system. The Gulf Coast Aquifer consists of complexly interbedded clays, silts, sands, and gravels of Cenozoic age, which are hydrologically connected to form a large, leaky artesian aquifer system that extends from the Rio Grande northeastward across the Gulf coastal plain to the Louisiana-Texas border. The aquifer provides water to all or parts of 54 counties, and municipal and irrigation uses account for 90 percent of the total volume pumped from the aquifer. The Houston metropolitan area is the largest municipal user, where well yields average about 1,600 gallons per minute (gpm) (Ashworth and Hopkins, 1995). Groundwater is generally of good quality in the shallower portions of the Gulf Coast Aquifer, except near the coast where saltwater encroachment limits the amount of freshwater available from the aquifer. Fresh water is defined as having less than 1,000 milligrams per liter (mg/L) total dissolved solids).

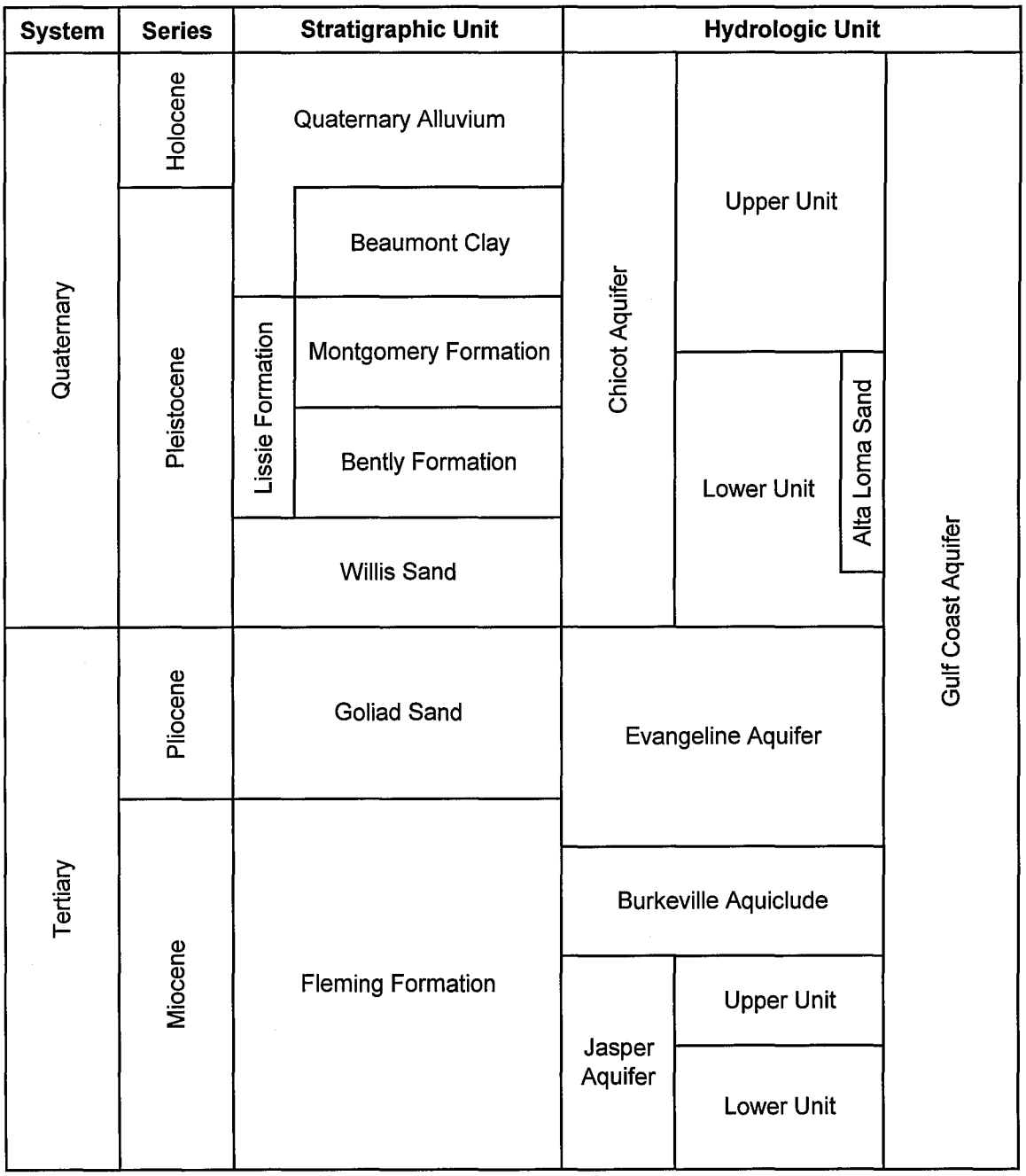
In the upper Texas coastal region, the Gulf Coast Aquifer is subdivided into several parts, of which the Chicot Aquifer is the uppermost (Figure 3.8-1). The Chicot Aquifer consists of the Willis, Lissie (Montgomery and Bently), and Beaumont formations, and overlying alluvial deposits. The Chicot Aquifer is approximately 600 feet thick in the vicinity of the project area and includes all deposits from land surface to the top of the underlying Evangeline Aquifer. The Chicot Aquifer has been divided into an upper unit and lower unit. Throughout portions of the project area, the basal part of the lower Chicot Aquifer is formed by a massive, laterally extensive, sand section with an average transmissivity of approximately 10,000 ft^2/day (Guyton & Associates, 1972; Jorgensen, 1975; Kreitler et al., 1977). This sand unit is known locally as the Alta Loma Sand.

The Evangeline Aquifer underlies the Chicot Aquifer within the region (Figure 3.8-1). The basis for separating the aquifers is primarily a difference in hydraulic conductivity, which in part causes differences in water levels between the two units (Jorgensen, 1975). The Evangeline Aquifer consists of the Goliad Sand and upper portions of the Fleming Formation. The average transmissivity of the aquifer has been reported to be about 12,000 ft^2/day (Guyton & Associates, 1972). The aquifer is underlain by the Burkeville Aquiclude that serves to confine the Evangeline from the underlying Jasper Aquifer.

Water well records kept by the Texas Water Development Board (TWDB) for Harris, Galveston, and Chamber counties indicate that water wells in the project area are completed in the Chicot and Evangeline aquifers. Most of the wells in the vicinity of the proposed and alternative sites are completed in the lower unit of the Chicot Aquifer. Water wells completed within this unit are typically completed at depths ranging from about 300 to 700 feet. Wells completed in the upper unit of the Chicot

FIGURE 3.8-1

GEOLOGIC AND HYDROLOGIC UNITS WITHIN THE PROJECT AREA



Sources: Baker, 1979; Jorgensen, 1975.

Aquifer are typically completed at depths ranging from 15 to 200 feet. Water wells screened in the underlying Evangeline Aquifer are typically drilled to depths of 800 to 1,500 feet. Groundwater is reportedly used mainly for domestic purposes, and in lesser amounts, for public supply, stock, and industrial purposes.

Groundwater recharge to the aquifers occurs by precipitation onto outcrop areas and vertical leakage from overlying aquifers. However, most precipitation runs off and becomes stream flow or evaporates immediately and only a small fraction of the total rainfall recharges the surficial aquifer. Regional groundwater flow in the aquifers is generally southeastward from outcrop areas towards areas of natural discharge (Wesselman, 1971). Superimposed upon this natural discharge regime is artificial discharge caused by groundwater pumping. Because of historical groundwater development in the region, water levels declined and localized cones of depression developed around areas of extensive groundwater pumping, altering the natural flow pattern and causing groundwater to flow toward these centers of pumping (Jorgensen, 1975). However, since the late 1970s and early 1980s, groundwater usage in the area has largely been replaced with surface water, which has resulted in the recovery of water levels in areas of decreased pumping.

Most of the groundwater pumped in the project area is derived from the lower unit of the Chicot Aquifer; therefore, historical water level declines have been the greatest in this unit. Recent water level data from the TWDB water well database indicates that water levels for wells completed in the Lower Chicot typically range from about 80 to 150 feet bgs within the project area.

Groundwater quality data from the TWDB database indicates that groundwater from water wells completed in the Chicot Aquifer within the project vicinity generally has total dissolved solids (TDS) concentrations less than 500 mg/L to more than 2,000 mg/L. Most of the groundwater from the Chicot Aquifer has an average TDS concentration of less than 1,000 mg/L. Chloride concentrations typically range from less than 100 mg/L to over 500 mg/L and average less than 250 mg/L. Water wells completed in the underlying Evangeline Aquifer have TDS concentrations from less than 300 mg/L to more than 1,000 mg/L. Most of the groundwater from the Evangeline Aquifer has an average TDS concentration of less than 600 mg/L. Chloride concentrations range from less than 50 mg/L to over 250 mg/L and average less than 150 mg/L. In general, groundwater quality in both the Chicot and Evangeline becomes poorer near the coast where saltwater encroachment limits the amount of fresh water available from the aquifers. The TDS content is usually the main factor that determines the use of groundwater. Typically, fresh water has a TDS concentration of less than 1,000 mg/L. Recommended Federal secondary drinking water standards for TDS and chlorine are 500 mg/l and 250 mg/L, respectively.

Land-surface subsidence has affected most of the project region. Subsidence in the area has been primarily caused by groundwater withdrawals, although subsidence may also result from oil and gas production. As groundwater is removed, the artesian pressure drops and there is a decline in the groundwater piezometric surface. When this occurs, water-saturated clay beds that separate water-bearing sands become compressible, and subsequent compaction and dehydration leads to the lowering of the surface elevation. Subsidence in the project area, coupled with an increase in impermeable surfaces, has subjected an increasingly large area along Galveston Bay and the Houston Ship Channel to

flooding from high tides. Further subsidence has been successfully controlled in the region through the conversion from groundwater to surface water by cities, utility districts and industries, which has significantly reduced the amount of groundwater being pumped from the primary aquifers in the area.

3.9 HAZARDOUS MATERIALS SITE ASSESSMENT

A search of publicly available records for hazardous material sites was conducted for the proposed site and the alternative sites. The following TNRCC and EPA databases were reviewed for this study. The radius of the search used for each database is indicated in the discussions for each site. The search methodology follows American Society of Testing and Materials (ASTM) guidelines.

- Texas State Superfund List – The Texas State Superfund database is a list of sites that the state of Texas has identified for investigation or remediation. Also included are all the sites in the TNRCC's Voluntary Cleanup Program (VCP) and the Innocent Owner/Operator Program (IOP).
- Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Database – CERCLIS is the official repository for site and non-site specific Superfund data in support of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and contains information on hazardous waste site assessment and remediation from 1983 to the present. CERCLIS information is used to report official Superfund accomplishments to Congress and the public, assist EPA Regional and Headquarters managers in evaluating the status and progress of site cleanup actions, and communicate planned activities and budgets.
- National Priority List (NPL) – The NPL is a priority subset of the CERCLIS list and is a list of priority sites that the EPA has determined to pose a threat to human health and/or the environment and where remedial action is required.
- No Further Remedial Action Planned (NFRAP) – The EPA database lists of a CERCLIS site that has been designated "no further remedial action planned," or NFRAP.
- Emergency Response Notification System (ERNS) – The EPA database of release notification as required by Section 103 of the CERCLA.
- Resource Conservation and Recovery Information System (RCRIS) – Treatment, Storage or Disposal (TSD) Database - RCRIS, under the Resource Conservation and Recovery Act (RCRA), provides information concerning facilities that generate, transport, treat, store, and/or disposes of hazardous waste as Federally defined. The RCRIS TSD database is a subset of the RCRIS list which tracks facilities that treat, store and/or dispose of hazardous waste.
- RCRIS Generators Database – This database, under the RCRA, tracks facilities that generate or transport hazardous waste. Hereafter, these facilities are referred to as RCRA GEN facilities. A conditionally exempt small quantity generator (CESQG) is a facility that produces less than 100 kilograms (kg) per month of hazardous waste, a small quantity generator (SQG) produces at least 100 kg per month but less than 1,000 kg per month of hazardous waste, and a large quantity generator (LQG) produces more than 1,000 kg per month of hazardous waste.
- RCRIS Corrective Action (CORRACT) Database – The CORRACT database lists sites that currently or in the past have had corrective action.

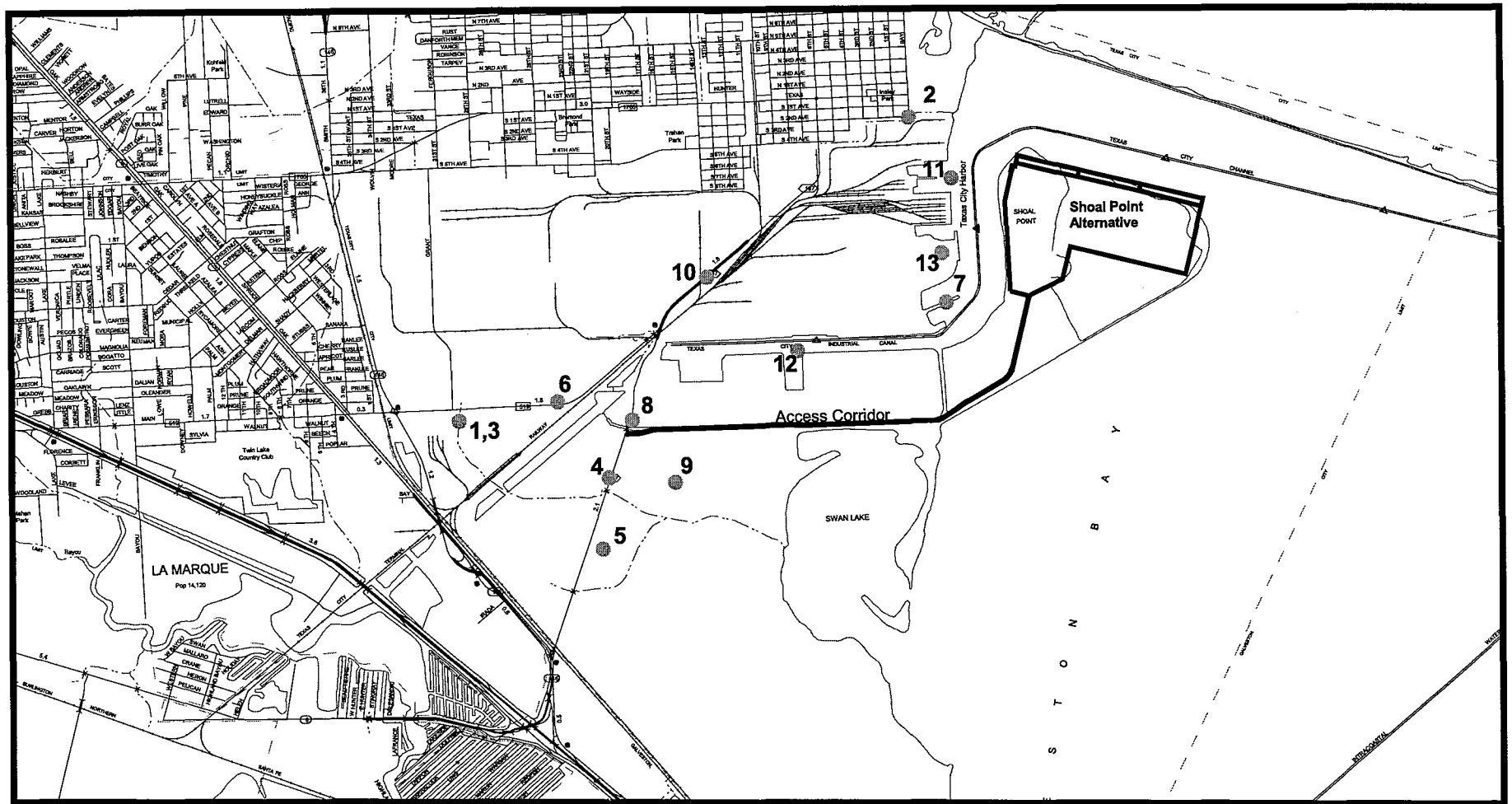
- Facility Index System Database (FINDS) – The EPA database of identification numbers associated with a property or facility which the EPA has investigated or has been made aware of in conjunction with various regulatory programs.
- Toxic Release Inventory System (TRIS) Database – EPA's database of all facilities that have had or may be prone to toxic material releases.
- The TNRCC Solid Waste Facilities (SWF) – The TNRCC requires municipalities and counties to report known active and inactive landfills. The Solid Waste Facilities database is a listing of solid waste facilities, transfer stations, and processing stations registered and tracked by the TNRCC Solid Waste Division.
- Registered Storage Tank Listings – The Registered Storage Tank database is a list of facilities with permitted USTs (underground storage tanks) and/or above-ground storage tanks (ASTs). (Note: Above-ground storage tanks used in the refining and production of gasoline are not required to be registered with the TNRCC.)
- Leaking Underground Storage Tank (LUST) Listings – The LUST database is a list of facilities with known underground storage tank releases.
- National Pollutant Discharge Elimination System – (NPDES) EPA's database of all permitted facilities receiving and discharging effluents.

3.9.1 Shoal Point

According to the regulatory agency database report, 136 listings are identified at 13 sites within the Shoal Point search area. Figure 3.9.1-1 depicts the locations of the hazardous material sites identified. Several sites are registered within multiple databases and multiple sites may be located at a single facility or map location. On the basis of the results of the regulatory database searches, the following sites are located within the Shoal Point search area:

- one NPL site;
- one CERCLIS site;
- one State Superfund site;
- two RCRA TSD sites;
- one SWF site;
- three RCRA generators sites;
- three RCRA CORRACT sites;
- one registered storage tank site;
- one LUST site;
- three facilities with 99 reported emergency response actions and 9 unlocatable reported emergency response actions;
- fourteen NPDES sites.

No FINDS or TRIS sites were located within the 0.25-mile search radius. The following provides a summary of the results of the regulatory agency database information search.



Hazardous Material Site

N
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2500 0 2500 5000 7500 Feet

SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.9.1-1

Hazardous Material Site Location Map
Shoal Point Study Area

Prepared for: USACE	
Job No.: 440622	Scale: 1" = 5000'
Prepared by: A. Pugh	Date: November 27, 2001
File: N:\440622\acrview\tx83sc\hazmat\haz_mat_apr\shoal_pt_apr	

NPL Site

The EPA National Priority Listing was searched for facilities located within a 1-mile radius of the subject property. The Tex-Tin Corporation facility (Map ID No.1) is located south of FM 519 and east of SH 146. The facility was built in 1941 by the U.S. government to process ore and manufacture primary metals. The facility was declared a Superfund site in September 1998 and has been divided into four operable units (OU).

Map ID	Site Name/Address	Site ID No.	ID No.	Status/Comments
1	Tex-Tin Corporation Smelter Facility	OU 1	EPA ID No. TXD062113329	Site placed on NPL in September 1998. Site is undergoing remedial action.
3	Amoco property-Area H of Tex-Tin site	OU 2	Texas VCP ID No. 311300	Site listed as State Superfund site and currently enrolled in VCP.
1	Swan Lake Salt Marsh, Swan Lake and Wah Chang Ditch	OU 4	NA[1]	Impacted by surface drainage from Tex-Tin site. Undergoing remedial alternatives analysis.

[1] Not available.

Swan Lake, Swan Lake Salt Marsh, and the Wah Chang Ditch are considered part of the Tex-Tin Superfund site because these areas also contain contaminants found at the Tex-Tin Site. Contaminated surface runoff from the Tex-Tin Site was conveyed to Galveston Bay via the Wah Chang Ditch, through the Swan Lake Salt Marsh. Contaminated runoff was suspected to have flooded the salt marsh during heavy rainfall allowing the contaminants to settle out in the marsh. The constituents of concern identified within the Superfund site include metals and polynuclear aromatic hydrocarbons. Historic operations at the facility are reported to have impacted soil, sediment, groundwater, local water wells, and air. OU 3 is a residential area located approximately 2,000 feet west-northwest of OU 1. It is not located within the Shoal Point search area and is therefore not listed above.

CERCLIS Site

The CERCLIS database was searched for facilities located within a 0.5-mile radius of the project site and one CERCLIS site was found. The Sterling Chemical Company (Map ID No. 2), located at 201 Bay Street, was assessed by the EPA in April 1980. EPA records indicated that no further remedial action is planned.

State Superfund Site

The State Superfund listing was searched for sites located within a 1-mile radius of the project site and one State Superfund site was found. The Amoco Chemical Company operated a 27-acre site identified as Area H of the Tex-Tin Site. The Amoco facility is identified as 2800 FM 510 East (Map ID No. 3). The contaminants include metals and have reportedly impacted the soil and groundwater at the site. The Amoco Corporation has enrolled the site in the TNRCC VCP. The types of remedial action taken include on-site monitoring, deed restriction, and a cap over the impacted area.

RCRA-TSD Sites

The RCRA-TSD listing was searched for sites located within a 0.5-mile radius of the project site and two RCRA-TSD sites were found.

Map ID	Site Name/Address	EPA ID No.	Status/Comments
2	Sterling Chemicals Inc. – 201 Bay Street South Texas City, Texas 77590	TXD008079527	Several violations have been issued since 1988, and two compliance orders were issued in 1994 and 1998.
4	Amoco Oil Company Land Farm 1 & 2 – Loop 197 South Between Hwy 6 and FM 519 Texas City, Texas 77590	TXD072181381	Several violations were reported between 1989 and 1993.

Solid Waste Facilities

The TNRCC SWF database was searched for sites located within a 0.5-mile radius of the project site and one SWF site was found. The City of Texas City Municipal Landfill (Map ID No. 5), located at Loop 197 at Swan Lake, was closed in 1983. The post-closure maintenance report has been completed and filed with the TNRCC. There are no records of outstanding environmental issues concerning contaminant migration at the facility.

RCRA GEN Sites

The RCRA GEN database was searched for sites located within a 0.25-mile radius of the project site and three RCRA GEN sites were found.

Map ID	Site Name/Address	Classification	Status/Comments
6	BP Amoco Chemical Company Texas City Barge Site 1M S L-197 Texas City, Texas 77590	SQG	No violations or enforcement actions indicated.
7	Amoco Oil Company Industrial Docks 40 and 41 Texas City, Texas 77590	LQG	No violations or enforcement actions indicated.
8	Amoco Pipeline Company HIPS 1505 Loop 197 South Texas City, Texas 77590	Conditionally Exempt	No violations or enforcement actions indicated.

RCRA CORRACT Sites

The RCRA-CORRACT database was searched for sites located within a 1-mile radius of the project site and three RCRA-CORRACT sites were found.

Map ID	Site Name/Address	Action	Status/Comments
2	Sterling Chemicals Inc. 201 Bay Street South Texas City, Texas 77590	State and EPA compliance orders issued in 1993, 1994, and 1997. Numerous violations.	Facility manufactures industrial chemicals, plastics, resins, cyclic crudes and intermediates.

Map ID	Site Name/Address	Action	Status/Comments
9	Gulf Coast Waste Disposal Authority Malone Road Texas City, Texas 77590	EPA compliance orders issued in 1988,1989, and 1991. Numerous violations	Facility treats and/or stores industrial waste.
10	Marathon Oil Company 1320 Loop 197 South Texas City, Texas 77590	No compliance orders reported. Limited violations.	Facility performs petroleum refining.

Registered Storage Tank Sites

The Registered Storage Tank database was searched for sites located within a 0.25-mile radius of the project site and one registered storage tank site was found. Fifteen underground storage tanks, located at 201 South Bay Street, are owned by Sterling Chemicals, Inc. (Map ID No. 2). Sterling has removed all but two of the USTs.

LUST Sites

The LUST database was searched for sites located within a 0.5-mile radius of the project site and one LUST site was found. The Sterling Chemicals Inc. facility (Map ID No. 2) reported a leak in an underground storage tank system on September 2, 1992. The release resulted in minor soil contamination only. The TNRCC issued a final concurrence and the case is closed.

ERNS Sites

The ERNS database was searched for sites located within a 0.25-mile radius of the project site and 108 ERNS sites were reported. Ninety-one of the spill sites were reported to be located at the shipping docks in the Texas City Harbour (Map ID No. 11), four within the Industrial Ship Canal (Map ID No. 12), four on land adjacent to Dock Road (Map ID No. 13), and the remaining nine could not be located based on the information provided.

Approximately one-half of all spill incidents were reported to involve oil of quantities less than 10 gallons. The largest spill reported resulted in the release of 500 gallons of crude oil into the water. The remaining incidents involved fuel, fuel feedstocks, or chemicals. Information from the database indicated that most releases occurred on the water and a spill response team had been contacted to contain the material.

NPDES Sites

The NPDES database was searched for sites located within a 0.25-mile radius of the project site and fourteen sites were reported in the vicinity of the study area. However, the location of only one facility could be field-verified. Location data on the remaining facilities is unavailable and they may not be located within a 0.25-mile radius of the project site.

Map ID	Site Name/Address	Action	Status/Comments
6	Amoco Chemical Co. "Plant A" South 6th at State Loop 197 Texas City, Texas 77590	Issue Date: 3-30-1990 Expire Date: 4-30-1995	Minor. Receiving waters - Industrial Barge Canal/ Texas City. TX 0004758

Map ID	Site Name/Address	Action	Status/Comments
6	Amoco Production Company-Galveston Texas City, Texas	Issue Date: NA Expire Date: NA	Minor. TX0004812
6	Amoco Texas Refining Co. Texas City, Texas	Issue Date: 9-18-1980 Expire Date: 10-18-1985	Minor. TX0002984
NL[1]	Exxon Corp-Dickinson Fld Texas City, Texas	Issue Date: NA Expire Date: NA	Minor. TX0004243
NL	Hillman Shrimp & Oyster Company Texas City, Texas	Issue Date: 01-14-1987 Expire Date: 01-14-1992	Minor. TX0101206
NL	Intercoastal Terminal, Inc. Texas City, Texas	Issue Date: 09-25-1987 Expire Date: 09-25-1992	Minor. TX089753
NL	South Gillock Plant Texas City, Texas	Issue Date: NA Expire Date: NA	Minor. TX0095397
NL	The Dallas Groups of America Texas City, Texas	Issue Date: 04-10-1975 Expire Date: 05-21-1980	Minor. TX0008249
NL	Tinse Chemical Co., Inc. Texas City, Texas	Issue Date: 10-27-1989 Expire Date: 10-27-1994	Minor. TX0103861
NL	Union Oil-Galveston Texas City, Texas	Issue Date: NA Expire Date: NA	Minor. TX0005967
NL	Union Oil-Galveston Texas City, Texas	Issue Date: NA Expire Date: NA	Minor. TX0005975
NL	Union Oil-Galveston Texas City, Texas	Issue Date: NA Expire Date: NA	Minor. TX0005983
NL	US Oil of LA-Galveston Texas City, Texas	Issue Date: NA Expire Date: NA	Minor. TX0006823
NL	Coastal States Crude Gathering Texas City, Texas	Issue Date: NA Expire Date: NA	Minor. TX0110213

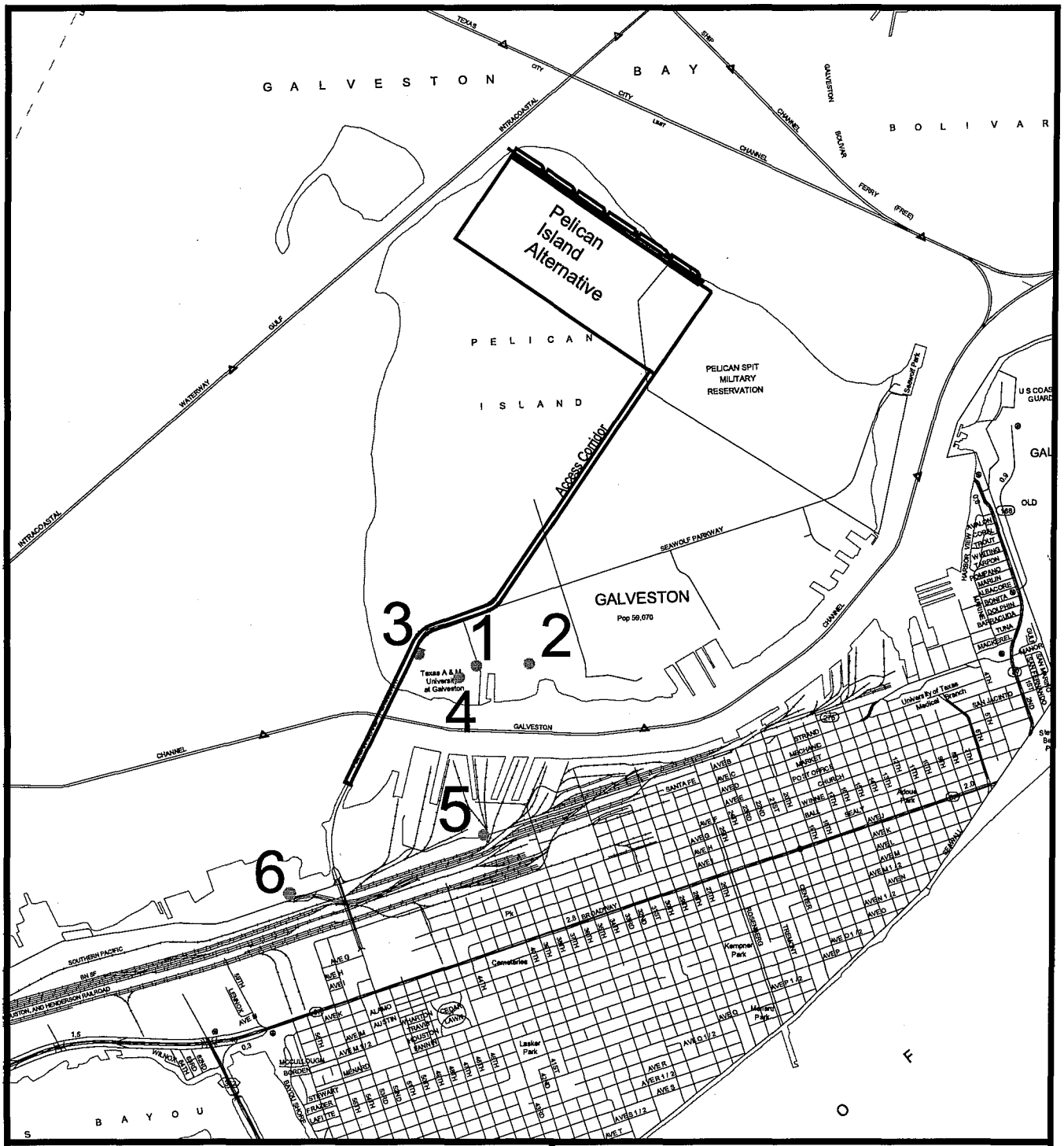
NL[1] - Not located.

3.9.2 Pelican Island

According to the regulatory agency database report, 23 listings are identified at six sites within the Pelican Island search area. Figure 3.9.2-1 depicts the locations of the hazardous material sites identified. Several sites are registered within multiple databases and multiple sites may be located at a single facility or map location. On the basis of the results of the regulatory database searches, the following sites are located within the Pelican Island search area:

- two CERCLIS sites;
- two State Superfund sites;
- three FINDS sites;
- two TRIS sites;
- three RCRA GEN sites;
- two registered storage tank sites;
- two NPDES sites;
- seven facilities which reported emergency response actions.

No NPL, RCRA-TSD, RCRA CORRACT, LUST or SWF sites were located within the specified search radius. The following provides a summary of the results of the regulatory agency database information search.



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Hazardous Material Site

2000 0 2000 4000 6000 Feet

SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.9.2-1

Hazardous Material Site Location Map Pelican Island Study Area

Prepared for: USACE	
Job No.: 440622.00	Scale: 1" = 4000'
Prepared by: A. Pugh	Date: November 26, 2001
File: N:440622\arcview\tx83sc\hazmat\shoal_pt_hazmat.apr	

CERCLIS Sites

The CERCLIS database was searched for facilities located within a 0.5-mile radius of this alternative and two CERCLIS sites were found.

Map ID	Site Name/Address	Action	Status/Comments
1	Newpark Shipbuilding Pelican Island Galveston, Texas 77553	Discovery – 12-01-1979, Preliminary Assessment – 02-01-1983	EPA issued that no further remedial action is planned (12-01-1979).
6	Discharging Lagoon Located off Port Industrial Rd. (now Harborside Dr.) Galveston, Texas 77554	Discovery – 05-01-1990, Preliminary Assessment – 06-29-1993	EPA issued that no further remedial action is planned (10-09-1997).

State Superfund Sites

The State Superfund listing was searched for sites located within a 1-mile radius of this alternative and two State Superfund sites were found.

Map ID	Site Name/Address	Action	Status/Comments
1	TATSUMI USA/ Todd Shipyard Pelican Island Galveston, Texas	Applied to VCP on 8-30-1996.	23.3-acre site identified as a ship painting and repair facility. Contaminated Media unknown. VCP application withdrawal.
5	SPTCO Galveston Wharves Site 4100 Old Port Industrial Blvd Galveston, Texas	Enrolled in VCP on 6-08-1999.	21.8-acre site identified as a creosote distribution facility. Contaminated media-semivolatile organic compounds (SVOCs) in soils and groundwater. Under investigation.

FINDS Sites

The FINDS listing was searched for sites located within a 0.25-mile radius of this alternative and three FINDS sites were found.

Map ID	Site Name/Address	Regulatory Database	Status/Comments
2	Galveston Terminals Inc 3801 JH Field Blvd Galveston, Texas 77554	RCRIS ID No. TX0000717686	No information available.
2	Galveston Terminals Inc 3801 GTI Blvd Box 3 Galveston, Texas 77554	RCRIS ID No. TXD048153977	No information available.
3	Texas A&M University at Galveston 200 Sea Wolf Park Blvd. Galveston, Texas 77550	RCRIS ID No. TXD020817961	No information available.

TRIS Site

The TRIS listing was searched for sites located within a 0.25-mile radius of this alternative and two TRIS sites were found.

Map ID	Site Name/Address	Regulatory Database	Status/Comments
1	Newpark Shipbuilding-Pelican East 2920 Newpark Rd. Galveston, Texas 77554	TRIS ID No. 77554NWPRK2920N	Open. No additional information available.
1	Todd Shipyards Corp. Pelican Island Galveston, Texas 77554	TRIS ID No. TXD008077372	Open. No additional information available.

RCRA GEN Sites

The RCRA GEN listing was searched for sites located within a 0.25-mile radius of this alternative and three RCRA GEN sites were found.

Map ID	Site Name/Address	Regulatory Database	Status/Comments
2	Galveston Terminals Inc 3801 GTI Blvd Box 3 Galveston, Texas 77554	RCRIS ID No. TXD048153977	LQG of hazardous waste.
3	Texas A&M University at Galveston 200 Sea Wolf Park Blvd. Galveston, Texas 77550	RCRIS ID No. TXD020817961	SQG of hazardous waste.
4	Western Geophysical-A Div. of Baker Hughes 23rd St Pelican Island Galveston, Texas 77552	RCRIS ID No. TXD049079221	SQG of hazardous waste.

Registered Storage Tank Sites

The Registered Storage Tank database was searched for sites located within a 0.25-mile radius of this alternative and two registered storage tank sites were found.

Map ID	Site Name/Address	Regulatory Database	Status/Comments
1	Newpark Shipbuilding-Pelican Island 2920 Newpark Rd. Galveston, Texas 77554	TNRCC ID No. 0071610	Two ASTs on site. No additional information available
3	Texas A&M University at Galveston 200 Sea Wolf Park Blvd. Galveston, Texas 77550	TNRCC ID No. 0050087	Two USTs on site. Two 4,320-gal tanks removed from ground.

ERNS Sites

The ERNS database was searched for sites located within a 0.25-mile radius of this alternative and seven ERNS sites were found.

Map ID	Site Name/Address	Release	Action/Status/Comments
1	Todd Shipyards Pier E Pelican Island Galveston, Texas	3/14/1990 17-gal misc. motor oil	No cleanup action taken on sheen. Highway Related.
1	Todd Shipyard Channel Berth Galveston, Texas	9/12/1990 10-gal bilge oil	No additional information available. Status unknown.
1	Pelican Island Todd S Shipyard Galveston, Texas	9/11/1996 2-gal unknown oil	MSU Galveston responded/Sheen Dissipated.
1	Todd Shipyard Drydock Galveston, Texas	12/21/1989 1-gal engine oil	No cleanup action taken on sheen. Status unknown.
1	Pier D Todd Shipyard Galveston, Texas	9/26/1987 80-gal lube oil	Local pollution clean up company called. Status unknown.
2	Galveston Terminals Inc 3801 GTI Blvd Box 3 Galveston, Texas 77554	10/21/1994 3-barrels crude oil	Secured release/vacuum truck on scene. Plant Related.
3	Pelican Island Texas A&M University Galveston, Texas	6/01/1994 unknown quantity of oil	No additional information available. Status unknown.

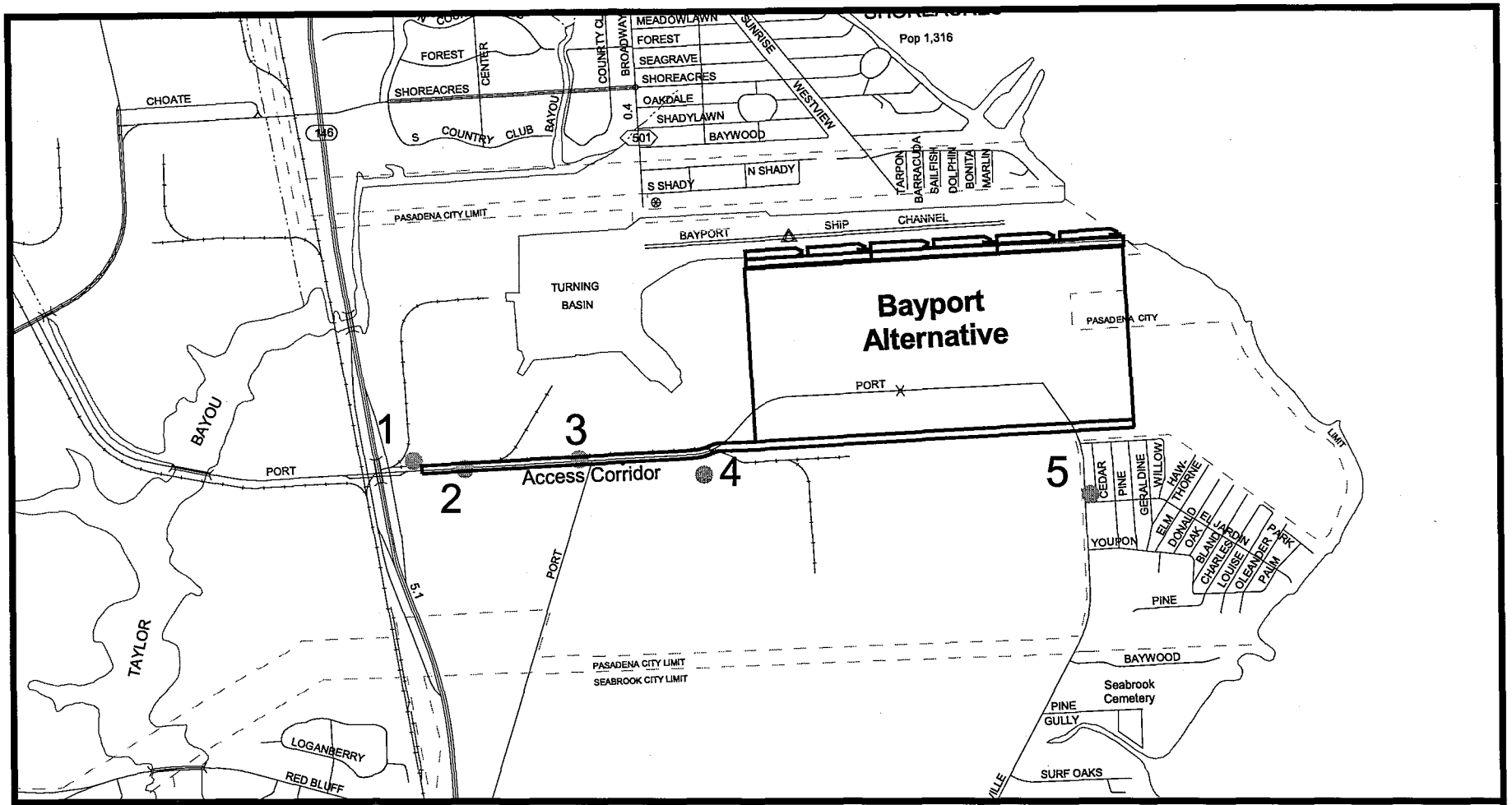
NPDES Sites

The NPDES database was searched for sites located within a 0.25-mile radius of this alternative and two NPDES sites were found.

Map ID	Site Name/Address	Action	Status/Comments
1	Newpark Shipbldg-Pelican Isle Galveston Co on Pelican Isle adjacent to Galveston Channel Galveston, Texas 77554	Issue Date: 12-09-1988 Expire Date: 12-09-1993	Minor. Receiving waters-Galveston Channel. TX0005754
3	Texas A&M Univ-Mitchell Campus-Galveston East Side Seawolf Parkway Galveston County Galveston, Texas	Issue Date: 07-18-1986 Expire Date: 07-18-1991	Minor. No additional information available. TX0063231

3.9.3 Bayport

According to the regulatory agency database report, 87 listings are identified at five sites within the Bayport search area. Figure 3.9.3-1 depicts the locations of the hazardous material sites identified. Several sites are registered within multiple databases or with multiple listings in the same



● Hazardous Material Site

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2500 0 2500 5000 Feet

SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.9.3-1

Hazardous Material Site Location Map
Bayport Study Area

Prepared for: USACE	
Job No.: 440622	Scale: 1" = 2500'
Prepared by: A. Pugh	Date: August 28, 2001
File: N:\440622\acrview\tx83sc\hazmat\shoal_pt_hazmat.apr	

database. On the basis of the results of the regulatory database search and the site reconnaissance, the following sites are located within the search area:

- two CERCLIS sites;
- eight FINDS sites;
- five TRIS sites;
- three RCRA TSD sites;
- nine RCRA generators sites;
- three RCRA CORRACT sites;
- three registered storage tank sites;
- four facilities, with 51 reported emergency response actions;
- two NPDES sites.

No NPL, SWF, LUST, or State Superfund sites were located within the specified search radius. The following provides a summary of the results of the regulatory agency database information search.

CERCLIS Sites

The CERCLIS database was searched for facilities located within a 0.5-mile radius of this alternative and two CERCLIS sites were found.

Map ID	Site Name/Address	Action	Status/Comments
1	Petro United Terminals, Inc. 11666 Port Rd. Seabrook, TX 77586 TXD096602941	Discovery 05-01-1989, Preliminary Assessment 06-01-1989	No further remedial action planned.
2	Celanese Chemical Company, Inc.-Bayport Marine 11807 Port Rd. Seabrook, TX 77586 TXD000719286	Discovery 01-01-1983, Preliminary Assessment 03-01-1984	EPA issued no further remedial action planned 1/1/1985.

FINDS Sites

The FINDS listing was searched for sites located within a 0.25-mile radius of this alternative and eight FINDS sites were found.

Map ID	Site Name/Address	Regulatory Database	Status/Comments
1	Celanese Chemical Company, Inc. 11666 Port Rd. Seabrook, TX 77586	RCRIS ID No. TXD980796478	No details available.
1	Petro United, Inc. 11666 Port Rd. Seabrook, TX 77586	RCRIS ID No. TXD096602941	Listed in the CERCLIS and RCRA-TSD and RCRA GEN databases. No other details available.

Map ID	Site Name/Address	Regulatory Database	Status/Comments
1	SGS Control Services, Inc. 11666 Port Rd. Mobile Home Bldg. Seabrook, TX 77586	RCRIS ID No. TXD982562530	Listed in the RCRA GEN database. No other details available.
2	Caleb Brett USA Inc. Bayport 11727 Port Rd. Seabrook, TX 77586	TRIS ID No. TX0002445872	No details available.
2	Hoechst Celanese Chemical Group 11807 Port Rd. Seabrook, TX 77586	RCRIS ID No. TXD000719286	Listed in the TRIS and RCRA GEN databases. No other details available.
2	Hoechst Celanese Company 11807 Port Rd. La Porte, TX 77586	TRIS ID No. TX0000887372	No details available.
4	Huntsman Chemical Corp. 12222 Port Rd. Pasadena, TX 77507	RCRIS ID No. TXD987985678	Listed in the TRIS and RCRA GEN databases. No other details available.
4	Fina Oil & Chem Corp. 12212 Port Rd. Pasadena, TX 77507	RCRIS ID No. TXD988079091	Listed in the TRIS and RCRA GEN databases. No other details available.

TRIS Site

The TRIS listing was searched for sites located within a 0.25-mile radius of this alternative and five TRIS sites were found.

Map ID	Site Name/Address	Regulatory Database	Status/Comments
2	Celanese LTD 11807 Port Rd. Seabrook, TX 77586	RCRIS ID No. TXD000719286	No details available.
2	Celanese LTD-Bayport Terminal 11807 Port Rd. Seabrook, TX 77586	TRIS ID No. 77586HCHST11807	No details available.
4	CNA Holdings, Inc. Gur Bayport Plant 12212 C Port Rd. Pasadena, TX 77507	TRIS ID No. 77507HCHST12212	No details available.
4	Fina Oil & Chem Corp. 12212 Port Rd. Pasadena, TX 77507	RCRIS ID No. TXD988079091	No details available.
4	Huntsman Chemical Corp. 12222 Port Rd. Pasadena, TX 77507	RCRIS ID No. TXD987985678	No details available.

RCRA TSD Sites

The RCRA-TSD listing was searched for sites located within a 0.5-mile radius of this alternative and three RCRA-TSD sites were found.

Map ID	Site Name/Address	Regulatory ID No.	Status/Comments
1	LBC Petro United, Inc. 11666 Port Rd. Seabrook, TX 77586	TXD096602941	No violations and 1enforcement action indicated.
2	Celanese LTD-Bayport Terminal 11807 Port Rd. Seabrook, TX 77586	TXD000719286	12 violation and 6 enforcement actions indicated.
3	Baytank (Houston) Inc. 12211 Port Rd. WHSE Seabrook, TX 77586	TXD102684370	1 violation and 4 enforcement actions indicated.

RCRA GEN Sites

The RCRA GEN database was searched for sites located within a 0.25-mile radius of this alternative and nine RCRA GEN sites were found.

Map ID	Site Name/Address	Classification	Status/Comments
1	LBC Petro United, Inc. 11666 Port Rd. Seabrook, TX 77586	LQG	No violations or enforcement actions indicated.
1	SGS Control Services, Inc. 11666 Port Rd. Mobile Home Bldg. Seabrook, TX 77586	SQG	No violations or enforcement actions indicated.
2	Caleb Brett USA Inc. Bayport 11727 Port Rd. Seabrook, TX 77586	LQG	No violations or enforcement actions indicated.
2	Celanese LTD 11807 Port Rd. Seabrook, TX 77586	LQG	No details available.
3	Baytank (Houston) Inc. 12211 Port Rd. WHSE Seabrook, TX 77586	LQG	No details available.
4	ELF Atochem North America, Inc. 12100B Port Rd. Pasadena, TX 77507	LQG	No violations or enforcement actions indicated.
4	Fina Oil & Chem Corp. 12212 Port Rd. Pasadena, TX 77507	LQG	No violations or enforcement actions indicated.

Map ID	Site Name/Address	Classification	Status/Comments
4	American Acryl, LP 12100 Port Rd. Pasadena, TX 77507	LQG	No violations or enforcement actions indicated.
4	Nova Chemicals USA, Inc. 12222 Port Rd. Pasadena, TX 77507	LQG	No violations or enforcement actions indicated.

RCRA CORRACT Sites

The RCRA CORRACT database was searched for sites located within a 1-mile radius of this alternative and three RCRA CORRACT sites were found.

Map ID	Site Name/Address	Action	Status/Comments
1	LBC Petro United, Inc. 11666 Port Rd. Seabrook, TX 77586	Subject to corrective action	No violations and 1 enforcement action indicated.
2	Celanese LTD 11807 Port Rd. Seabrook, TX 77586	Subject to corrective action	12 violations and 6 enforcement actions indicated.
3	Baytank (Houston) Inc. 12211 Port Rd. WHSE Seabrook, TX 77586	Subject to corrective action	1 violation and 4 enforcement actions indicated.

Registered Storage Tank Sites

The Registered Storage Tank database was searched for sites located within a 0.25-mile radius of this alternative and three registered storage tank sites were found.

Map ID	Site Name/Address	Tank Information	Status/Comments
3	Baytank (Houston) Inc. 12211 Port Rd. WHSE Seabrook, TX 77586	3 ASTs on site	No details available.
4	American Hoechst Corporation 12212 Port Rd. Pasadena, TX 77507	3 USTs on site	Status unknown.
5	Red's Fast Stop 4829 Todville Rd. Pasadena, TX 77586	1 UST on site	Currently in use.

ERNS Sites

The ERNS database was searched for sites located within a 0.25-mile radius of this alternative and 51 ERNS sites were reported at four facilities.

Eighteen of the spill sites were reported to be located at the FINA Oil & Chemical Company (Map ID No. 4) located at 12212 Port Road; 15 of the spill sites were reported to be located at Baytank Houston, Inc. (Map ID No. 3) located at 12211 Port Road; 12 of the spill sites were reported to be located at Celanese, LTD (Map ID No. 2) located at 11807 Port Road, and the remaining six spill sites were reported to be located at Petro United (Map ID No. 1) located at 11666 Port Road.

The largest spill reported resulted in the release of 7,000 gallons of N-Butyl Acetate into water. Another significant spill involved the release of 300 gallons of benzene into Bayport Ship Channel. It was reported that booms were deployed. The remaining incidents involved such compounds as methylacrylate, hexane, ethylene, ethylene glycol, vinyl acetate, acetic acid, methyl alcohol, propanol, benzene, sulfuric acid, polyether polyols, hydraulic oil, or other various hazardous waste chemicals being released. Information from the database indicated that more than half of the releases occurred on land. In the majority of the reported spill incidents, a spill response team was contacted to contain the material.

NPDES Sites

The NPDES database was searched for sites located within a 0.25-mile radius of this alternative and two NPDES sites were found.

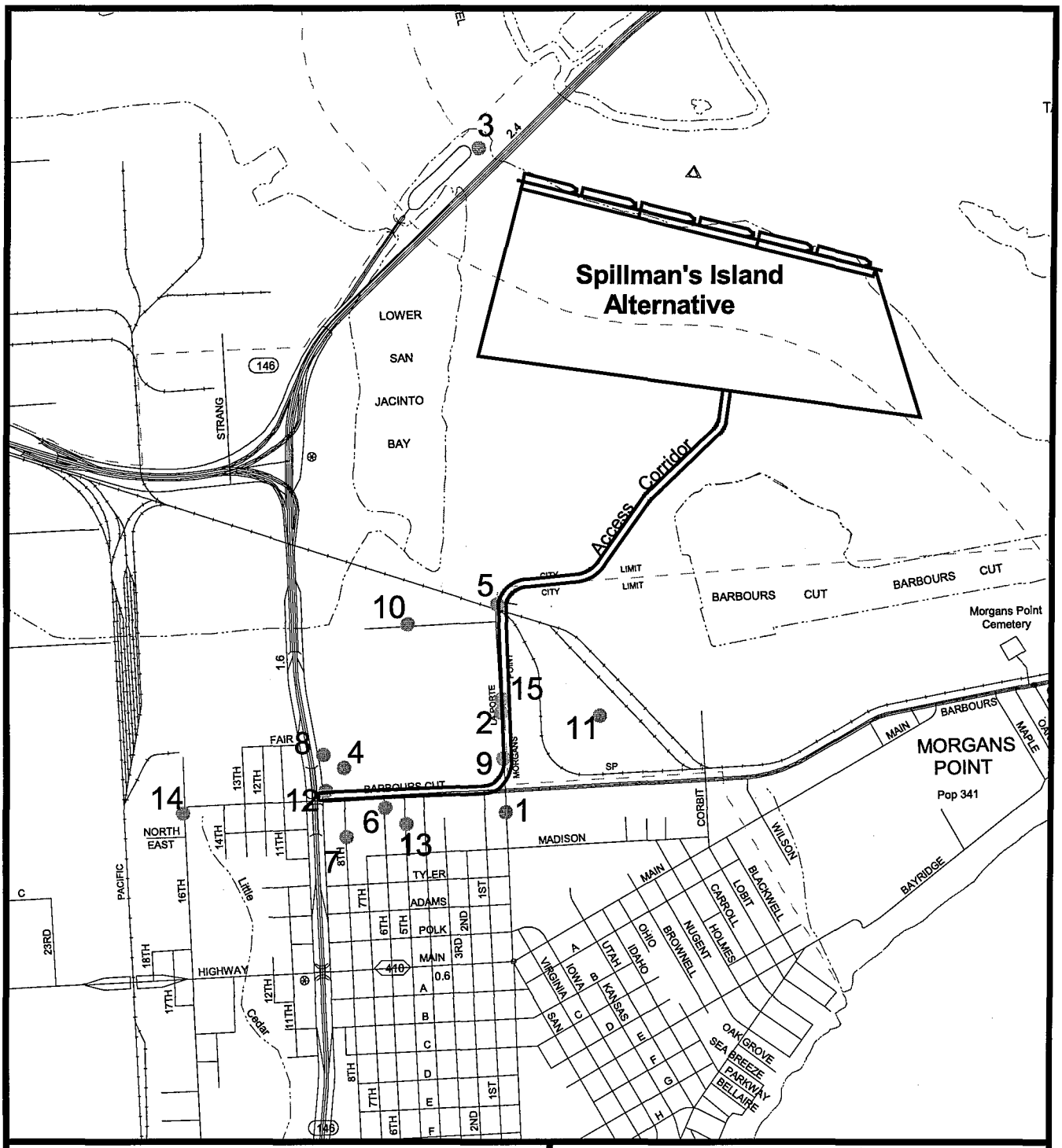
Map ID	Site Name/Address	Action	Status/Comments
1	FaciPetroUnited, Inc. Seabrook, Texas	Issue Date: 5-10-1996 Expire Date: 5-31-2001	Minor. Receiving waters-Segment 2438 Bayport Channel. TX0075302
2	Bayport Marine Terminal 11807 Port Road Seabrook, Texas 77586	Issue Date: 5-10-1988 Expire Date: 5-10-1993	Minor. No additional information available. TX0091235

3.9.4 Spillman's Island

According to the regulatory agency database report, 36 listings are identified at 14 sites within the Spillman's Island search area. Figure 3.9.4-1 depicts the locations of the hazardous material sites identified. Several sites are registered within multiple databases or with multiple listings in the same database. On the basis of the results of the regulatory database search and the site reconnaissance, the following sites are located within the search area:

- three CERCLIS sites;
- nine FINDS sites;
- two TRIS site;
- one SWF site;
- six RCRA GEN sites;
- eight registered storage tank sites;
- four LUST sites;
- one NPDES site;
- one facility with two reported emergency response actions.

No NPL, State Superfund, RCRA-TSD, or RCRA CORRACT sites were located within the specified search radius. The following provides a summary of the results of the regulatory agency database information search.



Hazardous Material Site

N W E S

2500 0 2500 Feet

SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.9.4-1
Hazardous Material Site location Map
Spillman's Island Study Area

Prepared for: USACE	
Job No.: 440622.00	Scale: 1" = 2500'
Prepared by: A. Pugh	Date: November 27, 2001
File: N:440622\arcview\tx83sc\hazmat\shoal_pt_hazmat.apr	

CERCLIS Sites

The CERCLIS database was searched for facilities located within a 0.5-mile radius of this alternative and three CERCLIS sites were found.

Map ID	Site Name/Address	Action	Status/Comments
1	C & R Chartering Company, Inc. 602 N. Broadway La Porte, Texas 77571 TXD038840708	Discovery 09-11-1985, Preliminary Assessment 02-01-1986	EPA issued no further remedial action planned.
2	Harris County Landfill 900 North Broadway La Porte, Texas 77571 TXD980514855	Discovery 11-01-1979, Preliminary Assessment 01-01-1980	EPA issued no further remedial action planned.
3	Highway 146 (Baytown Tunnel) Hwy. 146 La Porte, Texas 77571 TXD980749642	Discovery 03-01-1981, Preliminary Assessment 11-01-1986	EPA issued no further remedial action planned.

FINDS Sites

The FINDS listing was searched for sites located within a 0.25-mile radius of this alternative and nine FINDS sites were found.

Map ID	Site Name/Address	Regulatory Database	Status/Comments
1	C&R Chartering Service, Inc. 602 N Broadway La Porte, Texas 77571	CERCLIS ID No. TXD038840708	No details available.
2	Harris County Landfill 900 N Broadway La Porte, Texas 77571	CERCLIS ID No. TXD980514855	No details available.
3	Baytown Tunnel HWY 146 La Porte, Texas 77571	CERCLIS ID No. TXD980749642	No details available.
5	Tenneco Oil, Co. End of N Broadway Morgan's Point, Texas 77571	ID No. TXD987972833	No details available.
5	EGP Fuels 1200 N Broadway La Porte, Texas 77571	RCRIS ID No. TXD008084238	No details available.
6	Jack B Kelly, Inc. 615 N 6th Street La Porte, Texas 77571	RCRIS ID No. TXD981592660	No details available.
7	Bath Electrical Systems, Inc. 519 N 8th St. La Porte, Texas 77571	RCRIS ID No. TXD000719088	No details available.

Map ID	Site Name/Address	Regulatory Database	Status/Comments
8	Specialized Tank Services 910 HWY 146 N La Porte, Texas 77572	RCRIS ID No. TXD987989977	No details available.
9	Tank Container Services, Inc. 801 N Broadway La Porte, Texas 77571	RCRIS ID No. TXD982550899	No details available.

TRIS Site

The TRIS listing was searched for sites located within a 0.25-mile radius of this alternative and two TRIS sites were reported at one facility.

Map ID	Site Name/Address	Regulatory Database	Status/Comments
5	EGP Fuels Co. 1200 N Broadway La Porte, Texas 77571	TRIS ID No. 77572GPFLS1200N	No details available.
5	EGP Fuels Co. 1200 N Broadway La Porte, Texas 77571	TRIS ID No. TXD008084238	No details available.

Solid Waste Facilities

The TNRCC SWF database was searched for sites located within a 0.5-mile radius of this alternative and, although no SWF sites were reported, the Harris County Landfill (Map ID No. 2), located at 900 North Broadway, is a closed solid waste landfill. The site is reported to be a CERCLIS site. The post-closure maintenance report has been completed and filed with the TNRCC. There are no records of outstanding environmental issues concerning contaminant migration at the facility. The EPA has determined that no further remedial action is planned at the site.

RCRA GEN Sites

The RCRA GEN database was searched for sites located within a 0.25-mile radius of this alternative and six RCRA GEN sites were found.

Map ID	Site Name/Address	Classification	Status/Comments
4	Dragon Industries 816 West Barbours Cut La Porte, Texas 77571	SQG	No violations or enforcement actions indicated.
5	EGP Fuels-Morgan's Pt Pl 1200 N Broadway La Porte, Texas 77571	LQG	6 violations 5 enforcement actions indicated.

Map ID	Site Name/Address	Classification	Status/Comments
6	Jack B Kelley, Inc. 615 N 6th Street La Porte, Texas 77571	SQG	No violations or enforcement actions indicated.
7	Semac Incorporated 519 N 8th Street La Porte, Texas 77571	SQG	No violations or enforcement actions indicated.
8	Specialized Tank Services 910 HWY 146 N La Porte, Texas 77572	SQG	No violations or enforcement actions indicated.
9	Tank Container Services, Inc. 801 N Broadway La Porte, Texas 77571	LQG	No violations or enforcement actions indicated.

Registered Storage Tank Sites

The Registered Storage Tank database was searched for sites located within a 0.25-mile radius of this alternative and eight registered storage tank sites were found.

Map ID	Site Name/Address	Tank Information	Status/Comments
6	Jack Kelley, Inc. 526 Barbours Cut Blvd. La Porte, Texas 77571	3 USTs on site	2 USTs removed from ground; 1 UST status unknown.
8	Refrigerated Container Service 910 HWY 146 N La Porte, Texas 77571	1 AST on site	1 AST - no details available.
10	Barbours Cut Auto Terminal, Inc. 400 N L La Porte, Texas 77571	3 USTs on site	3 USTs removed from ground.
11	Fairway Terminal Corp. 526 Barbours Cut Blvd. Morgan's Point, Texas 77571	1 UST on site 1 AST on site	1 UST removed from ground; 1 AST no details available.
12	KCI, Inc. 820 W Barbours Cut Blvd. La Porte, Texas 77571	5 USTs on site	5 USTs removed from ground.
12	Port Auto Truck Stop 904 W Barbours Cut Blvd. La Porte, Texas 77571	8 USTs on site	5 USTs removed from ground; 3 USTs currently in use.
13	La Porte ISD Maintenance Transportation 600 N 5th Street La Porte, Texas 77571	5 USTs on site	4 USTs currently in use; 1 UST removed from ground.
15	Morgan's Point Plant # 401 1000 N Broadway La Porte, Texas 77571	2 ASTs on site	2 ASTs no details available.

LUST Sites

The LUST database was searched for sites located within a 0.5-mile radius of this alternative and four LUST sites were found.

Map ID	Site Name/Address	LUST Information	Status/Comments
10	Barbours Cut Auto Terminal Yard 3 400 N L Street La Porte, Texas 77571	Soil contamination only	Final Concurrence Issued, Case closed; no USTs remain on site.
12	KCI, Inc. 820 W Barbours Cut Blvd. La Porte, Texas 77571	GW Impacted, no apparent threats or impacts to receptors	Final Concurrence Issued, Case closed, no USTs remain on site.
12	Port Auto Truck Stop 904 W Barbours Cut Blvd. La Porte, Texas 77571	No GW Impacted, no apparent threats or impacts to receptors	Status Unknown. Three USTs remain on site.
14	Barbours Cut 631 N. 16th Street La Porte, Texas 77572	Soil contamination only	Final Concurrence Issued, Case closed; no USTs remain on site.

ERNS Sites

The ERNS database was searched for sites located within a 0.25-mile radius of this alternative and two ERNS sites were reported. Both spill sites were reported at EGP Fuels (Map ID No. 5), 1200 North Broadway, in La Porte, Texas.

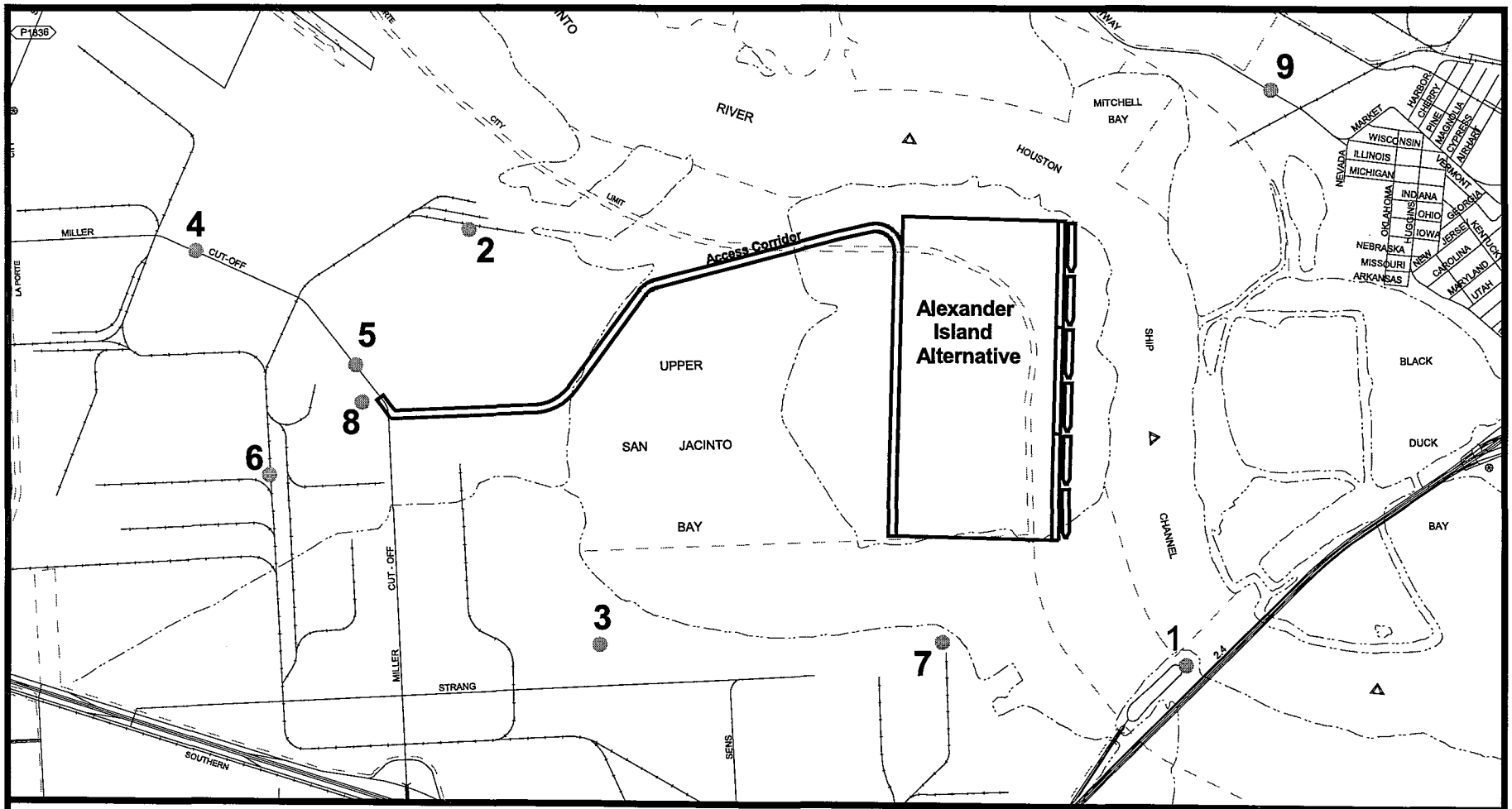
The largest spill reported resulted in the release of 100 gallons of flare seal water, a flammable liquid, into the water. The remaining incident involved 2 gallons of No. 2 fuel oil being released. Information from the database indicated that a spill response team had been contacted to contain and remove the released material.

NPDES Sites

The NPDES database was searched for sites located within a 0.25-mile radius of this alternative, and EPG Fuels (Map ID No. 5) is the only NPDES permit holder in the vicinity of the study area. The database indicated the NPDES permit (TX0106721) had expired on 11/09/97. The receiving water of the discharge is listed as Texas Water Quality Stream Segment 2436, Barbours Cut.

3.9.5 Alexander Island

According to the regulatory agency database report, 32 listings are identified at nine sites within the Alexander Island search area. Figure 3.9.5-1 depicts the locations of the hazardous material sites identified. Several sites are registered within multiple databases. On the basis of the results of the regulatory database search and the site reconnaissance, the following sites are located within the search area:



Hazardous Material Site

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SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.9.5-1

Hazardous Material Site Location Map Alexander Island Study Area

Prepared for: USACE	
Job No.: 440622	Scale: 1" = 3000'
Prepared by: A. Pugh	Date: November 27, 2001
File: N:\440622\acrview\tx83sc\hazmat\layouts	

- two CERCLIS sites;
- one State Superfund site;
- three FINDS sites;
- three TRIS sites;
- three RCRA TSD sites;
- two RCRA GEN sites;
- five RCRA CORRACT sites;
- one LUST site;
- one facility, which reported ten emergency response actions;
- two NPDES sites.

No NPL; SWF; or Registered AST, UST, or LUST sites were located within the specified search radius. The following provides a summary of the results of the regulatory agency database information search.

CERCLIS Sites

The CERCLIS database was searched for facilities located within a 0.5-mile radius of this alternative and two CERCLIS sites were found.

Map ID	Site Name/Address	Action	Status/Comments
1	Highway 146 (Baytown Tunnel) Hwy 146 La Porte, Texas 77571 TXD980749642	Discovery 03-01-1981, Preliminary Assessment 11-01-1986	Construction debris discovered on-site. EPA issued no further remedial action planned.
2	Houston Lighting and Power-Bertron Station 2012 Miller Cut Off Deer Park, Texas 77001 TXD000761833	Discovery 09-01-1989, Preliminary Assessment 08-06-1990	EPA issued no further remedial action planned.

State Superfund Sites

The State Superfund listing was searched for sites located within a 1-mile radius of this alternative and one State Superfund site was found. The State Superfund site, EPC Nitrogen-Benzene Transfer Station (Map ID No. 9) is reported to be located on Bayway Drive in Baytown, Texas. The facility is a pipeline system for benzene transfer. The facility was declared a Superfund site in 1997, and the current status has been rejected. The constituent of concern is TPH. Historic operations at the facility are reported to have impacted soil and groundwater.

FINDS Sites

The FINDS listing was searched for sites located within a 0.25-mile radius of this alternative and three FINDS sites were found.

Map ID	Site Name/Address	Regulatory Database	Status/Comments
8	Amoco Chemical Co. 1515 Miller Cut Off Rd. Deer Park, Texas 77536	RCRIS ID No. TXD987999562	No details available.
8	Quantum Chemical Corp. 1515 Miller Cut Off Rd. Deer Park, Texas 77536	RCRIS ID No. TXD058276130	No details available.
8	US Industrial Chemical Div. of 1515 Miller Cut Off Rd. Deer Park, Texas 77536	CERCLIS ID No. TXD980696959	No details available.

TRIS Site

The TRIS listing was searched for sites located within a 0.25-mile radius of this alternative and three TRIS sites were found.

Map ID	Site Name/Address	Regulatory Database	Status/Comments
3	Millennium Petrochemical, Inc. 1515 Miller Cut Off Rd. La Porte, Texas 77571	RCRIS ID No. TXD058276130	No details available.
8	Amoco Chemical Co. 1515 Miller Cut Off Rd. Deer Park, Texas 77536	RCRIS ID No. TXD987999562	No details available.
8	BP Amoco Chemical Co. 1515 Miller Cut Off Rd. Deer Park, Texas 77536	TRIS ID No. 77536QNTMC1515M	No details available.

RCRA TSD Sites

The RCRA-TSD listing was searched for sites located within a 0.5-mile radius of this alternative and three RCRA-TSD sites were found.

Map ID	Site Name/Address	Regulatory ID No.	Status/Comments
2	Reliant Energy, Inc. Miller Cut Off Rd. Deer Park, Texas 77536	TXD000761833	No violations or enforcement actions indicated.
3	La Porte Plant 11603 Strange Rd. La Porte, Texas 77571	TXD058276130	26 violations and 10 enforcement actions indicated.
4	The Geon Co. 2400 Miller Cut Off Rd. La Porte, Texas 77571	TXD070133319	23 violations and 13 enforcement actions indicated.

RCRA GEN Sites

The RCRA GEN database was searched for sites located within a 0.25-mile radius of this alternative and two RCRA GEN sites were found.

Map ID	Site Name/Address	Classification	Status/Comments
3	Millennium Petrochemicals, Inc. 11603 Strange Rd. La Porte, Texas 77571	LQG	No details available.
8	BP Amoco Chemical Co. 1515 Miller Cut Off Rd. Deer Park, Texas 77536	LQG	No violations or enforcement actions indicated.

RCRA CORRACT Sites

The RCRA CORRACT database was searched for sites located within a 1-mile radius of this alternative and five RCRA CORRACT sites were found.

Map ID	Site Name/Address	Action	Status/Comments
3	La Porte Plant 11603 Strange Rd. La Porte, Texas 77571	Subject to corrective action	26 violations and 10 enforcement actions indicated.
4	The Geon Co. 2400 Miller Cut Off Rd. La Porte, Texas 77571	Subject to corrective action	23 violations and 13 enforcement actions indicated.
5	Reliant Energy, Inc. Miller Cut Off Rd. La Porte, Texas 77571	Subject to corrective action	No violations or enforcement actions indicated.
6	Dow Chemical Hwy 134 E .5 M N of Hwy 225 La Porte, Texas 77571	Subject to corrective action	21 violations and 9 enforcement actions indicated.
7	E I Dupont De Nemours 11701 Strange Rd. La Porte, Texas 77571	Subject to corrective action	28 violations and 9 enforcement actions indicated.

LUST Sites

The LUST database was searched for sites located within a 0.5-mile radius of this alternative and one LUST site was found. The Geon Company facility (Map ID No. 4) reported a leak in an underground storage tank system on September 22, 1994. The release resulted in no groundwater impact. The TNRCC issued a final concurrence, and the case is closed.

ERNS Sites

The ERNS database was searched for sites located within a 0.25-mile radius of this alternative and ten ERNS sites were reported. The spill sites occurred at the Quantum Chemical Corporation (Map ID No. 8) located at 1515 Miller Cutoff Road.

The incidents involved the release of gasoline, chlorine gas, kerosene, hazardous waste, sulfuric acid, and PCB material. Information from the database indicated that most releases occurred on land. In the majority of the reported spill incidents, the released material was contained and the spill site remediated.

NPDES Sites

The NPDES database was searched for sites located within a 0.25-mile radius of this alternative and two NPDES sites were found.

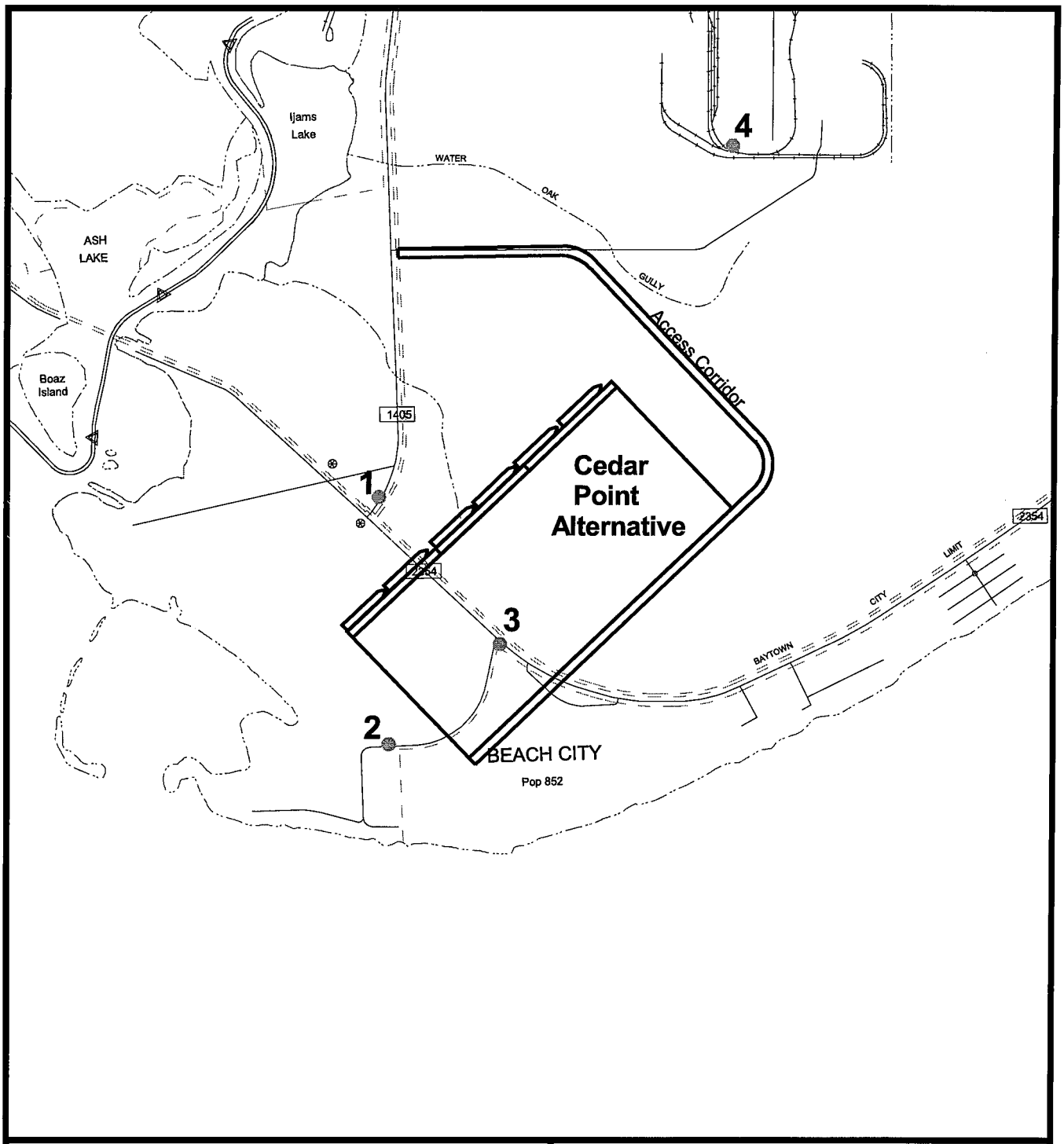
Map ID	Site Name/Address	Action	Status/Comments
3	Equistar Chemicals/Millenium 11603 Strang Road Deer Park, Texas 77536	Issue Date: 12-9-1994 Expire Date: 1-31-2000	Major. Receiving waters-Segment 2427. Mail Contact-Quantum Chemical. TX0002836
4	Oxy Vinyls, L.P. BF Goodrich 2400 Miller Cut-Off Road La Porte, Texas	Issue Date: 6-14-1986 Expire Date: 7-01-2000	Major. Receiving waters-Segment 1005. Mail Contact-Geon Company. TX0070416

3.9.6 Cedar Point

According to the regulatory agency database report, four listings are identified at three sites within the Cedar Point search area. One unregistered UST facility (Map ID No. 3) was identified within the search area during the site reconnaissance. Figure 3.9.6-1 depicts the locations of the hazardous material sites identified. On the basis of the results of the regulatory database search and the site reconnaissance, the following sites are located within the search area:

- one FINDS site;
- one RCRA TSD site;
- one RCRA CORRACT site;
- one SWF site;
- one unregistered storage tank facility.

No NPL; CERCLIS; State Superfund; ERNS; TRIS; RCRA GEN; Registered USTs, ASTs, or LUSTs; or NPDES sites were identified within the study area. However, one unregistered UST facility was identified within the study area during the site reconnaissance. The following provides a summary of the results of the regulatory agency database information search.



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Hazardous Material Site

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SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.9.6-1

Hazardous Material Site Location Map Cedar Point Study Area

Prepared for: USACE	
Job No.: 440622.00	Scale: 1'=2500'
Prepared by: A. Pugh	Date: November 27, 2001
File: N:440622\arcview\tx83sc\hazmat\shoal_pt_hazmat.apr	

FINDS Sites

The FINDS listing was searched for sites located within a 0.25-mile radius of this alternative and one FINDS sites was found. A Texas Crude, Inc. facility (Map ID No.2) is located 0.24 mile southwest of the subject property at 5513 Cedar Point Road. The facility has an EPA ID No. of TXD987968542. No information was available from the database concerning the nature of the regulatory concerns of the facility.

RCRA TSD Sites

The RCRA-TSD listing was searched for sites located within a 0.5-mile radius of this alternative and one RCRA-TSD site was found. United States Steel Corporation (USX) (Map ID No.4) is located 0.45 mile northeast of the subject property along FM 1405. The facility has an EPA ID No. of TXD047467113. The database lists the dates of several violations and enforcement actions (1987-1998) and indicates that the facility is subject to corrective action.

Solid Waste Facilities

The TNRCC SWF database was searched for sites located within a 0.5-mile radius of this alternative and one SWF site was found. Waste Management-Baytown Landfill facility (Map ID No.1) is located 0.3 mile from the subject property at 4791 Tri-City Beach Road. No information was available from the regulatory agency database review. According to quarterly groundwater monitoring reports reviewed at the TNRCC, no detectable concentrations of contaminants were detected in groundwater beneath this active landfill facility.

RCRA CORRACT Sites

The RCRA CORRACT database was searched for sites located within a 1-mile radius of this alternative and one RCRA CORRACT site was found. United States Steel Corporation (USX) (Map ID No.4) is located 0.45 mile northeast of the subject property along FM 1405. The facility has an EPA ID No. of TXD047467113. The database reported a Compliance Order dated December 1989, which may have instigated the corrective action. No other information was available from the database.

Registered Storage Tank Sites

The Registered Storage Tank database was searched for sites located within a 0.25-mile radius of this alternative and no registered storage tank sites were found. However, an unregistered UST site (Map ID No. 3) is located at the intersection of FM 2354 and Cedar Point Road at 6100 Tri City Beach Road. This facility is currently operated as a grocery/convenience store, but appeared to have previously operated USTs.

3.10 SURFACE WATER QUALITY AND HYDROLOGY

This section includes a general discussion of Galveston Bay monitoring data and addresses general water quality and quantity information. Existing surface water monitoring data and

other descriptive information regarding surface water conditions at each alternative site are presented in the following subsections.

3.10.1 General Conditions

A centralized data clearinghouse was established in 1998 to provide a single site for public access to Galveston Bay monitoring data. The H-GAC serves as custodian for the Data and Mapping Resource section, with oversight from the Galveston Bay Estuary Program (GBEP) (formerly the Galveston Bay National Estuary Program, or GBNEP) and the Galveston Bay Monitoring Subcommittee. Data are available in segment sub-regions, based on hydrographic segmentation developed in 1992 to help address spatial variation in the Galveston Bay system. Additionally, a Data and Information Management System (DIMS) is being developed for Galveston Bay. Data records extend back 25 years for most parameters and back to the 1950s for the more conventional parameters. Several recent studies have summarized trends in water and sediment quality for the Galveston Bay area. General water quality trends (GBEP, 2001a) include:

- Salinity has declined over the period of record
- Summer temperatures have risen slightly
- Dissolved oxygen has increased
- Ammonia-nitrogen and total phosphorus have declined
- Chlorophyll-a has declined over the last 25 years to less than 25 percent of its 1975 value
- Fecal coliform bacteria levels have declined over some portions of the bay
- Lower Galveston Bay is listed on the 2000 303(d) list for copper in water and pathogens in oyster tissue
- The Texas City Channel is listed for dissolved oxygen
- Upper Galveston Bay and the Houston Ship Channel are on the 303(d) list based on seafood consumption advisories for catfish and blue crabs from the Texas Department of Health (TDH).

TSS values in the Galveston Bay system are generally higher near points of inflow such as the Trinity or San Jacinto rivers, and lower toward the open-bay system (Ward and Armstrong, 1992). Background TSS data compiled by TNRCC and discussed for each alternative site show TSS values generally below 100 mg/L.

Dredging activities affect TSS in the water column as sediments are disturbed by mechanical dredging and water from hydraulic dredging re-enters the bay. Dredged sediments suspended in the water column will vary in quality, depending on the location of dredging. Metals and some organic materials are often associated with the added TSS.

Galveston Bay sediments are a mixture of fine sands along with clays and silts. The highest proportion of fine and organic sediments tends to be in the navigation channels where slower water velocities and less turbulence promotes settling. General sediment quality trends (GBEP, 2001a) include:

- Metals and conventional organics generally follow a spatial trend of elevated concentrations near regions of runoff, inflow and waste discharges. Lower, more uniform concentrations exist in the open bay.
- The Houston Ship Channel generally has the highest sediment concentrations of most parameters in the Galveston Bay system because it receives the greatest volumes of runoff and wastewater discharges.

3.10.2 Shoal Point Alternative

The project site for the applicant's proposed alternative is on the northern end of Shoal Point (formerly known as Snake Island), a confined DMPA. The docks would front on the Texas City Channel. This channel is considered water quality segment 2437 and has designated uses of High Quality Aquatic Habitat and Non-Contact Recreation.

Table 3.10.2-1 summarizes available water quality data in segment 2437 along with the adjacent segment 2439. The salinity data in the Texas City Channel segment is slightly higher than the lower Galveston Bay segment, and dissolved oxygen is slightly lower. Based on the fecal coliform data available, both segments appear to meet contact recreation criteria.

The Texas City Channel has been used for navigation since the start of the twentieth century and has required periodic maintenance dredging. Since the mid 1960s when the current 40-foot project channel was completed, maintenance dredging has employed two primary placement locations. Material dredged from the lower end of the channel tends to be sandy and is pumped to the north side of the Texas City Dike where it maintains the beach that protects the dike from erosion. Material used for beach nourishment enters the bay directly, without any special confinement for settling. Material dredged from the middle section of the channel and into the harbor is placed in confined placement areas on Shoal Point. Water leaves the confined placement areas after most of the dredged material settles.

Dredging activity generally takes place on a 3-year cycle and involves approximately 2.4 mcy from the Channel, Turning Basin and Industrial Canal, with another 0.1 mcy contributed by private interests maintaining dock areas. Of this, an average of 1.2 mcy dredged from the channel between Bolivar Roads and station 20+000 (near the turn, at Navigation Markers 9 and 10) has historically been placed on the north side of the Texas City Dike as beach nourishment. A total of 1.3 mcy is placed in Shoal Point during each maintenance cycle, or an average of 0.43 mcy each year. Assuming that solids are transported in the dredged slurry at a concentration of 10 percent, every 3 years approximately 13 mcy of water is pumped with the dredged material. This substantial volume of water is returned to the bay or the Texas City Channel through overflow weirs located in the placement areas. If the sediment concentration were higher, the water volume would be less.

The effects of this periodic dredging activity include destruction of benthic habitat in the channel bottoms. At times, there could be localized areas of higher suspended solids concentrations near the overflow weirs of confined placement areas. Considerably higher TSS concentrations are produced in the areas on the north side of the Texas City Dike where dredged material is placed for beach nourishment. Also, construction of Beneficial Use sites would produce substantial turbidity increases.

TABLE 3.10.2-1
SUMMARY OF SURFACE WATER QUALITY DATA IN THE GENERAL AREA OF SHOAL POINT ALTERNATIVE

Parameter	Storet code	Unit	Number of data [1]	Mean [2]	Standard deviation [3]	Maximum	Minimum	Data period	
								Start	End
Segment 2437, Texas City Ship Channel									
Dissolved oxygen (Criterion is 4 mg/L) [4]	00300	mg/L	171	6.77	1.65	12.30	2.00	11/17/92	05/16/00
Salinity	00480	ppt	171	22.47	5.38	37.60	6.00	11/17/92	05/16/00
Total suspended solids	00530	mg/L	152	20.6	14.4	126.0	6.00	11/17/92	11/08/99
NH_3-N	00610	mg/L	13	0.20	0.18	0.63	< 0.01	11/17/92	01/13/99
NO_2-N + NO_3-N	00630	mg/L	5	0.62	1.16	2.70	0.10	01/13/99	01/13/99
Total phosphorus	00665	mg/L	13	0.16	0.10	0.40	0.02	11/17/92	01/13/99
Fecal coliform (Criterion is 200 cfu/dL) [4]	31616	cfu/dL [5]	149	18	0.42	2400	1	11/17/92	11/08/99
Segment 2439, Lower Galveston Bay									
Dissolved oxygen (Criterion is 4 mg/L) [4]	00300	mg/L	423	7.48	1.75	14.00	3.00	10/07/92	07/13/00
Salinity	00480	ppt	430	18.24	8.89	38.00	< 0.009	10/07/92	07/13/00
Total suspended solids	00530	mg/L	233	32.2	36.4	325.0	1.00	10/07/92	11/19/99
NH_3-N	00610	mg/L	72	0.16	0.34	2.18	< 0.01	10/07/92	10/21/99
NO_2-N + NO_3-N	00630	mg/L	32	0.07	0.06	0.22	< 0.01	02/09/93	10/21/99
Total phosphorus	00665	mg/L	44	0.13	0.06	0.30	0.04	10/07/92	01/13/99
Fecal coliform (Criterion for oyster waters is 14 cfu/dL) [4]	31616	cfu/dL [5]	230	33	0.69	24000	8	10/07/92	11/19/99

Source: Galveston Bay Information Network, 2001.

[1] Data collected at depth less than or equal to 0.3 m.

[2] Geometric mean for fecal coliform.

[3] Standard deviation of log data for fecal coliform.

[4] Ambient criteria exist for only dissolved oxygen and fecal coliform.

[5] Colony forming units per deciliter (equivalent to 100 mL).

One concern associated with dredging, including routine maintenance dredging that is part of the baseline condition and future project-related dredging, is that water transported with the dredged sediment and discharged must not result in exceedances of Texas Surface Water Quality Standards (TNRCC, 2000). To address this matter, elutriate tests are routinely performed on sediments prior to dredging. The elutriate test simulates the dredging process by mixing representative volumes of sediment to be dredged with water collected from the site. After a specified amount of agitation which simulates the dredging process, the solids are allowed to settle in a similar fashion to a confined placement area, and the concentration of parameters in the water is measured. These elutriate values represent a conservative estimate of concentrations expected in the water column during dredging and in the discharge from a DMPA. The elutriate test was originally developed in response to Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972, as discussed in the Ocean Dumping Manual (USEPA and USACE, 1991).

Table D-1 in Appendix D lists the elutriate test results for the Texas City Channel project since 1986, along with the current (TNRCC, 2000) water quality criteria. Based on a comparison of the criteria and observed levels, there has been no indication of water concentration data exceeding acceptable standards in the Texas City Channel area. New work sediments that might be dredged during construction would be less likely to exhibit contamination because they have not been exposed to anthropogenic influences. Sediment samples have been collected from new work areas and analyzed for contaminants, and the results (see Appendix D-4) confirm this anticipated absence of contamination.

In summary, the baseline condition includes routine dredging of maintenance material which temporarily destroys benthic habitat in the area being dredged. Localized areas of higher suspended solids may be produced at the overflow weirs from confined areas, and considerably higher levels are produced during placement on the north side of the Texas City Dike for beach nourishment. This has the effect of radically altering benthic habitat in the placement areas. While the effects of dredging can be dramatic at a particular place and time, the effects are localized and typically only exist for a period of a few weeks every 3 years. Recolonization of benthic areas disturbed in dredging and placement typically requires a number of months. Maintenance dredging that has been performed in the Texas City area for nearly 100 years has had minor negative impacts to water quality.

3.10.3 Pelican Island Alternative

The Pelican Island site is on the northeastern shore of the island. There are no perennial surface waters on the island that would be affected by this alternative. Waters adjacent to the site are part of Bolivar Roads. Tidal action exchanges this water with the Gulf on a daily basis. Accordingly, quality characteristics of this water are a mixture of Galveston Bay and Gulf of Mexico waters. The designated uses for segment 2439, Lower Galveston Bay, are Contact Recreation, High Quality Aquatic Life Use, and Oyster Habitat (TAC 307.10). Table 3.10.3-1 summarizes available surface water quality data in the general area of the site. As presented in the table, salinity at this site has a large range, but its average is close to half that of sea water. Although the TSS can be high, it averages only 32 mg/L. Also, the geometric mean fecal coliform level is well below the 200 colony forming unit per deciliter (cfu/dL) that is the criterion for contact recreation use.

TABLE 3.10.3-1
SUMMARY OF SURFACE WATER QUALITY DATA IN THE GENERAL AREA OF PELICAN ISLAND ALTERNATIVE

Parameter	Storet code	Unit	Number of data [1]	Mean [2]	Standard deviation [3]	Maximum	Minimum	Data period	
								Start	End
Segment 2439, Lower Galveston Bay									
Dissolved oxygen (Criterion is 4 mg/L) [4]	00300	mg/L	423	7.48	1.75	14.00	3.00	10/07/92	07/13/00
Salinity	00480	ppt	430	18.24	8.89	38.00	< 0.009	10/07/92	07/13/00
Total suspended solids	00530	mg/L	233	32.2	36.4	325.0	1.00	10/07/92	11/19/99
NH_3-N	00610	mg/L	72	0.16	0.34	2.18	< 0.01	10/07/92	10/21/99
NO_2-N + NO_3-N	00630	mg/L	32	0.07	0.06	0.22	< 0.01	02/09/93	10/21/99
Total phosphorus	00665	mg/L	44	0.13	0.06	0.30	0.04	10/07/92	01/13/99
Fecal coliform (Criterion for oyster waters is 14 cfu/dL) [4]	31616	cfu/dL [5]	230	33	0.69	24000	8	10/07/92	11/19/99

Source: Galveston Bay Information Network, 2001.

[1] Data collected at depth less than or equal to 0.3 m.

[2] Geometric mean for fecal coliform.

[3] Standard deviation of log data for fecal coliform.

[4] Ambient criteria exist for only dissolved oxygen and fecal coliform.

[5] Colony forming units per deciliter (equivalent to 100 mL).

3.10.4 Bayport Alternative

The Bayport site is on the southern shore of the inland portion of the Bayport Channel. There are no perennial surface waters that cross the site and would be affected by the alternative. Waters on the shore adjacent to the site are part of the Bayport Channel. Tidal action exchanges this water with the bay on a daily basis. Accordingly, quality characteristics of this water are typical of Galveston Bay. The designated uses for segment 2438, Bayport Channel, are Non-Contact Recreation and High Quality Aquatic Life Support (TAC 307.10). Table 3.10.4-1 summarizes water quality data in the area. There is a substantial amount of data in the upper Galveston Bay segment (Segment 2421), but limited data in the Bayport Channel. According to the data available, salinity, dissolved oxygen, TSS, and fecal coliform values in the two segments appear to be very similar.

Table D-2 in Appendix D lists the elutriate and water test results for maintenance dredging on the Bayport and Barbours Cut channel projects since 1992 along with the current (TNRCC, 2000) water quality criteria. Based on a comparison of the criteria and observed levels, there has been no indication of water concentration data exceeding acceptable standards in the sediments to be dredged from the Bayport Channel or Barbours Cut areas. One exception is an isolated case in 1992 in which the elutriate copper concentration exceeded the criterion by a small amount. New work sediments that might be dredged during construction would be less likely to exhibit contamination because they have not been exposed to anthropogenic influences.

3.10.5 Spillman's Island Alternative

The Spillman's Island site is on the northeastern shore of the island. There are no perennial surface waters on the island that would be affected by the alternative. Waters on the shore adjacent to the site are part of the Houston Ship Channel. Tidal action exchanges this water with the bay on a daily basis. Accordingly, quality characteristics of this water are a mixture of upper channel and Galveston Bay waters. The site is within water quality segment 1005, Houston Ship Channel/San Jacinto River Tidal. The designated uses for segment 1005 are Non-Contact Recreation and High Quality Aquatic Life Support (TAC 307.10). Table 3.10.5-1 summarizes water quality data in the area. In general, water quality at this site is quite good. Salinity averages about 11 parts per thousand (ppt), dissolved oxygen is near saturation, and the fecal coliform levels are well below the geometric mean criterion for contact recreation. The nitrate-N average concentration of 0.66 mg/L is slightly higher than Galveston Bay.

Tables D-3a and D-3b in Appendix D list the elutriate and water test results for sediments prior to routine maintenance dredging of the Houston Ship Channel from Red Fish Reef to Morgan's Point since 1989, along with the current (TNRCC, 2000) water quality criteria for each parameter. Based on a comparison of the criteria and observed concentrations, there has been no indication of water concentration data from the elutriate tests exceeding acceptable criteria in the Houston Ship Channel area. New work sediments that might be dredged during construction would be less likely to exhibit contamination because they have not been exposed to anthropogenic influences.

TABLE 3.10.4-1
SUMMARY OF SURFACE WATER QUALITY DATA IN THE GENERAL AREA OF BAYPORT ALTERNATIVE

Parameter	Storet code	Unit	Number of data [1]	Mean [2]	Standard deviation [3]	Maximum	Minimum	Data period	
								Start	End
Segment 2421, Upper Galveston Bay									
Dissolved oxygen (Criterion is 4 mg/L)[4]	00300	mg/L	199	8.11	1.82	14.29	3.00	10/07/92	07/12/00
Salinity	00480	ppt	199	12.65	6.40	24.60	0.80	10/07/92	07/12/00
Total suspended solids	00530	mg/L	70	19.7	12.0	72.0	3.00	10/07/92	11/29/99
NH_3-N	00610	mg/L	68	0.12	0.24	1.73	< 0.01	10/07/92	11/29/99
NO_2-N + NO_3-N	00630	mg/L	29	0.20	0.29	1.40	0.005	05/13/97	11/29/99
Total phosphorus	00665	mg/L	40	0.19	0.06	0.30	0.05	10/07/92	07/28/94
Fecal coliform (Criterion for oyster waters is 14 cfu/dL)[5]	31616	cfu/dL [5]	68	29	0.65	17000	< 10	10/07/92	10/18/99
Segment 2438, Bayport Channel									
Dissolved oxygen (Criterion is 4 mg/L)[5]	00300	mg/L	6	7.30	1.49	9.10	5.60	07/12/93	05/10/00
Salinity	00480	ppt	6	15.20	6.99	21.70	3.60	07/12/93	05/10/00
Total suspended solids	00530	mg/L	2	21.0	8.5	27.0	15.00	07/12/93	07/28/94
NH_3-N	00610	mg/L	2	0.04	0.00	0.04	0.04	07/12/93	07/28/94
Total phosphorus	00665	mg/L	2	0.26	0.06	0.30	0.22	07/12/93	07/28/94
Fecal coliform (Criterion is 200 cfu/dL)[5]	31616	cfu/dL [5]	2	30	0.67	90	< 10	07/12/93	07/28/94

Source: Galveston Bay Information Network, 2001.

[1] Data collected at depth less than or equal to 0.3 m.

[2] Geometric mean for fecal coliform.

[3] Standard deviation of log data for fecal coliform.

[4] Ambient criteria exist for only dissolved oxygen and fecal coliform.

[5] Colony forming units per deciliter (equivalent to 100 mL).

Note: No NO_2-N + NO_3-N data available for Segment 2438.

TABLE 3.10.5-1
SUMMARY OF SURFACE WATER QUALITY DATA IN THE GENERAL AREA OF SPILLMAN ISLAND ALTERNATIVE

Parameter	Storet code	Unit	Number of data [1]	Mean [2]	Standard deviation [3]	Maximum	Minimum	Data period	
								Start	End
Segment 1005, Houston Ship Channel/San Jacinto River Tidal									
Dissolved oxygen (Criterion is 4 mg/L)[4]	00300	mg/L	176	6.84	1.50	11.80	3.70	01/12/93	04/17/01
Salinity	00480	ppt	158	10.81	5.75	23.00	< 1	01/12/93	04/17/01
Total suspended solids	00530	mg/L	154	21.7	12.9	84.0	4.00	01/12/93	04/09/01
NH_3-N	00610	mg/L	156	0.17	0.18	0.80	< 0.01	01/12/93	04/09/01
NO_2-N + NO_3-N	00630	mg/L	50	0.66	0.38	1.67	0.07	01/12/93	07/14/98
Total phosphorus	00665	mg/L	71	0.28	0.10	0.60	0.11	01/12/93	07/19/00
Fecal coliform (Criterion is 200 cfu/dL)[4]	31616	cfu/dL [5]	93	43	0.81	9100	< 1	01/12/93	04/09/01

Source: Galveston Bay Information Network, 2001.

[1] Data collected at depth less than or equal to 0.3 m.

[2] Geometric mean for fecal coliform.

[3] Standard deviation of log data for fecal coliform.

[4] Ambient criteria exist for only dissolved oxygen and fecal coliform.

[5] Colony forming units per deciliter (equivalent to 100 mL).

3.10.6 Alexander Island Alternative

The Alexander Island site is on the eastern shore of the island, fronting on the Houston Ship Channel and adjacent to San Jacinto Bay. There are no perennial surface waters on the island that would be affected by the alternative. Waters on the shore adjacent to the site are part of San Jacinto Bay. Tidal action exchanges this water with the bay on a daily basis. Accordingly, quality characteristics of this water are a mixture of upper channel and Galveston Bay waters. The site fronts on Segment 1005 and is adjacent to water quality segment 2427, San Jacinto Bay. The designated uses for segment 2427 are Contact Recreation and High Quality Aquatic Life Support (TAC 307.10). Table 3.10.6-1 summarizes water quality data for the area. Levels in San Jacinto Bay do not appear to be significantly different from Segment 1005 (see Table 3.10.6-1) or upper Galveston Bay Segment 2421 shown in Table 3.10.4-1.

Tables D-3a and D3b in Appendix D list the elutriate and water test results for sediments prior to routine maintenance dredging of the Houston Ship Channel from Red Fish Reef to Morgan's Point since 1989, along with the current (TNRCC, 2000) water quality criteria for each parameter. Based on a comparison of the criteria and observed levels, there has been no indication of water concentration data exceeding acceptable standards in the Houston Ship Channel area. New work sediments that might be dredged during construction would be less likely to exhibit contamination because they have not been exposed to anthropogenic influences.

3.10.7 Cedar Point Alternative

The Cedar Point site is on the southwestern shore of Cedar Point, below the mouth of Cedar Bayou, fronting on upper Galveston Bay. Although no apparent perennial surface waters on the island would be affected by the alternative, there are tidal wetlands on the site that would be affected. Waters on the shore adjacent to the site are part of upper Galveston Bay. Tidal action exchanges this water with the bay on a daily basis. Accordingly, quality characteristics of this water are a mixture of Cedar Bayou and Galveston Bay waters. The site is within water quality segment 2421, upper Galveston Bay. The designated uses for segment 2421 are Contact Recreation, High Quality Aquatic Life Support, and Oyster Habitat (TAC 307.10). Table 3.10.7-1 summarizes water quality data in the area. The Cedar Bayou Tidal segment 0901, located just upstream of the site, has parameters similar to upper Galveston Bay with the exception of fecal coliform, which is above the geometric mean for contact recreation.

Tables D-3a and D-3b in Appendix D list the elutriate and water test results for sediments prior to routine maintenance dredging of the Houston Ship Channel from Red Fish Reef to Morgan's Point since 1989, along with the current (TNRCC, 2000) water quality criteria for each parameter. Based on a comparison of the criteria and observed levels, there has been no indication of water concentration data exceeding acceptable standards in the Houston Ship Channel area. New work sediments that might be dredged during construction would be less likely to exhibit contamination because they have not been exposed to anthropogenic influences.

TABLE 3.10.6-1
SUMMARY OF SURFACE WATER QUALITY DATA IN THE GENERAL AREA OF ALEXAMDER ISLAND ALTERNATIVE

Parameter	Storet code	Unit	Number of data [1]	Mean [2]	Standard deviation [3]	Maximum	Minimum	Data period	
								Start	End
Segment 1005, Houston Ship Channel/San Jacinto River Tidal									
Dissolved oxygen (Criterion is 4 mg/L)[4]	00300	mg/L	176	6.84	1.50	11.80	3.70	01/12/93	04/17/01
Salinity	00480	ppt	158	10.81	5.75	23.00	< 1	01/12/93	04/17/01
Total suspended solids	00530	mg/L	154	21.7	12.9	84.0	4.00	01/12/93	04/09/01
NH_3-N	00610	mg/L	156	0.17	0.18	0.80	< 0.01	01/12/93	04/09/01
NO_2-N + NO_3-N	00630	mg/L	50	0.66	0.38	1.67	0.07	01/12/93	07/14/98
Total phosphorus	00665	mg/L	71	0.28	0.10	0.60	0.11	01/12/93	07/19/00
Fecal coliform (Criterion is 200 cfu/dL)[4]	31616	cfu/dL [5]	93	43	0.81	9100	< 1	01/12/93	04/09/01
Segment 2427, San Jacinto Bay									
Dissolved oxygen (Criterion is 4 mg/L)[4]	00300	mg/L	17	7.17	1.49	8.90	3.70	10/06/92	07/19/00
Salinity	00480	ppt	17	11.74	6.33	20.30	2.00	10/06/92	07/19/00
Total suspended solids	00530	mg/L	8	15.4	8.9	32.0	6.00	10/06/92	07/21/94
NH_3-N	00610	mg/L	8	0.14	0.12	0.34	0.02	10/06/92	07/21/94
Total phosphorus	00665	mg/L	8	0.32	0.10	0.43	0.13	10/06/92	07/21/94
Fecal coliform (Criterion is 200 cfu/dL)[4]	31616	cfu/dL [5]	8	66	0.95	1800	< 10	10/06/92	01/25/95

Source: Galveston Bay Information Network, 2001.

[1] Data collected at depth less than or equal to 0.3 m.

[2] Geometric mean for fecal coliform.

[3] Standard deviation of log data for fecal coliform.

[4] Ambient criteria exist for only dissolved oxygen and fecal coliform.

[5] Colony forming units per deciliter (equivalent to 100 mL).

Note: No NO_2-N + NO_3-N data available for Segment 2427.

TABLE 3.10.7-1
SUMMARY OF SURFACE WATER QUALITY DATA IN THE GENERAL AREA OF CEDAR POINT ALTERNATIVE

Parameter	Storet code	Unit	Number of data [1]	Mean [2]	Standard deviation [3]	Maximum	Minimum	Data period	
								Start	End
Segment 0901, Cedar Bayou Tidal									
Dissolved oxygen (Criterion is 4 mg/L)[4]	00300	mg/L	41	7.84	1.99	12.89	4.14	02/17/93	06/07/01
Salinity	00480	ppt	41	9.19	5.86	24.30	0.81	02/17/93	06/07/01
Total suspended solids	00530	mg/L	29	42.9	31.4	147.0	7.00	02/17/93	11/01/00
NH_3-N	00610	mg/L	29	0.09	0.07	0.33	< 0.01	02/17/93	11/01/00
NO_2-N + NO_3-N	00630	mg/L	19	0.29	0.26	0.96	< 0.01	02/17/93	06/15/98
Total phosphorus	00665	mg/L	29	0.23	0.10	0.57	< 0.01	02/17/93	11/01/00
Fecal coliform (Criterion is 200 cfu/dL)[4]	31616	cfu/dL [4]	7	226	1.11	25000	< 10	02/17/93	05/17/95
Segment 2421, Upper Galveston Bay									
Dissolved oxygen (Criterion is 4 mg/L)[4]	00300	mg/L	199	8.11	1.82	14.29	3.00	10/07/92	07/12/00
Salinity	00480	ppt	199	12.65	6.40	24.60	0.80	10/07/92	07/12/00
Total suspended solids	00530	mg/L	70	19.7	12.0	72.0	3.00	10/07/92	11/29/99
NH_3-N	00610	mg/L	68	0.12	0.24	1.73	< 0.01	10/07/92	11/29/99
NO_2-N + NO_3-N	00630	mg/L	29	0.20	0.29	1.40	0.005	05/13/97	11/29/99
Total phosphorus	00665	mg/L	40	0.19	0.06	0.30	0.05	10/07/92	07/28/94
Fecal coliform (Criterion for oyster waters is 14 cfu/dL)[4]	31616	cfu/dL [5]	68	29	0.65	17000	< 10	10/07/92	10/18/99

Source: Galveston Bay Information Network, 2001.

[1] Data collected at depth less than or equal to 0.3 m.

[2] Geometric mean for fecal coliform.

[3] Standard deviation of log data for fecal coliform.

[4] Ambient criteria exist for only dissolved oxygen and fecal coliform.

[5] Colony forming units per deciliter (equivalent to 100 mL).

3.11 VEGETATION

The site descriptions and specific acreage values (presented in impacts section for each alternative) for the vegetation communities were determined by a combination of aerial photograph interpretation and data from NWI maps. These were groundtruthed during field visits by PBS&J staff and Charlie Belaire of Belaire Environmental, Inc. (BEI). More specific information regarding the vegetation of wetland plant communities at Shoal Point and Bayport alternatives was derived from wetland delineations at Shoal Point (PBS&J, 2001b) and Bayport (Berg-Oliver Associates, 1998; USACE, 2002).

The project study area is located within the Gulf Coast Prairies and Marshes Natural Region, which include the subregions Dunes/Barriers, Estuarine Zone, and Upland Prairies and Woods (Hatch et al., 1999; Diamond and Smeins, 1987). In Texas, this region extends from Baffin Bay (north of the Coastal Sand Plain) to the eastern border of the state. It is divided into the Coastal Marshes (approximately 495,000 acres) and the more inland Coastal Prairie (9 million acres). The Upper Coastal Prairie of Texas (approximately 21,000 square miles) is a narrow strip, approximately 50 miles wide, that borders the coastal marshes from Matagorda Bay to the Sabine River and corresponds to the wetter side of the Texas Coastal Prairie. Average annual rainfall increases from west to east and ranges from 30 to 50 inches per year. The region includes barrier islands on the coastline, estuarine marshes, remnant tallgrass prairies (most converted to agricultural and/or developed lands), oak parklands, and oak mottes. Forested wetlands and riparian woodlands occur in the river bottomlands.

The following classifications of plant communities are divided according to upland versus aquatic (including wetlands) habitats and further described in terms of woody (forest, woodland, shrubland) versus herbaceous (grassland, marsh) forms and in terms of salinity regimes (saline, brackish, freshwater). This method combines the hierarchy of the Cowardin system for wetlands and deepwater habitats (Cowardin et al., 1979) and the Texas Natural Heritage Program's (TNHP) Plant Community classification and Series Level descriptions (TNHP, 1993; Diamond et al., 1987) for uplands and wetlands. Table 3.11-1 summarizes the occurrence of these vegetation community types at each alternative site. See figures 3.11-1 through 3.11-6 for vegetation maps of each alternative site.

3.11.1 Upland Plant Communities

3.11.1.1 Upland and Nonwetland Riparian Woodlands and Forests

There are several communities of upland forest, including nonwetland riparian woodlands, in the Galveston Bay area. Series include the Coastal Live Oak-Sugarberry Series, Water Oak-Coastal Live Oak Series, Loblolly Pine-Oak Series, and Chinese tallow woodland. The Coastal Live Oak-Sugarberry Series (*Quercus virginiana-Celtis laevigata*), is essentially a maritime woodland or forest of the Upper Gulf Coast, which is found on the Chenier Plains (Chambers County) and as mottes on Bolivar Peninsula off east Galveston Bay. Associated species include yaupon (*Ilex vomitoria*), cedar elm (*Ulmus crassifolia*), and ash (*Fraxinus* spp.) intermixed with open patches of little bluestem (*Schizachyrium scoparium*) grasslands (Harcombe and Neaville, 1977; TNHP, 1993; Bezanson, 2001). The Water Oak-Coastal Live Oak Series (*Quercus nigra-Quercus virginiana*) is a mostly deciduous, riparian woodland of the floodplains and bayous in the Upper Coastal Prairie. Associated species include pecan (*Carya*

TABLE 3.11-1

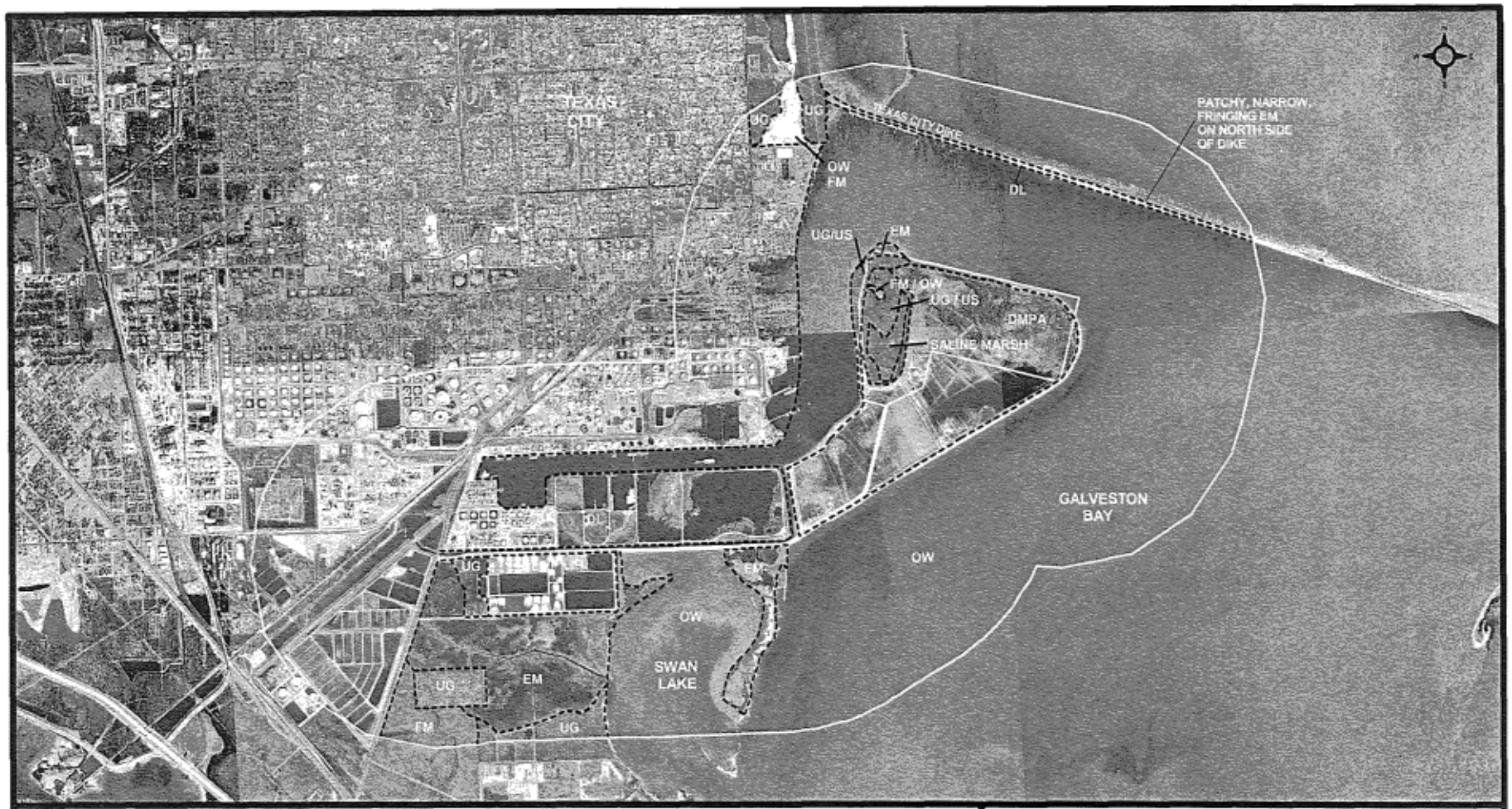
SUMMARY OF PLANT COMMUNITY TYPES AT ALTERNATIVE SITES

	HABITAT TYPES							
	Uplands			Wetlands[1]				
	Palustrine (freshwater)			Palustrine (freshwater)		Saline (includes brackish and intermediate)		
Alternative Site	Upland Woodlands and Forests	Upland Shrublands	Upland Grasslands	Wooded Wetlands	Freshwater Marshes	Salt/Brackish Marshes	Sand Flats/ Mud Flats/ Algal Flats	Seagrass Meadows
Shoal Point		✓	✓		✓[2]	✓	✓	
Pelican Island		✓	✓		✓	✓	✓	
Bayport	✓	✓	✓	✓	✓	✓		
Spillman's Island		✓	✓			✓		✓[3]
Alexander Island		✓	✓			✓		✓[3]
Cedar Point	✓	✓	✓	✓	✓	✓		✓[3]

[1] Includes both jurisdictional and nonjurisdictional (i.e., isolated) wetlands.

[2] Fresh to brackish fringe wetlands around ponds within active DMPA Cell C.

[3] No true seagrasses; potential for widgeongrass.



DL	Developed Lands (Industrial, Urban, High-density Residential)
DMPA	USACE Confined Dredged Material Placement Area
EM	Estuarine Marsh/Flats
FM	Freshwater Marsh/Flats
UG	Upland Grassland (incl. rangeland, pasture)
US	Upland Shrub/Scrub
UF	Upland Forest/Woodland
OW	Open Water

4500 0 4500 Feet

SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.11-1
Shoal Point
Vegetation Map

Prepared for:USACE	
Job No.:440622	Scale:1"=4500'
Prepared by:Tom Church	Date:8/26/02
File: N:\\440622\arcview\veg_aerials.apr (Aland-SHOAL_POINT layout)	

DL	Developed Lands (Industrial, Urban, High-density Residential)
DMPA	USACE Confined Dredged Material Placement Area
EM	Estuarine Marsh/Flats
FM	Freshwater Marsh/Flats
SSW	Freshwater Shrub/Scrub Wetland
UG	Upland Grassland (incl. rangeland, pasture)
US	Upland Shrub/Scrub
OW	Open Water

4000 0 4000 Feet

SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.11-2
Pelican Island
Vegetation Map

Prepared for:USACE	
Job No :440622	Scale:1"=4000'
Prepared by:Tom Church	Date:8/27/02
File: N:\\440622\arcview\veg_aerials.apr (Aport-PELICAN layout)	

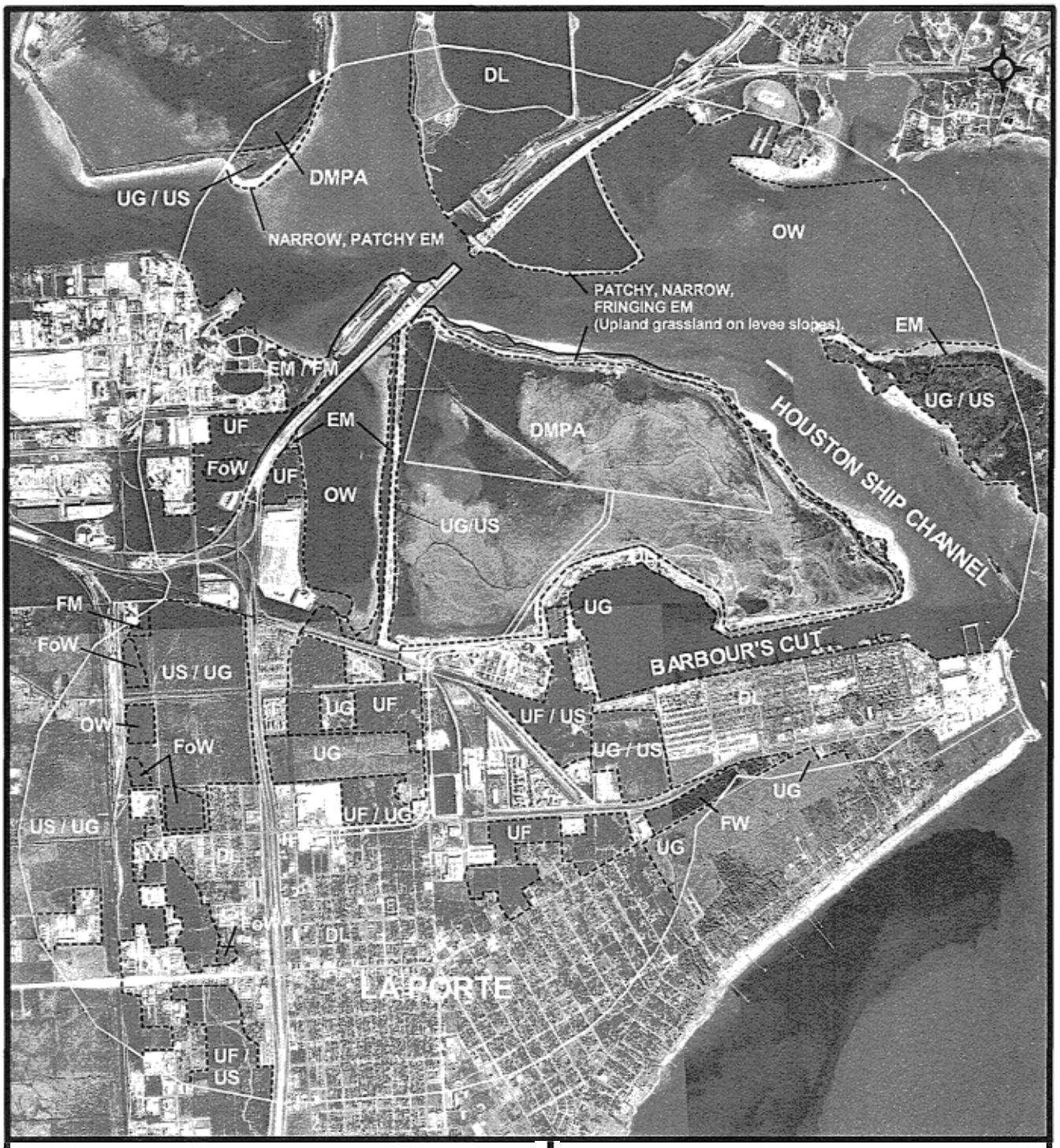
DL	Developed Lands (Industrial, Urban, High-density Residential)
EM	Estuarine Marsh/Flats
FM	Freshwater Marsh/Flats
SSW	Freshwater Shrub/Scrub Wetland
FoW	Freshwater Forested Wetland
UG	Upland Grassland (incl. rangeland, pasture)
US	Upland Shrub/Scrub
UF	Upland Forest/Woodland
OW	Open Water

3000 0 3000 Feet

SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.11-3
Bayport
Vegetation Map

Prepared for:USACE	
Job No.:440622	Scale:1"=3000'
Prepared by:Tom Church	Date:6/27/02
File: N:\\440622\arcview\veg_aerials.apr (Aland-BAYPORT layout)	



DL	Developed Lands (Industrial, Urban, High-density Residential)
DMPA	USACE Confined Dredged Material Placement Area
EM	Estuarine Marsh/Flats
FM	Freshwater Marsh/Flats
FoW	Freshwater Forested Wetland
UG	Upland Grassland (incl. rangeland, pasture)
US	Upland Shrub/Scrub
UF	Upland Forest/Woodland
OW	Open Water

3000 0 3000 Feet

SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.11-4
Spillman's Island
Vegetation Map

Prepared for: USACE	
Job No.: 440622	Scale: 1"=3000'
Prepared by: Tom Church	Date: 8/12/02
File: N:\\440622\arcview\veg_aerials.apr (Aport-SPILLMAN layout)	

DL	Developed Lands (Industrial, Urban, High-density Residential)
DMPA	USACE Confined Dredged Material Placement Area
EM	Estuarine Marsh/Flats
FM	Freshwater Marsh/Flats
FoW	Freshwater Forested Wetland
UG	Upland Grassland (incl. rangeland, pasture)
US	Upland Shrub/Scrub
UF	Upland Forest/Woodland
OW	Open Water

4000 0 4000 Feet

SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.11-5
Alexander Island
Vegetation Map

Prepared for:USACE	
Job No.:440622	Scale:1"=4000'
Prepared by:Tom Church	Date:8/27/02
File: N:\\440622\arcview\veg_aerials.apr (Aland-ALEXANDER layout)	

DL	Developed Lands (Industrial, Urban, High-density Residential)
EM	Estuarine Marsh/Flats
FM	Freshwater Marsh/Flats
SSW	Freshwater Shrub/Scrub Wetland
FoW	Freshwater Forested Wetland
UG	Upland Grassland (incl. rangeland, pasture)
US	Upland Shrub/Scrub
UF	Upland Forest/Woodland
OW	Open Water

3000 0 3000 Feet

SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.11-6
Cedar Point
Vegetation Map

Prepared for:USACE	
Job No.:440622	Scale:1"=3000'
Prepared by:Tom Church	Date:6/27/02
File: N:\\440622\arcview\veg_aerials.apr (Aport-Cedar_Point layout)	

illinoinensis), cedar elm, sugarberry, yaupon, hawthorns (*Crataegus* spp.), and deciduous holly (*Ilex decidua*) (TNHP, 1993). The Loblolly Pine-Oak Series (*Pinus taeda-Quercus* spp.) occurs in the Galveston Bay system along bayous (e.g., Pine Gully in eastern Galveston Bay south of Red Bluff and Double Bayou on western Trinity Bay). Oak species may include post oak (*Quercus stellata*), southern red oak (*Quercus falcata*), white oak (*Quercus alba*) and water oak. This community often occurs as second growth or after disturbance and is highly variable. Another woodland type has been created by the introduction of an exotic species, the Chinese tallow tree (*Sapium sebiferum*), which rapidly invades disturbed areas or abandoned agricultural fields. These woodlands are virtual monocultures of tallow trees, but include increasing numbers of native species including sugarberry, American elm (*Ulmus americana*), cedar elm, water oak, and ash (Bruce et al., 1995).

Coastal woodland and forest communities provide valuable nesting, resting, and foraging habitat for numerous resident, wintering, and neotropical migrant land-bird species, as well as for many terrestrial wildlife species. In addition, many species of wading birds, including egrets and herons may use woodlands and forests as rookery sites. Coastal woodland and forest communities also act to control erosion and buffer against tropical storms. Socioeconomic values of woodland and forest communities include timber, habitat for furbearing and game species, and consumptive and non-consumptive recreation (Moulton et al., 1997).

The upland and nonwetland riparian woodland and forest plant community type occurs on Bayport and Cedar Point, but not on the other alternative sites. Refer to Section 4.0 (Environmental Consequences) for site specific descriptions of this community type.

3.11.1.2 Upland Shrublands

Upland grasslands and disturbed areas (including abandoned agricultural lands) generally include some shrub species, such as eastern baccharis (*Baccharis halimifolia*), Hercules club (*Zanthoxylum clava-herculis*), wax myrtle (*Myrica cerifera*) and tree saplings of Chinese tallow, live oak, and sugarberry. Woody encroachment of grasslands and agricultural lands creates an upland shrubland dominated by the above species. This vegetation type is generally a successional community and quickly can become a tallow woodland if not maintained by clearing, mowing or burning.

Upland shrub communities provide valuable nesting, resting, and foraging habitat for numerous resident, wintering, and neotropical migrant land-bird species, as well as for many terrestrial wildlife species. In addition, woodland and forest communities also act to control erosion and buffer against tropical storms. Grasslands also provide valuable habitat for many species of game animals, including white-tailed deer (*Odocoileus virginianus*), mourning dove (*Zenaida macroura*), northern bobwhite (*Colinus virginiana*), and wild turkey (*Meleagris gallopavo*).

The upland shrubland plant community type occurs to some extent on all of the alternative sites. Refer to Section 4.0 (Environmental Consequences) for site-specific descriptions of this community type.

3.11.1.3 Upland Grasslands

The Coastal Prairie community for this area was historically a little bluestem-brownseed paspalum grassland (*Schizachyrium scoparium-Paspalum plicatulum*) (TNHP, 1993). Associated species included yellow Indiangrass (*Sorghastrum nutans*), tall dropseed (*Sporobolus asper*), bristlegrasses (*Setaria* spp.), big bluestem (*Andropogon gerardii*), hairyawn muhly (*Muhlenbergia capillaris*), fimbry (*Fimbristylis* spp.) and a variety of forbs. Less than 3 percent of the original coastal prairie community remains due to agricultural, urban, and industrial development as well as encroachment by exotic species, particularly the Chinese tallow tree. Currently, most nonagricultural upland grassland communities in the region are not classified as coastal prairie. In place of the historic species composition, most of the upland grasslands are now dominated by mixtures of forbs and pasture grasses, such as coastal bermudagrass (*Cynodon dactylon*), smutgrass (*Sporobolus indicus*), Johnsongrass (*Sorghum halepense*) and Texas wintergrass (*Stipa leucotricha*).

Upland grassland communities provide valuable nesting, resting, and foraging habitat for numerous resident, wintering, and neotropical migrant land-bird species, as well as for many terrestrial wildlife species. Grassland communities also provide valuable habitat for many species of game animals, including white-tailed deer, mourning dove, northern bobwhite, and wild turkey. In addition, grassland communities also provide forage for livestock species.

The upland grassland plant community type occurs to some extent on all of the alternative sites. Refer to Section 4.0 (Environmental Consequences) for site-specific descriptions of this community type.

3.11.2 Aquatic Plant Communities (Includes Wetlands)

This category includes both wetlands, which support emergent vegetation, and permanently inundated areas that support submerged vegetation. Data from several sources were used to compile the descriptions for the study area (White and Paine, 1992; Texas Parks and Wildlife Department (TPWD), 1999a). Coastal wetlands are distinctive areas between terrestrial and aquatic systems where the water table is at or near the surface or the land is covered by less than 2 meters of water. Coastal wetlands play an important part in sustaining the health and abundance of life within the ecosystem. The wetland and aquatic plant communities are described in this section; however, the role of wetlands in the functioning of the ecosystem is discussed in the following section (3.12). Aquatic plant communities provide valuable habitat (foraging, refuge, and nursery areas) for a variety of aquatic and terrestrial wildlife species. In addition, these communities act to filter excess nutrients and sediment from storm water runoff and stabilize shorelines by acting as wave buffers (GBF, 1998).

Swan Lake is a predominantly open-water system that occurs just south of the hurricane/ stormwater channel associated with the Shoal Point alternative. Once a shallow, intertidal embayment dominated by *Spartina alterniflora* marshes, Swan Lake was significantly altered by ground subsidence over the past 50 years to its current open-water condition. Currently, State and Federal Natural Resource Trustees are involved in efforts to restore a portion (approximately 95 acres) of the lake to its previous condition by adding material to raise the subsurface elevation and planting marsh species.

3.11.2.1 Forested Wetlands

Forested (or woody) wetland communities in the Galveston Bay area include the Bald Cypress-Water Tupelo Series, Bald Cypress-Sycamore Series, and the Black Mangrove Series (TNHP, 1993) as well as Coastal Flatwoods (Moulton and Jacobs, 2000). Forested wetlands occur in riparian areas, fringing the bayous, and in depressional areas in the surrounding uplands. The Bald Cypress-Water Tupelo Series (*Taxodium distichum-Nyssa aquatica*) is a deciduous swamp forest. Associated species depend on the depth and duration of flooding and past disturbance. Water tupelo is present in the deepest water or in cut-over swamp, and black gum (*Nyssa sylvatica* var. *biflora*), overcup oak (*Quercus lyrata*), water hickory (*Carya aquatica*), and ashes (*Fraxinus pennsylvanica and F. caroliniana*) occur in shallow or less frequently flooded areas (TNHP, 1993; White and Paine, 1992; Harcombe and Neaville, 1977). The Bald Cypress-Sycamore Series (*Taxodium distichum-Platanus occidentalis*) is a mainly deciduous forest that occurs along narrow floodplains and stream channels (TNHP, 1993). Galveston Bay is the northern limit of the Black Mangrove Series (*Avicennia germinans*) on the Texas coast. Small scattered patches along the water's edge are located along Bolivar Roads at Big Reef Park (Galveston Island) and on Mud Island in West Bay near San Luis Pass. It is intermixed with smooth cordgrass (*Spartina alterniflora*) and the Glasswort-Saltwort Series (*Salicornia* spp. – *Batis maritima*) (TNHP, 1993; Britton and Morton, 1989). Moulton and Jacobs (2000) describe a community called Coastal Flatwood wetlands. Galveston Bay is the western limit of these types of forests, which occur on poorly drained soils in interfluvial zones. Dominant species include a mix of hardwoods such as willow oak (*Quercus phellos*), sweetgum (*Liquidambar styraciflua*), dwarf palmetto (*Sabal palmetto*), Chinese tallow, and sometimes loblolly pine.

Forested wetland communities provide valuable nesting, resting, and foraging habitat for numerous resident, wintering, and neotropical migrant land-bird species, as well as for many aquatic and terrestrial wildlife species. In addition, many species of wading birds, including egrets and herons may use these areas as rookery sites. Forested wetland communities also filter excess nutrients and sediment from storm water runoff. Socioeconomic values include timber, habitat for furbearing and game species, and consumptive and non-consumptive recreation (Moulton et al., 1997).

The forested wetland plant community type occurs on the Bayport and Cedar Point alternative sites. Refer to Section 4.0 (Environmental Consequences) for site-specific descriptions of this community type.

3.11.2.2 Salt Prairie

Salt prairie is another term for the Gulf Cordgrass Series (*Spartina spartinae*), a transitional area including wetlands and nonwetlands (TNHP, 1993). Salinity also varies and species composition may include sedges (*Cyperus* spp., *Carex* spp.), switchgrass (*Panicum virgatum*), and bushy bluestem (*Andropogon glomeratus*). It generally occurs between the upland grasslands and the coastal marshes (Diamond and Smeins, 1984).

Salt prairies, like other grassland communities, provide valuable nesting, resting, and foraging habitat for numerous resident, wintering, and neotropical migrant land and water bird species, as

well as for many aquatic and terrestrial wildlife species. These communities may also provide valuable habitat for furbearing and game bird species, including rails and gallinules.

The salt prairie plant community type occurs on the Bayport and Cedar Point alternative sites. Refer to Section 4.0 (Environmental Consequences) for site-specific descriptions of this community type.

3.11.2.3 Low and High Salt Marshes (Including Vegetated Salt Flats)

The terms "Low" and "High" in reference to marshes indicates wetter (low) and drier (high) soil conditions in these plant communities. This generally correlates to slope position or relative elevation, i.e., the high salt marsh is upslope from the adjacent low salt marsh. These marshes include the Smooth Cordgrass Series, Saltgrass-Cordgrass Series, and the Glasswort-Saltwort Series (TNHP, 1993). The Smooth Cordgrass Series (*Spartina alterniflora*) is restricted to areas along the coast that are subject to daily tidal inundation. Associated species may include black rush (*Juncus romerianus*), saltgrass (*Distichlis spicata*), big cordgrass (*Spartina cynosuroides*) and marshhay cordgrass (*Spartina patens*). The Saltgrass-Cordgrass Series (*Distichlis spicata-Spartina* spp.) is a salt or brackish marsh community that forms along the Gulf Coast. It can form nearly pure stands, but smooth cordgrass, marshhay, *Paspalum* spp., *Sporobolus* spp., and lovegrass (*Eragrostis* sp.) may be present. The Glasswort-Saltwort Series (*Salicornia* spp.- *Batis maritima*) forms on alternately wet and dry saline soils, commonly on wind tidal flats along the Gulf Coast. Associated species include shoregrass (*Monanthochloe littoralis*), camphor daisy (*Machaeranthera phyllocephala*), bushy sea ox-eye (*Borrichia frutescens*), seepweed (*Suaeda* spp.), sea purslane (*Sesuvium portulacastrum*), and seashore dropseed (*Sporobolus virginicus*). Intermediate marshes include a combination of both communities, but generally lack the species that cannot tolerate dry conditions such as smooth cordgrass. These species often form landscape mosaics over broad areas.

Salt marsh communities provide valuable nesting, resting, and foraging habitat for numerous water bird species, as well as for many aquatic and terrestrial wildlife species. Numerous species of wading and shorebirds use these areas as foraging and nesting sites. Salt marsh communities also filter excess nutrients and sediment from storm water runoff, buffer inlands from storms, and provide for consumptive and non-consumptive recreation (Moulton et al., 1997).

The low and high salt marshes plant community type occurs on the Pelican Island, Shoal Point, Alexander Island, and Cedar Point alternatives. Refer to Section 4.0 (Environmental Consequences) for site-specific descriptions of this community type.

3.11.2.4 Low and High Brackish Marshes

Brackish marshes occur at somewhat higher elevations than the low salt marshes, where inundation is less frequent. The Marshhay Cordgrass Series (*Spartina patens*) includes both the low and high marshes, which depends on elevation and soil saturation. Marshhay cordgrass is generally dominant, but the bulrushes (*Scirpus* spp.) may dominate in wetter areas. Associated species include saltgrass, *Paspalum* spp., and Gulf cordgrass (TNHP, 1993).

Brackish marsh (estuarine) communities provide valuable nesting, resting, and foraging habitat for numerous water bird species, as well as for many aquatic and terrestrial wildlife species. Numerous species of wading and shorebirds use these areas as foraging and nesting sites. Brackish marshes provide valuable nursery areas for numerous organisms, including fish, shellfish, and invertebrates. Brackish marshes also filter excess nutrients and sediment from storm water runoff, buffer inlands from storms, and provide for consumptive and non-consumptive recreation (Moulton et al., 1997).

The low and high brackish marshes plant community type occurs on the Pelican Island, Shoal Point, Alexander Island and Cedar Point alternative sites. Refer to Section 4.0 (Environmental Consequences) for site-specific descriptions of this community type.

3.11.2.5 Low and High (Wet Prairies) Freshwater Marshes

Freshwater marshes generally occur at inland sites, but may occur in the estuary if rainfall or river flow is sufficient to prevent regular salt water intrusion. Common plants include rushes (*Juncus* spp.), sedges, cattails (*Typha* spp.), and common reed (*Phragmites australis*).

Freshwater marsh communities provide valuable nesting, resting, and foraging habitat for numerous water bird species, as well as for many aquatic and terrestrial wildlife species. Numerous species of wading and shorebirds use these areas as foraging and nesting sites. Freshwater marsh communities provide valuable nursery areas for numerous organisms, including birds, mammals, reptiles and amphibians, fish, and invertebrates. Freshwater marshes also filter excess nutrients and sediment from storm water runoff, buffer inlands from storms, and provide for consumptive and non-consumptive recreation (Moulton et al., 1997).

The low and high freshwater marshes plant community type occurs on the Shoal Point, Bayport, Alexander Island and Cedar Point alternatives. Refer to Section 4.0 (Environmental Consequences) for site-specific descriptions of this community type.

3.11.2.6 Sand Flats/Mud Flats/Algal Mats

The estuarine intertidal unconsolidated shore category includes coastal wetlands periodically flooded by tidal waters and with less than 30 percent areal coverage by vegetation. This category includes sandbars, mudflats, and other nonvegetated or sparsely vegetated habitats called salt flats. Sparse vegetation of salt flats may include glasswort, saltwort, and shoregrass. Wetlands consisting mostly of sand flats dominated by algal beds or blue-green algal mats and periodically flooded by astronomic or wind tides were also included in this category. These flats differ from less diverse, unvegetated areas that do not receive regular inundation (Galveston Bay Foundation (GBF), 1998).

These tidal flats serve as valuable foraging, resting, and nesting grounds for many gulls, terns, wading birds, shorebirds, fish, and invertebrates. Plankton and detritus collect on these areas at high tide and act as food sources for benthic communities including mollusks, shellfish, and invertebrates, which in turn act as a food source for wading birds and shorebirds.

The sand flats/mud flats/algal mats plant community type occurs on the Pelican Island, Shoal Point, Alexander Island and Cedar Point alternatives. Refer to Section 4.0 (Environmental Consequences) for site-specific descriptions of this community type.

3.11.2.7 Submerged Aquatic Vegetation/Seagrass Meadows

SAV, or submerged aquatic vegetation, includes all rooted, vascular plant species that grow in water but are not emergent (i.e., they do not grow above the water surface). This includes the true seagrasses which cannot tolerate extended freshwater conditions as well as the freshwater species. TPWD (1999a) lists five seagrass genera (*Halodule*, *Thalassia*, *Syringodium*, *Halophila*, and *Ruppia*) as occurring in Texas. He points out that widgeongrass (*Ruppia maritima*) is technically not a seagrass because it can also tolerate low salinity conditions, including fresh water (TPWD, 1999a). Widgeongrass appears in many areas of Galveston Bay. Unlike the true seagrasses which are perennial, widgeongrass is an annual species; thus, populations are generally more ephemeral and difficult to track from year-to-year (White and Paine, 1992). Five species of SAV are found within the Galveston Bay system, including widgeongrass and American wild celery (*Vallisneria americana*), which grow in brackish to freshwater areas, and the true seagrasses: shoalgrass (*Halodule wrightii*), turtlegrass (*Thalassia testudinum*) and stargrass (*Halophila engelmannii*). Widgeongrass and shoalgrass are the most common in the Galveston Bay system (TPWD, 1999a).

Only small remnants of true seagrass meadows (which excludes widgeongrass and American wild celery) continue to survive in the Galveston Bay system, primarily in Christmas Bay. However, recent restoration efforts to establish shoalgrass in West Bay, off Galveston Island, have been successful. According to the Seagrass Conservation Plan of Texas (TPWD, 1999a), the Galveston Bay system, including the secondary bays and inlets, has approximately 280 acres of seagrass coverage. There has been a drastic decline in the areal coverage of seagrass beds in the Galveston Bay System since the 1950s. These losses have been attributed to a combination of several phenomena (Pulich and White, 1991; Sheridan, 2001), including historical subsidence caused by groundwater withdrawal which not only increases water depth (decreasing available light), but intensifies shoreline erosion problems (thus increasing turbidity and further decreasing available light). Pulich and White (1991) also indicate that the construction of hard structures, such as bulkheads and riprap, to counter shoreline erosion decreased the amount of shoreline with the broad, shallow waters required by SAV. Also, storms, particularly Hurricane Carla in 1961, have destroyed seagrass meadows, which then became erosional areas due to the problems described above.

SAV communities generate high primary productivity and provide habitat (food, nursery ground, and refuge) for numerous organisms, including shrimp, fish, crabs and their prey. Animal abundances in SAV beds can be 2 to 25 times greater than in adjacent unvegetated areas (TPWD, 1999a). SAV beds also provide habitat for migratory waterfowl, sea turtles, and wading and diving birds (mergansers, loons, cormorants, pelicans).

There are no true seagrass beds associated with any of the alternative sites. However, occasional, ephemeral patches of widgeongrass occur in waters adjacent to the Alexander Island, Spillman's Island, and Cedar Point alternative sites. No widgeongrass was observed at the Bayport site

during field visits and it is not likely to occur in the Bayport Ship Channel. However, it may occur in the vicinity, especially north of the channel entrance (Pulich and White, 1991). Widgeongrass is also reported to occur in the pond outside of the leveed DMPA on Alexander Island (Glass, 2001a) and may occur in ponds at Cedar Point. No SAV of any kind was observed within the sites or in adjacent bay waters during the field visits.

3.11.2.8 Beaches/Sand Dunes

Beaches and sandbars, formed of unconsolidated materials (i.e., sands and/or mud), are unvegetated or sparsely vegetated due to extreme physical conditions (e.g., wave and wind action, high salinity, and soil conditions). These areas include both wetlands and uplands, depending on hydrogeomorphic characteristics. Depending on the width of the area, a beach may grade into or also be part of a tidal flat. Many of the small islands in the Bay, which serve as bird rookeries, are primarily beach and sand bar habitats (GBF, 1998).

Beaches and dunes serve as valuable foraging, resting, and nesting grounds for many colonial waterbirds, shorebirds, shellfish, and invertebrates. Plankton and detritus collect on beaches at high tide and act as food sources for numerous shellfish, mammal, and bird species. Beaches and dunes also act to control erosion and buffer against tropical storms. Dunes provide valuable cover and foraging habitat for game animals and livestock. Beaches and dunes also provide for consumptive and non-consumptive recreation.

The beaches/sand dunes habitat type occurs to some extent on all of the alternatives; however, it may be combined with the tidal flats if it is within the tidal zone. Refer to Section 4.0 (Environmental Consequences) for site-specific descriptions of this community type.

3.12 SECTION 404/SECTION 10 JURISDICTIONAL AREAS (WETLANDS AND OPEN WATER)

The site descriptions and specific acreage values (presented in impacts section for each alternative) for jurisdictional wetlands were determined by a combination of aerial photograph interpretation and data from NWI maps. These were groundtruthed during field visits by PBS&J staff and Charlie Belaire of BEI. More specific information on wetland plant communities at Shoal Point and Bayport alternatives was derived from wetland delineations at Shoal Point (PBS&J, 2001b) and Bayport (Berg-Oliver Associates, 1998; USACE, 2002). Verification of these wetland delineations by the USACE has occurred; however, delineations and USACE verification has not occurred at the other alternative sites.

Wetlands are important natural resources that provide habitat for fish, shellfish and other wildlife (Turner, 1977; Sather and Smith, 1984; White and Paine, 1992; GBNEP, 1994a). Coastal wetlands also serve to filter and process agricultural runoff and buffer coastal areas against storm and wave damage (White and Paine, 1992).

Subsidence (due to historical groundwater withdrawal) and erosion (accelerated by loss of vegetation due to subsidence) are the two major causes for the loss of more than 30,000 acres of wetland

habitat in the Galveston Bay system since the 1950s (White et al., 1993; White and Payne, 1992; Harris-Galveston Coastal Subsidence District (HGCSD), 1998). Other causes include urban and agricultural development and dredging and filling for navigation channels (GBNEP, 1994a, 1994b).

The broad, level, coastal lowlands often support landscape mosaics of several community types which intergrade and interfinger. These communities include salt and brackish marshes, vegetated and nonvegetated salt flats, and salt prairies. The composition of wetland plant communities is described in the above section (3.11.2).

Section 10 (33 U.S.C. 403) of the Rivers and Harbors Act of 1890 (superseded) and 1899 (33 U.S.C. 401, et seq.) established permit requirements for certain activities affecting navigable waters of the U.S. The geographic jurisdiction of the Rivers and Harbors Act includes all navigable waters of the U.S., defined (33 CFR Part 329) as "those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce." The Clean Water Act, formerly known as the Federal Water Pollution Control Act, added Section 404 authority (33 U.S.C. 1344). Section 404 of the Clean Water Act authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits for the discharge of dredged or fill material into the waters of the U.S., including wetlands. The USACE provides guidelines for the determination of the areas under Section 404 jurisdiction (USACE, 1987). The wetland plant communities described in Section 3.11 are generally under Section 404 jurisdiction, although certain areas within a community may not meet all the criteria described in the USACE Wetland Delineation Manual (1987). Therefore, some wetland plant communities may not be considered jurisdictional wetlands.

The project study area lies within the jurisdiction of the USACE-Galveston District office. All activities subject to Section 10 and/or 404 must be permitted through the USACE Regulatory Branch of the Galveston District. Although the primary goal is to avoid negative impacts to any waters of the U.S., where avoidance is impossible or impractical, certain impacts (e.g., filling of wetlands) from these activities may be mitigated as part of the granting of the permit. Mitigation may include the creation of replacement wetlands or payments for marsh creation or set asides (e.g., in-lieu fee projects or mitigation banks).

3.13 TERRESTRIAL WILDLIFE

3.13.1 Wildlife Habitat and Species

The permit applicant's proposed site and the alternative sites lie within the Austroriparian Biotic Province, as described by Blair (1950). This biotic province stretches from the Pineywoods of eastern Texas to the Gulf of Mexico and through the southeastern U.S. to the Atlantic Ocean. It is characterized by extensive pine and hardwood forests, swamps, marshes, and other hydric communities (Blair, 1950; Hatch et al., 1990). The following wildlife habitat descriptions are based on field observations, aerial photo interpretation, and consultation with local experts.

On several of the alternative project sites, wildlife habitat is severely restricted because the sites are active DMPAs that are periodically inundated. The alternative sites at Spillman's Island and Alexander Island are located on active DMPAs which are largely unvegetated. The vegetated areas that do occur inside the levees are predominantly saltcedar. The alternative project site at Pelican Island is

also located within an active DMPA, and a large percentage of the site is unvegetated. The road that would be constructed to access the site would cross an area that supports emergent wetland, grassland, and shrub-dominated habitats. The majority of the proposed Shoal Point site is actively used as a DMPA. The western portion of this site, however, has not been used for placement of material in many years and currently supports a shrub-dominated vegetation community that provides habitat for a variety of wildlife species. A portion of the access road for this location would cross shallow aquatic, marsh habitat, and unvegetated tidal flats along the northern edge of Swan Lake. The western portion of the new road would be constructed across emergent wetlands and upland shrub habitat.

By contrast, the proposed project sites at Bayport and Cedar Point have not been significantly disturbed, relatively speaking, and provide vegetated habitats that support a more diverse wildlife community than can be found on the other four sites. Slightly less than half of the Bayport site is upland woodlands. This site also includes Chinese tallow-dominated shrublands, forested wetlands, freshwater marshes, and shrub/grasslands. The majority of the proposed Cedar Point site is upland woodland habitat, with the remainder composed of shrub/grassland and, to a lesser extent, freshwater wetlands (marshes and woodlands). A small portion of the site is Chinese tallow-dominated shrubland.

3.13.1.1 Amphibians

Although the western lesser siren (*Siren intermedia nettingi*), marbled salamander (*Ambystoma opacum*), three-toed amphiuma (*Amphiuma tridactylum*), smallmouth salamander (*Ambystoma texanum*), and dwarf salamander (*Eurycea quadridigitata*) have been documented from at least one of the project counties (Dixon, 2000), they are not likely to occur at most of the alternative sites due to a general absence of moist bottomland or freshwater habitats to which they are restricted. Because of the presence of freshwater habitats, these salamander species may occur on the Bayport and Cedar Point sites, although this is unlikely.

Several species of frogs and toads are of potential occurrence at some of the alternative sites, particularly Bayport and Cedar Point, which contain freshwater wetlands. These include Blanchard's cricket frog (*Acris crepitans blanchardi*); several treefrogs such as the green treefrog (*Hyla cinerea*) and Cope's gray treefrog (*Hyla chrysocelis*); upland chorus frog (*Pseudacris triseriata feriarum*); Gulf Coast toad (*Bufo valliceps*); Woodhouse's toad (*Bufo woodhousii woodhousii*); southern leopard frog (*Rana sphenocephala*); and eastern narrowmouth toad (*Gastrophryne carolinensis*) (Bartlett and Bartlett, 1999; Dixon, 2000).

3.13.1.2 Reptiles

Reptiles that may occur at the proposed and alternative sites include lizards, such as the green anole (*Anolis carolinensis*), six-lined racerunner (*Cnemidophorus sexlineatus sexlineatus*), five-lined skink (*Eumeces fasciatus*), Mediterranean gecko (*Hemidactylus turcicus*), and northern fence lizard (*Sceloporus undulatus hyacinthinus*), and turtles, such as the three-toed box turtle (*Terrapene carolina triunguis*) (Bartlett and Bartlett, 1999; Dixon, 2000).

Snakes of the region include the eastern yellowbelly racer (*Coluber constrictor flaviventris*), Texas rat snake (*Elaphe obsoleta lindheimeri*), western mud snake (*Farancia abacura*

reinwardtii), eastern hognose snake (*Heterodon platirhinos*), prairie kingsnake (*Lampropeltis calligaster calligaster*), and several venomous species such as the southern copperhead (*Agkistrodon contortrix contortrix*), western cottonmouth (*Agkistrodon piscivorus leucostoma*), Texas coral snake (*Micrurus fulvius tener*), and western diamondback rattlesnake (*Crotalus atrox*) (Dixon, 2000; Werler and Dixon, 2000).

3.13.1.3 Birds

Numerous avian species are found within the project region, and many species are likely to frequent the proposed or alternative sites.

Many species were encountered in the study area during PBS&J's June 2001 field trip. Year-round residents include the pied-billed grebe (*Podilymbus podiceps*), brown pelican, neotropic cormorant (*Phalacrocorax brasilianus*), great blue heron (*Ardea herodias*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), little blue heron (*Egretta caerulea*), tricolored heron (*Egretta tricolor*), cattle egret (*Bubulcus ibis*), black-crowned night-heron (*Nycticorax nycticorax*), yellow-crowned night-heron (*Nyctanassa violacea*), white ibis (*Eudocimus albus*), roseate spoonbill (*Ajaia ajaja*), mottled duck (*Anas fulvigula*), black vulture (*Coragyps atratus*), red-shouldered hawk (*Buteo lineatus*), American coot (*Fulica americana*), killdeer (*Charadrius vociferus*), American oystercatcher (*Haematopus palliatus*), black-necked stilt (*Himantopus mexicanus*), American avocet (*Recurvirostra americana*), willet (*Catoptophorus semipalmatus*), laughing gull (*Larus atricilla*), caspian tern (*Sterna caspia*), royal tern (*Sterna maxima*), Forster's tern (*Sterna forsteri*), rock dove (*Columba livia*), mourning dove (*Zenaida macroura*), horned lark (*Eremophila alpestris*), blue jay (*Cyanocitta cristata*), American crow (*Corvus brachyrhynchos*), northern mockingbird (*Mimus polyglottos*), loggerhead shrike (*Lanius ludovicianus*), European starling (*Sturnus vulgaris*), white-eyed vireo (*Vireo griseus*), northern cardinal (*Cardinalis cardinalis*), red-winged blackbird (*Agelaius phoeniceus*), eastern meadowlark (*Sturnella magna*), great-tailed grackle (*Quiscalus mexicanus*), and house sparrow (*Passer domesticus*).

Summer residents observed in the study area during the June 2001 field trip include the green heron (*Butorides striatus*), fulvous whistling-duck (*Dendrocygna bicolor*), Wilson's plover (*Charadrius wilsonia*), least tern (*Sterna antillarum*), yellow-billed cuckoo (*Coccyzus americanus*), common nighthawk (*Chordeiles minor*), scissor-tailed flycatcher (*Tyrannus forficatus*), purple martin (*Progne subis*), barn swallow (*Hirundo rustica*), and indigo bunting (*Passerina cyanea*). Summer residents breed in the area. A summer visitor, the wood stork (*Mycteria americana*), was also encountered in the study area. This species is not likely to breed in the area.

Three winter resident species were observed during PBS&J's June 2001 field trip: common loon (*Gavier immer*), lesser yellowlegs (*Tringa flavipes*), and whimbrel (*Numenius phaeopus*). Other migrants/winter residents expected to occur in the study area include the American white pelican (*Pelecanus erythrorhynchos*), double-crested cormorant (*Phalacrocorax auritus*), gadwall (*Anas strepera*), canvasback (*Aythya valisineria*), ring-necked duck (*Aythya collaris*), lesser scaup (*Aythya affinis*), bufflehead (*Bucephala albeola*), greater yellowlegs (*Tringa melanoleuca*), ring-billed gull (*Larus delawarensis*), ruby-crowned kinglet (*Regulus calendula*), cedar waxwing (*Bombycilla cedrorum*), yellow-rumped warbler (*Dendroica coronata*), vesper sparrow (*Pooecetes gramineus*), savannah sparrow (*Passerculus sandwichensis*), song sparrow (*Melospiza melodia*), Lincoln's sparrow (*Melospiza lincolnii*),

white-throated sparrow (*Zonotrichia albicollis*), dark-eyed junco (*Junco hyemalis*), and American goldfinch (*Carduelis tristis*). Numerous other migrating species such as arctic shorebirds wintering on the Gulf Coast, northern passerines wintering in Central America, and raptors and waterfowl, may pass through or over the study area during spring and fall migrations (Texas Ornithological Society (TOS), 1995; Dickinson, 1999; Sibley, 2000).

Even the sites that are situated on active DMPAs attract numerous shorebirds, raptors, and wading birds that may forage in adjacent waters, on available aquatic features on the site, and on unvegetated areas of the DMPAs. Any of the sites may provide roosting or nesting sites for a number of bird species, and they may be used as staging areas for migrating species, particularly the Bayport and Cedar Point sites, which provide wooded habitat.

Of the cells included in the Shoal Point DMPA, cells A and B are still active; Cell C is currently inactive. Cell A provides loafing habitat for many species, including the black-necked stilt, American avocet, laughing gull, caspian tern, royal tern, Forster's tern, and least tern. During a site visit on 20 June 2001, nesting Forster's terns were encountered on the northern portion of this cell. It is possible that the other species mentioned also nest there. Several species were also observed loafing on the northern shoreline of Cell C, including the neotropic cormorant, brown pelican, Forster's tern, and laughing gull. Two freshwater ponds occur in Cell C. Species encountered around the ponds during the June 2001 site visit include the pied-billed grebe, neotropic cormorant, black-crowned night-heron, American coot, barn swallow, red-winged blackbird, and great-tailed grackle. It is likely that wintering waterfowl also use these ponds. The following species were encountered foraging and/or loafing in Cell B: great blue heron, great egret, snowy egret, little blue heron, yellow-crowned night-heron, white ibis, roseate spoonbill, killdeer, black-necked stilt, American avocet, lesser yellowlegs, willet, and laughing gull.

A rookery associated with Swan Lake occurs just south of the proposed access road. Nesting Forster's terns were observed in this rookery during the June 2001 site visit. During the 2000 nesting season, the following number of nests was recorded at this rookery: 220 black skimmer (*Rynchops niger*), 86 laughing gull, 42 Forster's tern, 8 gull-billed tern (*Sterna nilotica*), and 1 caspian tern (FWS, 2001c). Other species observed loafing or foraging in the Swan Lake area during the visit include the American white pelican, brown pelican, neotropic cormorant, great blue heron, snowy egret, little blue heron, white ibis, roseate spoonbill, American oystercatcher, and whimbrel. Species encountered foraging/loafing in the channel adjacent to the proposed access road during the June 2001 field trip include the common loon, neotropic cormorant, great blue heron, snowy egret, green heron, black-crowned night-heron, yellow-crowned night-heron, Forster's tern, least tern, and barn swallow. Marshes south of the access road near its junction with Loop 197 provide habitat for wading birds and wintering waterfowl.

During PBS&J's site visit on 19 June 2001, Forster's terns and laughing gulls were observed nesting on the northeast portion of the island in the marsh areas dominated by maritime saltwort. Approximately 40 Forster's tern and 20 laughing gull nests were counted. A more intensive survey would probably reveal more nests, since an estimated 300 to 500 Forster's terns and 500 to 1,000 laughing gulls were observed. Several wading birds were encountered foraging in the lagoon area, including the great blue heron, great egret, snowy egret, little blue heron, tricolored heron, yellow-crowned

night-heron, white ibis, roseate spoonbill, black-necked stilt, American avocet, and willet, as well as waterfowl such as the fulvous whistling-duck and mottled duck. The beach area also provides loafing areas for many species including the neotropic cormorant, laughing gull, Forster's tern, and brown pelican. Another rookery occurs on a small island, Pelican Spit (Little Pelican Island), northwest of Pelican Island on the other side of the GIWW and approximately 2,000 feet from the project site. This rookery is one of the largest in the Galveston Bay system. Species nesting here include the brown pelican, neotropic cormorant, great blue heron, great egret, snowy egret, little blue heron, tricolored heron, reddish egret, cattle egret, black-crowned night-heron, white ibis, white-faced ibis, roseate spoonbill, fulvous whistling-duck, laughing gull, gull-billed tern, royal tern, sandwich tern (*Sterna sandvicensis*), Forster's tern, and black skimmer (GLO, 1996b; FWS, 2001c; TXBCD, 2001).

A rookery occurs on the northeastern part of Alexander Island. This rookery has supported hundreds of nesting pairs of birds. Nesting species include the neotropic cormorant, great blue heron, great egret, snowy egret, little blue heron, tricolored heron, cattle egret, black-crowned night-heron, and roseate spoonbill (GLO, 1996b; FWS, 2001c; TXBCD, 2001). However, since 1996, no nests have been recorded at the site, suggesting that the site is currently inactive. No monitoring program is in place at the site. Another rookery occurs approximately 3,000 feet northwest of the site on the easternmost Goat Island in Scott Bay (FWS, 2001c; TXBCD, 2001), while a colony of least terns, Forster's terns, and black skimmers is located approximately 3,000 feet northeast of the site (GLO, 1996b; FWS, 2001c; TXBCD, 2001). The Goat Island rookery includes the neotropic cormorant, great egret, snowy egret, tricolored heron, cattle egret, black-crowned night-heron, roseate spoonbill, and least tern.

A rookery occurs near the Cedar Point site, on the northern end of Boaz Island. Forester's terns, least terns, and black skimmers have been documented at the rookery (FWS, 2001c; TXBCD, 2001). However, the rookery has been unused since 1995 and was inactive during PBS&J's site visit in June 2001.

3.13.1.4 Mammals

Mammals of this region include the Virginia opossum (*Didelphis virginiana*), least shrew (*Cryptotis parva*), eastern mole (*Scalopus aquaticus*), eastern red bat (*Lasiurus borealis*), seminole bat (*Lasiurus seminolus*), evening bat (*Nycticeius humeralis*), nine-banded armadillo (*Dasypus novemcinctus*), eastern cottontail (*Sylvilagus floridanus*), swamp rabbit (*Sylvilagus aquaticus*), eastern gray squirrel (*Sciurus carolinensis*), eastern fox squirrel (*Sciurus niger*), Baird's pocket gopher (*Geomys breviceps*), hispid pocket mouse (*Chaetodipus hispidus*), fulvous harvest mouse (*Reithrodontomys fulvescens*), cotton mouse (*Peromyscus gossypinus*), white-footed mouse (*Peromyscus leucopus*), hispid cotton rat (*Sigmodon hispidus*), eastern woodrat (*Neotoma floridana*), nutria (*Myocastor coypus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), common raccoon (*Procyon lotor*), and striped skunk (*Mephitis mephitis*) (Schmidly, 1983; Davis and Schmidly, 1994).

3.14 AQUATIC ECOLOGY

The Galveston Bay system is an intricate assemblage of interacting habitats that are greatly influenced by the Gulf of Mexico. The Galveston Bay system provides important nursery habitat

for numerous commercially and recreationally important estuarine-dependent fish and shellfish species, as well as providing habitat for marine mammals, reptiles, resident birds, wintering waterfowl, shorebirds, and other avian species. The immediate watershed of Galveston Bay also provides a variety of freshwater habitats. This section describes the dominant types of aquatic habitat present within the Galveston Bay system.

3.14.1 Freshwater Habitats and Fauna

Major freshwater habitats within the study area include the Trinity and San Jacinto Rivers and their tributaries. These rivers contribute most of the freshwater inflow into Galveston Bay. Of these, the Trinity River Basin is the largest, with a drainage area of 17,969 square miles. The San Jacinto River basin is much smaller, with a drainage area of 3,949 square miles (Stanley, 1992). Numerous smaller streams and bayous drain directly into the Galveston Bay system and provide freshwater inflow and habitat for freshwater organisms. These include Cedar, Buffalo, Armand, Taylor, and Dickinson bayous, and Clear Creek.

A diversity of warmwater fish species occur in the freshwater reaches of these streams and are typical of those found in the southeastern U.S. Species that occur in these rivers and larger bayous include catfish (Ictaluridae), suckers (Catostomidae), shad (*Dorosoma* spp.), gar (Lepisosteidae), minnows and carp (Cyprinidae), sunfishes (Centrarchidae), freshwater drum (*Aplodinotus grunniens*), and temperate basses (Percichthyidae) (Hubbs, 1982). Species that occur in the smaller streams and backwaters include sunfish, gar, bowfin (*Amia calva*), grass pickerel (*Esox americanus*), minnows and carp, bullhead catfish (*Ameiurus* spp.), pirate perch (*Aphredoderus sayanus*), topminnows (*Fundulus* spp.), and western mosquitofish (*Gambusia affinis*) (Hubbs, 1982). Much of Buffalo Bayou and its tributaries have been channelized and are dominated by treated wastewater effluent from municipal and industrial facilities. In certain reaches, exotic species such as grass carp (*Ctenopharyngodon idella*) and armored catfish (*Hypostomus plecostomus*) are common (Denton, 2001).

Due to their proximity to the Houston metropolitan area, the Trinity and San Jacinto rivers and larger bayous within the study area are highly utilized for sport fishing. Catfish, sunfish, and temperate basses are some of the species sought by anglers (Simmons, 1986). Striped bass (*Morone saxatilis*) is an anadromous species that occurs in the Galveston Bay system and Trinity River and is an important sportfish in the Trinity River.

Most aquatic invertebrates in these freshwater systems are ubiquitous, and distribution of some taxa, such as various insects and mussels, is strongly influenced by habitat availability and water quality. Invertebrates common to the study area include crayfish (Cambaridae), dragonflies (Odonata), mayflies (Ephemeroptera), midge flies (Chironomidae), water bugs (Hemiptera), water beetles (Coleoptera), and snails (Gastropoda). Mussels are common in the larger tributaries and include round pearlshell (*Glebula rotundata*), paper pondshell (*Anodonta imbecillis*), yellow sandshell (*Lampsilis teres*), and washboard (*Megalonaias nervosa*) (Howells et al., 1996).

Freshwater habitats within the immediate vicinity of the proposed and alternative project sites are mostly small ephemeral pools and roadside ditches. These areas are typically not permanent

and may dry up during periods of low rainfall. Due to their elevation and proximity to the marine environment, salinity can be variable at these locations, limiting their value as freshwater ecosystems. Fish species occurring in these temporary habitats may include western mosquitofish and sheepshead minnow (*Cyprinodon variegatus*). A variety of birds, mammals, reptiles, and amphibians may use these freshwater sources for water, food, and breeding. For a more detailed description of terrestrial wildlife, refer to Section 3.13.

Freshwater habitats and fauna occur near or within the Shoal Point, Bayport, Alexander Island, and Cedar Point alternatives. Refer to Section 4.0 (Environmental Consequences) for site-specific descriptions of this community type.

3.14.2 Open Bay

The open-bay habitat type refers to the water column and the species that inhabit the water column. Galveston Bay is the largest bay system in Texas, covering an area of about 600 square miles. It is a shallow water body, averaging about 6 feet deep, and is divided by the deeper Houston Ship Channel (GBEP, 2001a; GBF, n.d.). The volume of the bay has been increased due to subsidence through flooding and inundation, and has sunk in some places by as much as 10 feet since 1906 (HGCSD, 1998).

Galveston Bay has the highest primary productivity of all Texas bays (Armstrong, 1987). Phytoplankton, including diatoms, green algae, blue-green algae, dinoflagellates, euglenoids, cryptophytes, and golden-brown algae are the primary producers of the open bay. They take up carbon by photosynthesis and pass it through the food chain to the primary consumers, zooplankton and phytoplanktivorous (plant-eating) fishes (Armstrong, 1987; Sheridan et al., 1989; GBEP, 2001a). Zooplankton consists mainly of copepods, cladocerans, chaetognaths, and larval stages of fish, shrimp and crabs. They are important because they are the basis of the food chain and are the source of food for all larval and juvenile fish. Zooplankton are limited by turbidity (which limits the phytoplankton production and, therefore, food availability) and currents which can carry them out to sea and away from concentrated food masses. It appears that zooplankton production in Galveston Bay is also directly related to water temperature and inversely related to salinity (Armstrong, 1987).

The open-bay communities occur near the proposed and all alternative sites. Refer to Section 4.0 (Environmental Consequences) for site-specific descriptions of the open-bay community type.

3.14.2.1 Nekton Assemblages

Nekton assemblages (organisms occurring within the water column) consist mainly of secondary consumers which receive their food from the plankton assemblages (discussed above) or from juveniles or smaller nekton. Galveston Bay supports a diverse nekton population including fish, shrimp and crabs, some of which are resident species, spending their entire life in the bay, whereas others are migrant species spending only a portion of their life cycle in the estuary. Numerous studies have focused on the nekton assemblages in Galveston Bay, including Reid (1957), Parker (1965), Bechtel and Copeland (1970), Odum et al. (1974), Chambers and Sparks (1959), and Chapman (1964).

Dominant nekton species inhabiting the Galveston Bay system are Atlantic croaker (*Micropogonias undulatus*), white shrimp (*Litopenaeus setiferus*), brown shrimp (*Farfantepenaeus aztecus*), Gulf menhaden (*Brevoortia patronus*), bay anchovy (*Anchoa mitchilli*), blue crab (*Callinectes sapidus*), sand seatrout (*Cynoscion arenarius*), and hardhead catfish (*Arius felis*), all of which are estuarine dependent (Reid, 1957; Chambers and Sparks, 1959; Parker, 1965). These species are ubiquitous along the Texas coast and do not appear to be affected by differences in salinity. There are seasonal differences in populations, the fall usually being the smallest in biomass and number (juveniles). Newly spawned fish and shellfish begin migrating into the bay in winter and early spring, with the maximum biomass observed during the summer months. Feeding strategies for these species include planktivores (bay anchovy and Gulf menhaden), detritivores (striped mullet (*Mugil cephalus*) and pinfish (*Lagodon rhomboides*)), and producers (plankton). Most of the open-bay species are predators, including the blue crab, mantis shrimp (*Squilla empusa*), Atlantic croaker, spot (*Leiostomus xanthurus*), southern flounder (*Paralichthys lethostigma*), black drum (*Pogonias cromis*), and sand seatrout (Parker, 1965).

Shrimp utilize the open-bay bottom as nursery habitat from spring through fall and then migrate to the Gulf. These species have shown population fluctuations, with a decline in the mid-1980s. Similar declines were reported for Aransas Bay, Corpus Christi Bay, and the Laguna Madre estuaries. The main causes of the decline are thought to be overfishing, pollution, and low freshwater inflows. However, in 1990 and 1991 these species began to rebound, partially from an increase in freshwater inflow due to heavy rains (Walton and Green, 1993).

The nekton community occurs near the proposed and all alternative sites. Refer to Section 4.0 (Environmental Consequences) for site-specific descriptions of this community type.

3.14.2.2 Life Cycles

This discussion of the life cycles of important recreational and commercial aquatic species is included to facilitate understanding of how and when these species utilize the various habitats in the region.

Eastern Oysters

Eastern oysters spawn in the spring. Rising temperatures and chemical cues stimulate the release of sperm into the water column by males. When this occurs, the female oysters release their eggs into the water. Larval oysters prefer estuarine conditions. They will remain as plankton in the water column for 2 or 3 weeks before settling onto a hard substrate and eventually transforming into an adult (Britton and Morton, 1989).

Blue Crabs

Female blue crabs mate and migrate to the higher salinity areas of the estuary (near tidal inlets or just offshore) where they lay their eggs. These eggs are attached to the underside of their abdomen and are brooded in this capacity for about two weeks. Prior to egg hatching, females move seaward and hatch offshore. The larvae pass through several larval stages in the marine plankton before they begin to move back into the estuary with the surface plankton. Female blue crabs occur in the bay

year round, but peak in June and July, whereas males remain in the lower salinity portions of the bay throughout their life (Britton and Morton, 1989).

Shrimp

Brown, pink and white shrimp all have similar life cycles. All spawning occurs year-round in the Gulf, with the peak spawn in the fall. Male shrimp transfer sperm to the female, who carries it around until she releases the eggs to be fertilized by the sperm. Eggs hatch into the larval stage within 24 hours and remain in the Gulf undergoing various larval stages for several weeks. Postlarvae are carried by the currents into the shallow areas of the estuary, tidal creeks and marshes to mature. Here the shrimp increase in size and soon move to the deeper waters of the estuary, eventually moving offshore in the Gulf to spawn. Peak spawning season for brown shrimp occurs from September to May, and for pink and white shrimp, March to September (Britton and Morton, 1989).

Red Drum

Red drum spawn from October through January in the nearshore Gulf close to the mouth of bays and inlets. The eggs hatch in the Gulf, and the larvae float and are transported by currents into the estuary where the fish mature before migrating back into the Gulf. Adult red drum use the estuaries but tend to spend most of their life offshore (Matlock, 1987; Patillo et al., 1997).

Black Drum

Mature black drum spawn in the open bay, in nearshore Gulf waters, or in connecting passes from January to mid-April. During spawning, eggs and sperm are randomly released into the water column for fertilization. Black drum larvae and small young move into upper bay areas and tidal creeks, where they remain until they reach about 4 inches in size and then move into the open bay. Black drum remain in the bay until they reach sexual maturity (about 2 years) (Patillo et al., 1997).

Southern Flounder

Adult southern flounder leave the bay for offshore waters to spawn during the late fall and early winter. Eggs and sperm are randomly released into the water column for fertilization. Immediately after spawning, adults return to the estuaries and rivers. Larval flounder remain offshore in the plankton for 4 to 8 weeks; then metamorphosis begins and the larvae are carried into the estuaries. Juvenile southern flounders begin migrating to low salinity water up rivers, where, according to some researchers, juvenile and young adults remain for the first 2 years. Once they reach sexual maturity (2 years) they begin migrating to the Gulf to spawn (Patillo et al., 1997; Daniels, 2000).

Atlantic Croaker

Eggs and sperm of the Atlantic croaker are randomly released into the water column for fertilization. Spawning occurs nearshore in the Gulf near passes from September to May. Early larval stages are found offshore in plankton and are carried by currents inshore to estuarine areas. Juvenile

Atlantic croaker move into rivers and creeks where they spend 6 to 8 months. Adults migrate offshore in March and April (Patillo et al., 1997).

Sheepshead

Sheepshead spawn offshore during March and April. Eggs and sperm are randomly released into the water column for fertilization. The larvae move into the seagrass beds of the estuary. They remain in this pelagic stage for 30 to 40 days, then metamorphose into juveniles. The juveniles "settle out" in the seagrass beds becoming substrate-oriented, then move to nearshore reefs where they mature. Sheepshead reach sexual maturity by age two (Patillo et al., 1997).

Striped Mullet

Striped mullet spawning occurs offshore near the water's surface from October to March. Eggs and sperm are randomly released into the water column for fertilization. The eggs and larvae remain offshore where they develop into prejuveniles, then enter the bays and estuaries to mature. Sexual maturity occurs at 3 years of age, adults remain near inshore waters during their life (Patillo et al., 1997).

Spotted Seatrout

The spawning season of the spotted seatrout can be lengthy, but generally runs from March to October. They spawn in shallow grassy areas in the bays. Eggs and sperm are randomly released into the water column for fertilization. Spotted seatrout remain in the bay or nearshore for the duration of their life (Patillo et al., 1997).

Sand Seatrout

Sand seatrout migrate to the Gulf in late fall or winter to spawn. Eggs and sperm are randomly released into the water column for fertilization. Larvae are carried into the estuary by the currents and migrate to the upper areas of the estuary, preferring channels, small bayous, and shallow marshes to develop. Adult spotted seatrout reach sexual maturity at twelve months (Patillo et al., 1997).

Refer to Table 3.14.2-1 for a summary of spawning information for Galveston Bay's recreationally and commercially important species.

3.14.3 Open-Bay Bottom

The open-bay bottom is the second largest habitat of the Galveston Bay system. Open-bay bottom includes bay bottom habitat that is not covered with seagrasses or oyster reefs (GBEP, 2001a). Anthropogenic habitats in this area include dredged channels, DMPAs, bulkheads, and jetties (Armstrong, 1987). Over the past 100 years the open-bay bottom has increased in size due to dredging (GBEP, 2001a). Other factors have included subsidence, dredged material placement, and loss of seagrasses.

TABLE 3.14.2-1
SPAWNING OF GALVESTON BAY
RECREATIONALLY AND COMMERCIALLY IMPORTANT SPECIES

Species	Spawning Habitat Type	Peak Spawn Times
Eastern Oyster	Bays and estuaries	All months
Blue Crab	Bays, estuaries and nearshore waters	June and July
White Shrimp	Offshore	March - October
Pink Shrimp	Offshore	April - September
Brown Shrimp	Offshore	September - May
Red Drum	Neashore waters	October - January
Black Drum	Estuaries, passes, and nearshore waters	January - April / Early fall
Southern Flounder	Offshore	Late fall - early winter
Atlantic Croaker	Nearshore waters	September - May
Sheepshead	Offshore	March and April
Striped Mullet	Offshore	October - March
Spotted Seatrout	Shallow grassy areas in bays	March - October
Sand Seatrout	Neashore waters	March - September

The open-bay bottom fauna are divided into two groups (Green et al., 1992): epifauna, such as crabs and smaller crustaceans which live on the surface of the bottom substrate, and infauna, such as mollusks and polychaetes which burrow into the bottom substrate. Mollusks and other infaunal organisms are filter feeders, animals that strain suspended particles from the water column. Others, such as polychaetes, feed by ingesting sediments and extracting the nutrients. Many of the epifauna and infauna feed on plankton and are then fed upon by numerous fish species and birds (Armstrong, 1987; GBEP, 2001a). The open-bay bottom includes vast flat areas of mud and sand and contributes large quantities of nutrients and food resources, making them one of the most important components of this habitat type. The dominant infauna found in Galveston Bay bottom include the common estuarine polychaete (*Streblospio benedicti*), capitellid polychaete (*Mediomastus californiensis*), ivory barnacle (*Balanus eburneus*), dwarf clam (*Mulinia lateralis*), and common rangia (*Rangia cuneata*) (Armstrong, 1987).

The open-bay bottom occurs near the proposed site and all alternatives. Refer to Section 4.0 (Environmental Consequences) for site-specific descriptions of this community type.

3.14.4 Oyster Reefs

Eastern oyster reefs are present in many areas of the Galveston Bay system and provide ecologically important functions. Commercial harvesting makes up the majority of the bay harvest of oysters. Oyster reefs are formed where a hard substrate and adequate currents are plentiful. Currents carry nutrients to the oysters and take away sediment and waste products that have been filtered by the oyster. Most oyster reefs are subtidal or intertidal and found near passes and cuts, and along the edges of marshes. Oysters can filter water 1,500 times the volume of their body per hour and, hence, play an important ecological role in the estuary, influencing water clarity and phytoplankton abundance (Powell et al., 1992; GBEP, 2001a). Due to their lack of mobility and their tendency to bioaccumulate pollutants, oysters are an important indicator species for determining contamination in the bay. The majority of oysters in Galveston Bay are located in mid-Galveston Bay, the central portion of East Bay, and West Bay where major tributaries bring in fresh water which mixes with the saline waters of the Gulf of Mexico (GBEP, 2001a).

Many organisms, including mollusks, polychaetes, barnacles, crabs, gastropods, amphipods, and isopods, can be found living on the oyster reef forming a diverse community (Sheridan et al., 1989). Oyster reef communities are dependent upon the introduction of food resources from the open bay and marshes. Predators and parasites control oyster populations. Many organisms feed on oyster populations, including fish (e.g., the black drum), crabs (stone crab [*Menippe adina*] and blue crab), and gastropods such as the oyster drill (*Thais haemastoma*), which can drill through the shell of the oyster (Sheridan et al., 1989; GBEP, 2001a). When oyster reefs are exposed during low tides, shore birds use them as resting places (Armstrong, 1987).

The TDH monitors the oysters in the Galveston Bay system for pathogens and contaminants. Openings and closures of oyster harvesting based on human health risks have been taking place since 1967 by the TDH (Table 3.14.4-1). Bay closures due to bacteriological contamination have

taken place in 1969, 1973, 1974, 1976, 1979, 1981, and 1983 through 2001 (see Table 3.14.4-1). An oil spill in 1990 resulted in the only closure due to chemical contamination (Heideman, 2001).

TABLE 3.14.4-1
GALVESTON BAY CLOSURES – 1967 TO MARCH 18, 2001

Year	Location	Year	Location
1969	Trinity, Galveston and East Bays	1990	Trinity, Galveston, East and West Bays
1973	Trinity, Galveston, East and West Bays	1991	Trinity, Galveston, East and West Bays
1974	Trinity, Galveston and East Bays	1992	Entire Galveston Bay Complex
1976	Trinity, Galveston and East Bays	1993	Trinity, Galveston, East and West Bays
1979	Trinity, Galveston, East and West Bays	1994	Trinity, Galveston, East and West Bays
1981	Trinity, Galveston, East and West Bays	1995	Trinity, Galveston, East and West Bays
1983	Trinity, Galveston, East and West Bays	1996	Entire Galveston Bay Complex
1984	Trinity, Galveston, East and West Bays	1997	Trinity, Galveston, East and West Bays
1985	Trinity, Galveston, East and West Bays	1998	Trinity, Galveston, East and West Bays
1986	Trinity, Galveston, East and West Bays	1999	Trinity, Galveston, East and West Bays
1987	Trinity, Galveston, East Bays	2000	Trinity, Galveston, East and West Bays
1988	Trinity, Galveston, East Bays	2001	Galveston Bay
1989	Entire Galveston Bay Complex		

Oyster reef communities occur near the Shoal Point, Bayport, and Cedar Point alternatives. Refer to Section 4.0 (Environmental Consequences) for site-specific descriptions of this community type.

3.14.5 Seagrass Beds

SAV can be found along the shorelines in soft sediments. These seagrass communities generate high primary productivity, provide a refuge for numerous organisms, and serve as spawning and nursery grounds for many recreational and commercial finfish and shellfish species. Some of the aquatic fauna associated with seagrasses include polychaetes, mollusks, blue crab, shrimp, red drum, southern flounder, and spotted seatrout. There are no true seagrasses associated with any of the alternative sites. Refer to Section 3.11.2.7 for a more detailed description of the vegetation composition of the seagrass community.

3.14.6 Salt Marshes

The emergent vegetation of the Galveston Bay system plays an important part in sustaining its health and abundance of life. Emergent vegetation contributes to the productivity of the estuary providing particulate matter, nutrients, structure, protection, substrate, habitat for estuarine species, flood control, and improved water quality. Salt marshes serve as spawning and nursery grounds for many recreational and commercial species (Sheridan et al., 1989; TPWD, 1997). Crabs, shrimp, mollusks, red drum, southern flounder, and spotted seatrout are some of the aquatic fauna associated with salt marshes.

Refer to sections 3.11.2.3 and 3.11.2.4 for a more detailed description of the vegetation composition of this habitat.

3.14.7 Recreational and Commercial Fisheries

The principal finfish harvested by sport-boat anglers in the Galveston Bay system from 1982 to 1992 were Atlantic croaker, red drum (*Sciaenops ocellatus*), spotted seatrout (*Cynoscion nebulosus*), sand seatrout, southern flounder, sheepshead (*Archosargus probatocephalus*), and black drum (Warren et al., 1994). In comparison with all Texas bay systems, the Galveston Bay system supported the largest percentage of all these species, with the exception of red drum, caught by private-boat fishermen for the period of 1982 to 1992 (Warren et al., 1994). Between 1982 and 1992, the Galveston Bay system accounted for the greatest private-boat pressure (35%) and landings (41%), and headboat pressure (45%) and landings (57%) of all Texas bay systems (Warren et al., 1994). More than 262,000 recreational fishing licenses were sold in Brazoria, Chambers, Galveston, Harris, and Liberty counties during 1998 and 1999 (GBEP, 2001a).

The most important commercial finfish species currently reported from the Galveston Bay system are Atlantic croaker, black drum, sheepshead, striped mullet, and southern flounder (Sheridan et al., 1989; Robinson et al., 1998; TPWD, 2000) (Table 3.14.7-1). From 1994 to 1998, 211,400 pounds of finfish made up the annual commercial harvest in Galveston Bay, with an annual ex-vessel (i.e., actual harvest) value averaging $151,500 (TPWD, 2000). Overall, from 1972 to 1999, black drum, flounder, and sheepshead landings have declined in the Galveston Bay system, with striped mullet being the only species that has shown an increase in landings (Robinson et al., 1998). From 1990 to 1999, Atlantic croaker and whiting landings increased (National Marine Fisheries Service (NMFS), 2001; Campbell, 2001). In comparison with all Texas bay systems, Galveston Bay supported the smallest percentage of commercial finfish landings, totaling about 7 percent (Robinson et al., 1998).

The main shellfish species in the Galveston Bay system include brown shrimp, pink shrimp (Farfantepenaeus duorarum), white shrimp, blue crab, and eastern oyster (*Crassostrea virginica*) (Table 3.14.2-1). From 1993 to 1997, commercial landings of shellfish in Galveston Bay consisted of brown and pink shrimp (25%); white shrimp (53%); blue crab (30%); and eastern oyster (87%) (Robinson et al., 1998). From 1994 to 1998, seven million pounds of shrimp (mainly brown and white) were commercially harvested in Galveston Bay, with an ex-vessel value of almost $10 million (TPWD, 2000). More blue crabs are landed in Galveston Bay than in any other Texas bay. Landings increased from 200,000 pounds per year in 1960 to over 3,000,000 pounds per year in 1990 (Walton and Green, 1993). Landings of oysters have fluctuated through the years, but have increased significantly since 1960. Approximately 81 percent of oysters were harvested from public reefs, between 1982 and 1986, with the remainder from private oyster leases issued by the State (GBNEP, 1994). From 1994 to 1998, 4 million pounds of oysters were commercially harvested in Galveston Bay, with an ex-vessel value averaging over $8 million (TPWD, 2000).

The Seafood Safety Division of the TDH has periodically monitored the fish and crabs along the Texas coast since 1970 to assess the potential health risks from chemical contaminants. Analyses are performed on the edible portions of fish and crabs for parameters such as metals,

TABLE 3.14.7-1
TEXAS COMMERCIAL LANDINGS FOR GALVESTON BAY
ANNUAL SUMMARIES, 1990-1999

Species	Year																			
	1990		1991		1992		1993		1994		1995		1996		1997		1998		1999	
	lbs. (x 1,000)	$	lbs. (x 1,000)	$	lbs. (x 1,000)	$	lbs. (x 1,000)	$	lbs. (x 1,000)	$	lbs. (x 1,000)	$	lbs. (x 1,000)	$	lbs. (x 1,000)	$	lbs. (x 1,000)	$	lbs. (x 1,000)	$
Fish																				
Atlantic Croaker	0.44	0.16	1.57	0.45	13.48	4.69	5.62	1.22	2.82	6.88	4.85	12.06	5.64	7.81	5.88	21.25	6.96	15.48	10.89	57.24
Black Drum	22.34	20.03	11.09	5.64	4.93	4.13	11.79	10.42	27.31	18.62	27.15	19.44	16.61	13.61	13.18	10.53	41.95	36.03	49.02	40.81
Flounder	13.76	16.12	19.77	24.68	28.71	36.58	22.66	28.73	26.19	32.82	19.44	24.84	37.62	53.68	19.46	29.16	33.92	49.99	18.81	32.01
Whiting	0.25	0.08	2.91	0.83	2.94	1.04	0.70	0.23	0.55	0.17	0.23	0.11	0.88	0.41	1.48	0.71	1.47	0.75	1.03	0.50
Mullet	19.47	20.37	41.61	21.23	21.76	6.14	102.50	19.39	29.21	11.59	32.20	20.00	61.71	26.74	82.94	25.49	66.93	20.15	38.93	31.93
Sheepshead	15.02	4.60	9.56	3.28	13.69	4.81	13.09	4.01	12.24	3.37	11.32	3.27	36.11	10.80	18.73	5.94	30.08	10.04	25.53	8.50
Unclassified:																				
Food	10.45	3.79	13.38	7.42	1.00	0.29	8.67	1.72	12.02	3.45	7.71	2.20	6.65	3.28	9.98	3.29	15.69	5.15	12.31	5.05
Scrap	29.81	4.35	3.40	1.62	6.15	2.88	6.79	4.39	29.02	8.68	89.31	32.06	37.42	13.51	17.33	6.29	21.71	9.36	15.89	9.15
TOTAL FISH	**111.54**	**69.50**	**103.29**	**65.15**	**92.66**	**60.56**	**171.82**	**70.11**	**139.36**	**85.58**	**192.21**	**113.98**	**202.64**	**129.84**	**168.98**	**102.66**	**218.71**	**146.95**	**172.41**	**185.19**
Shellfish																				
Crabs, Blue	1,908.09	729.52	1,531.86	535.37	841.69	420.10	1,846.05	960.44	1,762.08	1,009.17	1,538.15	977.32	2,126.13	1,351.36	1,918.59	1,231.97	2,615.09	1,631.02	1,732.71	1,098.42
Oyster Meats	1,166.65	4,093.49	2,331.38	5,967.52	58.28	4,874.36	20.29	4,420.03	17.44	7,247.43	11.14	7,948.37	72.82	11,010.00	30.84	8,787.11	2,969.12	7,071.14	4,904.75	10,620.76
Shrimp (heads on):																				
Brown and Pink	1,974.56	1,306.59	1,344.62	1,127.47	2,415.39	1,823.07	2,436.61	1,720.29	3,184.07	3,860.44	2,609.46	2,440.49	3,099.52	3,775.36	2,983.98	4,229.20	2,313.17	3,148.82	1,832.27	2,470.55
White	2,841.55	4,771.56	1,789.08	2,465.05	2,615.13	3,665.52	3,359.49	4,334.57	3,139.24	6,082.71	4,045.73	5,784.20	4,133.31	7,379.78	4,503.27	8,890.66	2,176.27	4,580.38	2,328.19	5,751.26
Other	0.23	0.46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Squid	12.25	6.04	10.75	7.84	38.03	20.43	9.45	5.05	15.49	8.68	10.49	6.32	32.89	17.53	17.55	8.85	34.95	17.62	41.27	24.04
TOTAL SHELLFISH	**7,903.33**	**10,907.66**	**7,007.69**	**10,103.25**	**5,968.52**	**10,803.48**	**7,671.89**	**11,440.38**	**8,118.32**	**18,208.43**	**8,214.97**	**17,156.70**	**9,464.67**	**23,534.03**	**9,454.23**	**23,147.79**	**10,108.60**	**16,448.98**	**10,839.19**	**19,965.03**
GRAND TOTAL	**8,014.87**	**10,977.16**	**7,110.98**	**10,168.40**	**6,061.18**	**10,864.04**	**7,843.71**	**11,510.49**	**8,257.68**	**18,294.01**	**8,407.18**	**17,270.68**	**9,667.31**	**23,663.87**	**9,623.21**	**23,250.45**	**10,327.31**	**16,595.93**	**11,011.60**	**20,150.22**

Sources: NMFS, 2001; Campbell, 2001.

pesticides, polychlorinated biphenyls (PCBs), SVOCs and VOCs (TDH, 1997; TDH, 1999a). In 1990, the TDH issued a limited consumption advisory for catfish and crabs from the upper part of the Houston Ship Channel and the southern portion of the San Jacinto River due to elevated levels of dioxins, PCBs and chlorinated pesticides from these areas (EPA, 2002b).

In 1990, Texas A&M surveyed oysters, blue crab, spotted seatrout, black drum and southern flounder from four sites in Galveston Bay to determine contaminant concentrations and potential risk to seafood consumers. Hydrocarbons, pesticides, heavy metals and PCBs were measured. This study found the area near the Houston Ship Channel to be the most contaminated and that contamination decreased downbay. Consuming limited quantities of seafood was found to be safe (GBEP, 2001a).

Recently, the TDH completed a bay-wide study to evaluate the potential health risks of consuming fish and crabs from Galveston Bay. This study showed that fish and crab species are safe for unlimited consumption from the majority of Galveston Bay, south of the Houston Ship Channel, where most recreational fishing occurs. It also prompted the TDH to continue their 1990 limited consumption advisory for portions of the Houston Ship Channel because of continued elevated levels of dioxins, PCBs and chlorinated pesticides in these areas. The study did not include oysters, which are continuously monitored by another TDH program, or shrimp, which are not considered a source of harmful chemicals (EPA, 2002).

3.14.8 Essential Fish Habitat

Congress enacted amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (PL 94-265) in 1996 that established procedures for identifying Essential Fish Habitat (EFH) and required interagency coordination to further the conservation of Federally managed fisheries. Rules published by the NMFS (50 CFR Sections 600.805 - 600.930) specify that any Federal agency that authorizes, funds or undertakes, or proposes to authorize, fund, or undertake an activity which could adversely affect EFH is subject to the consultation provisions of the above mentioned act and identifies consultation requirements. This section and the associated impacts sections were prepared to meet these requirements.

EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." When referring to estuaries, it is further defined as "all waters and substrates (mud, sand, shell, rock and associated biological communities) within these estuarine boundaries, including the sub-tidal vegetation (seagrasses and algae) and adjacent tidal vegetation (marshes and mangroves)" (Gulf of Mexico Fishery Management Council (GMFMC), 1988).

The proposed project site and alternative sites are located in an area that has been identified by the GMFMC as Essential Fish Habitat (EFH) for adult and juvenile brown and white shrimp, red drum, and Spanish mackerel (*Scomberomorus maculatus*). EFH for these species in the vicinity of the proposed and alternative sites includes estuarine emergent wetlands; estuarine mud, sand and shell substrates; SAV; and estuarine water column. Detailed information on red drum, shrimp, and other Federally managed fisheries and their EFH is provided in the 1998 EFH amendment of the Fishery Management Plans for the Gulf of Mexico, prepared by the GMFMC. The 1998 EFH amendment was

prepared as required by the MSFCMA (P.L. 104-297) as amended. Refer to Table 3.14.8-1 for a listing of the life stages and EFH of brown and white shrimp, red drum, and Spanish mackerel.

As set forth in NMFS rules, EFH Assessments must include the following (section numbers indicate the location of this information in this EIS): 1) a description of the proposed action (see sections 1.0 and 2.0); 2) an analysis of the effects, including cumulative effects, of the action on EFH, the managed species, and associated species by life history stage (see sections 4.1.15, 4.2.15, 4.3.15, 4.4.15, 4.5.15, 4.6.15, and 4.7.15 for impacts related to each alternative, and 4.8.7 for cumulative effects); 3) the Federal agency's views regarding the effects of the action on EFH to be included in the Record of Decision; and 4) proposed mitigation, if applicable (see Section 4.2.15). If appropriate, the assessment also should include the results of an onsite inspection, the views of recognized experts on the habitat or species effects, a literature review, an analysis of alternatives to the proposed action, and any other relevant information (other relevant information is included in the sections referenced above for each alternative).

The following describes the preferred habitat, life history stages, and relative abundance of each EFH managed species based on information provided by GMFMC (1998).

Brown shrimp. Brown shrimp eggs are demersal and occur offshore. The larvae occur offshore and begin to migrate to estuaries as postlarvae. Postlarvae migrate through passes on flood tides at night mainly from February to April with a minor peak in the fall. In estuaries, brown shrimp postlarvae and juveniles are associated with shallow vegetated habitats but also are found over silty sand and non-vegetated mud bottoms. Postlarvae and juveniles have been collected in salinity ranging from zero to 70 ppt (parts per thousand). The density of late postlarvae and juveniles is highest in marsh edge habitat and submerged vegetation, followed by tidal creeks, inner marsh, shallow open water and oyster reefs; in unvegetated areas muddy substrates seem to be preferred. Juveniles and sub-adults of brown shrimp occur from secondary estuarine channels out to the continental shelf but prefer shallow estuarine areas, particularly the soft, muddy areas associated with plant-water interfaces. Sub-adults migrate from estuaries at night on ebb tide on new and full moon. Abundance offshore correlates positively with turbidity and negatively with hypoxia (low levels of oxygen in the water). Adult brown shrimp occur in neritic Gulf waters (i.e., marine waters extending from mean low tide to the edge of the continental shelf) and are associated with silt, muddy sand, and sandy substrates (GMFMC, 1998). Adult brown shrimp are considered common in the project vicinity from April to October. Juveniles are abundant year-round, peaking from April to October.

Marine habitat is critically important to the reproduction and survival of shrimp. Adult brown shrimp occur throughout the Gulf's marine habitat to depths of about 110 meters.

Larval shrimp feed on phytoplankton and zooplankton. Postlarvae feed on phytoplankton, epiphytes, and detritus. Juveniles and adults prey on amphipods, polychaetes, and chironomid larvae but also on algae and detritus (Pattillo et al., 1997). The habitat of these prey is essentially the same as that required by shrimp, estuarine and marine.

TABLE 3.14.8-1

MAJOR ESSENTIAL FISH HABITAT CATEGORIES
FOR MANAGED SPECIES IN THE GALVESTON BAY SYSTEM

Species	Life Stage	Ecotype	Essential Fish Habitat
Brown Shrimp	eggs	marine	<110 m depth, demersal
	larvae	marine	<110 m depth, planktonic
	postlarvae/juvenile	marine	marsh edge, SAV, tidal creeks, inner marsh
	subadults	estuarine	mud bottoms, marsh edge
	adults	marine	<110 m depth, silt sand, muddy sand
White Shrimp	eggs	marine	<40 m depth, demersal
	larvae	marine	<40 m depth, planktonic
	postlarvae/juvenile/ subadults	estuarine	marsh edge, SAV, marsh ponds, inner marsh, oyster reefs
	adults	marine	<33 m depth, silt, soft mud
Red Drum	eggs/larvae	marine	planktonic
	postlarvae/juvenile	marine/estuarine	SAV, estuarine,mud bottoms, marsh/water interface
	subadults	estuarine	mud bottoms, oyster reefs
	adults	marine/estuarine	Gulf of Mexico, estuarine mud bottoms, oyster reefs
Spanish Mackerel	larvae	marine	<50 m depth
	juvenile	marine/estuarine	offshore, beach and estuarine
	adults	marine	pelagic

Source: GMFMC, 1998.

White shrimp. White shrimp are offshore and estuarine dwellers and are pelagic or demersal, depending on life stage. Their eggs are demersal and larval stages planktonic; both occurring in nearshore marine waters. Postlarvae migrate through passes mainly from May to November with peaks in June and September. Migration is in the upper 2 meters of the water column at night and at mid-depths during the day. Postlarval white shrimp become benthic once they reach the estuary, where they seek shallow water with muddy-sand bottoms high in organic detritus or rich marsh where they develop into juveniles. Postlarvae and juveniles inhabit mostly mud or peat bottoms with large quantities of decaying organic matter or vegetative cover. Densities are usually highest in marsh edge and SAV, followed by marsh ponds and channels, inner marsh, and oyster reefs. White shrimp juveniles prefer salinities of less than 10 ppt and can be found in tidal rivers and tributaries. As juveniles mature, they move to coastal areas where they mature and spawn. Adult white shrimp move from estuaries to coastal areas, where they are demersal and inhabit soft mud or silt bottoms (GMFMC, 1998). In the project vicinity, adult white shrimp are common from July to March, while juveniles are highly abundant year-round.

Marine habitat is critically important to the reproduction and survival of shrimp. Adult white shrimp occur throughout the Gulf's marine habitat to depths of about 40 meters.

Larval shrimp feed on phytoplankton and zooplankton. Postlarvae feed on phytoplankton, epiphytes, and detritus. Juveniles and adults prey on amphipods, polychaetes, and chironomid larvae but also on algae and detritus (Pattillo, et al., 1997). The habitat of these prey is essentially the same as that required by shrimp, estuarine and marine.

Red drum. Red drum occupy a variety of habitats, ranging from depths of 40 meters offshore to very shallow estuarine waters. Spawning occurs in Gulf near the mouths of bays and inlets in the fall and winter months. Eggs hatch mainly in the Gulf and larvae are transported into the estuary where they mature and before moving back to the Gulf to spawn. Adult red drum use estuaries, but tend to spend most of their time offshore as they age. They are found over a variety of substrates including sand, mud, and oyster reefs, and can tolerate a wide range of salinities (GMFMC, 1998). Adult and juvenile red drum are common year-round in the project vicinity.

Estuaries are especially important to the larval, juvenile, and sub-adult red drum. Juvenile red drum are most abundant around marshes, preferring quiet, shallow, protected waters with muddy or grassy bottoms (Simmons and Breuer, 1962). Sub-adult and adult red drum prefer shallow bay bottoms and oyster reef substrates (Miles, 1950).

Estuaries are also important to the prey species of red drum. This is essential to larvae, juvenile, and early adult red drum since they spend all of their time in the estuary. Larval red drum feed mainly on shrimp, mysids, and amphipods, while juveniles feed on more fish and crabs (Peters and McMichael, 1988). Adult red drum feed mainly on shrimp, blue crab, striped mullet, and pinfish. Protection of estuaries is important to maintain the essential habitat for red drum and because so many prey species of red drum are estuarine dependent (GMFMC, 1998).

Spanish mackerel. Spanish mackerel are pelagic, occurring at depths to 75 meters throughout the coastal zone of the Gulf of Mexico. Adults are usually found along coastal areas, extending out to the edge of the continental shelf; however, they also display seasonal migrations and will inhabit high salinity estuarine areas at times. The occurrence of adults in Gulf estuaries is infrequent and rare. Spawning occurs in offshore waters during May through October. Nursery areas are in estuaries and coastal waters year-round. Larvae are most often found offshore from depths of 9 to 84 meters. Juveniles are found offshore, in the surf area, and sometimes in estuarine habitats. Juveniles prefer marine salinities and are not considered estuarine-dependent. The substrate preference of juveniles is clean sand; the preferences of other life stages are unknown (GMFMC, 1998). Adult and juvenile Spanish mackerel are considered common in the project vicinity from April to October.

Estuaries are important habitats for most of the major prey species of Spanish mackerel. They feed throughout the water column on a variety of fishes, especially herrings. Squid, shrimp, and other crustaceans are also eaten. Most of their prey species are estuarine-dependent, spending all or a portion of their lifecycle in estuarine. Because of this Spanish mackerel are also dependent on the estuaries to some degree, and therefore, can be expected to be detrimentally affected if the productive capabilities of estuaries are seriously degraded (GMGMC, 1998).

In addition to being designated EFH for brown shrimp, white shrimp, Spanish mackerel, and red drum, Galveston Bay provides nursery and foraging habitat that supports various life stages of forage species and recreationally important marine fishery species such as spotted seatrout, southern flounder, grey snapper, Atlantic croaker, black drum, Gulf menhaden, striped mullet, blue crab, stone crab, pink shrimp, spot, pinfish, sheepshead, gizzard shad (*Dorosoma cepedianum*), bay anchovy, sheepshead minnow, Gulf killifish (*Fundulus grandis*), and silversides (*Menidia* spp.). Such organisms serve as prey for other fish managed under the MSFCMA by the GMFMC (e.g., red drum, mackerels, snappers, and groupers) and highly migratory species managed by the NMFS (e.g., billfishes and sharks).

Wetlands and SAV provide other estuarine support functions, including: 1) providing a physically recognizable structure and substrate for refuge and attachment above and below the sediment surface; 2) binding sediments; 3) preventing erosion; 4) collecting organic and inorganic material by slowing currents; and 5) providing nutrients and detrital matter to the Galveston Bay estuary.

Moreover, Galveston Bay provides habitat for many benthic animals, including marine worms and crustaceans which are consumed by higher trophic level predators such as shrimp, crabs, and black drum. Benthic organisms also have a key role in the estuarine food web because they 1) mineralize organic matter, releasing important nutrients to be reused by primary producers; 2) act as trophic links between primary producers and primary consumers; and 3) aggregate dissolved organics within estuarine waters, which are another source of particulate matter for primary consumers.

3.15 ENDANGERED AND THREATENED SPECIES

3.15.1 Plant Species

Texas Biological and Conservation Data System (TXBCD) files (2001), including lists of species of potential occurrence in each county (TXBCD, 1999a, 1999b, 1999c), were reviewed to

determine whether any plant species (or natural areas) of concern are known to occur in the study area. Information provided by the FWS (2001b) was also reviewed. Correspondence with the FWS is documented in Appendix H-8. The FWS response letter does not discuss any particular concerns about any of the plant species that appear in the county lists. FWS (2001a) and Texas Parks and Wildlife Department (TPWD, 1999b) list only one endangered and no threatened plant species known to occur in any of the project area counties (Harris, Galveston and Chambers). The endangered species is Texas prairie dawn *(Hymenoxys texana)*, which is known to occur in approximately 50 sites in Harris County (TXBCD, 1999a). In addition to the endangered Texas prairie dawn, the FWS county-by-county lists (2000) include two species of concern (SOC): Houston machaeranthera (*Machaeranthera aurea*) and Texas windmill-grass (*Chloris texensis*). TPWD county lists also include rare species (no regulatory status): coastal gay-feather (*Liatris bracteata*), Grand Prairie evening primrose (*Oenothera pilosella* ssp. *sessilis*), Texas meadow rue (*Thalictrum texanum*), threeflower broomweed (*Thurovia triflora*), Correll's false dragon-head (*Physostegia correlli*) and corkwood (*Leitneria floridana*).

The Federally listed species are described below using information from several sources (Gould, 1975; Ajilvsgi, 1979; Correll and Johnston, 1979; Loughmiller and Loughmiller, 1984; Tveten and Tveten, 1993; Texas Organization for Endangered Species (TOES), 1993; TPWD, 2001). No element occurrence records (EOR) were located in TXBCD files (2001) for any endangered, threatened, rare, or SOC species within or near (less than 2 miles) any of the alternative sites. Site-specific habitats that could potentially support any of the above species (based on habitat requirements as described in the literature), and that may be affected by development at the alternative sites, are described in Sections 4.1-4.7. Table 3.15.1-1 lists endangered and threatened plant species of potential occurrence in the study area.

Texas prairie dawn, a member of the composite family (Asteraceae), is an annual forb up to six inches tall with small yellow flower heads (less than 1/2 inch in diameter). This species occurs within and on the outskirts of Houston in Fort Bend and Harris counties. Habitat destruction by urban development is its primary threat. It occurs on sparsely vegetated areas at the base of mima mounds or other nearly barren areas on slightly saline soils in coastal prairie grasslands. Its flowering period is from March to July.

Houston machaeranthera, another member of Asteraceae, is a local endemic to the Houston area and appears on the FWS and TPWD Harris and Galveston county lists. It is an annual, tap-rooted forb, approximately 6 to 12 inches tall, with small, narrow leaves (1 to 4 inches long by <0.1 inch wide). The inflorescence has yellow disk and ray flowers and blooms from October to November. Houston machaeranthera occurs in seasonally wet, saline areas around the base of mima mounds and barren or sparsely vegetated grasslands, disturbed pastures and roadsides on sandy loam soils, specifically Clodine, Gessner and Wockley series.

Texas windmill-grass is a rare perennial clump grass (Family Poaceae) that is endemic to Harris, Brazoria, Chambers and Brazos counties. Few specimens have been collected; most were more than 50 years ago. It grows in silty loam in open to barren areas in coastal prairie or upland grassland communities as well as ditches and roadsides. Culms are erect and glabrous (14 to 18 inches tall). The leaf blades are rough, up to 6 inches long, and narrow (approximately 0.1 inch wide). The panicle

TABLE 3.15.1-1

ENDANGERED AND THREATENED PLANT SPECIES OF POTENTIAL OCCURRENCE IN THE STUDY AREA

Common Name	Scientific Name	Status	
		FWS	TPWD
Texas prairie dawn	*Hymenoxys texana*	E	E
Houston machaeranthera	*Machaeranthera aurea*	SOC	--
Texas windmill-grass	*Chloris texensis*	SOC	--

Sources: FWS (2001a), TPWD (1999b).

Nomenclature follows Hatch et al., 1990.

TPWD - Texas Parks and Wildlife Department.

FWS - U.S. Fish and Wildlife Service.

E - Endangered; in danger of extinction.

SOC - FWS Species of Concern; species for which some evidence of vulnerability exists, but not enough to support listing at this time.

-- - For state status, indicates 'rare' species with no regulatory status.

(inflorescence) has 8 to 10 branchlets (arms of the windmill) that are up to 8 inches long, and it flowers in the fall.

3.15.2 Fish and Wildlife Species

Table 3.15.2-1 lists fish and wildlife taxa that have a geographic range including Galveston, Harris, and Chambers counties and that are considered by the FWS or TPWD to be endangered, threatened, or rare (FWS, 1995, 1999a, 1999b, 2000, 2001a; TPWD, 1999b; TXBCD, 2001). It should be noted that inclusion on the list does not imply that a species is known to occur in the study area, but only acknowledges the potential for occurrence. In fact, many species are unlikely to be present. This section presents distributional data concerning each Federally listed or State-listed species, along with a brief evaluation of the potential for the species to occur within the study area.

Eleven taxa listed in Table 3.15.2-1 are considered endangered or threatened by both the FWS and TPWD. Those listed as endangered are the Houston toad (*Bufo houstonensis*), leatherback sea turtle (*Dermochelys coriacea*), hawskbill sea turtle (*Eretmochelys imbricata*), Kemp's Ridley sea turtle (*Lepidochelys kempii*), brown pelican, Attwater's greater prairie-chicken (*Tympanuchus cupido attwateri*), whooping crane (*Grus americana*), interior least tern (*Sterna antillarum*), and the West Indian manatee (*Trichechus manatus*). The following species are listed as threatened: loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), piping plover (*Charadrius melodus*), and bald eagle (*Haliaeetus leucocephalus*). The bald eagle has been officially proposed for delisting (64 FR 128; 36453-36464; July 6, 1999), although a final decision by the FWS has been postponed indefinitely. If delisted, the bald eagle would still receive protection under provisions of the Bald Eagle Protection Act and the Migratory Bird Treaty Act.

The Houston toad is endemic to southeast central Texas and is currently known from Austin, Bastrop, Burleson, Colorado, Freestone, Lavaca, Leon, and Robertson counties (Price and Yantis, 1993). The toad is also believed to occur in Lee County, since it contains suitable soils and lies between Bastrop and Burleson counties, which both support toad populations (FWS and IUCN/SSC Captive Breeding Specialists Group, 1994). The Houston toad has been extirpated from part of its historic range, Harris, Liberty, and Fort Bend counties. This species would, therefore, not occur on the proposed or alternative sites.

The above-mentioned five species of sea turtles are of potential occurrence within Galveston Bay and associated aquatic habitats. The most likely to occur are Kemp's ridley and the loggerhead. Both species can be found in inshore waters and both nest sporadically along the Texas coast. While the green turtle occasionally occurs along the Texas coast and juveniles and adults can be found in inshore waters on the seagrass beds or feeding on algae, this species more frequently occurs along the south Texas coast. The leatherback, primarily a pelagic species that rarely visits Texas coastal waters, and the hawksbill, also a rare visitor to Texas, are the least likely to occur in the study area. None of these sea turtles is likely to nest on the proposed or alternative sites due to the general absence of suitable nesting beaches.

TABLE 3.15.2-1

ENDANGERED, THREATENED, AND RARE FISH AND WILDLIFE
OF POTENTIAL OCCURRENCE IN GALVESTON, HARRIS, AND CHAMBERS COUNTIES[1]

Common Name[2]	Scientific Name[2]	Status[3]	
		FWS	TPWD
FISH			
Creek chubsucker	*Erimyzon oblongus*	--	T
AMPHIBIANS			
Houston toad	*Bufo houstonensis*	E	E
REPTILES			
Leatherback sea turtle	*Dermochelys coriacea*	E	E
Hawksbill sea turtle	*Eretmochelys imbricata*	E	E
Kemp's Ridley sea turtle	*Lepidochelys kempii*	E	E
Loggerhead sea turtle	*Caretta caretta*	T	T
Green sea turtle	*Chelonia mydas*	T	T
American alligator	*Alligator mississipiensis*	T/SA	--
Alligator snapping turtle	*Macroclemys temminckii*	SOC	T
Texas horned lizard	*Phrynosoma cornutum*	SOC	T
Texas diamondback terrapin	*Malaclemys terrapin littoralis*	SOC	--
Gulf salt marsh snake	*Nerodia clarkii*	SOC	--
Texas garter snake	*Thamnophis sirtalis annectens*	SOC	--
Timber rattlesnake	*Crotalus horridus*	--	T
Smooth green snake	*Liochlorophis vernalis*	--	T
BIRDS			
Brown Pelican	*Pelecanus occidentalis*	E	E
Attwater's greater prairie-chicken	*Tympanuchus cupido attwateri*	E	E
Whooping crane	*Grus americana*	E	E
Interior least tern	*Sterna antillarum*	E	E
Piping plover	*Charadrius melodus*	T	T
Bald eagle	*Haliaeetus leucocephalus*	T/PDL	T
Mountain plover	*Charadrius montanus*	PT	--
Reddish egret	*Egretta rufescens*	SOC	T
White-faced ibis	*Plegadis chihi*	SOC	T
Bachman's sparrow	*Aimophila aestivalis*	SOC	T
Black rail	*Laterallus jamaicensis*	SOC	--
Southeastern snowy plover	*Charadrius alexandrinus tenuirostris*	SOC	--
Loggerhead shrike	*Lanius ludovicianus*	SOC	--
American peregrine falcon	*Falco peregrinus anatum*	DL	E
Arctic peregrine falcon	*Falco peregrinus tundrius*	DL	T
Wood stork	*Mycteria americana*	--	T
Swallow-tailed kite	*Elanoides forficatus*	--	T
White-tailed hawk	*Buteo albicaudatus*	--	T
Sooty tern	*Sterna fuscata*	--	T

TABLE 3.15.2-1 (Concluded)

ENDANGERED, THREATENED, AND RARE FISH AND WILDLIFE
OF POTENTIAL OCCURRENCE IN GALVESTON, HARRIS, AND CHAMBERS COUNTIES[1]

Common Name[2]	Scientific Name[2]	Status[3]	
		FWS	TPWD
MAMMALS			
West Indian manatee	*Trichechus manatus*	E	E
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	SOC	T
Southeastern myotis	*Myotis asutroriparius*	SOC	--
Plains spotted skunk	*Spilogale putorius interrupta*	SOC	--

[1] According to FWS (1995, 1999a, 1999b, 2000, 2001a), TPWD (1999b), TXBCD (2001).

[2] Nomenclature follows Collins (1990), Hubbs et al. (1991), Manning and Jones (1998), and AOU (1998, 2000).

[3] FWS - U.S. Fish and Wildlife Service.

TPWD - Texas Parks and Wildlife Department.

E - Endangered.

T - Threatened.

PT - Proposed for listing as threatened

T/PDL - Currently listed as Threatened, but proposed for delisting.

T/SA - Threatened due to similarity of appearance to other endangered or threatened species.

SOC - FWS Species of Concern; species for which some evidence of vulnerability exists, but not enough to support listing at this time.

DL - Formerly listed as threatened or endangered, but due to significant population increases, has officially been removed from threatened or endangered status.

-- - Not listed.

The brown pelican is primarily a coastal species inhabiting shorelines and nearshore islands. While this pelican occasionally wanders inland (TOS, 1995), it does not usually stray from saltwater habitat for extended periods. This species was observed at or near several of the alternative project sites during PBS&J's June 2001 field visit.

Attwater's greater prairie-chicken was formerly abundant in parts of the coastal prairie of Texas, which includes the project area counties. It is a subspecies of the greater prairie-chicken, which, although historically inhabiting native prairie and oak savannahs throughout central North America as well as the coastal plain from Massachusetts to Virginia, is currently restricted to prairie intermixed with cropland, mainly in mid-western states. Attwater's greater prairie-chicken, probably the most endangered bird in Texas, was once a common resident in most of the Texas coastal plain, but is currently declining from Galveston County to Aransas and Refugio counties (Lehmann, 1941; Schroeder and Robb, 1993; TOS, 1995; FWS, 1995). Although the species is found in Galveston County, it would not occur on the proposed or alternative project sites due to the lack of suitable habitat.

Each year, the entire breeding population of whooping cranes migrates 2,600 miles from Wood Buffalo National Park in Canada's Northwest Territories to the oak savannahs, salt marshes, and bays of the Aransas National Wildlife Refuge (NWR) and surrounding area. The normal migration corridor for the whooping crane stretches from the panhandle eastward to the east-central portion of the state (FWS, 1995). During migration, the whooping crane makes regular stops at small stock ponds or other water bodies occurring in pastureland and feeds in cultivated fields such as sorghum or corn. Whooping cranes will utilize a variety of habitats for foraging and roosting during these stops, but seem to prefer isolated sites away from human activities (FWS, 1994). The proposed and alternative sites are within the southeastern limit of the migration corridor; however, the project area counties are not included within the wintering range of this species (Oberholser, 1974; Lewis, 1995; FWS, 1995). This species is not expected to occur at the proposed or alternative sites.

The interior least tern historically has nested on sandbars of the Colorado River, Red River and Rio Grande within Texas. Small remnant breeding populations persist at isolated locations within the historic range. This species winters along the entirety of the Texas coast, but the FWS (1995) considers any least tern within 50 miles of the coast to be the coastal subspecies and, thus, not protected by the Endangered Species Act. No sightings of the interior least tern have been reported within the project counties (Oberholser, 1974; Thompson et al., 1997). The occurrence of this species in any of the alternative project sites, other than as a rare migrant, is unlikely. The coastal subspecies, however, was frequently encountered in the study area during PBS&J's June 2001 field visit.

The West Indian manatee historically inhabited the Laguna Madre. It is now, however, extremely rare in Texas. Texas records report this species from Cow Bayou, near Sabine Lake, Copano Bay, the Bolivar Peninsula, and the mouth of the Rio Grande (Davis and Schmidly, 1994). The occurrence of the West Indian manatee in the vicinity of the alternative project sites is highly unlikely.

An inhabitant of coastal beaches and tidal flats, the piping plover is a regular migrant along the lower Texas coast where it may also overwinter (Oberholser, 1974; TOS, 1995). Wintering birds have been reported along the length of the Texas coast (Haig and Oring, 1985, 1987; Haig, 1992; Haig

and Plissner, 1993). The piping plover is not expected to frequent any of the alternative project sites because of the lack of suitable habitat.

The bald eagle is a regular migrant and winter resident in the eastern half of the state and is usually found in association with large bodies of water (TOS, 1995). In Texas, wintering and migrating bald eagles frequently stop over along the shores of reservoirs and large rivers, which provide the eagle with the bulk of its dietary requirements. The bald eagle is currently known to nest in at least 35 Texas counties, including Harris and Chambers counties. Galveston County is not included within the wintering or nesting range of the bald eagle (FWS, 1995; Polasek, 2000). Even though this species nests in Harris and Chambers counties, it is not expected to occur in the vicinity of any of the alternative project sites because of the influence of surrounding commercial/industrial development.

The mountain plover (*Charadrius montanus*) has been proposed for listing as threatened by the FWS (64 FR 7587-7601; 16 February 1999). It is known to nest in Jeff Davis County near the Davis Mountains and in Presidio County in the Sierra Vieja Mountains. This species is a rare migrant east to the Colorado River in central Texas, absent from the woodlands of east Texas. It is a rare-to-uncommon local winter resident on the coastal plains and inland from south Texas through the Edwards Plateau region and into the South Plains (TOS, 1995). The mountain plover is generally found in agricultural fields, and is not expected to occur at any of the alternative project sites due to the general absence of suitable foraging habitat.

The FWS does not consider the American alligator (*Alligator mississipiensis*) to be biologically endangered or threatened and lists it as threatened due to similarity of appearance (T/SA) to the crocodile. Because of the similarity of appearance of American alligator hides and parts to the appearance of hides and parts of other protected crocodilians, it is necessary to restrict commercial activities involving alligator specimens taken in the U.S. to ensure the conservation of other crocodilians that are biologically threatened or endangered. This species predominantly occurs in southeastern Texas and westward along the coastal plain. This species in not likely to occur in any of the alternative project locations due to the general lack of suitable habitat, with the possible exception of the Cedar Point alternative site, which may support suitable habitat.

While not Federally listed, fourteen of the taxa in Table 3.15.2-1 are considered as SOC by the FWS. An SOC, as described in Section 3.15.1, is a species for which some evidence of vulnerability exists, but not enough to support listing at the present time. Six of these fourteen are also listed by TPWD as threatened. They are as follows: alligator snapping turtle (*Macroclemys temminckii*), Texas horned lizard (*Phrynosoma cornutum*), reddish egret (*Egretta rufescens*), white-faced ibis (*Plegadis chihi*), Bachman's sparrow (*Aimophila aestivalis*), and Rafinesque's big-eared bat (*Corynorhinus rafinesquii*).

The alligator snapping turtle is an inhabitant of deep rivers, lakes, and large streams with muddy bottoms (Bartlett and Bartlett, 1999). According to Dixon (2000), this species has been recorded from Harris County, but not from Galveston or Chambers counties, and Conant and Collins (1991) do not include Galveston or Chambers counties within its range. Garrett and Barker (1987) and Bartlett and Bartlett (1999), however, do include Galveston County within the range of this species. Regardless, the

alligator snapping turtle is not expected to occur within any of the alternative project sites due to the general lack of suitable, deep, freshwater habitat.

Except for a small area along the Louisiana border, the Texas horned lizard was historically found throughout the state in areas with flat, open terrain, scattered vegetation, and sandy or loamy soils. It has almost vanished from the eastern half of the state, but still maintains relatively stable numbers in west Texas. According to Price (1990), it has virtually disappeared east of a line from Fort Worth to Austin to Corpus Christi. This decline is speculated to be linked to habitat loss due to agricultural expansion, the spread of the imported fire ant (*Solenopsis invicta*), and indiscriminate use of broadcast insecticides to combat the fire ant (Price, 1990). Bartlett and Bartlett (1999), however, indicate that populations of this species, which have been thought to be declining, may be stabilizing in some areas, and state that actual population statistics are unknown. The species has been recorded from the project counties; therefore, the presence of the horned lizard in the alternative project sites is possible.

The reddish egret is a common resident along the Texas coast. This species inhabits saline and freshwater habitats in all coastal counties, although it is more numerous southward. The reddish egret is also a rare post-breeding visitor over most of Texas south of the Panhandle (Oberholser, 1974; TOS, 1995). It forages in brackish marshes, shallow salt ponds, and tidal flats and nests on the ground, in trees or bushes, or in brushy thickets of yucca and pricklypear on dry coastal islands (TXBCD, 2001). While this species was not encountered in the study area during the June 2001 field trip, it may occur at any of the alternative project sites.

The white-faced ibis is considered a rare to uncommon spring and fall migrant throughout Texas and a rare to uncommon post-breeding visitor north and west of its usual breeding range within Gulf Coast counties (TOS, 1995). Occurrences have been documented in the project counties, where it is also known to nest (Oberholser, 1974; TOS, 1995). Habitat for this ibis consists of marshes, lake fringes, and other shallow wetland areas (Ryder and Manry, 1994). This species was observed on Shoal Point by PBS&J staff during a field trip to the area in April 2001. It may also occur at any of the other alternative project sites.

Bachman's sparrow is an inhabitant of open pine or oak woods, bushy pastures, and scrub palmetto thickets (Dickinson, 1999). It is an uncommon local resident in the east Texas pine forests west to Leon and Van Zandt counties and south to Harris County (TOS, 1995). The range of this species does not include the coastal areas of the project counties, and no suitable habitat occurs on any of the alternative sites.

Rafinesque's big-eared bat occurs throughout the southeastern U.S., with east Texas being at the western limit of its range. Rafinesque's big-eared bat roosts in tree cavities, crevices under bark, under dry leaves, in buildings, and abandoned wells (Davis and Schmidly, 1994). This bat typically occurs in forested regions. It is not expected to occur at any of the alternative sites.

The other eight SOC in Table 3.15.2-1 are not listed by TPWD. They are as follows: Texas diamondback terrapin (*Malaclemys terrapin littoralis*), Gulf salt marsh snake (*Nerodia clarkii*), Texas garter snake (*Thamnophis sirtalis annectens*), black rail (*Laterallus jamaicensis*), southeastern

snowy plover (*Charadrius alexandrinus tenuirostris*), loggerhead shrike, southeastern myotis (*Myotis austroriparius*), and plains spotted skunk (*Spilogale putorius interrupta*).

The Texas diamondback terrapin inhabits brackish and saltwater marsh, estuarine, and other coastal hydric and aquatic habitats, particularly reedy saline marshes. This species occurs from Corpus Christi northward along the Texas coast into Louisiana and Mississippi (Bartlett and Bartlett, 1999). It is reported from the project counties (Dixon, 2000; TXBCD, 2001) and may occur at some of the alternative sites.

In Texas, the Gulf salt marsh snake is restricted primarily to brackish coastal marshes, and occurs from the Corpus Christi Bay northward along the rest of the Texas coast. Typically the saline marsh habitats occupied by this species are dominated by saltgrass, annual seepweed (*Suaeda linearis*), smooth cordgrass, marshhay cordgrass, and/or Gulf cordgrass. The Gulf salt marsh snake also inhabits freshwater marshes inland from the coast that commonly support arrowheads (*Sagittaria* spp.), sedges, and southern naiad (*Najas guada-lupensis*) (Werler and Dixon, 2000). This species has been recorded from Galveston and Chambers counties (Dixon, 2000) and may occur in suitable habitat within the alternative project sites.

Historically, the Texas garter snake was abundant in tallgrass habitat associated with prairie potholes and riparian meadowlands. Over 95 percent of the native tallgrass prairie in Texas, however, has been converted to agricultural use. This species is now relatively rare but fairly numerous in scattered locations. Aside from prairie, the Texas garter snake inhabits marshy, flooded pastureland or meadows and grassy or brushy cover near ponds and streams, including the riparian canyon habitat at the eastern edge of the Edward's Plateau (Tennant, 1998; Werler and Dixon, 2000). Several sources do not include the Texas coastal plain within the range of this species (Tennant, 1998, Conant and Collins, 1991; Dixon, 2000). Werler and Dixon (2000), however, include scattered localities, which are based on specimen records, in a number of coastal plain counties, including the project counties. Although this species may occur in the general project region, it is not expected to be found on most of the alternative project sites, which are generally lacking in suitable prairie and freshwater marsh habitats. The exception may be Cedar Point, which does have fairly extensive freshwater marsh and forested habitats.

The black rail is a small, sparrow-sized rail that is a rare migrant in the eastern third of Texas and is a rare to locally uncommon resident of the upper and central Texas coast. A secretive bird and reluctant to flush, it typically inhabits cordgrass-dominated habitats that are minimally influenced by tides. In some localities, this species may also occur in dry oat fields (Oberholser, 1974; TOS, 1995; Sibley, 2000). The black rail is a winter resident of coastal Galveston, Harris, and Chambers counties, and may occur in cordgrass flats on any of the alternative project sites.

The southeastern snowy plover (FWS, 2000), also referred to as the Cuban snowy plover (Oberholser, 1974), is the subspecies of the snowy plover typically observed on Texas beaches. This bird is an uncommon summer resident along the Texas coast as far north as Galveston County. It is of rare occurrence during the winter, except around Galveston Bay where it is uncommon. It is a rare to uncommon migrant throughout the state and a rare to uncommon summer resident in northern Texas. The western subspecies (*Charadrius alexandrinus nivosus*) also occurs in Texas as an uncommon

migrant across the state and uncommon winter resident along the coast (TOS, 1995). The snowy plover primarily inhabits unvegetated beaches and coastal flats. However, it is also attracted to barren shores associated with large inland alkaline, saline, and freshwater lakes (Oberholser, 1974). This species is not expected on any of the alternative sites due to a general absence of suitable habitat.

The loggerhead shrike is a rare to common resident throughout Texas, except for portions of the South Texas Plains where it is a migrant/winter resident (TOS, 1995). The loggerhead shrike inhabits open country with scattered trees and shrubs, agricultural fields, savannah, desert scrub, and occasionally open woodlands. Its habitat always includes hunting perches supplied by fences, low trees, brush, and the like, usually with some bare ground or very short grass (American Ornithologists' Union (AOU), 1998). Where resident, it generally lives in pairs on permanent territories. The loggerhead shrike is a small, avian predator that hunts from perches and impales its prey on sharp objects such as cactus and mesquite thorns and the barbs of barbed-wire fences. This species is a year-round resident in the majority of Texas, including the project counties (Oberholser, 1974; Yosef, 1996; Sibley, 2000), and may occur on any of the alternative project sites, particularly in winter due to the influx of migrants. A loggerhead shrike was observed near Spillman's Island during PBS&J's June 2001 field visit.

The southeastern myotis ranges from the Ohio River valley into the southeastern U.S., reaching its western limits in east Texas (Schmidly, 1983). This bat is a cave dweller when caves are available. In Texas and most of Louisiana, the southeastern myotis generally roosts in human habitations and manmade structures such as bridges, culverts, drainpipes, boat houses, barns, attics of houses, and hollow trees. It usually selects roosting sites in close proximity to ponds and streams where it feeds on insects. Galveston County is outside the range of this species, while Harris and Chambers counties are at the extreme southwestern limit of its range (Davis and Schmidly, 1994). The southeastern myotis is generally associated with the Pineywoods of east Texas, and is not expected to occur at any of the alternative project sites.

The plains spotted skunk, a subspecies of the eastern spotted skunk, inhabits the eastern half of the state, including the eastern half of the Edwards Plateau and westward across north Texas (Davis and Schmidly, 1994). It inhabits a variety of ecological situations including open fields, prairies, croplands, fencerows, farmyards, forest edges and woodlands (Schmidly, 1983). The range of this skunk includes most of east Texas, including the project counties. This species generally prefers forested habitats and tallgrass prairies, and is attracted to rocky outcrops and canyons when available. Where they occur, plains spotted skunks often den in or under buildings (Davis and Schmidly, 1994). The plains spotted skunk may occur in the general region but is not expected to occur in the coastal habitats associated with the alternative project sites.

The nine remaining taxa in Table 3.15.2-1 are State-listed; they are not Federally listed, nor are they Federal candidates or Federal SOC. The American peregrine falcon (*Falco peregrinus anatum*) is State-listed as endangered, while the arctic peregrine falcon (*Falco peregrinus tundrius*), wood stork, swallow-tailed kite (*Elanoides forficatus*), white-tailed hawk (*Buteo albicaudatus*), sooty tern (*Sterna fuscata*), timber rattlesnake (*Crotalus horridus*), smooth green snake (*Liochlorophis vernalis*), and creek chubsucker (*Erimyzon oblongus*) are listed by TPWD as threatened.

The American peregrine falcon was recently removed from the endangered species list (64 FR 46542-46558; 25 August 1999). This delisting also removed the designation of endangered due to similarity of appearance (E/SA) for the arctic peregrine falcon and any other free-flying peregrine falcons within the 48 conterminous states. Both the American peregrine falcon and arctic peregrine falcon are statewide migrants in Texas (TOS, 1995; FWS, 1995), and the Texas coast provides important migratory habitat for both subspecies. Additionally, arctic peregrines are known to overwinter on the Texas coast. Peregrines have been reported from the project counties (Oberholser, 1974; FWS, 1995) and may frequent any of the alternative project sites, particularly during spring or fall migration.

The wood stork formerly bred in southeast Texas, but now only occurs during post-breeding dispersal from Mexico (Rappole and Blacklock, 1994; TOS, 1995). Potential habitat within the project region is limited because of urban development, but includes shallow-water habitats such as inundated sand and coastal marshes. Wood storks forage in prairie ponds, flooded pastures or fields, ditches, and other shallow freshwater and saltwater habitats (Coulter et al., 1999; TXBCD, 2001). This species has been recorded from the project counties (Oberholser, 1974) and, therefore, is of potential occurrence at the various project sites. An adult wood stork was encountered near the Shoal Point site by PBS&J on 20 June 2001.

The swallow-tailed kite is a casual to rare migrant in all parts of the state except the Panhandle and western half of the Edwards Plateau (TOS, 1995). Habitat includes freshwater and brackish marshes, bottomland forests, and swamps (Oberholser, 1974; Meyer, 1995). Historically, it was a very common to uncommon breeding species in the eastern half of Texas, but was almost completely extirpated from the state by 1910 (Oberholser, 1974). It was last reported breeding in Harris County in 1914 and did not breed in the state again until 1994, when a nest was observed near the Neches River in Tyler County (Brown et al., 1997). Swallow-tailed kites have been observed exhibiting breeding behavior during the breeding season since 1990, and a recent survey (Shackelford and Simons, 2000) confirmed nest sites in Orange County, Texas. The swallow-tailed kite has been recorded in numerous Texas counties between Clay County along the Red River and Hidalgo County along the Rio Grande, and has been observed in most of the Gulf Coast counties. Within Texas, this species most often occurs in Chambers, southern Harris, Liberty, Hardin, Jefferson, Orange, eastern Tyler, Jasper, and Newton counties (Shackelford and Simons, 2000). It may also occur in Galveston County. The swallow-tailed kite is not expected to occur at any of the alternative project sites, due to the distance from its preferred forest habitat and the influence of surrounding urban/industrial development.

The white-tailed hawk is an uncommon local summer resident of the coastal plain from Harris and Colorado counties south to the Rio Grande (TOS, 1995). It inhabits coastal grasslands ranging from cordgrass flats adjacent to the Gulf of Mexico to mesquite-oak savannahs farther inland (Oberholser, 1974). This species has been reported from Galveston and Harris counties and could occur at any of the alternative project sites.

The sooty tern is a local summer resident along the central and lower Texas coast and has been recorded as nesting in Galveston County (TOS, 1995). This species nests on oceanic, tropical islets, and is predominantly pelagic, generally avoiding the mainland except when blown inland by strong

hurricane-force winds (Oberholser, 1974). It could occur at any of the alternative project sites as a rare visitor.

The timber rattlesnake generally prefers upland woods and rocky ridges throughout most of its range in the central and northeastern U.S. In Texas and throughout the south, it is known as the canebrake rattlesnake because of its historic prevalence in the dense cane thickets that were common in the bottomlands of east Texas before 1900. Although the cane thickets are almost gone, the timber rattlesnake still prefers dense undergrowth in riparian woodlands (Tennant, 1998). It primarily inhabits moist lowland forests and hilly woodlands near rivers, streams, and lakes in the eastern third of the state from the Red River to the Gulf Coast (Werler and Dixon, 2000), but can also be found in open, upland pine and deciduous woods and the second-growth pastures of unused farmland. Although this species is reported from Harris County and its range includes Galveston and Chambers counties, it does not generally occur in coastal habitats and is not the species of rattlesnake likely to occur on any of the proposed project sites.

The smooth green snake occurs as a relict population along the Gulf Coast in habitats of open, shortgrass prairie. It is an extremely rare snake in Texas, known from only 10 specimens collected in Austin, Chambers, Harris, and Matagorda counties (Werler and Dixon, 2000). This species has not been recorded from Galveston County and is not expected to occur at any of the alternative project sites due to the general absence of suitable prairie habitat.

The creek chubsucker (listed as threatened by TPWD) is a freshwater fish that, while common throughout the central and eastern U.S., in Texas is known to occur only in various tributaries of the Red, Sabine, Neches, Trinity, and San Jacinto rivers. It is dependent on a variable stream-flow regime. Although this species occupies a wide variety of habitats, it seldom occurs in impoundments. Population decline is attributed to increased siltation in its stream habitat (Lee et al., 1980; Pflieger, 1975). The creek chubsucker would not occur at any of the alternative sites due to the absence of suitable freshwater habitat.

3.16 CULTURAL RESOURCES

The project area is located in Harris, Galveston and Chambers counties, Texas, which are part of the Southeast Texas Archeological Region of the Eastern Planning Region of Texas (Kenmotsu and Perttula, 1993).

3.16.1 Previous Investigations

Previous investigations of cultural resources in the vicinity of the proposed project study area including the Houston Ship Channel have been conducted by a diverse array of professional and avocational archaeologists and historians. One of the earliest was a Texas centennial-era survey conducted to locate important historical sites and landmarks associated with the state's settlement and struggle for independence. The statewide centennial-era survey program was conducted concurrently during the 1930s with a broader survey of the nation's most important landmarks. This survey resulted in the recognition of numerous sites in the Houston/Galveston vicinity, among them the San Jacinto

Battlefield site (41HR277). This early phase or research into historical resources of the state and nation provided a starting point from which later legislation and scientific research would be enacted.

A post-World War II Federal program of archaeological survey and salvage was implemented along many of the nation's river basins. These surveys relied largely on local professional and avocational archaeological groups and individuals to conduct the field investigations. J.B. Wheat's survey of the Addicks Reservoir portion of the San Jacinto River basin for the Texas Archaeological Salvage Project in 1946 not only provided some of the earliest scientific data concerning the region's prehistoric cultural sites, but also provided an impetus for the founding of the local Houston Archeological Society (HAS). Since its founding, HAS and its members have contributed substantially to ongoing archaeological research in the Galveston Bay area.

HAS members Worthington and Neyland surveyed the Galveston Bay area shoreline in the mid- to late-1950s, providing initial assessments of site extent and condition. They also noted the destructive effects which erosion and subsidence were having on the area's numerous shell middens. Worthington and Neyland's survey efforts have been used since then to guide subsequent research in the Galveston Bay vicinity. These sites originally recorded by HAS and Neyland have recently been reassessed by TARL (Takac et al., 2000) for the U.S. Army Corps of Engineers, Galveston District. Ten previously recorded sites were surveyed, evaluated, and/or tested during the course of the project. Sites 41HR33, 41HR104, 41HR105 41HR405, 41HR577, 41HR680, 41HR681, and 41HR685 were all determined to have subsided beneath the water line, eroded, or were natural accumulations of redeposited material (Takac et al., 2000). Site 41HR576, a historic site, was tested. The recommendations for this site were that documentary and archival investigations be conducted to determine whether additional field testing is warranted. Site 41HR121 was also relocated and tested. The site yielded *Rangia* and oyster shell, ceramics, and lithic debitage. Site 41HE121 is believed to date to the earliest Galveston Bay ceramic period and mitigation was recommended.

HAS and Texas Archeological Society members also contributed to the research conducted at the Harris County Boy's School sites between 1968 and 1972. Aten and Chandler (1971) and Aten (1983) used the detailed documentation of burial features associated with a Late Archaic shell midden to describe coastal culture mortuary practices and to expand his ceramic seriation for the Galveston Bay region.

With the passage of the National Historic Preservation Act in 1966, the USACE became the primary sponsor of cultural resource investigations in the Galveston Bay region by virtue of its ongoing responsibilities for maintenance and operation of the Houston and Galveston ship channels. Since then the USACE has sponsored numerous projects which have contributed substantially to the information base available to current researchers.

During the early 1970s, a USACE-sponsored survey conducted by Paul McGuff, with the assistance of others, re-visited many of the sites originally recorded by Worthington and Neyland. Surveys of upper Galveston Bay and Buffalo Bayou (McGuff and Ford, 1973, 1974) largely reiterated prior observations concerning degradation and loss of shoreline midden sites as a result of erosion and subsidence associated with continued urban-industrial development in the area. These surveys provided

an updated condition assessment necessary for the THC and the Texas Archeological Survey program of the University of Texas at Austin to plan more intensive investigations at selected sites.

Aten (1983) and others have hypothesized that the Crystal Beach and McFaddin Beach materials may be re-deposited from submerged Pleistocene landforms located just offshore. A USACE-sponsored archival study by McIntire (1982) for a Texas City Channel maintenance dredging project indicates that intact Pleistocene deposits may remain in the vicinity of the Texas City Dike. Well-preserved samples of numerous Pleistocene faunal species were recovered at an unspecified depth during the course of that project, leading to the suggestion that similar projects, carefully planned and executed, may reveal important information about early cultural developments in the Galveston Bay area.

3.16.2 Cultural Setting

The cultural history of the project study area has been assigned to four primary developmental stages: Paleoindian, Archaic, Late Prehistoric, and Historic. These divisions generally are believed to reflect changes in subsistence as reflected by the material remains and settlement patterns of the people occupying this portion of Texas in prehistoric and early historic times.

3.16.2.1 Paleoindian Period (10,000 B.C. - 6500 B.C.)

The earliest generally accepted culture of the Americas, the Paleoindian appears to have extended over most, if not all, of North America by the end of the Pleistocene epoch. It has been hypothesized that in Texas the Pleistocene coastline extended as much as 25 miles into the present Gulf of Mexico and that rivers cut deep canyons into sediments deposited during previous periods of glaciation (Aten, 1983). With the close of the Pleistocene came a period of climatic warming and a consequent rise in sea level as surface water was released from glaciers and polar ice. This began the period known as the Holocene epoch. Paleoindian cultural developments in the Gulf Coastal Plain region, as in most areas of North America, appear to have been intimately related to these gradual but vast changes in the world climate and local environmental conditions.

Occupation of the Texas Gulf Coast during the terminal Pleistocene is evidenced by the recovery of several types of well-made, lanceolate, parallel-flaked projectile points such as *Scottsbluff*, *Clovis*, *Plainview*, *Angostura*, and possibly *San Patrice* types. The presence of these distinctive projectile point types along the coastal plain appears to reflect activities that would typically have occurred in areas further inland where the environment is characterized by a mixture of deciduous and pine woodlands (Aten, 1983). According to Aten (1983), the coastal plain habitat typically supports low-density human populations. Archaeological evidence synthesized by Story et al. (1990) from numerous counties comprising the greater Gulf Coastal Plain in Texas, Louisiana, Arkansas and Oklahoma supports the suggestion that the Paleoindian groups probably existed in small nuclear families or bands which migrated widely in pursuit of seasonal subsistence resources.

Paleoindian sites in Galveston Bay that have been investigated include the Galena Site (41HR61) and the Crystal Beach Site (41GV101) on Bolivar Peninsula. Both of these sites yielded singular surface finds of the *Clovis* type, with the Galena site also yielding a later *Scottsbluff* type point. Another Paleoindian site, the McFaddin Beach site, 41JF50, in Jefferson County has yielded 33 early

culture points from a 25-mile stretch of beach over a span of several years (Story et al., 1990). The site has also yielded an extensive array of associated tools and faunal remains. An important aspect of the McFaddin Beach site is its potential to refine geoarchaeological predictive models for locating submerged cultural deposits within the bays and deltas of the Gulf Coasts' numerous rivers and their tributaries (Story et al., 1990). The parent deposit for the many artifacts recovered along McFaddin Beach appears to be a submerged Pleistocene shelf located just offshore which is being eroded by wave action (Aten, 1983). As this formation has been buried beneath the relatively shallow sediments of a minor stream that empties into the Gulf, it has been impacted by littoral erosion forces that have contributed to the redistribution of artifacts along the nearby beach. Aten suggests that similar formations may be buried beneath deeper sediments of more major deltaic and estuarine systems, such as the Galveston Bay system. Accordingly, submerged archaeological deposits located within the deeply buried sediments of the ancient Trinity and San Jacinto rivers where they extend across Galveston Bay may well exist; however, they would be less detectable and more difficult to investigate.

3.16.2.2 Archaic Period (6500 B.C. - A.D. 700)

Cultural developments appear to have progressed somewhat beyond those of the Paleoindian period with the onset of the Holocene epoch. Changes in the world climate caused sea levels to rise, inland prairies to expand and regional weather patterns to become more variable (Aten, 1983). Generally termed the Archaic, this next period of cultural development in the New World has been further sub-divided into Early, Middle, and Late stages based on changes observed in the archaeological record that appear to coincide with episodic shifts in the Holocene climate and environment. It is commonly thought that human lifestyles and subsistence strategies maintained patterns developed during the previous Paleoindian period, but with some notable differences.

Aten (1983) suggests that Early Archaic groups, like their Paleoindian predecessors, probably continued to migrate seasonally in small bands and relied on a generalized projectile point technology to facilitate their hunting and gathering of a variety of faunal and vegetal foodstuffs. Despite a paucity of intact Archaic components at sites in the upper Texas Gulf Coast region, it has been observed that Archaic lithic technologies appear to show an increased diversity of functional types and styles over those associated with the Paleoindian period. However, the level of craftsmanship and the use of fine exotic materials appear to have declined. In addition, the greater array of Archaic projectile point styles appears to reflect a greater degree of regional cultures. Story et al. (1990) surmise that Archaic period human populations may have become more dense, with individual bands covering less overall territory on their seasonal rounds.

Differentiation between Early, Middle, and Late Archaic culture sites in the upper Texas Gulf Coast region, without the benefit of sufficient associated cultural features and artifacts from which strong chronological dates and sequences can be derived, has been based largely on observation and comparison of projectile point styles associated with more intact archaeological contexts elsewhere in Texas and North America. The assumption has been that similar point styles are probably related chronologically, despite sometimes vast geographical distances. According to these lines of reasoning, Early Archaic point types are usually considered to include *Baird*, *Bell*, *Andice*, and *Wells*, whereas *Bulverde*, *Carrollton*, and *Trinity* points are usually attributed to the Middle Archaic stage. Based on a

relatively greater database for defining the Late Archaic, point types considered diagnostic of this cultural stage typically include *Gary*, *Kent*, *Yarbrough*, *Ellis*, *Palmillas*, and *Refugio* (Patterson, 1979).

Terminologies developed during the 1980s by Mercado-Allinger et al. (1984) have grouped the Early and Middle Archaic culture stages together into a single Early Pre-ceramic culture date, with the Late Archaic equating to their Late Pre-ceramic stage. The Harris County Boy's School sites have provided some of the most intact and diverse types of archaeological data relating to the Late Archaic, or Late Pre-ceramic period in Texas. They are particularly notable for the presence of an apparently intact Late Archaic component that includes not only projectile points but extensive midden refuse and numerous primary burials. Ceramics related to the Tchefuncte Period of the Lower Mississippi Valley were also recovered during the excavations.

The Late Pre-Ceramic, which coincides, in part, with Late Archaic elsewhere in Texas, extends from the approximate period in which sea level attained its present state until the advent of ceramic service and storage vessels, ca. A.D. 100 (Aten, 1983). During this period, population increased significantly, marked by an increase in the number of sites as well as intra-site artifact frequencies (Aten, 1983). Hall (1981) also noted an increase in traumatic death and the development of trade relations with Woodland cultures to the east during the Late Archaic. A settlement system, which may have included a seasonal round with group dispersal in coastal areas during the summer and consolidation in inland areas during the winter months, may have begun during the Late Archaic (Aten, 1983). However, the occurrence of shell middens at Late Archaic sites is not as common as at later sites (Patterson, 1979). Projectile points diagnostic of Late Archaic occupations include *Gary*, *Kent*, *Yarbrough*, *Ellis*, *Palmillas*, and *Refugio* (Patterson, 1979).

Excavations at the Harris County Boy's School, conducted between 1969 and 1972, yielded some of the most significant archaeological materials yet discovered in the upper Texas coastal region (Aten et al., 1976). During the Boy's School investigations, the remains of 32 individuals were recovered. Most of these were primary burials. They contained such offerings as shell beads, bone projectile points, bone dice, hammerstones, red ocher, and mussel shell (Aten et al., 1976). Occupation of the sites was during the Pre-Ceramic period, ending some time around A.D. 600. Ceramics related to the Tchefuncte Period of the lower Mississippi Valley were recovered during the excavations (Aten et al., 1976).

3.16.2.3 Late Prehistoric Period (A.D. 700 - A.D. 1519)

The Late Prehistoric, or Ceramic period, cultures experienced a relatively static environment. This stage lasted from the time when ceramics were adopted until European interaction with the aboriginal populations became firmly established. Aten (1983) has divided the Late Prehistoric in the Galveston Bay area into six chronological periods based on ceramic seriation: Clear Lake, Mayes Island, Turtle Bay, Round Lake, Old River, and Orcoquisac. In Addicks Reservoir in northern Harris County, Wheat (1953) identified two Ceramic period components. This division was based upon the continued use of Late Archaic dart-point types in the earlier component and the addition of arrow points in the later component. Mercado-Allinger et al. (1984) have adhered to the categories established by Wheat, designating Wheat's middle-level occupation the "Early Ceramic Period" and his upper level the "Late

Ceramic Period" and have integrated Aten's chronological periods. Chipped stone artifacts from the Late Prehistoric include the continued use of Late Archaic dart point types

The addition of *Perdiz* and *Scallorn* arrow points to the inventory marks the beginning of the Late Ceramic period. Ceramics of the earlier period may include *Goose Creek Plain*, variety *Anahuac*, *O'Neal Plain* variety *Conway*, *Mandeville Plain*, *Tchefuncte Plain*, *Goose Creek* variety unspecified, and *Tchefuncte Stamped*. In the Late Ceramic period, the ceramic inventory may include *San Jacinto Incised* and *Baytown Plain* varieties *Phoenix Lake* and *San Jacinto* (Aten, 1983). It should be noted, however, that several varieties of *Goose Creek Plain*, as well as *Goose Creek Incised* (and *Red-Filmed*), and the occurrence of bone tempering, span much of the Ceramic period.

Population during the Late Prehistoric tended to increase until European-introduced disease contributed to the decline of the aboriginal inhabitants. Patterson (1979) observed an increase in numbers of Late Prehistoric sites, while individual sites exhibit fewer cultural remains. He interprets this as evidence of a more mobile lifestyle.

3.16.2.4 Historic Period (A.D. 1519 - A.D. 1950)

Native Inhabitants

When Europeans arrived on the northern Texas coast, they encountered two major native groups, the Atakapa and the Karankawa Indians, who occupied separate territories divided approximately at the western shore of Galveston Bay. The Atakapa, speaking a language of the Tunican family, displayed traits closely related to the native of southwestern Louisiana. The Karankawan groups spoke a language of the Coahuiltecan family and were more closely related to the Indians further south in Texas and Mexico.

In spite of differences in language and apparent cultural derivation, the Atakapa and Karankawa maintained similar cultural patterns (Newcomb, 1993). Both groups were nomadic, although the Atakapa maintained semi-permanent winter villages in the interior. Ethnographic and archaeological evidence supports the contention that historic Karankawas resided during the fall and winter in large shoreline camps of 400 to 500 people. During the spring and summer they camped along stream courses in bands averaging about 55 individuals (Ricklis, 1996). Karankawa sites were generally located in sheltered bays or on the leeward side of stabilized dunes on the Laguna Madre side of Padre Island (Thomas and Weed, 1980). Conical huts and skin tents served as shelter for the Atakapa, while the Karankawa lived in portable windbreak style huts.

The Atakapa subsisted on shellfish, fish, birds' eggs, wild plants, deer and bear, while the Karankawa ate shellfish, turtles, marine and land plants, alligator, deer, bison, bear, and peccary. Atakapan technology included pottery, bows and arrows, dugout canoes, basketry, traps, manos and metates, drums and flutes, wooden bowls and utensils, and grass fiber textiles. The Karankawa also used pottery and the bow and arrow, along with dugout canoes propelled by poles, basketry, cane weirs, milling stones, drums and whistles, tambourines, lances, clubs, axes, and bone tools. Both groups buried their dead in burial mounds and left refuse middens, primarily shell. Both wore breechcloths and skirts and decorated themselves with tattoos.

Both the Atakapa and Karankawa were equally unprepared to defend themselves and their cultural traditions from the newly arrived Europeans. Even though the Karankawa integrated the Spanish Colonial mission-presidio complex into their traditional patterns of land use and seasonal settlement mobility, by the late eighteenth century, both the Atakapa and Karankawa peoples were in serious decline and either dispersed or assimilated into other groups (Newcomb, 1993; Ricklis, 1996). Currently the Karankawa is not a Federally recognized tribe, nor is there an extant Karankawa tribe (Gardner, 2001). The Atakapa are not a Federally recognized tribe either.

European Exploration and Colonization (1519-1821)

The initial exploration of the Gulf of Mexico and the American Southwest was by Spanish explorers Pineda (1519) and de Vaca (1528). The Spanish Crown, in its quest to observe and record the character and economic potential of the territory and its people, sanctioned both these explorers. This activity by Spain occurred within the context of greater colonial expansionist efforts undertaken by the primary Western European powers throughout the sixteenth century. Following Pineda's initial maritime effort to map the Gulf Coast, the earliest exploration of the Texas Gulf Coast territory was accomplished by Alvar Nunez Cabeza de Vaca who was shipwrecked in 1528 along with other members of an expedition in the Gulf of Mexico led by Panfilo de Narvaez (Weddle, 1985).

Much historical speculation has occurred concerning whether the island of Malhado upon which de Vaca's party was shipwrecked is the current Galveston Island or nearby San Luis Island. In either case, he lived among the Indians for the next several years and probably visited much of the Galveston Island vicinity during the Indian's seasonal rounds before he determined to make his way toward Panuco in Mexico and eventually back to Spain (Freeman, 1990, reported in Story et al., 1990). De Vaca's recollections of his adventures along the Texas coast and in the American Southwest were published years later, after his return to Spain.

De Vaca's account served, in turn, as the basis upon which subsequent explorations of the region were conducted by Hernando de Soto (1539) and Luis de Moscoso (1542). However, by 1561, Spain was facing increasing difficulties in maintaining its few colonies in Florida. The relatively poor economic prospects for these colonies and increasing competition from other colonial powers quelled the Spanish Crown's interest in colonizing its Florida territories. As a result, the Texas Gulf Coast remained relatively uninhabited by Europeans for the next two centuries until the threat of increased French exploration in the territory stimulated the Spanish government to establish more permanent settlements in the area (Weddle, 1991). In response to La Salle's establishment of Fort St. Louis at Matagorda Bay (1685), the Spanish government in Mexico sponsored a series of military expeditions to locate and defeat the rumored French settlement. La Salle's Fort St. Louis marked the beginning of France's efforts to colonize the Texas Gulf Coast. Fort St. Louis was eventually destroyed by hostile natives and its inhabitants killed.

Whereas Pineda, de Vaca, and others had developed maps of the greater Gulf Coast in the sixteenth and seventeenth centuries, the earliest detailed map of Galveston Bay was completed during an early eighteenth century expedition by Bernard de la Harpe (1721). De la Harpe was seeking to re-establish La Salle's former trading post and fortress in Matagorda Bay. Contrary to many modern

historical accounts that place de la Harpe's effort well south of San Antonio Bay, Taliaferro et al. (1988) suggest that his expedition was the first European effort to establish a settlement in Galveston Bay. Although hostile natives prevented the settlement, Fort Point on the east end of the "Isle de la Harpe" (Galveston Island) is thought to be the place at which de la Harpe landed and again laid claim to the area for France.

Spain's defense of the region, then called Nuevo Santander, was to be achieved by establishing a series of missions and associated presidios for their protection across western, central and eastern Texas. Mission Nuestra Senora de la Luz and its companion Presidio San Augustin de Ahumada comprised the Spanish ecclesiastical outposts in the Galveston Bay area. This mission, also known as Mission Orcoquisac after a principal Indian village located nearby, was founded in about 1756. It met with considerable resistance from the local tribes in the area and was ordered to relocate several times before the mission and its presidio were burned and abandoned in 1772 (Webb, 1952).

With the U.S. purchase of the Louisiana Territory from France in 1803, the long-running dispute over control of Texas shifted to include Spain and the U.S., both of which claimed land extending between the Rio Grande and Neches rivers. Increasing dissent against Spain's imperial control over New Spain gave rise to a series of revolutionary movements seeking to establish new independent nations in Mexico and Texas. Despite Spain's efforts at establishing a pair of military outposts just east of Galveston Bay, called Atascosita and Salcedo, to limit foreign intrusions into the area, Mexican and Texan revolutionaries displaced the Spanish at Salcedo in 1811 and the Gutierrez-McGee expedition effectively took control of the Trinity River vicinity in the following year (Richner and Bagot, 1978, reported in Story et al., 1990).

Until 1821, when Mexico won its independence from Spain, the territory of Texas, which then extended well north and west of the current areas of New Mexico, Colorado, Kansas, Oklahoma, and Utah, remained a frontier of contention between Spain, Mexico, and the U.S. Without sufficient political and military presence on the part of the Mexican government, this controversial region frequently attracted entrepreneurs and fugitives from Europe and adjacent upper and lower southern states along the Atlantic Coast.

3.16.2.5 Galveston

Although the Galveston Bay area was generally removed from the impacts of the Mexican war for independence (1811-1821), Galveston Island and Point Bolivar served as early operational bases from which Mexican nationals and others with Anglo-American affiliations directed their revolutionary activities against Spanish shipping in the Gulf Coast region. These efforts against Spain were part of a greater revolutionary plan being organized by Mexican patriots, such as General Francisco X. Mina, who operated out of New Orleans, Louisiana. Upon his arrival at the island in 1816, French privateer Louis Michael Aury was authorized by the Mexican revolutionary leaders to organize the first government there and proclaimed Galveston an official port of the Mexican Republic. Although the New Orleans group dropped their plans for an invasion of Mexico, Aury and Mina departed on an unsuccessful invasion attempt directed toward the town of Soto La Marina in Mexico. Jean Lafitte took their departure as an opportunity to commandeer Aury's fortress and port community (Tyler, 1996).

Having been run out of his previous privateering stronghold in Barataria, Louisiana, Lafitte's east end encampment (then called Campeche) on Galveston Island served as a new base for carrying out raids against Spanish shipping in the Gulf. Campeche reportedly was consisted of rude wooden huts surrounding Lafitte's own "Maison Rouge" fortress and was located near the bay shore just east of Galveston's current port facilities (Foster et al., 1993). Lafitte's control of the island contributed to his appointment as governor of the island by James Long's filibuster government founded in 1819. Long established his own fortress on Point Bolivar in 1820.

Increasing public awareness of Lafitte's disreputable trading activities and mistreatment of slaves led the U.S. government to order Lafitte's removal from his Galveston Island fortress in 1820 (McComb, 1986). Lafitte departed peaceably in early 1821, although he burned his encampment, and Long moved in shortly thereafter to re-establish Lafitte's razed fortress on the island's east end. Long's Texas Republic disintegrated with his death in 1821. His wife, Jane Long, remained at the Point Bolivar fortress until she heard of her husband's death. Shortly thereafter she departed with the first of the incoming Austin colony settlers in 1822.

With the demise of the Spanish empire in Mexico, one of the first changes instituted by the new Mexican Republic was the redefinition of certain territories and re-assignment of land grants. The Spanish province of Nuevo Santander, for example, became the Mexican Free State of Tamaulipas in 1824. Tamaulipas exercised control over its own vacant land and, between 1828 and 1836, allotted vacant lands to prominent Mexican citizens and soldiers (Pierce, 1917). Foreigners were allowed to immigrate and many entered the region through Galveston.

Under the terms of Mexico's colonization law of 1825, land settlement speculators from the United States began petitioning the Mexican Republic government for permission to settle in its northern territories. "Empresario" status was given to select applicants who were to promote settlement within lands granted as Mexican colonies. Moses Austin and his son, Stephen, were among these applicants. The current study area lies within the Austin family's second colony tract, granted to them in 1825 (GLO, 1993). In 1825 the Mexican government established Galveston Island as an official port and built the first customs house there in 1830 with a small military settlement to protect it.

In this same period of early Anglo-American immigration, the juncture of the San Jacinto River and Buffalo Bayou above Galveston Bay also became a focal point of settlement and commerce. Though the area was sparsely settled by Anglos in the late 1810s and early 1820s, Nathaniel Lynche's receipt of a charter to operate a ferry at this location prompted intensive occupation and development of the area. At both ends of his ferry crossing, Lynch and other speculators began promoting industry, commerce, and settlement at the nascent San Jacinto and Lynchburg townsites. The successful development of this area apparently occurred largely as a result of its situation at a crossroads of overland and waterborne transportation. This strategic position allowed outgoing cotton and lumber products of the coastal forests and river valleys to be marketed and shipped in exchange for incoming goods and supplies, while travelers could embark on their journeys in any direction.

By the early 1830s, Mexican apprehension of the growing Anglo-American population of Texas led to the institution of stricter laws for the Texans. The Mexican general at Matamoros

recommended sending more Mexican colonists into Texas and increasing the number of troops in the area in an attempt to establish a larger Mexican presence. Such recommendations did little except to anger the Texans. New laws aimed at restricting Texas commerce and abolishing slavery were perceived by the Texans as direct attacks on their livelihoods (Zavaleta, 1986). In 1832, Texans declared their independence and waged war against Mexico. The San Jacinto River and Galveston Bay vicinity were a vital center of revolutionary activity, with important events occurring at Turtle Bayou, Wallisville, Anahuac, Liberty, San Jacinto, Lynchburg, and New Washington.

At the height of hostilities in 1836, and under threat of advancing Mexican troops commanded by General Antonio Lopez de Santa Anna, the ad interim Texas Republican government led by David G. Burnet was temporarily relocated from San Felipe to Galveston. In an event known as the Runaway Scrape, thousands of Texan families fled central and south Texas, many of whom converged on the south shore of Buffalo Bayou waiting to cross the San Jacinto River at Lynch's Ferry. During Santa Anna's advance on Lynch's strategic crossing of the San Jacinto River, a move that resulted in one of the most important battles in Western history, Santa Anna's army burned the fledgling town of New Washington on what is known now as Morgan's Point.

With Santa Anna's defeat by General Sam Houston near San Jacinto on 21 April 1836, Texas became an independent republic. Burnet and his companions in Galveston did not learn of Houston's decisive victory for another two days (McComb, 1986); thus Galveston served as a temporary capital of the Republic before it was removed to Velasco (1836), Columbia (1836), and later to Houston (1837) before Austin was finally chosen as the permanent site of the capital in 1839.

Amid a flurry of speculation and developmental activity in the wake of Texas' successful war for independence from Mexico, backed extensively by businessmen from northern states and foreign nations, Galveston Island and the greater Galveston Bay region from this point in time served a preeminent role in the settlement and commerce of Texas. Galveston Island's geographical advantages as a natural port and its accessibility from several of Texas' major rivers enabled its early development as a principal Gulf Coast center for shipping and trade. The port also became a primary point of entry for immigration into Texas from a variety of foreign countries. The City of Galveston was founded in December of 1836 upon a tract of land patented to Michel B. Menard by the First Congress of the Texas Republic. The Republic of Texas retained ownership of the strategic eastern tip of Galveston for construction of Fort Travis to guard the entrance into Galveston Bay. Across the pass, efforts were underway to establish the Point Bolivar lighthouse as a navigation aid for this important waterway.

Under the leadership of Menard and other wealthy capitalists including Samuel May Williams, Thomas McKinney, and Gail Border, Galveston became the largest city in the Republic as well as one of the most important ports in the southern U.S. between 1836 and 1900. Menard founded the Galveston Bay Company in 1838, allowing Williams and McKinney to build and operate the first of Galveston's commercial wharves (Alperin, 1977). Construction of the Williams and McKinney wharf was quickly followed by a succession of others, all typically tee-shaped and extending across the broad mud flat that separated the commercial strand from the deep-water channel.

As the principal market center for the rich cotton plantations of Texas' major river valleys, Galveston quickly became the largest source of cotton for the Atlantic states and Europe, where the developing textile industry created a huge demand for the fiber. By 1839, Galveston's wharves supported over $1 million in commercial exchange; the vast majority being in cotton from the interior of Texas. By 1854, the successful proliferation of numerous independent docks in the port prompted Menard to organize the Galveston Wharf and Cotton Press Company in order to consolidate the port's overall activity under his authority (Alperin,1977).

The Galveston Wharf Company (as The Galveston Wharf and Cotton Press Company became known) was established with an unusual mixture of public and private ownership that exempted it from taxation. With complete control over all port activities, the Galveston Wharf Company was a dominant force in the city for the next 84 years. While the city's offshore location ensured its success as a commercial port, it delayed the city's connection to the nation's expanding railway transportation system. Once Galvestonians managed to fund construction of a railroad trestle to the mainland (ca. 1860), the combined importance of Galveston's deep-water port and its connection to the extensive rail complex at Harrisburg and Houston soon translated into important military advantages (Alperin, 1977).

Although the Republic decommissioned Fort Travis (also known as Post Galveston) in 1844, the east end military reservation was retained by the United States government beginning in 1845 and re-established as Fort Point (Freeman and Hannum, 1991). Following Texas' secession from the Union in 1861, the Confederate military established an extensive series of fortifications around the east end of the island, as well as on Pelican Spit and Point Bolivar, to protect the port during the American Civil War. Despite this array of defenses, the Union navy imposed a blockade of all Gulf Coast bays and harbors and successfully seized the city of Galveston in October of 1862. The Battle of Galveston was fought several months later on New Year's Day, 1863, with Confederate troops under General John B. McGruder's command recapturing the city in a combined naval and land attack. During the battle the Union gunboat USS *Westfield* ran aground north of Pelican Spit. It was then blown up by the crew to avoid its capture (Gearhart and Schmidt, 2002:17-21).

Galveston suffered some damage from naval bombardment during the Union's seizure of the city, and a subsequent fire in 1885 destroyed much of the town's commercial district. However, the city continued to prosper as a result of its superior location, facilities for shipping, and the cotton trade. For the next several decades, the city leaders continued to rely upon this important agricultural commodity and emphasized improvement of Galveston's harbor facilities. This narrowly focused economic program, combined with the island city's almost complete destruction during the great hurricane of 1900, placed Galveston's primary competitor, the inland community of Houston, in a highly advantageous position for attracting both Gulf Coast shipping commerce and prospective industrial interests. The primary obstacle faced by the Houston city leaders was the same obstacle recognized by its founders in the early nineteenth century: the need for a deep-water channel linking ports in Galveston Bay to the Gulf (Kelly, 1975).

3.16.2.6 Texas City

The Texas City community was originally a small settlement called Shoal Point that consisted of a few families on the Galveston Bay shore in the mid-1800s. The Myers brothers from Duluth, Minnesota, recognized the area as a potential port area and purchased the land as the first step in the development of a protected harbor in 1891 (Tyler, 1996). In 1893, the Myers and several other Duluth shippers including Augustus Wolvin purchased a 10,000-acre parcel of bay frontage that included Shoal Point and renamed it Texas City. They also formed the Texas City Improvement Company that year and received permission for dredging the first Gulf channel to Texas City in 1894. The company then constructed a four-mile rail spur line called the Texas City Terminal Railway (TCT) that linked its port facilities to the national railroad system in Texas City Junction. By 1897, the company had to be reorganized due to financial difficulties, and from the reorganization, the Texas City Company was organized to manage the townsite, and the Texas City Terminal Railway Company arose to operate the railroad and docks (Tyler, 1996).

Having acquired the TCT in 1898, Wolvin persuaded the Federal government to fund further dredging of the channel in 1904 to accommodate ocean-going vessels. By 1905 Texas City was designated as a United States port of customs. Port activity further increased with the construction of the Texas City Refining Company in 1908, which had been attracted partly due to the efforts of civic leader and TCT official Hugh B. Moore. Another large population increase came in 1913 when President Taft stationed the Second Division of the United States Army at Texas City in response to disturbances along Texas' Rio Grande border that increased in number at the start of the Mexican Revolution (1910-1940).

In 1913, Moore helped secure funds for the construction of the Texas City Dike. This dike was necessitated because the original channel was constructed across the natural water line, causing a need for constant dredging to keep the channel free of silt brought in by the currents. It was completed in 1915 and later extended in 1934 (Tyler, 1996). Economic growth was greatly spurred on by the fact that the dike allowed the channel to become a busy shipping lane attracting further industry.

Although the area has continued in a trend of prosperity and growth, explosions at the docks on 16 April 1947 caused a major setback that had to be overcome. The explosions occurred when a docked French ship called the *Grandecamp* that had been loaded with ammonium nitrate caught fire and exploded. This ignited several fires in nearby industry buildings and a US ship that was also carrying ammonium nitrate (Tyler, 1996). Although official figures report 576 known deaths, the actual figure is unknown. Several thousand people were also injured and property damage was estimated at $67 million. However, the town did rebuild and continued to expand so that the population in 1960 was double what it had been in 1950.

3.16.2.7 La Porte

The City of La Porte, located on the northwest shore of Trinity Bay, was established in 1892 as a real estate venture (Tyler, 1996). In 1915, La Porte suffered two major setbacks, first from a fire that destroyed all of the downtown business district and then from a disastrous hurricane. The Sylvan Beach Amusement Park was the avenue through which La Porte gained national attention during the

1920s and 1930s due to the many big bands that performed at Sylvan Beach. La Porte was considered a small village with only Sylvan Beach and the summer residents at Bay Ridge sustaining the economy.

During World War II, the growth of the shipyards and the petrochemical industry provided many jobs and made the area attractive to many newcomers. The opening of the La Porte-Baytown tunnel in 1954, the Lyndon B. Johnson Space Center in nearby Webster, and the Bayport Channel helped the growth and prosperity of the city (Tyler, 1996).

3.16.2.8 Baytown

Nathaniel Lynch, one of the first settlers in the area, operated a ferry across the junction of the San Jacinto River and Buffalo Bayou in 1822. Another early settler was William Scott, one of Stephen F. Austin's Old Three Hundred, who received a land grant in 1824 of approximately 9,000 acres. Other settlers in the area included Ashbel Smith who, in 1847, purchased a plantation named *Evergreen* on Tabbs Bay, Mrs. Anson Jones, David G. Burnet, and Sam Houston. By the early 1850s, John and Thomas S. Chubb had established a shipyard at the mouth of Goose Creek. The one ship built by them, the *Bagdad*, was launched in 1864.

The Baytown area remained largely undeveloped during the late 1800s and into the early 1900s. Besides entering the area by boat, a rough country road from Crosby to Cedar Bayou was the only entry into Baytown. In 1908, after two unsuccessful drilling attempts, an oil strike was made beside Tabbs Bay. In 1916, the Goose Creek oilfield became famous as the first offshore drilling operation in Texas and the third largest producing field after the Humble and Sour Lake oilfields. Because of the Goose Creek oilfield success, Ross S. Sterling decided to build a refinery near Goose Creek field in 1917. The refinery he founded was the Humble Oil and Refining Company (Exxon Company, U.S.A.) (Tyler, 1996). It was at this time that Sterling and his associates purchased about 2,200 acres in the William Scott survey and established Baytown. Baytown grew around the refinery and is now a highly industrialized city of refining, rubber, chemical, and carbon black plants (Tyler, 1996).

3.16.2.9 Shoal Point

The community of Shoal Point was located on the southwestern shore of Galveston Bay. Shoal Point is currently a DMPA that is partially owned by the City of Texas City. Disposal of dredged material at Shoal Point began post 1913. By 1924 it was emergent land and by 1932 it was labeled "Dredge Dumps" on the Virginia Point, Texas, U.S. Geological Survey topographic quadrangle.

3.16.2.10 Pelican Island

Pelican Island as it now exists is the result of modifications produced by the USACE with the goal of improving the Galveston Ship Channel along the north shore of Galveston Island. Pelican Island was originally a very small island well north of Galveston Island toward what is now Texas City. A small shifting sand island, called Pelican Spit, occupied an area just north of the east tip of Galveston Island. Prior to 1910, the USACE built a system of pile dikes between the islands and pumped material dredged from Galveston Channel into the intervening space. Pelican Spit and Pelican Island were thereby joined and considerably enlarged to form the current Pelican Island. The eastern tip of Pelican Island,

now occupied by Seawolf Park, is the remnant of Pelican Spit. There is no evidence of developments on the original, smaller Pelican Island.

3.16.2.11 Bayport Area

The industrial port of Bayport is located south of La Porte, Texas, across the Bayport Ship Channel. The construction of the Bayport Industrial Park and the Bayport Ship Channel fueled the growth and prosperity of the cities in the surrounding area, including La Porte and Pasadena. Historic and current settlements in the Bayport area include Red Bluff, Seabrook, Shoreacres, and Todville, as described below.

Red Bluff. The community of Red Bluff was located in southeastern Harris County. In 1880 J. E. Idlbrook ran a general store with a post office. In 1885 the population was 30, by 1890 it reached 100. Only scattered dwellings were present in 1936. The community became the Shoreacres development by the 1980s (Hardin, 2002).

Seabrook. Seabrook is located on the north side of Galveston Bay in Harris, Chambers, and Galveston counties. The settlement originally developed as a summer vacation destination. It boasted a post office by 1895. At the turn of the century the local school taught 100 students. In 1947 the local schools became part of the Clear Creek Independent School District, before joining the Clear Lake district. The Seabrook School for Boys was renamed the Harris County Boys School in 1955. Before the great depression, the population of Seabrook grew from 200 to 560. In 1936 the population was 200. Growth returned to the area in 1947 when the Albert and Ernest Fay shipyard brought workers to the area. The population peak occurred in 1974, with 8,242 residents. In 1990 the town had 6,685 residents and 127 businesses (Hazlewood, 2002).

Shoreacres. Shoreacres is located on the northwestern edge of Galveston Bay in southeastern Harris County. The town formed from the older community of Bay Oaks. It was incorporated in 1949. With improved water and sewage systems installed in the 1960s, the town grew from 183 in 1955 to 2,578 in 1970. The population was 1,434 in 1990 (Kleiner, 2002).

Todville. Todville was founded by John Grant Tod Jr. in 1900. It was a subdivision of the town of Seabrook. The 1936 highway map showed a cemetery at the former townsite. The townsite was subsumed by the suburb of Seabrook (Long, 2002).

3.16.2.12 Spillman's Island

Spillman's Island was named after James Spillman, whose name appears in historical records with a variety of spellings. The island was originally granted to Henry K. Lewis as a "...certain tract or island of land in the Bay of San Jacinto..." (GLO, 1830). According to the surveyor's notes "... about 1/3 of the Island is sea marsh and unfit for cultivation and no timber..." (GLO, 1830). Mrs. Hardin recollected that James Spillman "ran a vessel and about 1830 settled the Island. Died I think in 1840 or 41" (Lamar [Mirabeau Bonaparte] Papers, Document 2206, n.d.).

Aside from Spillman's reputed presence on the island during Lewis' period of ownership, it appears that Sam Houston attempted to develop a vineyard on the island, possibly with the assistance of James Spillman. In a letter from J. Wilson Copes to Ashbel Smith, dated 16 February 1838, Copes wrote: Uncle Sam, has gone to Stillmans [*sic*] Island to plant a vineyard on his lot there...The President will go to Nacogdoches on his return from the Island (Copes to Smith, City of Houston, 16 February 1838, Letter book No. 1, Smith Ashbel [Papers]). Despite this reference to a possible subdivision of the island into lots, by 1839 John W. Moore, acting curator of the Henry K. Lewis estate, sold the entire island to James Spillman (Harris County Deed Records [HCDR] C, 1839).

On 23 September 1839 the Post Office Department commissioned James H. Spillman's homestead as an official post office and listed J.H. Spillman as the Post Master. In February 1840, the Post Office Department approved Public Route No. 1, a weekly service form Houston to Galveston via Harrisburg, Lynchburg, Spillman's Island, and New Washington (Day, 1967). A letter routed from Spillman's Island to Galveston in 1840 validated the office's early operation (George A. Smith [Spillman's Island] to A. Smith [Galveston], Sunday, 12, July 1840, Letters folder 2G221, Smith [Ashbel] Papers).

The Spillman's Island post office was discontinued sometime during the Republic era (Germann and Janzen, 1991) possibly as a result of Spillman's demise in 1840. By February 1841 his estate administrator sold the land to Archibald Wynn. The estate inventory, dated 3 September 1840 listed Spillman's Island, as well as 1,868 acres on High Land Bayou and one Negro woman (Harris County Probate Records [HCPR] E:352-355). A petition for sale was filed in the probate records on 1 January 1841 (HCPR E:353).

Wynn sold the island on 9 June 1842 to Frances Levenhagen, the wife of Henry C.W. Levenhagen (HCDR H:276). Robert Levenhagen sold to Catherine Bowman, wife of Charles Bowman, an undivided third of the parcel lying on the Bay or River of San Jacinto, known and designated as Spillman's Island, together with one undivided third of all buildings and improvements for $400 on 23 August 1843 (HCDR I:8-9). Catherine Bowman, acting with the consent and authority of her husband, sold one undivided third of Spillman's Island together with one undivided third of all the buildings and other improvements to Charles Glaeweake on 23 March 1847 (HCDR N:235). On 27 September 1848, Henry Levenhagen, as administrator to the estate of Robert Levenhagen, sold the parcel of land known as Spillman's Island including all the houses and other buildings to Charles J. Glaeweake for $1,500 (HCDR N:74).

On 10 March 1849, Charles J. Glaeweake sold Spillman's Island to Joseph A. Harris for $1,200 (HCDR P:8). In turn Joseph Harris conveyed the same parcel to J.W. Jockusch of Galveston County for $1,200, also recorded in the deed records on 10 March 1849 (HCDR P:41). A structure clearly labeled with Spillman's name is shown on the *Map of Galveston From D. Harris' to Lawrence Cove* (USACE, 1851); however, on 9 July 1853 the parcel known as Spillman's Island was once again conveyed by means of an indenture between J.W. Jockusch and Thomas J. Jennings of Nacogdoches, this time for only $500 (HCDR Q:496). The decline in value for the property may suggest that Jennings received only a partial interest in the island or that the previous improvement had somehow diminished in value.

Tax records indicate that Jennings resided in the San Jacinto area through 1878 (Harris County Tax Records [HCTR], 1878: Pet. No. 3: Abstract No. 42: Reel 301). However, the USACE's 1871 depiction of a structure labeled Michael Jennison's on the island suggests that someone other than Jennings then occupied the property. While "Jennison's" may simply represent a misspelling of the Jennings family name or may be the name of a tenant, the question of Thomas Jennings' actual occupation of the island arises further, when in 1859 he wrote to Ashbel Smith to inquire whether or not someone was removing shells off the island (Jennings to Smith, Rusk, 9 August 1859, fol. 2G224, Smith [Ashbel] Papers). Smith's reply indicated that "...the question of residence must be decided by your own fancy and in view of future pursuits." Smith also noted that the shells remained undisturbed and described the island as eminently adapted to fruit trees, vegetables, grass for hay, and suitable for profitable cultivation (Smith to Jennings, 29 August 1867, Letterbook fol. 2G232, Smith [Ashbel] Papers).

By 1873, Jennings' status as an absentee landowner appears more certain. He probably lived in Fort Worth, but remained concerned about the shell deposits on the island (Jennings to Smith, Fort Worth, 23 March 1873, Letter folder 2G225 Smith [Ashbel] Papers):

> I am informed by a letter of the 13th inst. From M. Looscan Esqr. that Texas so far from complying with his contract to conserve my shells at Spillman is actually selling them to marauders. As you were kind enough to witness by contract with him will you do me the very great favor to call on him without delay and if you find this charge to be true, warn him that he must desist [or] I shall take steps for his immediate removal from the Island. Please address me as soon as convenient at this place where I shall remain several months in laying off and selling my addition to the future city on a tract of land belonging to my wife embracing the most beautiful part, and in fact more than half the city of Fort Worth.

By 1881, following the elder Thomas Jennings' death, Tom R. Jennings and Hyde Jennings, of Nacogdoches County transferred the island to Sarah Jennings of Fort Worth (HCDR 23:539-540: 8 November 1881). Hyde Jennings apparently regained the property because in 1892 he executed a deed transferring ownership of Spillman's Island to Tom R. Jennings for $10 (HCDR 66:581: 20 April 1892). The Jennings family continued to own the island and improvements until 4 January 1904 when a sale was made to Frank J. Kilpatrick (HCDR 159:401). Frank J. Kilpatrick deeded the island to Ringland F. Kilpatrick (HCDR 176:31) who sold the entire island to the U.S. for a ship channel ROW on 9 May 1907 (HCDR 205:532). The USACE removed a small part of the island for ship channel widening in 1926.

The Humble Oil & Refining Company paid taxes on 400 acres of Spillman's Island from 1928 through 1950 (HCTR 1910-1950). The La Porte quadrangle map (USGS, 1920) and the *Houston Ship Channel, Texas-Bolivar Roads to Houston Turning Basin* map (War Department, 1935) do not indicate any structures on Spillman's Island. The earliest cartographic indication of Humble's ownership appears on the PHA map, although this map does not indicate the presence of any structures.

3.16.2.13 Alexander Island

William Bloodgood is Alexander Island's earliest recorded occupant. His name is labeled in close association with a structure depicted on the lower part of the island by Alexander Thompson in 1828. No other evidence of Bloodgood's occupation of the island was located in the archival records reviewed. Subsequent cartographic depictions indicate that the island was called Perkins Island (Bringhurst, 1847; GLO, 1857), Badgers Island (USACE, 1871; 1897) and eventually Alexander Island (USACE, 1905). Documentary evidence suggests it was also known as Adams Island (*Houston Daily Telegraph*, 19 September 1825).

Two early maps of this area label Alexander Island as Perkins Island (Bringhurst, 1847; GLO, 1857). Even J.B. Badger, whose name appears on the island maps of 1871 and 1897 paid taxes on his property on Perkins Island in 1859. In 1868, the document transferring ownership of the island to Robert Alexander by the Adams family refers to the land as William Perkins Island. Alexander, after whom the island is now named, paid taxes on Perkins Island from 1873 to 1879 (although in 1876 it was listed as Adams Island). These references indicate that Perkins either lived on or owned the island very early in the settlement of the area. The first references to a Perkins family actually on the island are the newspaper accounts of the 1875 storm in which the M.S. Perkins house, with the family (three men, a woman, and a child) still in it, was reported floating down the river (the house was actually blown upstream toward Lynchburg) (*Daily Telegraph* 21 September 1875, Alexander [Robert] Papers). The account states that the Perkins family lived on the island about 0.25 mile below the Robert Alexander family. The location of Perkin's occupation site is unknown, although this description suggests that it may correlate to the lower (southeastern) part of the island where Bloodgood's occupation site was depicted by Thompson in 1828.

Although James Badger's occupation of the island remains unclear, in 1851 J.B. Badger rendered for taxation 650 acres on an island in Harris County valued at $500 (HCTR, 1851). In 1854 and 1857, Badger rendered 611 acres, valued at $611, on "an Island San Jacinto" (HCTR, 1854, 1857). Both the 1854 and 1857 tax records also noted that Badger acquired the land by means of a Claim Scrip certificate, although no such certificate appears for the name Badger in the GLO's index of original land grants in Harris County (GLO, 1996a). In 1859, Badger again rendered the 611 acres, now listed on Perkins Island, but with an increased valuation of $1,000 (HCTR, 1859), suggesting that improvements were made to the property. James Badger and his wife, Frances, subsequently sold the island to Doctor David Drysdale for $3000 cash on 3 September 1860 (HCDR X:594-595). The sale conveyed to Drysdale all of Badger's cattle, horses, and farming tools, except for four horses and 11 head of cattle (HCDR X:594-595). HCPR indicate that Badger died by about 1863 (HCPR Q:188-189).

Austin May Williams, son of Samuel May Williams of Galveston, married Mary Anna Adams 22 December 1854 at Lynchburg (Family Bible, Samuel May Williams Papers) and they moved to the island. While there, Williams appears to have worked as a blacksmith and cultivated a small farm, raising pigs, sheep, and a horse. He also had a slave named Ben (Samuel May Williams Papers). Less than a year later, in June 1855, the family abandoned the island en route to a sawmill in Fayette County. No deed record was located showing ownership on the island by Austin May Williams.

Property ownership on the island is confused between Dr. Drysdale's purchase in 1860 and Robert Alexander's purchase in 1868. About the time that Drysdale bought the land, John Adams and his family moved from Point Pleasant to the island (Samuel May Williams Papers). In the fall of 1860, Adams wrote to Austin May Williams complaining that Williams's brother sold property to Judge Campbell just when Adams was about to harvest his cotton crop on that property (Adams to Williams, 16 October 1860, Samuel May Williams Papers). Whether or not the land sold to Campbell was on the island or on the nearby mainland is unclear. Adams reputedly left his family on the island to fend for themselves while he went to farm in Ennis where he died in 1864 (Samuel May Williams Papers). On 1 April 1868, the widow Matura Ann Adams (relationship to John Adams unknown), sold the property to Robert Alexander. The purchase was deeded a tract of land containing 635 acres known as William Perkins Island together with all the stock thereon for $2,000 (HCDR 7:207-209). A further quit claim for the land and stock was executed 11 January 1869 by Adam's heirs. The heirs included Austin Williams and his wife Mary Ann Williams (nee Adams), Miss Elizabeth Francis Adams, Miss Caroline Sherad Adams, and Frank John Adams (HCDR 7:207-209). Apparently the Adams and Williams family were intermarried and sharing occupancy of the island. The widow Matura Ann Williams did not inherit title to the property on her husband's death, but rather owned said property in her own right by virtue of her purchase with her own separate funds.

Robert Alexander, a resident of Harris County, rendered acreage on Perkins Island during the years 1873, 1874, 1875, 1876 (listed as Adams Island) 1878, and 1879 (HCTR). In 1874, Alexander rendered 385 acres of "Perkins Island" valued at $1,000, and kept 7 horses and 70 head of cattle on the island (HCTR, 1870). According to the 1870 Population Schedule, Robert Alexander, a 65-year old minister from Tennessee, lived with his wife Eliza, age 55, also from Tennessee, and boarder John Randell, age 25, a Texas farmer (National Archives, 1965 [Subdivision no. 35]: 28/27: 4: 21 September 1870). For the years 1878 and 1879, Alexander rendered 600 acres on Perkins Island. In 1881, Alexander rendered 200 acres of Harris County land as a non-resident (HCTR 3rd Pct.), indicating that he no longer occupied the island.

Various sources indicate that Alexander became well established on the island during his period of occupation. Alexander's house plan incorporated a parlor and loft (*Daily Telegraph*, Tuesday, 21 September 1875. Alexander [Robert] Papers), and his personal property included a large stock of cattle, hogs, mules, and horses. In addition, he cultivated cotton and corn crops (*The Nashville Christian Advocate*, 30 October 1875, p. 3, Alexander [Robert] Papers). However, between 15 and 17 September, 1875, a severe storm passed through the Houston-Galveston Area (*Galveston Daily News* 21 September 1875, Alexander [Robert] Papers). Based on various accounts in the *Houston Daily Telegraph*, the *Texas Christian Advocate*, and the *Nashville Christian Advocate*, Alexander and his wife survived the storm but lost their home and its entire contents.

3.16.2.14 Cedar Point

The location of General Sam Houston's summer home on Trinity Bay known as Raven Moor is located in Cedar Point. A Centennial Marker was erected near the site in 1936 and a county historical marker was erected in 1986 (Tyler, 1996). The location of one of the markers, probably the

1986 marker is listed as being south of FM 2654, along Center Point Road. The Texas Historical Commission (THC) Atlas database indicated that both the markers were missing.

3.16.3 Regulatory Context

The following discussion provides the existing regulatory context for addressing potential impacts to cultural resources. Potential impacts of the proposed project and alternative sites on cultural resources are discussed in Section 4.0.

Any construction activity has the potential for adversely impacting cultural resource sites. The impacts may occur through changes in the quality of the historical, architectural, archaeological, or cultural characteristics of that cultural entity. These impacts may occur when an undertaking alters the integrity of location, design, setting, materials, construction, or association of the property that contributes to its significance according to the National Register criteria. Impacts may be direct or indirect.

As discussed in 36 CFR 800, adverse impacts to National Register or eligible properties may occur under conditions that include, but are not limited to:

1) destruction or alteration of all or part of a property;
2) isolation from or alteration of the property's surrounding environment (setting); or
3) introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting.

Direct impacts to known or unknown cultural resources sites may occur during the construction phase of any proposed project. Direct impacts are caused during the construction phase of the project or through increased vehicular and pedestrian traffic during the construction phase. The increase in vehicular traffic may damage surficial or shallowly buried sites, while the increase in pedestrian traffic may result in vandalism of some sites. Additionally, the integrity of the character of any unrecorded, significant historic structures could also be visually impacted by the construction of the project.

Indirect impacts include those caused by the undertaking that occur later in time or are further removed in distance but are reasonably foreseeable. These indirect impacts may include alteration in the pattern of land use, changes in population density, accelerated growth rates, or increased pedestrian or vehicular traffic, all of which may have an adverse impact on properties of historical, architectural, archaeological or cultural significance. Historical sites and landscapes might be adversely impacted by the visibility of the proposed project.

The preferred form of mitigation for cultural resources is avoidance. An alternative form of mitigation of direct impacts can be developed for archaeological and historical sites with the implementation of a program of detailed data retrieval. Additionally, Historic American Buildings Survey, Historic American Engineering Record documentation and relocation may be possible for some historic structures. Indirect impacts on historical properties and landscapes can also be lessened through careful design considerations and landscaping. If appropriate to the resource, other forms of mitigation may be implemented. These include but may not be limited to preparing a historic narrative and description of the

resource for distribution as educational materials, archival research, photographic and/or oral history documentation.

3.17 COMMERCIAL AND RECREATIONAL NAVIGATION

Galveston Bay is a major center of both commercial and recreational navigation. This section characterizes the area with the primary emphasis on commercial navigation.

Concentrations of recreational boating facilities and activity exist at Galveston, Clear Lake, the upper bay, and on the inland portion of the Houston Ship Channel near Baytown. Commercial fishing in the bay is a major activity.

The USACE (2001) reports over 32,000 recreational boats registered in Harris, Galveston, and Chambers counties, almost 1,000 fishing permits, and over 6,000 boat slips in the Galveston Bay area. Launch ramp activity for Galveston Bay ramps is presented in Section 3.18.3. While recreational boating and commercial fishing are major activities in the area, they have traditionally co-existed with deep-draft commercial navigation. Generally this means that recreational boats stay clear of larger commercial vessels that are restricted to navigation in the dredged channels. As none of the container terminal project alternatives will directly affect small craft fishing and recreational boating except for changes in the level of commercial vessel traffic, no attempt is made to quantify impacts on small craft traffic. It is important to note that in the future with any of the Build alternatives, deep navigation channels may be more heavily used than in the present, and this would limit recreational and fishing vessel activity in these areas. However, the vast majority of the bay system area is outside of the navigation channels, and this area will be unaffected by any of the project alternatives.

The primary emphasis of this analysis for a container vessel navigation project is on the existing commercial navigation sector. Of the six alternatives, only two have existing commercial navigation activity that could be affected by the project: the Port of Texas City operations and the marine operations at Bayport. Larger ocean-going vessels are typically restricted to one-way traffic in these channels. All of the other alternatives except Cedar Point have direct access to the main entrance of the bay or segments of the Houston Ship Channel that have two-way vessel traffic. Thus, all alternatives would experience minimal impacts from the addition of container vessel traffic. Cedar Point would require a separate channel to reach the Houston Ship Channel, but there is currently no deep-draft channel traffic on the existing barge channel.

Commercial navigation traffic in the Galveston Bay area is extensive. Table 3.17-1 lists the Galveston Bay commercial tonnage by port for 1995 to 1999. According to this data, Houston has the heaviest tonnage, but Texas City, by virtue of its high proportion of crude oil imports, accounts for a sizeable portion (22.4 percent in 1999) of the bay total.

The U.S. Coast Guard (USCG) Vessel Traffic Service (VTS) keeps records of vessel movements. Records for the year 2000 were obtained for the analyses that follow. A total of 20,574 ship movements and 131,130 movements of other vessels were recorded during the year. Of these, movements in the Texas City Channel represented 3,077 and 7,780, respectively. Recent Homeland Security policies have affected boat traffic in the Texas City Channel. The USCG has been charged with

restricting recreational boating and fishing within the channel, between the Texas City Dike and Shoal Point. This policy reduced the number of small vessels in the channel, thus reducing the potential for encounters between container ship traffic and recreational boats.

TABLE 3.17-1
WATERBORNE COMMERCE IN GALVESTON BAY (THOUSAND SHORT TONS)

	1995	1996	1997	1998	1999
Cedar Bayou	473	404	435	666	955
Houston Ship Channel	135,231	148,183	165,456	169,070	158,828
Dickinson Bayou	657	625	669	1,073	954
Texas City Channel	50,403	56,394	56,646	49,477	49,503
Galveston Channel	10,465	11,641	10,126	11,049	10,336
TOTAL	197,229	217,247	233,332	231,335	220,576

Source: USACE, 1999.

3.18 LAND USE/RECREATION/AESTHETICS

3.18.1 Regional Land Use

The Houston-Galveston Brazoria Consolidated Metropolitan Statistical Area (Houston CMSA) has land use patterns typical of communities dominated by single-family detached housing developments. Regional land use data is not available from the Regional Council of Governments; however, data is available on residential land use development throughout the area.

Table 3.18.1-1 provides data concerning new housing starts throughout the Houston-Galveston-Brazoria Consolidated Metropolitan Statistical Area (Houston CMSA), including the number of permits by number of units per structure and valuation of structures (U.S. Bureau of the Census (USBOC), various years).

In the Houston CMSA, a wide variety of housing types have been permitted over the 5-year period from 1996 to 2001, with the average cost of single-family housing amounting to approximately $125,000, and the average cost of all housing at $99,200.

In most of the communities in the study area, single-family housing is the primary type of housing which has been permitted, with the exception of the larger communities of Baytown, Galveston, Pasadena and Texas City, which have had multi-family building permits.

The most affordable single-family housing has been constructed in Texas City, with an average cost of approximately $80,800. Another 8,000 homes of all price ranges are planned in Texas City (Hoover, 2001). The next most affordable housing has been constructed in Pasadena, with an average single-family construction cost of approximately $91,800. Seabrook and Morgan's Point have constructed the most expensive single-family units, at an average cost of $183,500 and $221,200, respectively.

TABLE 3.18.1-1
NEW PRIVATELY OWNED RESIDENTIAL BUILDING PERMITS

Year / Description	Houston-Galveston-Brazoria CMSA (1)		Baytown		Beach City		Galveston		La Porte		Morgan's Point		Pasadena		Seabrook		Shoreacres		Texas City	
	Units	Avg. Cost Per Unit	Units	Avg. Cost Per Unit	Units	Avg. Cost Per Unit	Units	Avg. Cost Per Unit	Units	Avg. Cost Per Unit	Units	Avg. Cost Per Unit	Units	Avg. Cost Per Unit	Units	Avg. Cost Per Unit	Units	Avg. Cost Per Unit	Units	Avg. Cost Per Unit
1996																				
Single Family	19,436	$104,592	101	$95,319	18	$97,562	60	$129,015	182	$84,672	2	$155,000	338	$72,424	139	$94,786	24	$103,027	112	$88,032
Two Family	48	$39,708																		
Three and Four Family	135	$31,593																		
Five or More Family	4,499	$40,078					177	$30,508					31	$63,710						
Total	24,118	$92,020	101	$95,319	18	$97,562	237	$55,447	182	$84,672	2	$155,000	369	$71,692	139	$94,786	24	$103,027	112	$88,032
1997																				
Single Family	20,826	$115,352	107	$89,459	21	$100,067	63	$117,027	181	$84,619	3	$169,539	259	$77,359	170	$180,654	12	$107,804	100	$90,251
Two Family	78	$34,449							2	$25,000										
Three and Four Family	164	$22,463																		
Five or More Family	11,265	$38,925											431	$40,670						
Total	32,333	$88,058	107	$89,459	21	$100,067	63	$117,027	183	$83,967	3	$169,539	684	$54,919	170	$180,654	12	$107,804	100	$90,251
1998																				
Single Family	25,387	$123,787	149	$85,795	24	$105,080	188	$134,453	280	$123,100	2	$310,250	332	$91,374	181	$189,616	16	$112,309	102	$91,385
Two Family	110	$47,582											2	$20,000						
Three and Four Family	1,178	$42,257																		
Five or More Family	20,189	$40,865	385	$25,582																
Total	46,864	$85,836	534	$42,383	24	$105,080	188	$134,453	280	$123,100	2	$310,250	334	$90,946	181	$189,616	16	$112,309	102	$91,385
1999																				
Single Family	25,592	$129,261	124	$109,335	25	$109,787	101	$146,703	298	$118,437	1	$44,000	341	$100,387	136	$221,064	12	$92,266	120	$91,984
Two Family	118	$60,712																		
Three and Four Family	820	$46,944							188	$50,532										
Five or More Family	10,145	$45,139											388	$53,294						
Total	36,675	$103,930	124	$109,335	25	$109,787	101	$146,703	486	$92,169	1	$44,000	729	$75,322	136	$221,064	12	$92,266	120	$91,984
2000																				
Single Family	28,055	$137,329	127	$116,031	34	$115,108	154	$166,193	258	$119,795	3	$316,667	387	$106,679	145	$215,727	6	$124,833	367	$67,950
Two Family	118	$46,288					10	$88,455					2	$25,000						
Three and Four Family	96	$49,698																		
Five or More Family	7,631	$45,091																	208	$34,623
Total	35,900	$117,189	127	$116,031	34	$115,108	164	$161,453	258	$119,795	3	$316,667	389	$106,260	145	$215,727	6	$124,833	575	$55,894
January - April 2001																				
Single Family	10,212	$142,458	70	$118,675	9	$120,793	85	$144,723	59	$135,989	0	$0	172	$101,583	60	$215,900	5	$178,600	13	$123,876
Two Family	4	$63,250																		
Three and Four Family	16	$49,625																		
Five or More Family	2,245	$54,481																		
Total	12,477	$126,483	70	$118,675	9	$120,793	85	$144,723	59	$135,989	0	$0	172	$101,583	60	$215,900	5	$178,600	13	$123,876
1996 - April 2001																				
Single Family	129,508	$125,038	678	$101,155	131	$107,824	651	$143,015	1,258	$110,826	11	$221,193	1,829	$91,766	831	$183,521	75	$110,833	814	$80,826
Two Family	476	$47,702					10	$88,455	2	$25,000			4	$22,500						
Three and Four Family	2,409	$42,253							188	$50,532										
Five or More Family	55,974	$42,308	385	$25,582			177	$30,508					850	$47,273					208	$34,623
Total	188,367	$99,200	1,063	$73,784	131	$107,824	838	$118,601	1,448	$102,879	11	$221,193	2,683	$77,567	831	$183,521	75	$110,833	1,022	$71,422

Source: USBOC, Monthly New Privately-Owned Residential Building Permits, various years.

3.18.2 Identification of Existing Land Uses at Alternative Sites

Figures 3.18.2-1 through 3.18.2-6 illustrate land uses within 1 mile of each of the alternative sites. Land uses were based on USGS land use and land cover classification system, Level II, (Anderson et al., 1976) and were verified during field reconnaissance in the vicinity of each of the sites. It should be noted that wetland categories on the land use maps are not intended to represent jurisdictional wetland mapping (discussed in Section 3.12). The following sections describe existing land uses for each alternative. See Section 3.6 for additional information about wells and other facilities within the study area.

3.18.2.1 Shoal Point – Proposed Project

Land use for the Shoal Point site is illustrated in Figure 3.18.2-1. This site lies within the corporate limits of Texas City on Shoal Point peninsula. The site consists of two active DMPAs (transitional areas) and one inactive DMPA that is now mainly a shrub/brush rangeland. The site is accessed by a levee road which intersects with Loop 197. To the west of the site is a large area of industrial land use, primarily occupied by chemical refineries and storage facilities, and transportational land use, primarily rail and port facilities. TCT (Texas City Terminal Railway) lines and electrical transmission lines traverse the industrial area. Shoal Point is separated from the industrial area and transportation facilities by the Texas City Channel and turning basin.

To the north of the site lies the Texas City Dike, a 5-mile-long jetty used for fishing, boating, and swimming.

Beyond the industrial areas to the west and northwest of the site lie older residential and commercial areas of Texas City, numerous City parks, various churches, and an historical park. Many of the commercial establishments appear to be abandoned.

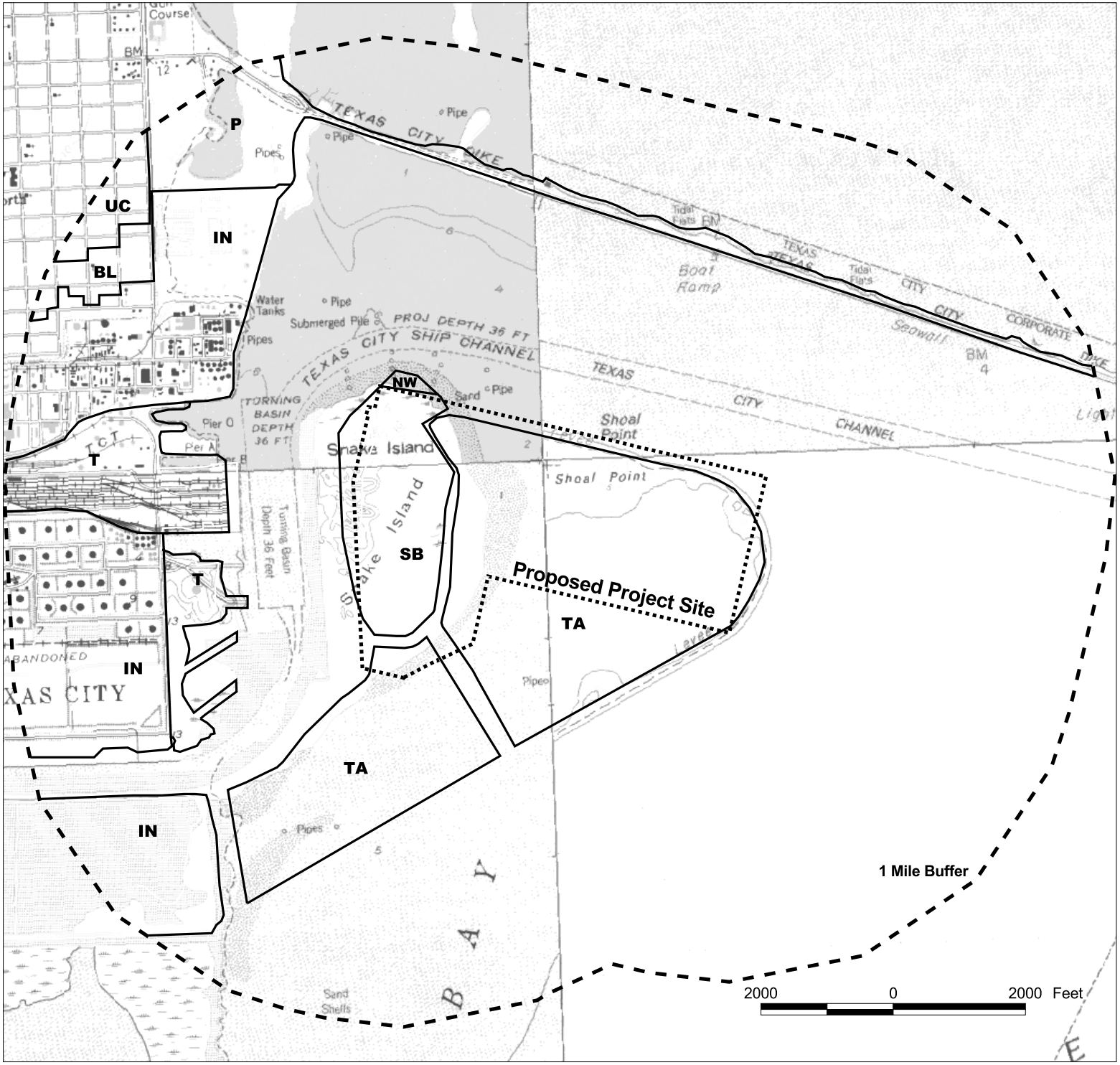
Churches include:

Second Avenue Church of God	102 2nd Avenue North (within 1 mile)
Mount Zion Baptist Church	324 3rd St North
Greater Macedonia Baptist Church	401 3rd Ave North
First United Methodist Church	317 5th Ave North
Mount Paran Missionary Baptist Church	19 6th St North
New Visions of Hope Christian Church	802 9th Ave North
Deliverance Holiness Church	1st Street North and Texas Avenue (within 1 mile)
True Mission Church of God in Christ	4th Street North
College View Church of God in Christ	4th Street North
Church under construction	4th Ave North between 2nd Street N and 3rd Street N

Existing Land Uses

Shoal Point Alternative

Figure 3.18.2-1



Legend:

- **P** Park
- **IN** Industrial
- **UC** Mixed Urban and Commercial
- **BL** Other Builtup Land
- **NW** Non-forested Wetland
- **SB** Shrub/Brush Rangeland
- **T** Transportation
- **TA** Transitional Area

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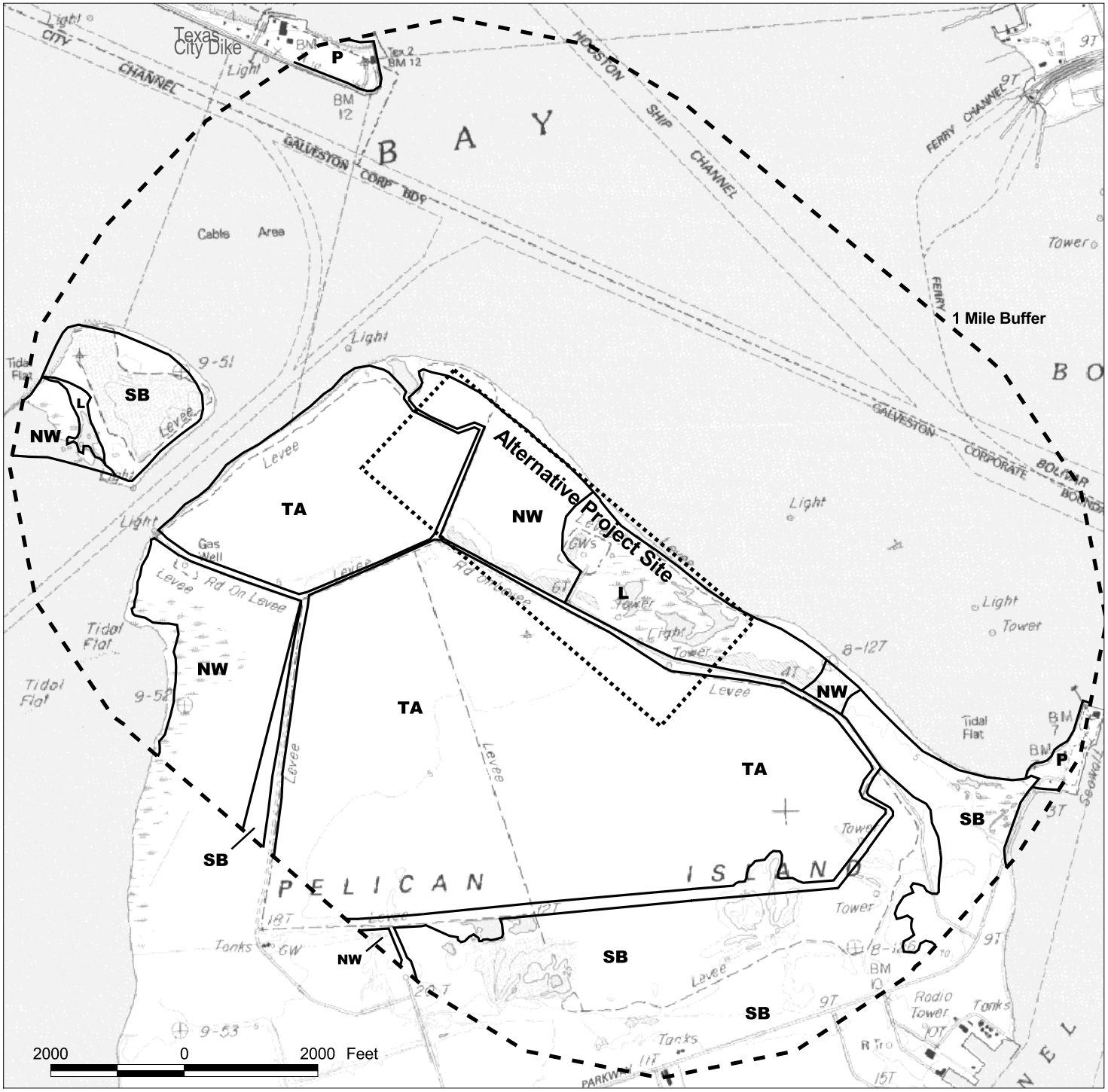
Existing Land Uses

Pelican Island Alternative

Figure 3.18.2-2



Legend:

- **P** Park
- **L** Lake
- **NW** Nonforested Wetland
- **TA** Transitional Areas
- **SB** Shrub/Brush Rangeland

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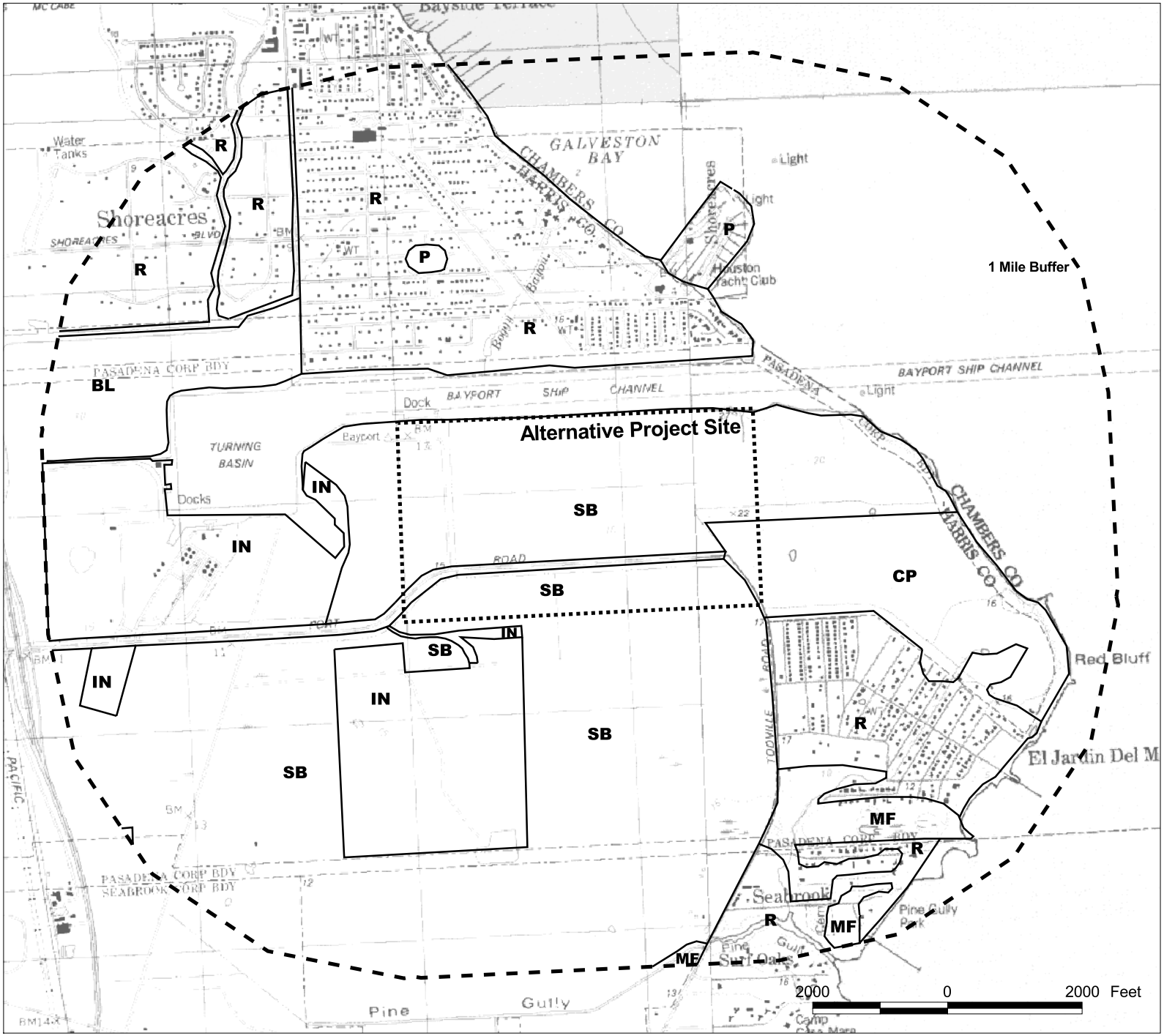
Existing Land Uses

Bayport Alternative

Figure 3.18.2-3



Legend:

- **CP** Cropland/Pastureland
- **P** Park
- **IN** Industrial
- **R** Residential
- **BL** Other Builtup Land
- **MF** Mixed Forest Land
- **SB** Shrub/Brush Rangeland

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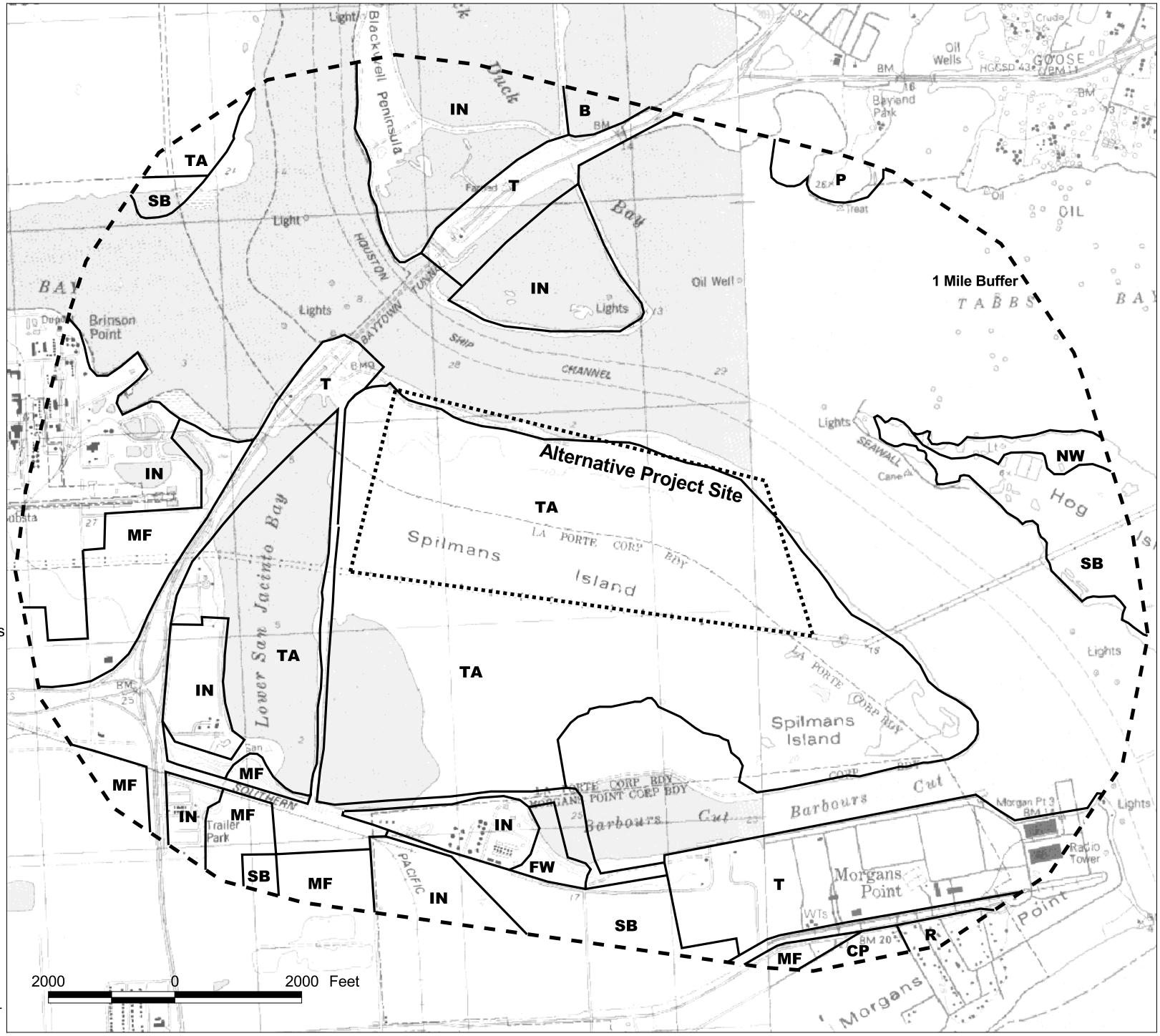
Existing Land Uses

Spillman's Island Alternative

Figure 3.18.2-4



Legend:

- **B** Bay
- **T** Transportation
- **TA** Transitional Areas
- **CP** Cropland/ Pastureland
- **FW** Forested Wetlands
- **NW** Nonforested Wetlands
- **P** Park
- **IN** Industrial
- **R** Residential
- **MF** Mixed Forest Land
- **SB** Shrub/Brush Rangeland

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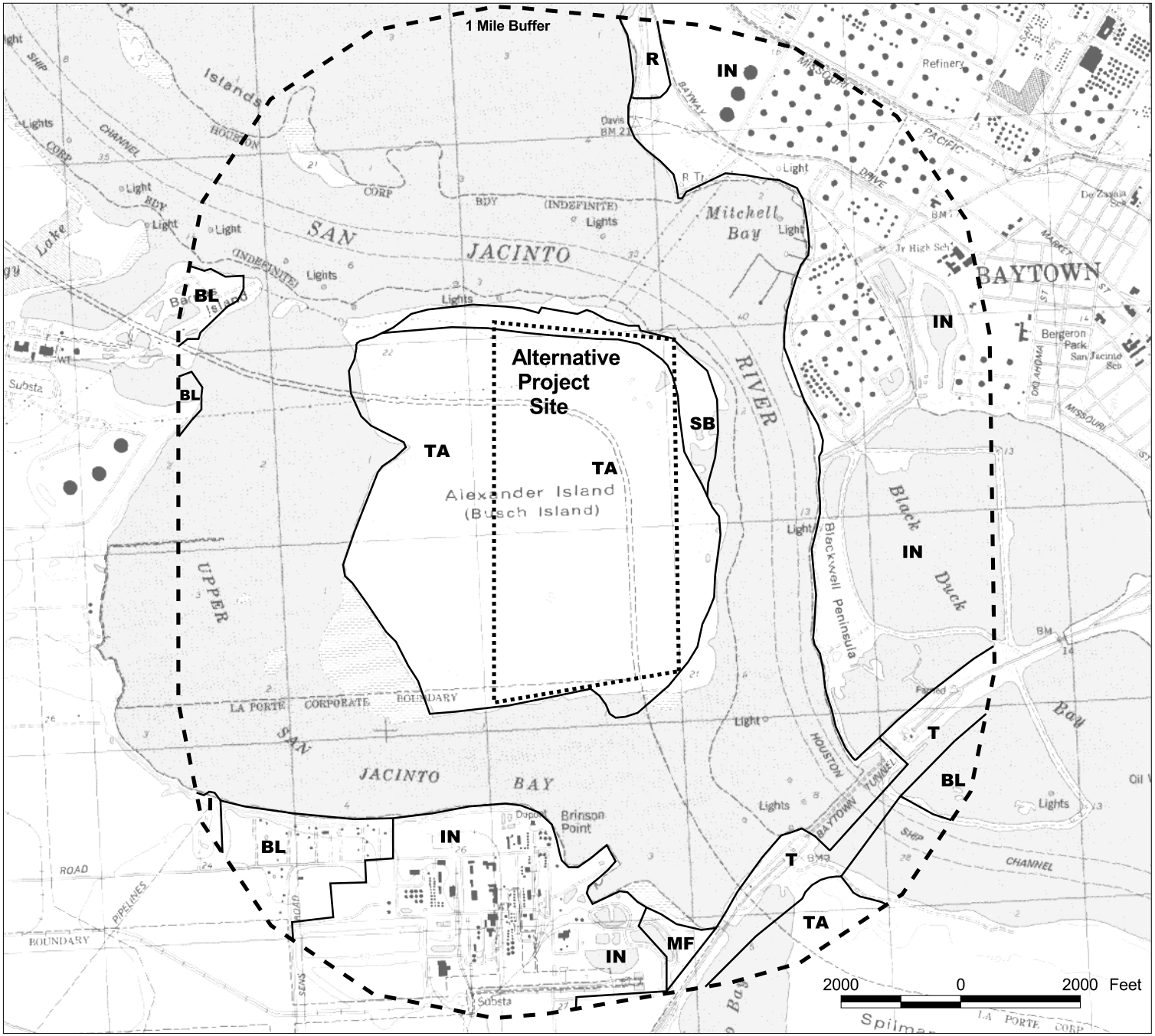
Existing Land Uses

Alexander Island Alternative

Figure 3.18.2-5



Legend:

- **IN** Industrial
- **R** Residential
- **BL** Other Builtup Land
- **MF** Mixed Forest Land
- **SB** Shrub/Brush Rangeland
- **T** Transportation
- **TA** Transitional Area

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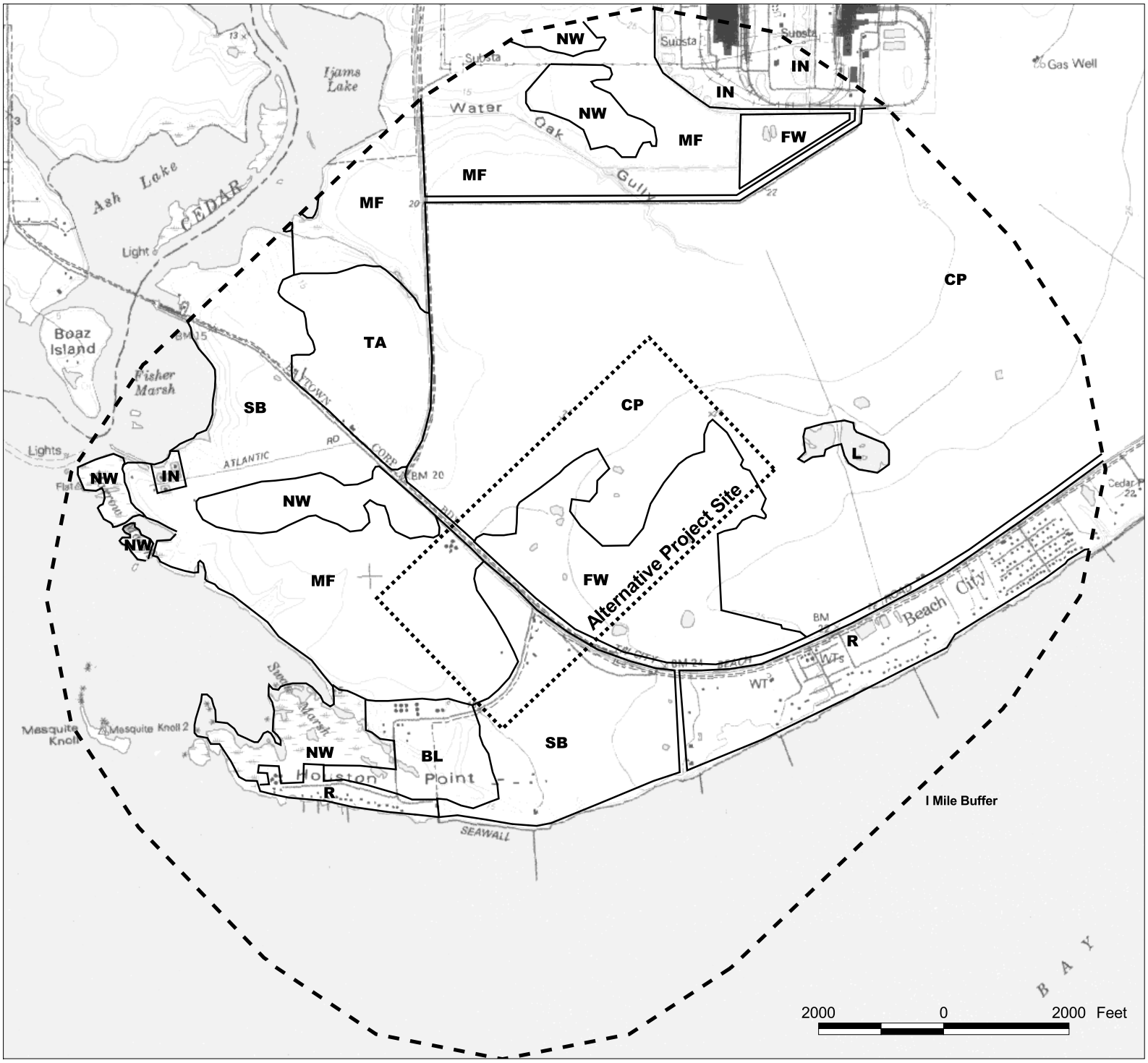
Existing Land Uses

Cedar Point Alternative

Figure 3.18.2-6



Legend:

- **CP** Cropland\ Pastureland
- **BL** Other Builtup Land
- **NW** Nonforested Wetlands
- **TA** Transitional Areas
- **L** Lake
- **IN** Industrial
- **R** Residential
- **FW** Forested Wetlands
- **SB** Shrub/Brush Rangeland
- **MF** Mixed Forest Land

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Parks include:

Anchor Park	Bay Street and Dike Road (within 1 mile)
Bay Street Park	Bay Street North (within 1 mile)
Braslau Park	100 5th Street North
Central High School Park	500 Block of 4th Avenue North
Danforth Park	4th Street North and 5th Avenue North
Insley Park	3rd Street and 2nd Avenue North (within 1 mile)
Mikeska Sandberg Park	Loop 197 South
Pioneer Park	400 6th Street North
Texas City Dike Park	Texas City Dike Road (within 1 mile)
Unnamed Park	3rd Street North and 2nd Avenue South
Unnamed Park	3rd Street North and 2nd Avenue North

Heritage Square is an historical park encompassing the 100 block of 3rd Avenue North, slightly more than 1 mile from the proposed site. It contains the Frank B. Davison Home, the Moore Home, the Lee Dick Home, and the Engineer's Cottage.

In addition to residential, park and church sites, commercial areas lie along 6th Street North and Texas Avenue and in other isolated sites through the neighborhood. Additionally, multi-family housing occurs on 6th Street North and 3rd Avenue North. Day-care centers include Texas City Nursery (313 4th St North), Energetic Tenderhearts Day Care (4th Street North), and Kids Enterprise II (601 4th St. North). All are more than 1 mile from the proposed site.

3.18.2.2 Pelican Island Alternative

Figure 3.18.2-2 shows land uses in the vicinity of the Pelican Island alternative. Pelican Island lies within the corporate limits of Galveston to the north of Galveston Island and is accessed via Pelican Island Causeway from Galveston Island and Seawolf Parkway across the island. The proposed alternative site is located on the northeast shore of the island. According to the TxDOT map of Pelican Island, the site is adjacent to the Pelican Spit Military Reservation which currently appears to be undeveloped. The only landside access to the alternative site is by a levee road. The GIWW separates Pelican Island from a small island (Pelican Spit) to the northwest. The Texas City Channel parallels the site to the northeast, and is intersected by the Houston Ship Channel and the Bolivar Roads Channel in the vicinity of Seawolf Park.

The Pelican Island alternative site and adjacent areas within 1 mile consist primarily of transitional areas in DMPAs. The USGS 7.5-minute topographical map of the site shows various towers and lights in the vicinity of the site, and a gas well nearly 1 mile west of the site. Beyond the 1-mile boundary, maritime industries and Texas A&M University-Galveston occur along the southern flank of the island.

At the far southeast corner of the island, slightly more than 1 mile from the Pelican Island alternative site, lies Seawolf Park.

To the north of the island lies the Texas City Dike, from which the Pelican Island site is visible. The Sampson Yarborough boat ramp, a bait shop, and a restaurant lie at the end of the dike.

3.18.2.3 Bayport Alternative

The Bayport alternative site lies on land which is currently shrub/brush rangeland on the south bank of the Bayport Ship Channel. Four incorporated communities fall within 1 mile of the Bayport alternative. The Bayport site lies across the Bayport Ship Channel from the community of Shoreacres to the north. Within 1 mile of the site, north of Shoreacres, is the subdivision of Bayside Terrace, which lies within the city limits of La Porte. The city limits of Pasadena encircle the Bayport site, but the only development within 1 mile of the site that is currently within the city of Pasadena is the subdivision of El Jardin del Mar, to the southeast of the site. South of the industrial sites along Port Road lie largely undeveloped areas within the corporate limits of Seabrook. Port Road is the access road to the Bayport site.

Shoreacres is the closest developed community to the proposed site and consists almost entirely of residential property, along with two community parks and Bayshore Elementary School. Shoreacres City Hall is at 601 Shoreacres Boulevard within five blocks of the ship channel. In addition, at the southeast corner of the community, on the bay near the mouth of the ship channel, are the Houston Yacht Club and a private park. Small multi-family developments are located at the southern end of Sunrise and Bay Colony, just north of the ship channel.

To the north of Shoreacres and within 1 mile of the Bayport site are developments in La Porte that consist of residential areas, including mobile home developments along Dwire and Pine Bluff, and multi-family apartments along County Road 501 (CR 501). Additionally, there are commercial land uses along CR 501 in La Porte. A private park, Bay Oaks Civic Club Park and Pier, is located where Dwire terminates at the bayfront, and Bay Oaks public park is located three blocks to the west on Dwire.

To the west of CR 501 in La Porte are additional single-family residential areas, as well as Shady River Park near Hackberry and Oak Leaf.

Along the south side of the Bayport Ship Channel are oil and gas storage facilities. Additional industrial sites lie along Port Road to the south and west of the proposed terminal site, including such companies as Nova Chemical, American Acryl, LBC, Odfjell, and others. Rail lines run along Port Road and into the industrial areas.

To the southeast of the site lies El Jardin del Mar subdivision which contains residential areas, a community park, and a private park and marina. A few commercial properties lie along Todville Road to the south of El Jardin del Mar.

South of the Port Road industrial areas are shrub/brush rangelands in Seabrook. There are also isolated commercial sites along Todville Road. Small residential areas are located in the vicinity

of Pine Gully, as well as the Pine Gully Park and Seabrook Cemetery. Camp Casa Mare, a Girl Scout sailing camp, lies just south of the mouth of Pine Gully on Galveston Bay (just outside of the 1-mile zone used in this analysis).

3.18.2.4 Spillman's Island Alternative

Spillman's Island is an active DMPA within an undeveloped area of the city of La Porte, proximate to the city of Morgan's Point. The proposed site is adjacent to extensive areas of existing container port docking and storage facilities at Barbours Cut. Rail lines run along Barbours Cut to the container port storage yards. Morgan's Point Cemetery lies north of Barbours Cut within the industrial area. A few commercial properties and governmental sites lie on the southern side of Barbours Cut. To the south of Barbours Cut lie residential areas. Southeast of the port facilities is The Point restaurant on Bay Ridge which has a view of the bay and docking ships.

To the north of Spillman's Island is Baytown, reached via the Baytown Bridge (SH 146). Immediately after crossing the Baytown Bridge, SH 146 passes an industrial site and Bayland Park and boat ramp, where a restaurant, boat shop, and marina are also located.

West of the site more industrial and transportational land uses occur. In addition to SH 146 and SH 225, rail lines also run through this part of the area.

3.18.2.5 Alexander Island Alternative

The southern edge of the Alexander Island alternative site lies within the La Porte city limits; otherwise this site lies on an unincorporated island in the Upper San Jacinto Bay. The island is an active DMPA with no roadway access. Within 1 mile of the site are predominantly industrial areas to both the south and east, with several rail lines traversing the southern area. Additionally, a residential area within the city limits of Baytown lies within 1 mile to the north.

Besides residential and industrial areas in Baytown, a commercial area largely consisting of boarded up shops occurs along Market and Minnesota streets slightly more than 1 mile from the proposed site. Police department offices and the Post Office are at Market and Blaffer streets. A private park for Exxon workers lies along the western side of Nevada.

St. Marks United Methodist Church is located at 1703 Oklahoma Street, and the Christian Science Society building lies at the southern end of Nevada Street. There are day-care centers at the Methodist Church site and at the intersection of Wisconsin and Huggins streets. All churches and day-care centers are more than 1 mile from the site.

3.18.2.6 Cedar Point Alternative

The southernmost corner of the Cedar Point alternative lies within the corporate limits of Beach City, with a strip of Baytown's city limits running through the site. Otherwise, the Cedar Point alternative lies in an unincorporated area of Chambers County. The site is composed of pastureland, shrub/brush rangeland, mixed forest, and forested wetlands. There are several homes along Cedar Point

Road within the site area, and the TriCity Beach Grocery stands at the corner of Cedar Point Road and TriCity Beach Road.

Residential areas with numerous residential docks stand within 1 mile of the site, to the southwest along Cedar Point Road and Bayside Road. Industrial sites occur at the end of Bayside and along Cedar Point Road.

Northwest of the site along TriCity Beach Road (FM 2354) there are a few industrial land uses in otherwise undeveloped rangelands. The Baytown City Landfill lies to the north of FM 2354, west of the intersection of FM 2354 and FM 1405. At the dead-end of FM 2354 at Ash Lake there is a marina and restaurant.

To the east of the site, along FM 2354, lies the community of Beach City, which consists of several residential areas fronting on Tabbs Bay. Several docks protrude into the bay from these areas. Pasturelands occur to the north of FM 2354, east of the site.

Directly north of the site, to the east of FM 1405, is a large industrial development surrounded by mixed forest and wetlands.

3.18.2.7 Sensitive Receptors

Figures 3.18.2-7 through 3.18.2-12 illustrate the location of various sensitive receptors, discussed above for each alternative site. Sensitive receptors include churches, schools, cemeteries, recognized historical sites, areas of relative aesthetic quality, and parks and recreational facilities.

3.18.3 Recreation

3.18.3.1 Parks

Figures 3.18.2-7 through 3.18.2-12 show the location of various public and private parks in the area and overall vicinity. An inventory of parks and recreational facilities in the region is included as Table E-1 (Appendix E). Major public parks near the various alternative sites are described below. Many of the parks and recreational activities are oriented toward water-based activities such as fishing, swimming, wind surfing, boating, birding, and other aquatic-based recreation.

Seawolf Park. This park displays a World War II-era destroyer escort ship (USS *Stewart*) and Gato class fleet submarine (USS *Cavalla*), a tank, and a small fighter plane. The SS *Selma*, a World War I experimental concrete ship, protrudes from the bay west of the park where it was scuttled in 1922. There are two historical markers in the park: one regarding the SS *Selma* and another regarding nineteenth century quarantine stations on Pelican Island. The park also includes a restaurant, viewing pavilion (from which commercial and gambling ships can be observed in the Galveston, Texas City, and Houston Ship channels), fishing pier, and playgrounds.

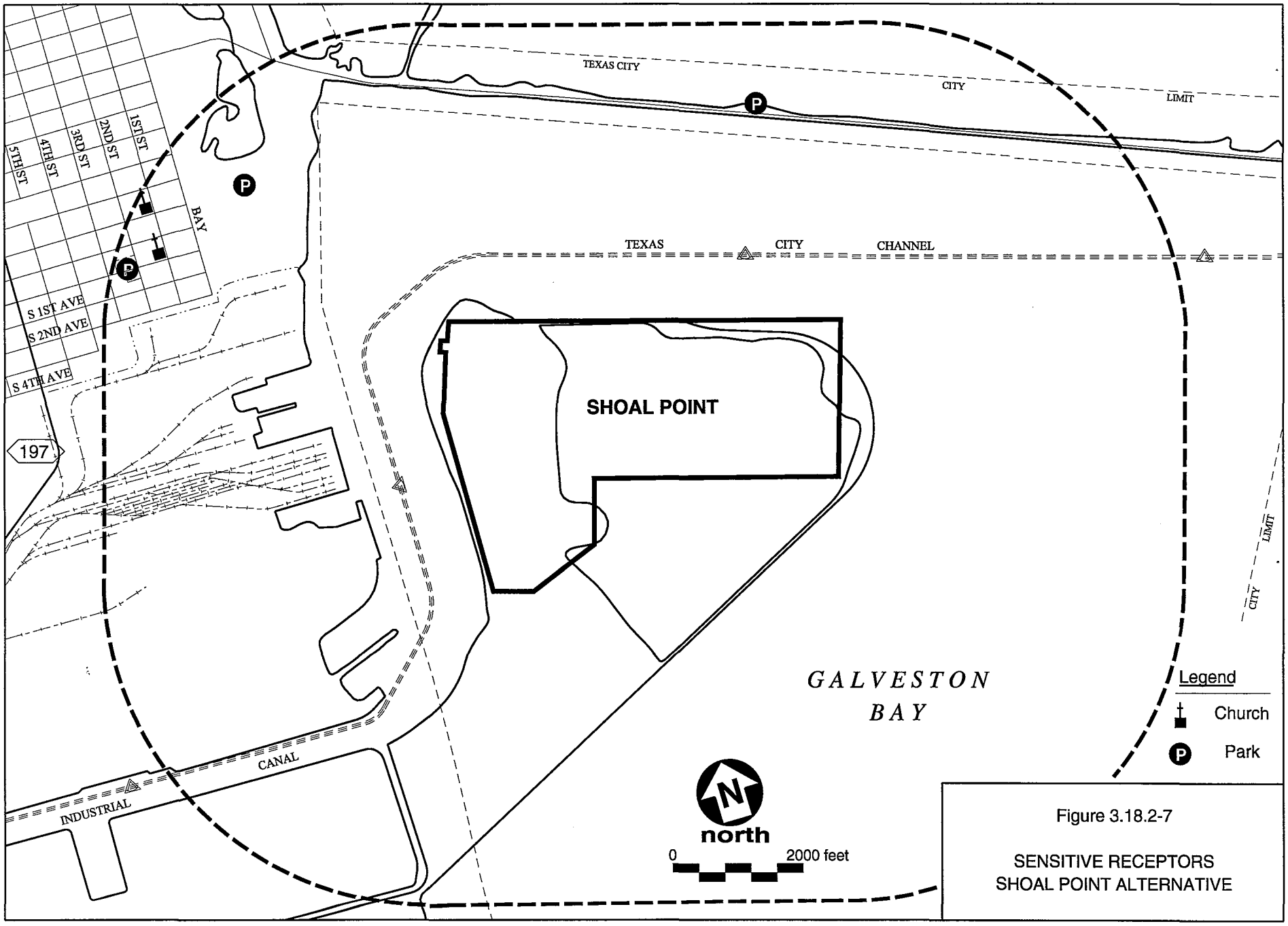

Figure 3.18.2-7

SENSITIVE RECEPTORS
SHOAL POINT ALTERNATIVE

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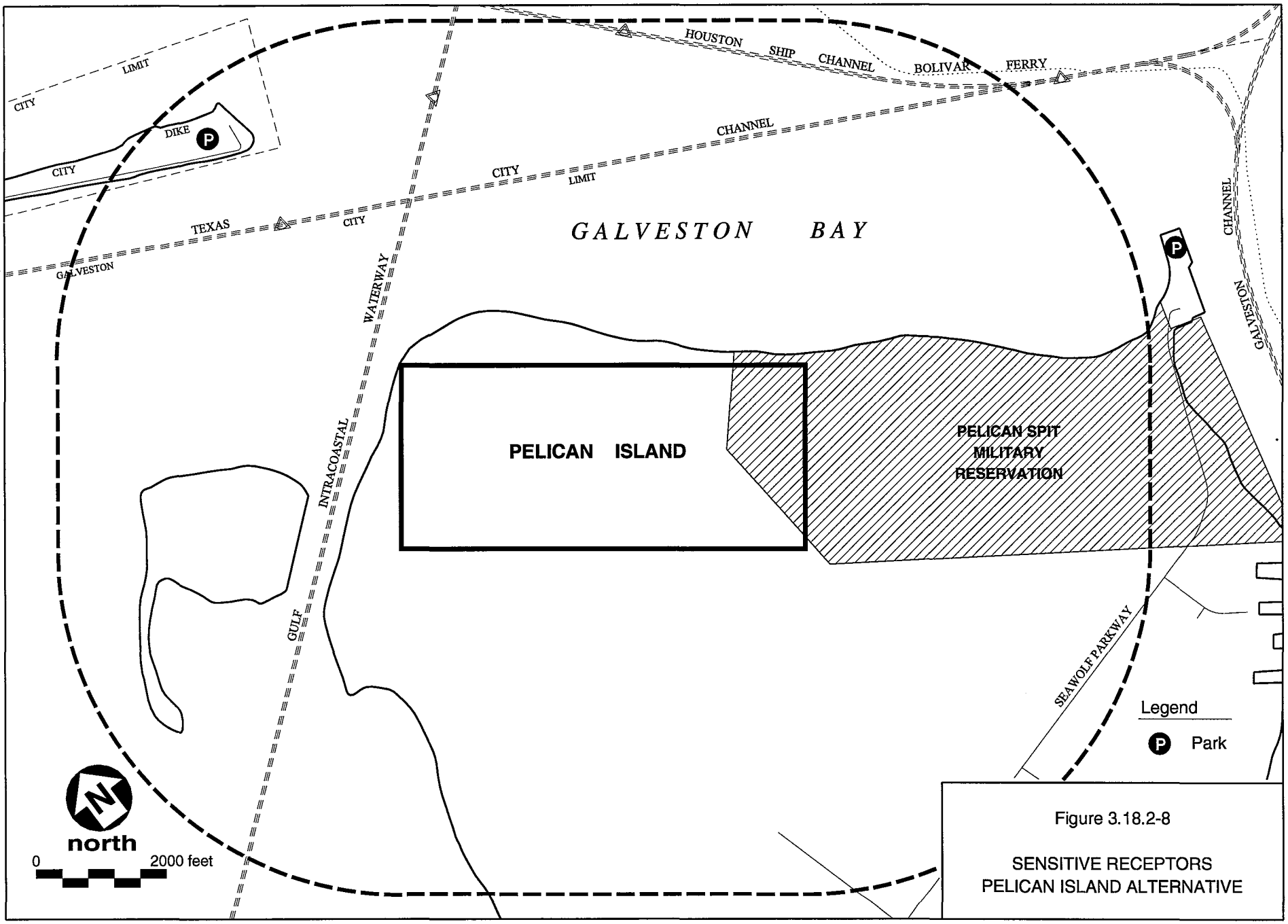

Figure 3.18.2-8

SENSITIVE RECEPTORS
PELICAN ISLAND ALTERNATIVE

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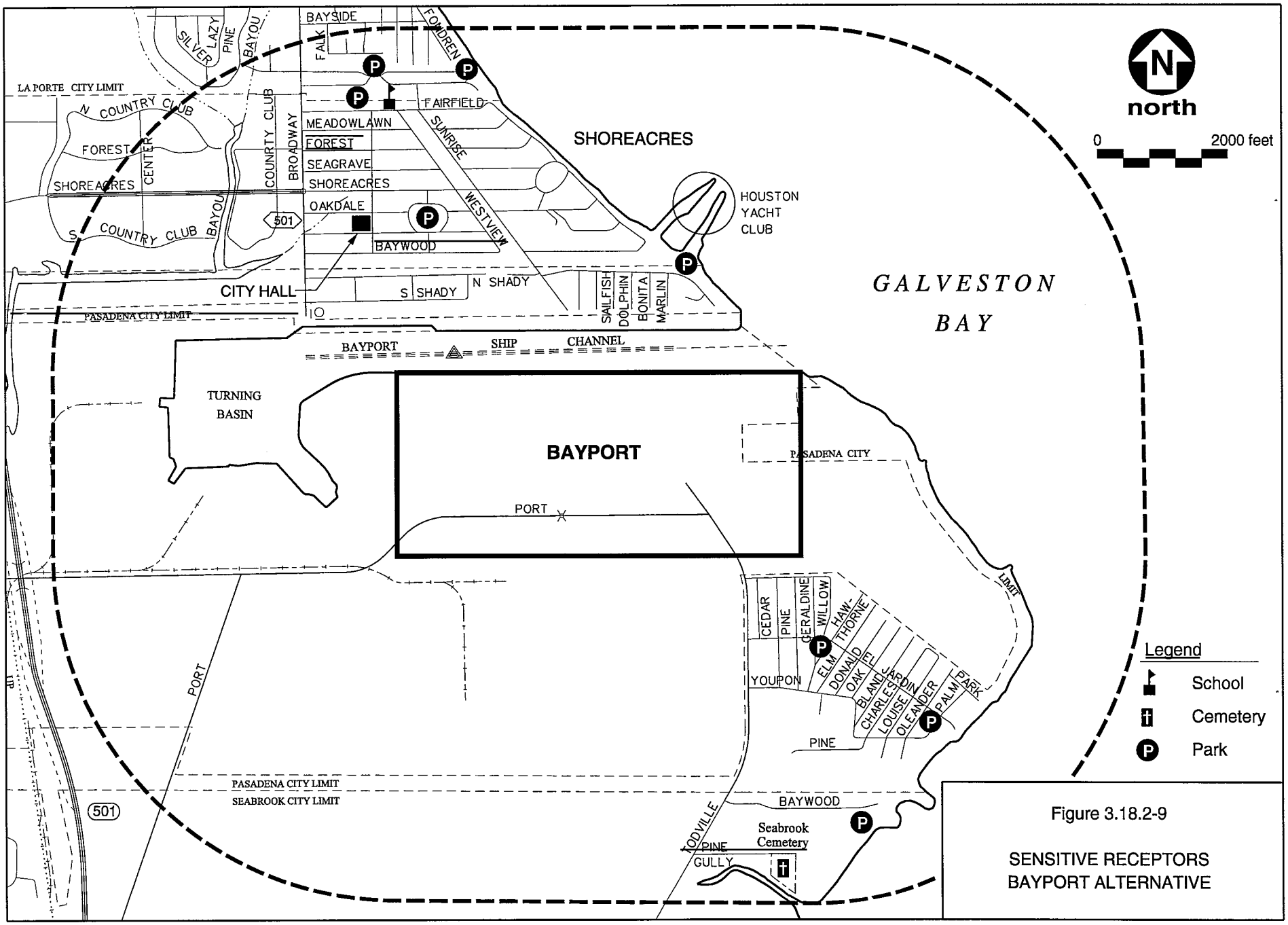

Figure 3.18.2-9

SENSITIVE RECEPTORS
BAYPORT ALTERNATIVE

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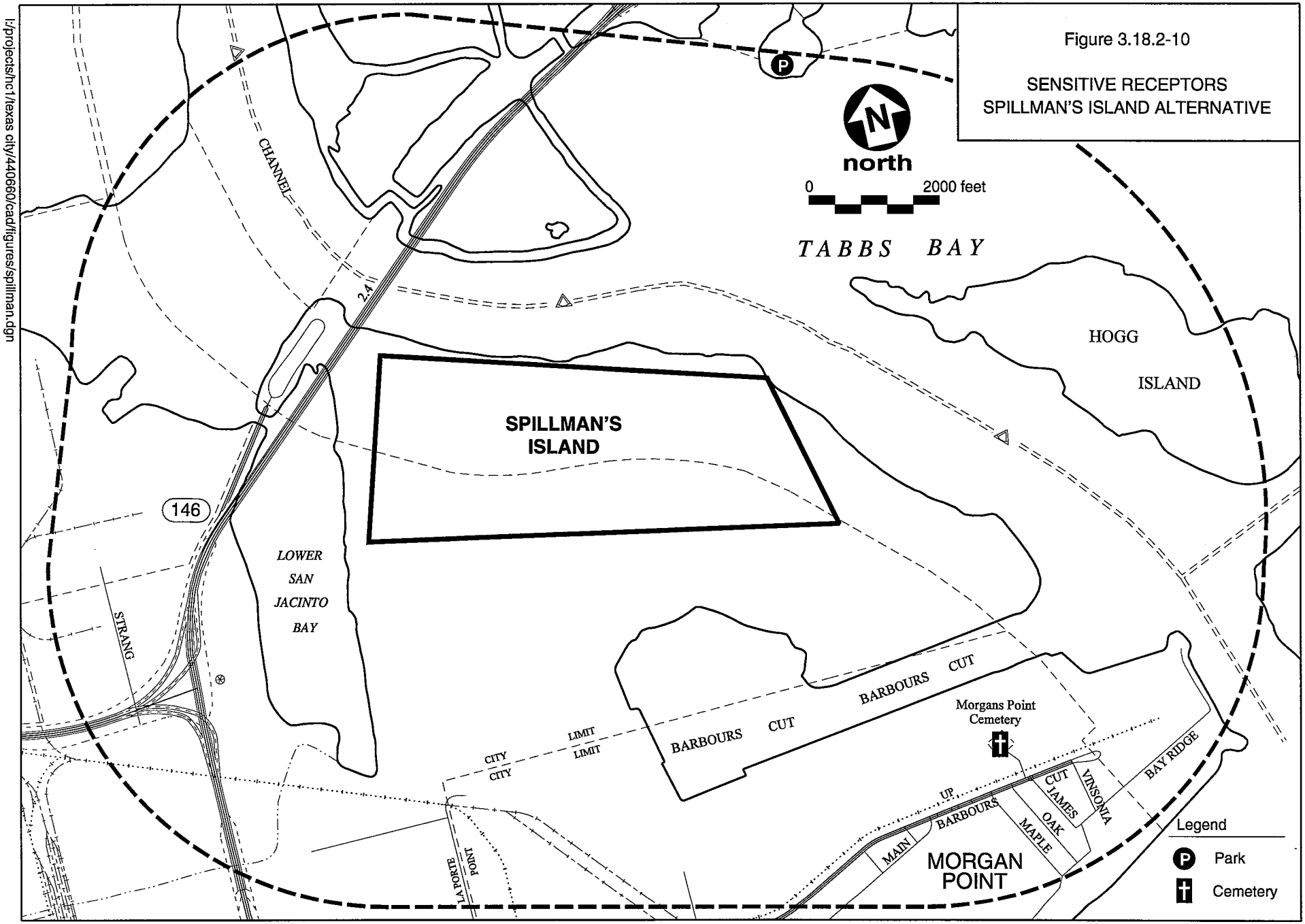

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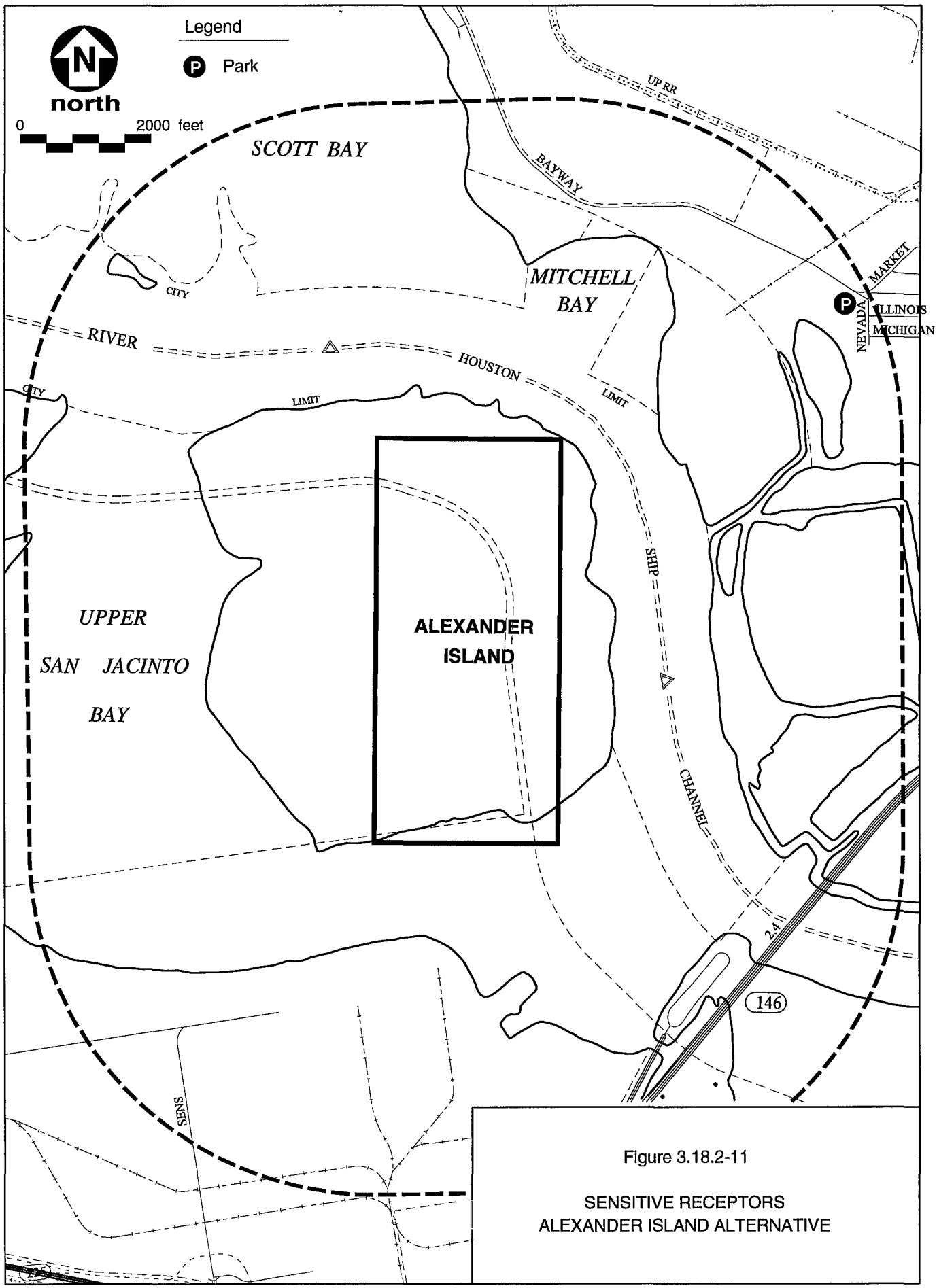

Figure 3.18.2-11

SENSITIVE RECEPTORS
ALEXANDER ISLAND ALTERNATIVE

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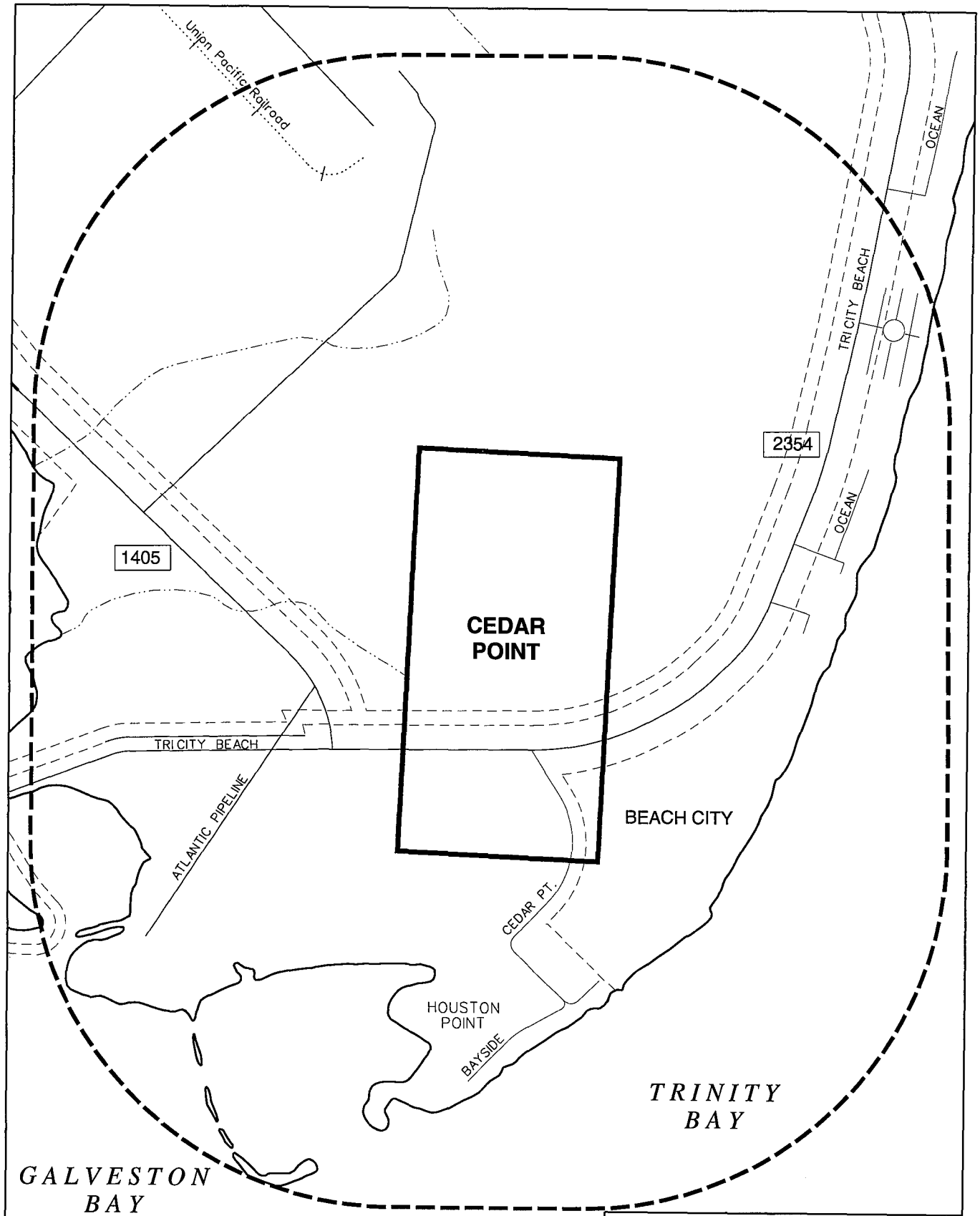

Note: No sensitive receptors were identified in the vicinity of Cedar Point.

Figure 3.18.2-12

SENSITIVE RECEPTORS
CEDAR POINT ALTERNATIVE

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Texas City Dike Park. Bait shops, fishing piers, beaches, boat ramps (Louis Schaper, Noah Welch, and Sampson Yarborough) and restaurants as well as Texas City Dike Park are situated along the dike road. The Shoal Point and Pelican Island sites are readily visible from the dike.

Bay Street Park. Northwest of the Shoal Point site and adjacent to the Texas City Dike is Bay Street Park, the largest Texas City park, including playgrounds, sports fields, nature trails, and other typical municipal park amenities. Additionally, the park contains the Thomas S. Mackey Nature Center and the Wings of Heritage historical display, including a stainless steel replica of a 1913 Burgess and Curtis Biplane and an F-100 Saber Jet from the U.S. Air Force. The park area closest to the site is Phase III of the Bay Street Park development devoted to special populations, with full wheelchair access. At the terminus of the dike at the mainland lies Haney Park and the First Ladies Pavilion. Also in this vicinity is the intersection of Texas City Dike Road and Skyline Drive, which follows the seawall northward in a scenic drive around inland lakes.

Bayland Park. Bayland Park in Baytown is located on Business SH 146 immediately east of the Baytown Bridge. It offers boat ramps, picnic areas, a marina, a restaurant, and a bait shop.

3.18.3.2 Recreational Facilities

A listing of the recreational facilities located within each park is provided in Table E-1. This listing is based on the most recent comprehensive inventory of facilities available (TPWD, 1987); however, it was last updated in 1987 and does not include the facilities that may have been constructed since that date. Throughout the area, at least 7,376 acres of parkland have been designated, of which 2,116 acres are developed. Amenities for the study area include more than 385 camp sites, 126 playgrounds, 3 golf courses, 28 multi-use courts, 42 basketball courts, 81 doubles tennis courts, 47 multi-use fields, 33 softball fields, 3 football fields, 16 soccer fields, 16 pools, and 16 boat ramps (TPWD, 1987).

3.18.3.3 Fishing and Boating

Galveston Bay and other minor bays and inland lakes offer many opportunities for sport fishing. Fishing occurs along the Texas City Dike, at Seawolf Park, and at many other shoreline parks and ramps. Boat ramps are located on the Texas City Dike (50/50 Camp, Dan's, Texas City Dike Marina, Rilats and Gastians, Curls), Shoreacres, Morgan's Point, El Jardin del Mar, Sylvan Beach, Baytown (Tabbs Bay, The Galley), and Cedar Point (Thompsons, Crawley's Bait Camp). Boat ramp activity, as available, is shown in Table 3.18.3-1 (TPWD, 2001b). All boatramp activity contained in the TPWD database was included in the vicinity analysis of the alternative sites. If boating activity data was not included for a particular facility, then it was not included in the TPWD database. The most popular recreational fishing in the area is for trout, redfish, black drum, and flounder (TPWD, 2001b). See Section 3.14.2.2 for additional information on recreational and commercial fisheries.

3.18.3.4 Birding

Birding is a popular activity along the Texas Gulf Coast that attracts many tourists. TPWD and TxDOT have jointly sponsored the development of the Great Texas Coastal Birding Trails.

TABLE 3.18.3-1

BOAT RAMP ACTIVITY: AVERAGE NUMBER OF TRAILERS DAILY
CURRENT SEASON

Location / Ramp	High Season		Low Season	
	Weekends	Weekdays	Weekends	Weekdays
BAYTOWN				
Tabbs Bay	NA	NA	NA	NA
The Galley	NA	NA	NA	NA
CEDAR POINT				
Crawley's Bait Shop	11	3	0	1
Thompsons	19	10	1	0
EL JARDIN DEL MAR				
El Jardin	NA	NA	NA	NA
LEAGUE CITY				
Sylvan Beach	22	9	6	2
MORGAN'S POINT				
Morgan's Point	1	0	0	0
SHOREACRES				
Shoreacres	1	0	NA	NA
TEXAS CITY DIKE				
Curls	7	1	0	1
Dans	3	0	1	0
Rilats and Gastians	3	0	0	0
Texas City Dike Marina	49	14	16	14
50/50 Camp	14	3	7	2

Source: TPWD, 2001.
NA - Not available from cited source.

Forty-three birding loops have been identified and marked with trail logos. Published information is available about the attributes of each site. Both private and public entities cooperate in providing access to these sites.

In the project vicinity, three loops have been identified: Galveston, Texas City, and Clear Lake (TPWD, 1999c). No sites in the Galveston Loop are proximate to the alternative project sites. Within the Texas City and Clear Lake loops, several sites are proximate to alternative project sites. These are:

- Texas City Loop
  1. Amoco Settling Ponds and Swan Lake (winter waterfowl and diving ducks)
  2. Texas City Dike (loons, grebes, diving ducks, gulls)
  3. Bay Street Park (ducks, hummingbird garden)
  4. Galveston Bay Preserve/Texas City Prairie Preserve (Attwater prairie chicken preserve)
- Clear Lake Loop
  1. McHale Park (pelicans, herons, egrets)
  2. Hester Garden Park (migrant land birds)
  3. Pine Gully Park (migrant land birds)
  4. Robinson Park (migrant land birds)

See Section 3.13.1.3 for additional information about birds in the project region.

3.18.4 Aesthetics

In order to assess the potential aesthetic impact on a given landscape, two primary elements must be evaluated: 1) the nature of the receiving landscape, and 2) the nature of the land use change which will be introduced to the viewscape.

In regard to the receiving landscape, a distinction is made between public and private impacts. Potential public impacts are generally governed by accessibility to the general public and the relative value of the view to the community. Although these are subjective valuations, several criteria are applied to select viewsheds of unique community value:

- Visibility from public roadways
- Visibility from recreational areas
- Visibility from commercial or institutional sites
- Visibility from areas of recognized national or regional importance
- Prominence of water in viewshed (water in the landscape is generally considered to enhance aesthetic value, even in highly urbanized settings)
- Visibility from areas of known unique archeological or historic features
- Intrusion of the new use into significant scenic views or areas with unique topographic features or geological formations

Although values placed on visual resources are subjective and differ from one community to another, there are some common features which landscape architects have identified as contributing to viewsheds perceived with higher aesthetic quality than others. These attributes relate to the aesthetic qualities of line, form, composition, contrast, texture, diversity (visual interest), and other aspects typically addressed by design professionals.

Viewsheds generally perceived as having a high level of visual quality have some or all of the following characteristics.

- "Natural environments," i.e., those with little or minimal human control over the design of the landscape, are generally viewed as having higher visual quality than human-made environments
- Water in the landscape, even in a highly urbanized setting, is usually seen as enhancing the quality of the view
- Views with a relatively higher degree of diversity, in terms of various forms, vegetation, land uses, etc., are perceived as having greater visual interest than more uniform landscapes
- Landscapes with unique topographic, geologic or vegetative attributes for the given region are often more highly valued than more typical landscapes

Some landscapes are more sensitive in terms of their ability to absorb the visual impact of a new land use than others. For example, viewscapes with a high degree of closure (i.e., a greater density of large vegetation or topographic relief that tends to screen the visibility of the intruding land use) are better able to incorporate an inconsistent use than open, more transparent landscapes. Moreover, views that have little visual complexity and consist of repetitive and consistent elements may be perceived to be more vulnerable to aesthetic intrusion than more complex vistas.

The general region of interest is highly urbanized with large areas of industrial development. Views are generally not pristine in terms of being devoid of human development in the landscape. Nevertheless, there are several areas, all public parks with waterscapes, which have a relatively high level of visual quality within the urban context. Those are discussed in the sections below.

3.18.4.1 Shoal Point Alternative

The Texas City Dike has been identified as an area of aesthetic value, as has Bay Street Park in Texas City (Hoover, 2001). The Texas City Dike and First Ladies Pavilion have panoramic views toward Galveston Bay on the north, and toward Shoal Point, Pelican Island, and the Texas City Channel on the south. There is currently industrial ship traffic through the channel and various large ships are also visible to the north in the Houston Ship Channel. Along the channel side of the dike there are fishing boats at various piers. In the midground viewshed, Shoal Point and Pelican Island are clearly visible, while in the background the industrial areas of Texas City and Galveston Island are seen. In the ship channel, various types of rusted buoys and pipes are visible.

Bay Street Park in Texas City lies at the intersection of the Dike with the mainland. From Skyline Road and further inland from the entrance to Thomas S. Mackey Nature Center which sits on high ground within the park, Shoal Point is visible very low on the horizon. Texas City industrial sites are visible

in the more distant background. From the Nature Center, the foreground includes vistas of Bay Street Park and playgrounds.

3.18.4.2 Pelican Island Alternative

The three story pavilion at Seawolf Park has panoramic vistas of Pelican Island, Galveston Bay and the Galveston Ship Channel, and Galveston Island. There are views of industrial and recreational ships, including cruise ships, in the bay and in the channel. The view toward Galveston Island is largely industrial, with port facilities clearly visible in the background. The foreground view includes Seawolf Park and its amenities, including the preserved World War II era ship, submarine, tank and small aircraft.

Another area of aesthetic value in the vicinity of Pelican Island is the eastern terminus of the Texas City Dike. The view from the dike is not a pristine natural view, but industrial development lies in the distant background in Galveston. There are currently boat docks, ship traffic and other human development in the area in both the foreground and distant background. Pelican Island itself is of low relief and presents little visual diversity. However, it does present a relatively natural element in an otherwise urban waterscape.

3.18.4.3 Bayport Alternative

Most of the access to views of the Bayport ship channel from the Shoreacres side of the channel are from private residences. Generally, there are private fences, vegetation and berms which somewhat obstruct the view from Shoreacres. The view toward the channel currently includes ships and industrial development in the foreground view and the open bay in the background. From the south side of the channel, the views include various industries and undeveloped property.

3.18.4.4 Spillman's Island Alternative

Bayland Park rests along SH 146 in Baytown at the eastern end of the Baytown Bridge. From the marina and restaurant in the park, there are views toward the west of boats in the marina, the Baytown Bridge and industrial areas in the distance in a highly industrial, although orderly and dynamic, urban waterscape.

3.18.4.5 Alexander Island Alternative

Alexander Island is located in an area which is dominated by industrial maritime and petrochemical uses.

3.18.4.6 Cedar Point Alternative

The Cedar Point area as a whole is in a considerably more natural state than the highly urbanized areas surrounding the bay and offers relatively undeveloped, although not pristine, waterscapes with views of the open bay and wildlife. Scattered residences and small businesses can be seen in the area in a generally low-density, suburban setting.

3.19 SOCIOECONOMICS

3.19.1 Population and Social Characteristics

3.19.1.1 Population

The region which contains the alternative sites lies in the Houston CMSA which includes Brazoria Metropolitan Statistical Area (MSA) (Brazoria County), Houston MSA (Chambers, Fort Bend, Harris, Liberty, Montgomery and Waller counties) and Galveston-Texas City MSA (Galveston County).

More specifically, the proposed Shoal Point site in Texas City lies in Galveston County, as does the Pelican Island alternative, which lies within the Galveston city limits. The Cedar Point alternative lies in Chambers County, and within the corporate limits of the small community of Beach City and Baytown. The Alexander Island, Spillman's Island, and Bayport alternatives all lie within Harris County. The Alexander Island site is proximate to Baytown, with a strip of incorporated La Porte running through the site; the Spillman's Island alternative lies to the north of Morgan's Point and lies partially in La Porte, and the Bayport site is within the corporate limits of Pasadena and adjacent to Shoreacres.

Table 3.19.1-1 shows historical and current populations for the state, for the Houston CMSA and for the various communities which contain the six alternatives, or communities which are adjacent to or within 1 mile of the alternative sites.

Historically, the Houston CMSA has grown at a faster rate than the state as a whole. Figure 3.19.1-1 illustrates the differences in growth rates over the past century. As a benchmark against which to compare subregional growth, the state has increased in population by 86 percent over the past 30 years (1970-2000) and Houston CMSA has more than doubled in population, growing by 114 percent during the same period (USBOC, various years).

Among the various cities in the study area, there is considerable variation in growth history. The major cities of Baytown and Pasadena have grown by 51 and 57 percent, respectively, over the past 30 years, less than half the growth rate of the region as a whole. La Porte, on the other hand, has mushroomed from a community of 7,149 in 1970 to 31,880 in 2000, more than quadrupling in size. Texas City has maintained a relatively stable population, experiencing only 7 percent growth over the same period, including a period of decline in the 1980s. Galveston has been steadily losing population, with a 7 percent loss in population since 1970.

Among the small communities, Beach City, near Cedar Point, has more than quadrupled in population since 1970, doubling in size in just the last 10 years. Seabrook has grown by 148 percent from 1970-2000, while Morgan's Point has lost almost half of its population, decreasing from 593 in 1970 to 336 in 2000. The small town of Shoreacres has also lost population, diminishing by 21 percent (from 1,872 to 1,488) over 30 years. These differential growth rates are shown graphically in Figure 3.19.1-2.

TABLE 3.19.1-1

HISTORICAL POPULATION OF THE REGION OF INTEREST AND SUBREGIONS

	Texas		Houston-Galveston-Brazoria CMSA (1)		Baytown		Beach City		Galveston		La Porte	
	Population	% Change	Population	% Change	Population	% Change	Population	% Change	Population	% Change	Population	% Change
1900	3,048,710		181,762						37,788		537	
1910	3,896,542	27.81%	234,376	28.95%					36,981	-2.14%	678	26.26%
1920	4,663,228	19.68%	329,787	40.71%					44,255	19.67%	889	31.12%
1930	5,824,715	24.91%	526,681	59.70%					52,938	19.62%	1,280	43.98%
1940	6,414,824	10.13%	735,553	39.66%					60,862	14.97%	3,072	140.00%
1950	7,711,194	20.21%	1,068,437	45.26%	22,983				66,568	9.38%	4,429	44.17%
1960	9,579,677	24.23%	1,581,137	47.99%	28,159	22.52%			67,175	0.91%	4,512	1.87%
1970	11,196,730	16.88%	2,181,315	37.96%	43,980	56.18%	363		61,809	-7.99%	7,149	58.44%
1980	14,229,191	27.08%	3,119,831	43.03%	56,917	29.42%	977	169.15%	61,902	0.15%	17,053	138.54%
1990	16,986,510	19.38%	3,731,131	19.59%	63,843	12.17%	852	-12.79%	59,067	-4.58%	27,923	63.74%
2000	20,851,820	22.76%	4,669,571	25.15%	66,430	4.05%	1,645	93.08%	57,247	-3.08%	31,880	14.17%
1970-2000 Percent Change		86%		114%		51%		353%		-7%		346%

	Morgan's Point		Pasadena		Seabrook		Shoreacres		Texas City	
	Population	% Change	Population	% Change	Population	% Change	Population	% Change	Population	% Change
1900										
1910										
1920									2,509	
1930			1,647						3,534	40.85%
1940			3,436	108.62%					5,748	62.65%
1950	651		22,483	554.34%			181		16,620	189.14%
1960	560	-13.98%	58,737	161.25%			518	186.19%	32,065	92.93%
1970	593	5.89%	89,957	53.15%	3,811		1,872	261.39%	38,908	21.34%
1980	428	-27.82%	112,551	25.12%	4,670	22.54%	1,260	-32.69%	41,399	6.40%
1990	341	-20.33%	119,604	6.27%	6,685	43.15%	1,316	4.44%	40,822	-1.39%
2000	336	-1.47%	141,674	18.45%	9,443	41.26%	1,488	13.07%	41,521	1.71%
		-43%		57%		148%		-21%		7%

Source: USBOC, various years.

(1) Houston-Galveston-Brazoria CMSA consists of Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery and Waller counties.

Figure 3.19.1-1
Comparison of Growth Rates
Texas and Houston CMSA

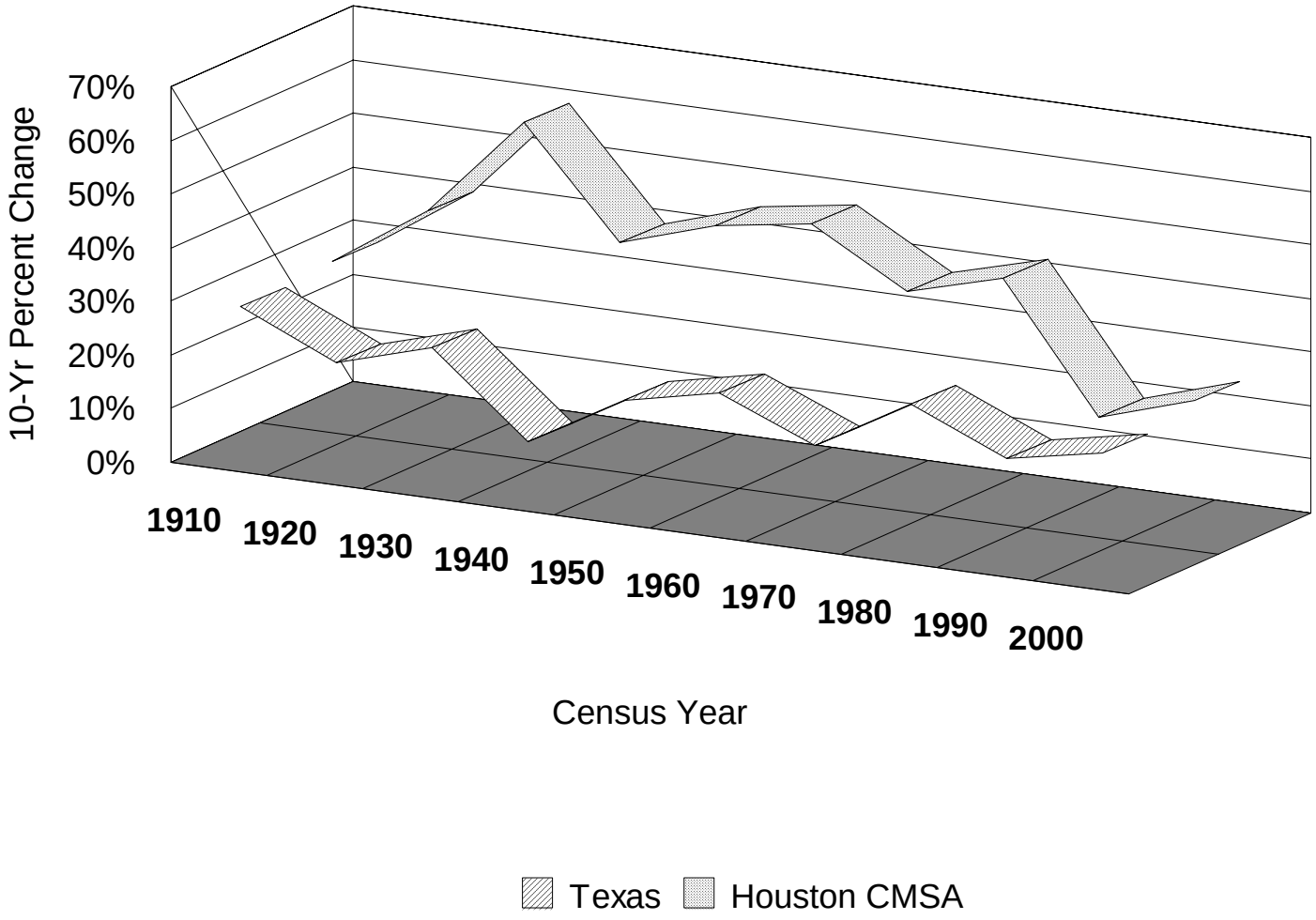
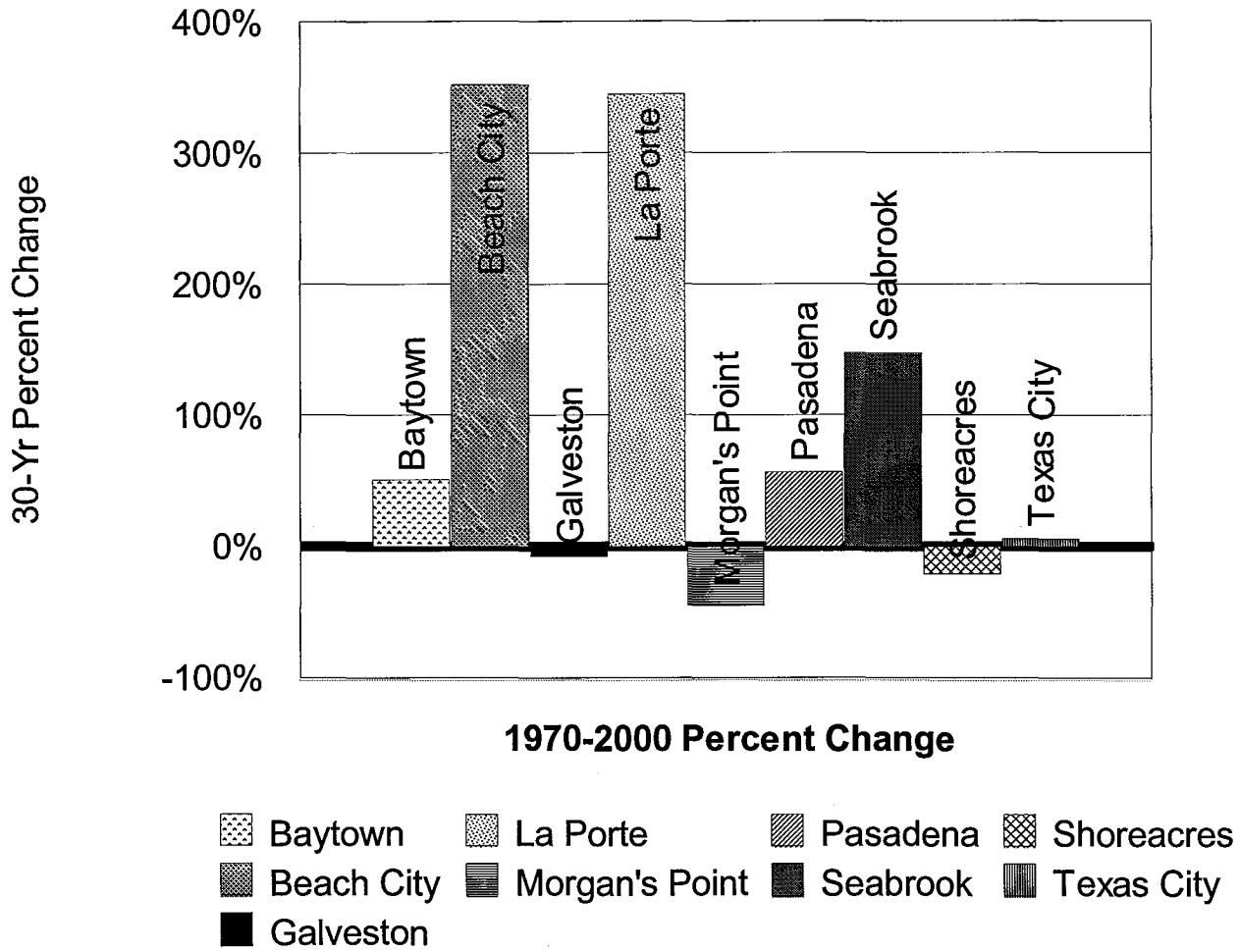


Figure 3.19.1-2
Comparison of Growth Rates
Study Area Communities



3.19.1.2 Social Characteristics

Table 3.19.1-2 presents various social characteristics of the region and local counties and cities. 2000 Census is presented as available; for those characteristics not yet published for the 2000 Census, 1990 data are shown.

Population by Race and Ethnicity. While the state was 53 percent Anglo in 2000, the Houston CMSA was 49 percent Anglo. The Houston CMSA had a greater proportion of African Americans [or Blacks] (17%) than the state (12%) and lesser Hispanic representation (29% versus the state's 32%).

The various communities exhibit a wide variety of ethnic character, as shown in Table 3.19.1-2. Beach City, Morgan's Point, Seabrook and Shoreacres are predominantly Anglo (>80%), while Galveston and Texas City have comparatively large African American populations (26 and 27%, respectively). Pasadena and Baytown have large Hispanic populations, with 48 percent and 34 percent, respectively. Figures 3.19.1-3 through 3.19.1-5 illustrate the different racial and ethnic compositions of the nine area communities.

Median Age. The median age of residents in the Houston CMSA was slightly lower than that of the state in 2000: 31.0 years as compared with the state's 32.3 years. Communities with a relatively high median age were Shoreacres (41.0), Beach City (39.5), Morgan's Point (38.2), Galveston (35.5) and Texas City (35.5). In comparison, Pasadena (29.2) and Baytown (30.6) had relatively young populations.

Household Size. The Houston CMSA and the state had similar household sizes in 2000: approximately 2.74 and 2.80, respectively. Cities with relatively low household sizes include Beach City (2.64), Galveston (2.30), Morgan's Point (2.32) and Seabrook (2.30). Those with relatively higher household sizes include La Porte (2.90) and Pasadena (2.99).

Educational Attainment. While 20 percent of the state population 16 years and older never finished high school, 19 percent of the Houston CMSA population did not finish high school. On the other hand, 15 percent of the Houston CMSA population earned a bachelors or higher college degrees, while 13 percent of statewide population had similar attainment.

Cities that had significantly lower percentages of non-high school graduates are Beach City (13%), La Porte (11%), Morgan's Point (13%), Seabrook (7%) and Shoreacres (6%). Cities that had a higher percentage of college graduates are Seabrook (23%) and Shoreacres (22%), while those with a significantly lower percentage of college graduates are Baytown (9%), La Porte (8%), Pasadena (6%) and Texas City (6%).

Poverty Status. In 1990, a somewhat smaller proportion of Houston CMSA residents lived below the poverty level compared with the state, amounting to 15 percent compared with the state's 18 percent. Beach City (9%, La Porte (9%), Seabrook (9%) and Shoreacres (4.5%) had comparatively low poverty percentages, while Galveston had a comparatively high percentage (24%).

TABLE 3.19.1-2
POPULATION CHARACTERISTICS OF THE REGION OF INTEREST AND SUBAREAS
1990, 2000

Characteristic	Texas		Houston-Galveston-Brazoria CMSA		Baytown		Beach City		Galveston		La Porte	
	#	%	#	%	#	%	#	%	#	%	#	%
TOTAL POPULATION (2000)	20,851,820		4,669,571		66,430		1,645		57,247		31,880	
GENDER (2000)												
Male	10,352,910	49.65%	2,326,943	49.83%	32,250	48.55%	838	50.94%	27,649	48.30%	15,817	49.61%
Female	10,498,910	50.35%	2,342,628	50.17%	34,180	51.45%	807	49.06%	29,598	51.70%	16,063	50.39%
POPULATION BY RACE / ETHNICITY (2000)												
Anglo	11,074,716	53.11%	2,273,655	48.69%	33,683	50.70%	1,537	93.43%	25,668	44.84%	22,746	71.35%
Black	2,421,653	11.61%	792,381	16.97%	9,004	13.55%	27	1.64%	14,606	25.51%	2,022	6.34%
Hispanic	6,669,666	31.99%	1,348,588	28.88%	22,748	34.24%	78	4.74%	14,753	25.77%	6,520	20.45%
Other	685,785	3.29%	254,947	5.46%	995	1.50%	3	0.18%	2,220	3.88%	592	1.86%
Total	20,851,820	100.00%	4,669,571	100.00%	66,430	100.00%	1,645	100.00%	57,247	100.00%	31,880	100.00%
MEDIAN AGE (2000)	32.3		31		30.6		39.5		35.5		32.6	
PERSONS/ HOUSEHOLD (2000)	2.74		2.80		2.80		2.64		2.30		2.90	
EDUCATIONAL ATTAINMENT (16 Years and Older) (1990)												
Less Than 9 Years	1,492,112	8.78%	275,272	7.38%	4,780	7.49%	19	2.23%	5,297	8.97%	1,070	3.83%
9-12 Years, No Diploma	1,924,831	11.33%	415,557	11.14%	5,907	9.25%	98	11.50%	6,269	10.61%	1,939	6.94%
High School Diploma	3,153,187	18.56%	651,863	17.47%	9,796	15.34%	191	22.42%	9,448	16.00%	5,406	19.36%
College, No Degree	2,777,973	16.35%	595,984	15.97%	8,954	14.03%	178	20.89%	7,307	12.37%	4,482	16.05%
Associate Degree	598,956	3.53%	128,183	3.44%	2,264	3.55%	26	3.05%	2,111	3.57%	1,139	4.08%
Bachelors Degree	1,530,849	9.01%	398,737	10.69%	3,516	5.51%	45	5.28%	4,331	7.33%	1,703	6.10%
Graduate / Professional Degree	673,250	3.96%	174,684	4.68%	1,932	3.03%	36	4.23%	3,799	6.43%	649	2.32%
POVERTY STATUS (1990)	3,000,515	17.66%	544,061	14.58%	10,148	15.90%	75	8.80%	13,891	23.52%	2,442	8.75%

TABLE 3.19.1-2 (Concluded)
POPULATION CHARACTERISTICS OF THE REGION OF INTEREST AND SUBAREAS
1990, 2000

Characteristic	Morgan's Point		Pasadena		Seabrook		Shoreacres		Texas City	
	#	%	#	%	#	%	#	%	#	%
TOTAL POPULATION (2000)	336		141,674		9,443		1,488		41,521	
GENDER (2000)										
Male	179	53.27%	70,767	49.95%	4,880	51.68%	752	50.54%	19,601	47.21%
Female	157	46.73%	70,907	50.05%	4,563	48.32%	736	49.46%	21,920	52.79%
POPULATION BY RACE / ETHNICITY (2000)										
Anglo	274	81.55%	67,846	47.89%	7,842	83.05%	1,340	90.05%	21,001	50.58%
Black	16	4.76%	2,242	1.58%	206	2.18%	17	1.14%	11,404	27.47%
Hispanic	43	12.80%	68,348	48.24%	1,017	10.77%	114	7.66%	8,520	20.52%
Other	3	0.89%	3,238	2.29%	378	4.00%	17	1.14%	596	1.44%
Total	336	100.00%	141,674	100.00%	9,443	100.00%	1,488	100.00%	41,521	100.00%
MEDIAN AGE (2000)	38.2		29.2		34.3		41.1		35.5	
PERSONS/ HOUSEHOLD (2000)	2.32		2.99		2.31		2.66		2.62	
EDUCATIONAL ATTAINMENT (16 Years and Older) (1990)										
Less Than 9 Years	21	6.16%	8,779	7.34%	92	1.38%	20	1.52%	3,004	7.36%
9-12 Years, No Diploma	22	6.45%	12,444	10.40%	378	5.65%	54	4.10%	5,516	13.51%
High School Diploma	60	17.60%	22,443	18.76%	893	13.36%	182	13.83%	9,296	22.77%
College, No Degree	44	12.90%	15,331	12.82%	1,291	19.31%	284	21.58%	6,887	16.87%
Associate Degree	5	1.47%	3,536	2.96%	266	3.98%	57	4.33%	1,858	4.55%
Bachelors Degree	31	9.09%	5,097	4.26%	1,063	15.90%	163	12.39%	1,762	4.32%
Graduate / Professional Degree	16	4.69%	2,548	2.13%	456	6.82%	121	9.19%	863	2.11%
POVERTY STATUS (1990)	40	11.73%	16,724	13.98%	629	9.41%	59	4.48%	6,776	16.60%

Source: USBOC, 1990, 2000.

Figure 3.19.1-3
Percent Anglo Population
Study Area Communities

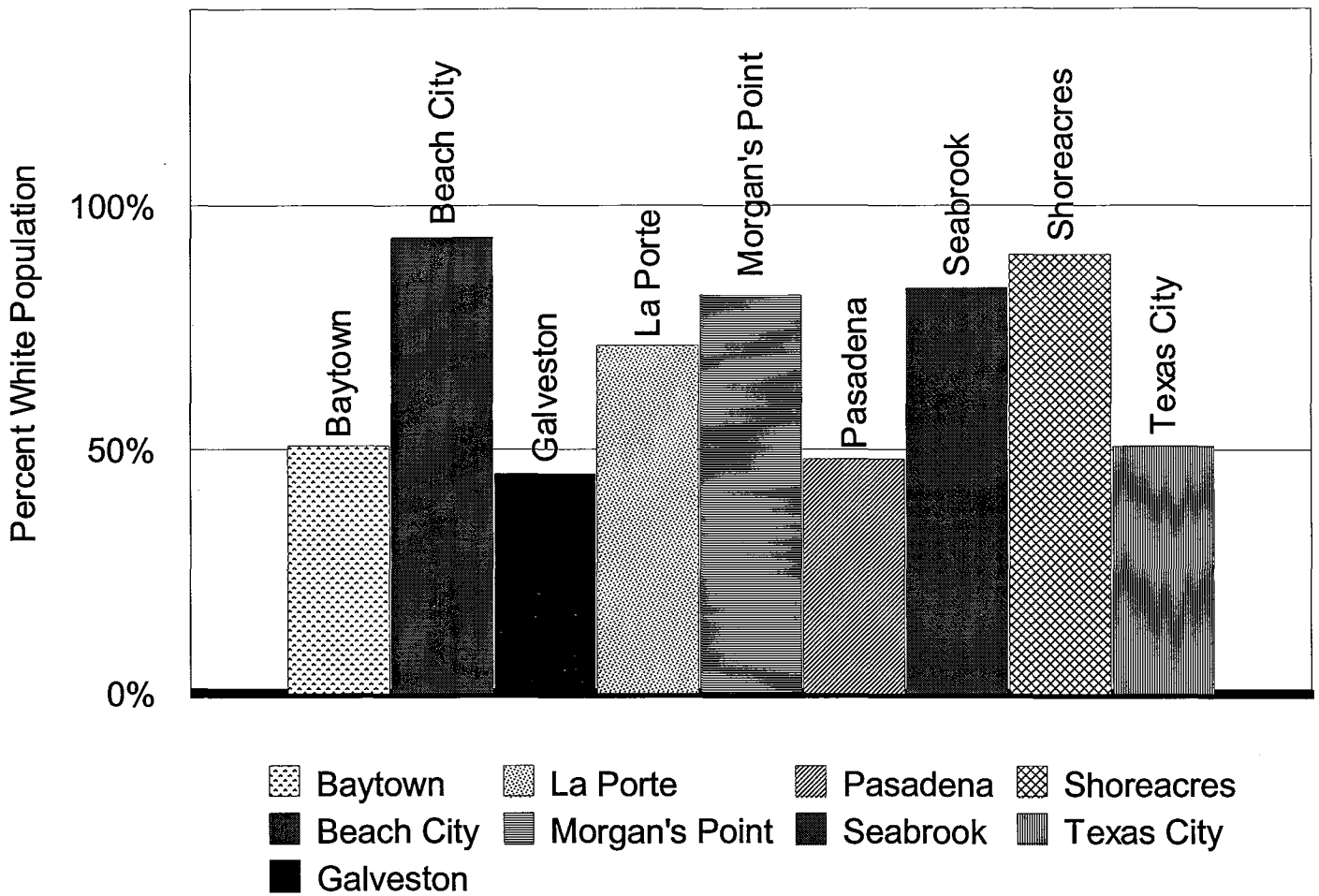


Figure 3.19.1-4
Percent Black Population
Study Area Communities

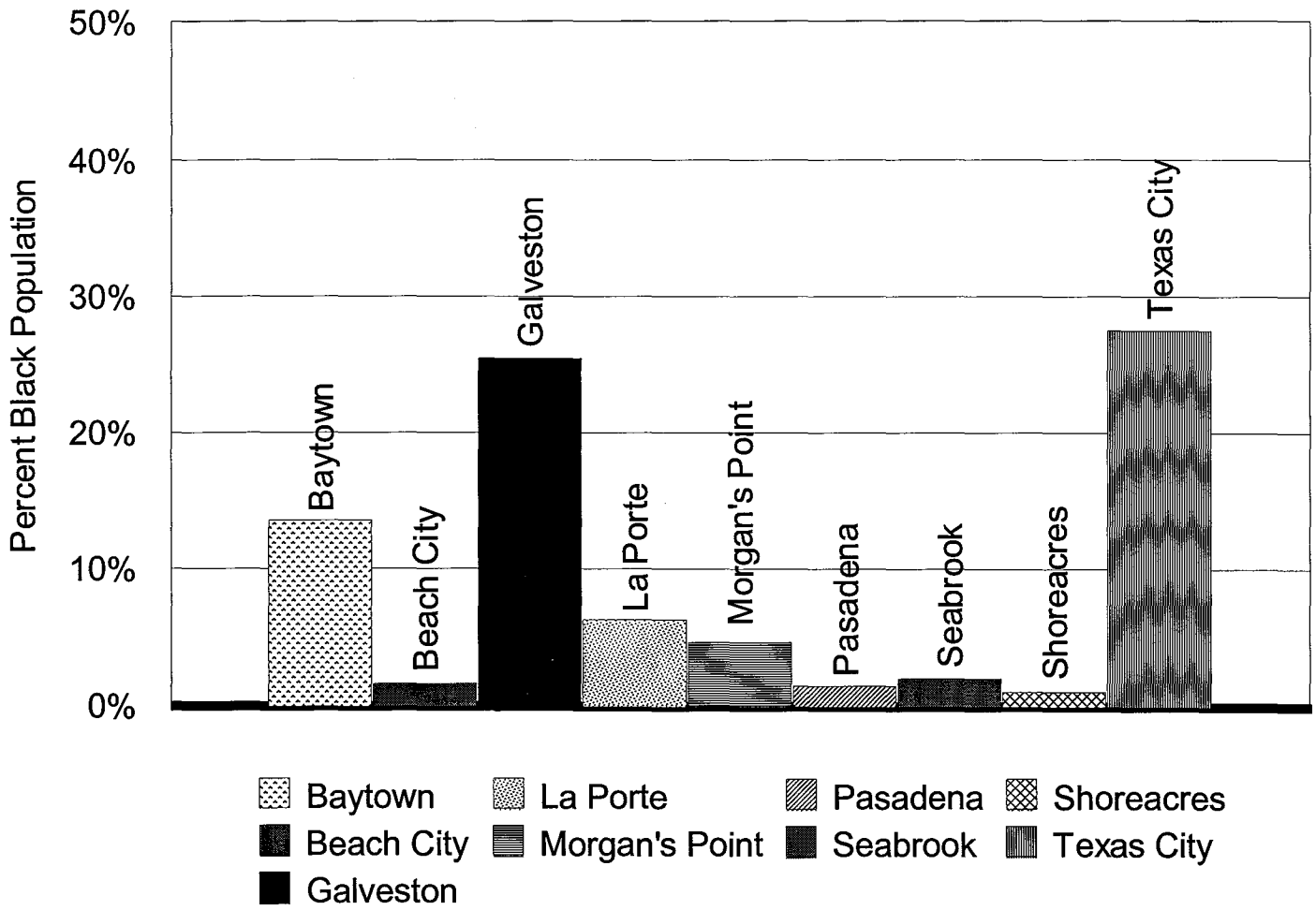
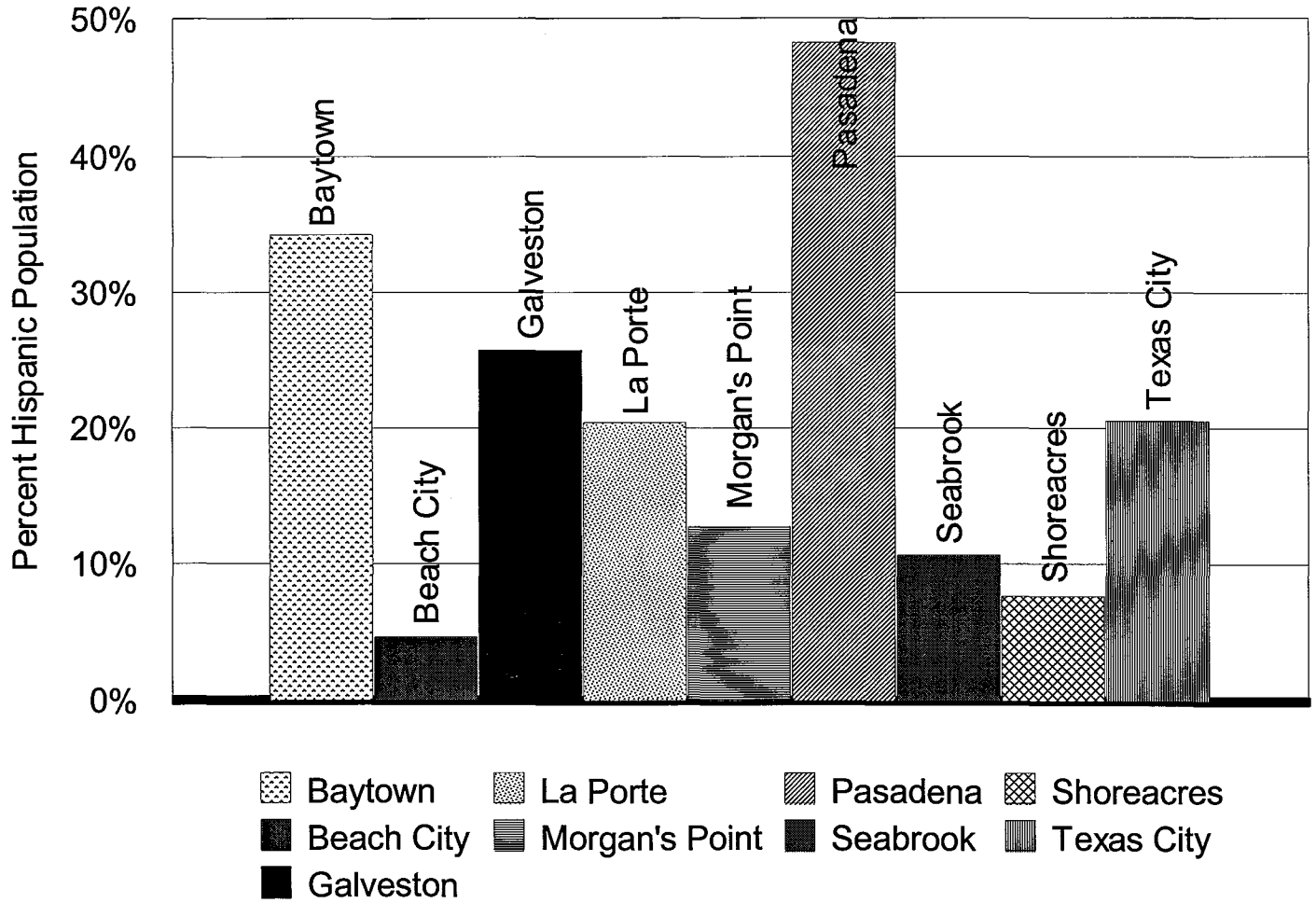


Figure 3.19.1-5
Percent Hispanic Population
Study Area Communities



3.19.2 Community Values

Requests were made to communities within the region of interest regarding their comprehensive plans or other documents or activities which expressed the values of the community as they might relate to the proposed project.

3.19.2.1 Baytown

Baytown 2020 is the Comprehensive Plan for the City of Baytown (Appendix E). According to the Plan Summary provided by the City (City of Baytown, 2000), the community recognizes the following goal, which is related to projects such as the proposed project: "Ensure that existing and future commercial and industrial development is viable and sufficient to support employment and tax base growth and does not adversely impact the City's image and aesthetics (Goal 4.3)."

In addition, the City has a land use plan as a component of Baytown 2020. That plan envisions areas to the northwest of the Cedar Point alternative site as primarily single-family and two-family residential, with some manufactured housing and light industrial in areas where such uses already exist. No changes in land use are anticipated for areas along SH146 which are nearest to the Alexander Island alternative (currently parkland and commercial, office and retail).

3.19.2.2 Beach City

Beach City currently has no planning or zoning departments and no comprehensive plan. The City is currently working on a long-range plan, but it will be at least a year before any results of that effort are complete (Gainer, 2001).

3.19.2.3 Galveston

Galveston has recently finished its comprehensive planning project, which is documented in its "Galveston Comprehensive Plan: A Shared Vision for Galveston Island" (City of Galveston, 2001) (Appendix E). That plan has a number of elements directly related to the proposed project or similar projects on Pelican Island:

1. Promote industrial expansion associated with the Port of Galveston (Objective LU-3.1), particularly through a growing presence on Pelican Island. More specifically, cruise line businesses are identified as a desirable industry.

2. Prepare a Wharves Area Specific Plan (Strategy LU-3.1.1), addressing such issues as Pelican Island access, environmental factors, land use compatibility, replacement of Pelican Island Bridge, future rail access, relocation of Seawolf Parkway, need for sewer expansion on the Island, and mitigation of potential environmental hazards from industrial operations.

3. Focus tactical economic development initiatives to strengthen port and industrial activities, among other economic activities, particularly in regard to the oil and gas industry (Objective ED-2)

4. Diversify and expand the economy, create quality jobs, promote the fiscal health of the City and enhance the quality of life in Galveston (Economic Development Goal)

3.19.2.4 La Porte

The La Porte Comprehensive Plan Update (City of La Porte, n.d.) mentions the Bayport site in several instances (Appendix E). Among its community challenges, it lists "Impact of Bayport Terminal (lights, noise, view, traffic, erosion)". It also lists the Bayport Terminal Complex as a major issue confronting the community and the impacts resulting from the Bayport Terminal as a barrier or obstacle to future progress. The plan makes no mention of potential port activities on Spillman's Island. The plan is generally supportive of economic development, but has no specific economic development component.

The proposed land use map for La Porte shows a future community park and low density residential development near the site of the Bayport alternative and adjacent to the community of Shoreacres. In the vicinity of Spillman's Island, the land use map envisions industrial development.

3.19.2.5 Morgan's Point

The Morgan's Point Comprehensive Plan (Morgan's Point Planning and Zoning Commission, 1996) notes that the City had intended for the container port in that city to be a residential area instead of industrial development; however, the plan also acknowledges that the container port is an economic benefit to the community (Appendix E). The plan notes that roughly 60% of the land area of the city is currently industrial and states a community desire to restrict any further industrial development within the city.

3.19.2.6 Pasadena

Pasadena's comprehensive planning document, Pasadena Plan (City of Pasadena, 1996) makes no mention of economic development similar to the proposed project, although it does offer support generally for economic development (Appendix E). It does not include port facilities as one of its list of desirable future industries, but it does envision a regional resort and marina along its bayfront environs. The City has taken no official position on the location of the container port in Bayport (Tietjens, 2001). However, the City has organized a Citizens Advisory Group to address concerns about the potential Bayport location. The report of that Group had not been released at the time of this writing.

3.19.2.7 Seabrook

The City of Seabrook provided City Resolution No. 2001-17 as an indication of the values of that community in regard to the Bayport alternative site (Appendix E). That resolution cites three earlier resolutions of similar nature and states the community's concerns about potential adverse impacts from a

railyard associated with the project and other environmental and safety issues. The resolution reaffirms the City's opposition to the expansion of the Bayport terminal facilities.

3.19.2.8 Shoreacres

Shoreacres has no planning department or comprehensive plan (Eldridge, 2001). However, Shoreacres has passed three resolutions since 1999 regarding the potential location of a container terminal at the Bayport site (City of Shoreacres, 1989, 1999, 2000) (Appendix E). Those resolutions oppose the expansion of the Bayport complex, based on the City's concerns about land use compatibility, environmental impacts, traffic effects and potential health hazards.

3.19.2.9 Texas City

The City of Texas City is the permit applicant for the proposed project. In 1998, the City undertook a planning effort entitled "Texas City Vision 2020," designed to be a practical action plan to further the "Goals 2000" effort, which was a far-ranging comprehensive plan. The Vision 2020 effort utilized key person interviews, citizen focus groups and community leader strategic deliberations to develop a prioritized set of actions for community growth and development. The Goals and Objectives of that effort are reproduced in Appendix E.

In the area of Economic Development and Tourism, one goal was "a port trade developed to its maximum capacity and potential." The two highest priority actions under that goal were 1) "Distribution (warehousing and storage) and intermodal shipping center"; and 2) "Texas MegaPort developed."

Other goals directly related to the proposed project are:

1. an economy that attracts residents and highly skilled individuals and results in higher incomes for all;
2. a waterfront development - completed - supportive of tourism and marine industry;
3. full employment - anyone who wants a job has a job or is in training to move to something else;
4. tourism assets have been identified, developed and marketed; and
5. change environmental quality perception (ecological management of sensitive areas).

3.19.3 Housing

Table 3.19.3-1 presents U.S. Bureau of Census information on housing in the state, the region (Houston CMSA), and communities in the vicinity of the various alternative sites (USBOC, 1990, 2000). Some data on housing was not available from the 2000 Census at the time of this writing; therefore, some data are from the 1990 Census and are so noted.

Occupancy. In 2000, 9 percent of housing units were vacant statewide, while 8 percent were vacant in the Houston CMSA. Galveston (21%) and Morgan's Point (22%) had significantly higher vacancy rates, while Shoreacres (6%) had slightly lower vacancy.

TABLE 3.19.3-1

HOUSING CHARACTERISTICS IN THE REGION OF INTEREST AND SUBREGIONS

1990, 2000

Characteristic	Texas		Houston-Galveston-Brazoria CMSA		Baytown		Beach City		Galveston		La Porte		Morgan's Point		Pasadena	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Housing Units (2000)	8,157,575		1,777,902		26,203		714		30,017		11,720		143		50,367	
Occupancy Status (2000)																
Occupied Units	7,393,354	90.63%	1,639,401	92.21%	23,483	89.62%	623	87.25%	23,842	79.43%	10,928	93.24%	111	77.62%	47,031	93.38%
Vacant Units	764,221	9.37%	138,501	7.79%	2,720	10.38%	91	12.75%	6,175	20.57%	792	6.76%	32	22.38%	3,336	6.62%
Tenure of Occupied Housing (2000)																
Owner Occupied	4,716,959	63.80%	994,347	60.65%	13,988	59.57%	530	85.07%	10,399	43.62%	8,438	77.21%	92	82.88%	26,385	56.10%
Renter Occupied	2,676,395	36.20%	645,054	39.35%	9,495	40.43%	93	14.93%	13,443	56.38%	2,490	22.79%	19	17.12%	20,646	43.90%
Median Year Structure Built (1990)	1972		1973		1968		1970		1959		1975		1944		1966	
Median Gross Rent (Renter-Occupied) (1990)	$395		$406		$385		$413		$381		$465		$463		$383	
Median Value (Owner-Occupied) (1990)	$58,900		$63,000		$49,300		$69,400		$56,800		$56,300		$83,300		$48,300	

Characteristic	Seabrook		Shoreacres		Texas City	
	#	%	#	%	#	%
Housing Units (2000)	4,536		594		16,715	
Occupancy Status (2000)						
Occupied Units	4,094	90.26%	559	94.11%	15,479	92.61%
Vacant Units	442	9.74%	35	5.89%	1,236	7.39%
Tenure of Occupied Housing (2000)						
Owner Occupied	2,126	51.93%	524	93.74%	9,803	63.33%
Renter Occupied	1,968	48.07%	35	6.26%	5,676	36.67%
Median Year Structure Built (1990)	1977		1966		1963	
Median Gross Rent (Renter-Occupied) (1990)	$433		$713		$365	
Median Value (Owner-Occupied) (1990)	$71,500		$72,200		$49,700	

Source: USBOC, 1990, 2000.

Tenure of Occupied Housing. Of the occupied housing in 2000, 64 percent of housing in the state and 61 percent of Houston CMSA housing was owner occupied. Communities with significantly higher proportions of owner occupied housing are La Porte (77%), Beach City (85%), Morgan's Point (83%), and Shoreacres (94%). Those with lower proportions of owner occupied housing were Pasadena (56%), Galveston (442%), and Seabrook (52%).

Median Year Structure Built. In 1990, the median age of housing was 17 to 18 years in the Houston CMSA and 18 years in the state as a whole. Morgan's Point had the oldest median age housing at 46 years, followed by Galveston (31 years), Texas City (27 years), Pasadena and Shoreacres (24 years), and Baytown (22 years). Newer housing was found in Beach City (20 years), La Porte (15 years), and Seabrook (13 years).

3.19.4 Economic Characteristics of Area Population

Table 3.19.4-1 shows various economic characteristics of the study area population in 1990 (Census 2000 detailed data was not available at the time of this writing).

3.19.4.1 Work Location: City Level

Statewide, approximately half of workers are employed in the same city in which they live. The Houston CMSA comprises a number of highly urbanized counties with a multitude of cities. Thus, in the region, less than half (46%) are employed in their city of residence.

This varies widely among the communities in the vicinity of the various alternative sites. The larger communities of Baytown and Texas City have profiles similar to the region, with 52 and 53 percent, respectively, working in the city of residence. The island city of Galveston has the highest percentage of residents working in their home city at 88 percent. At the other end of the spectrum, the smaller communities of Beach City (2%), Morgan's Point (9%), Shoreacres (4%) and Seabrook (16%) employ a low percentage of their residents, due to their small size and lack of economic development or diversity. La Porte and Pasadena also have many residents who work outside of their home communities, with only 27 and 36 percent, respectively, employed in the same city as their residence.

3.19.4.2 Work Location: County Level

Although many residents leave their own communities for work, the vast majority of them throughout the region remain in their home county for employment. The one exception is Beach City in Chambers County, in which 81 percent work in another county.

3.19.4.3 Median Travel Time to Work

Workers in the Houston CMSA have shorter travel times to work than the median for the state. In spite of the fact that a large portion of employees work outside their city of residence, Table 3.19.4-1 shows that in most communities the commute time is less than for the metropolitan area as a whole, due to the highly urbanized nature of the metropolitan area. The highest commute time is for workers from remote Beach City (29 minutes), 81 percent of which work outside of Chambers County.

Table 3.19.4-1
Economic Characteristics of the Region of Interest and Subareas
1990

Characteristic	Texas #	Texas %	Houston-Galveston-Brazoria CMSA #	Houston-Galveston-Brazoria CMSA %	Baytown #	Baytown %	Beach City #	Beach City %	Galveston #	Galveston %	La Porte #	La Porte %
TOTAL POPULATION	16,986,510		3,711,043		63,838		850		59,072		27,896	
WORK LOCATION: City Level												
Same City as Residence	3,730,130	49.01%	807,783	45.90%	13,890	51.82%	8	2.00%	22,404	87.60%	3,649	27.45%
Outside City of Residence	3,880,357	50.99%	952,013	54.10%	12,916	48.18%	392	98.00%	3,170	12.40%	9,643	72.55%
WORK LOCATION: County Level												
Same County as Residence	6,312,264	82.94%	1,514,876	86.08%	23,888	89.11%	78	19.50%	23,976	93.75%	12,609	94.86%
Different County than Residence	1,230,794	16.17%	234,159	13.31%	2,767	10.32%	322	80.50%	1,410	5.51%	580	4.36%
Outside State	67,429	0.89%	10,761	0.61%	151	0.56%	0	0.00%	188	0.74%	103	0.77%
MEDIAN TRAVEL TIME TO WORK (Minutes)	33.0		24.4		18.3		29.0		15.1		20.6	
INDUSTRY OF WORKERS												
Agriculture, Forest and Fisheries	212,402	2.78%	22,247	1.24%	182	0.66%	3	0.73%	397	1.47%	117	0.85%
Mining	164,571	2.16%	60,453	3.37%	633	2.31%	4	0.97%	254	0.94%	151	1.10%
Construction	514,102	6.73%	150,900	8.42%	4,286	15.63%	49	11.86%	1,402	5.19%	1,583	11.57%
Manufacturing	1,101,938	14.43%	252,048	14.07%	5,678	20.71%	96	23.24%	1,488	5.50%	3,257	23.80%
Transportation	350,773	4.59%	91,555	5.11%	990	3.61%	31	7.51%	1,045	3.87%	710	5.19%
Communications and Other Public Utilities	229,542	3.01%	52,809	2.95%	610	2.22%	2	0.48%	351	1.30%	422	3.08%
Wholesale Trade	375,869	4.92%	105,711	5.90%	1,256	4.58%	20	4.84%	681	2.52%	751	5.49%
Retail Trade	1,331,344	17.44%	295,950	16.52%	4,375	15.96%	60	14.53%	4,306	15.93%	1,888	13.80%
Finance, Insurance and Real Estate	521,461	6.83%	126,178	7.04%	1,137	4.15%	20	4.84%	1,938	7.17%	513	3.75%
Services	772,211	10.12%	188,757	10.53%	2,275	8.30%	40	9.69%	2,677	9.90%	1,208	8.83%
Professional	1,715,207	22.47%	388,914	21.70%	5,368	19.58%	78	18.89%	11,340	41.94%	2,707	19.78%
Public Administration	344,859	4.52%	56,362	3.15%	629	2.29%	10	2.42%	1,157	4.28%	378	2.76%
OCCUPATION												
Managerial & Professional	1,990,263	26.07%	510,107	28.47%	5,423	19.78%	110	26.63%	7,353	28.40%	3,172	23.18%
Tech., Sales, Adm. Supp.	2,485,034	32.55%	600,166	33.50%	8,251	30.09%	125	30.27%	8,100	31.29%	4,298	31.41%
Service	1,030,326	13.50%	224,439	12.53%	3,533	12.89%	31	7.51%	5,065	19.56%	1,449	10.59%
Farming, Forestry, Fishing	196,624	2.58%	20670	1.15%	149	0.54%	0	0.00%	475	1.83%	103	0.75%
Precision Prod, Craft, Repair	896,290	11.74%	215,067	12.00%	5,566	20.30%	60	14.53%	2,039	7.88%	2,554	18.66%
Operators, Fabricators, Laborers	1,035,742	13.57%	221,135	12.34%	4,497	16.40%	87	21.07%	2,857	11.04%	2,109	15.41%
CLASS OF WORKERS												
Private for Profit	5,439,776	71.25%	1,372,576	76.61%	22,128	80.70%	308	74.58%	14,203	54.86%	11,014	80.48%
Private, Not for Profit	417,685	5.47%	86,616	4.83%	1,282	4.68%	33	7.99%	1,933	7.47%	495	3.62%
Local Government	497,120	6.51%	102,344	5.71%	1,785	6.51%	25	6.05%	2,197	8.49%	790	5.77%
State Government	404,526	5.30%	73,799	4.12%	704	2.57%	7	1.69%	5,531	21.36%	516	3.77%
Federal Government	255,881	3.35%	36,092	2.01%	288	1.05%	16	3.87%	586	2.26%	303	2.21%
Self-Employed	579,252	7.59%	112,817	6.30%	1,143	4.17%	24	5.81%	1,327	5.13%	550	4.02%
Unpaid Family Workers	40,039	0.52%	7340	0.41%	89	0.32%	0	0.00%	112	0.43%	17	0.12%
MEDIAN HOUSEHOLD INCOME 1989	$27,016		$31,488		$30,151		$41,477		$20,825		$41,733	
As percent of State Median				116.55%		111.60%		153.53%		77.08%		154.48%
PER CAPITA INCOME IN 1989	$12,904		$14,943		$12,963		$17,167		$12,399		$14,349	
As percent of State Median				115.80%		100.46%		133.04%		96.09%		111.20%

Table 3.19.4-1 (Concluded)

Characteristic	Morgan's Point #	Morgan's Point %	Pasadena #	Pasadena %	Seabrook #	Seabrook %	Shoreacres #	Shoreacres %	Texas City #	Texas City %
TOTAL POPULATION	355		119,363		6,699		1,316		40,822	
WORK LOCATION: City Level										
Same City as Residence	11	9.09%	18,927	35.58%	669	15.88%	29	4.26%	9,234	53.27%
Outside City of Residence	110	90.91%	34,273	64.42%	3,545	84.12%	651	95.74%	8,100	46.73%
WORK LOCATION: County Level										
Same County as Residence	119	98.35%	51,228	96.29%	3,698	87.76%	643	94.56%	14,869	85.78%
Different County than Residence	2	1.65%	1,761	3.31%	499	11.84%	33	4.85%	2,432	14.03%
Outside State	0	0.00%	211	0.40%	17	0.40%	4	0.59%	33	0.19%
MEDIAN TRAVEL TIME TO WORK (Minutes)	15.9		21.1		18.7		22.3		17.6	
INDUSTRY OF WORKERS										
Agriculture, Forest and Fisheries	3	2.40%	384	0.71%	105	2.45%	18	2.56%	171	0.97%
Mining	0	0.00%	681	1.25%	81	1.89%	9	1.28%	229	1.30%
Construction	9	7.20%	7,256	13.33%	397	9.26%	42	5.97%	1,435	8.15%
Manufacturing	25	20.00%	10,431	19.17%	1,001	23.34%	172	24.43%	3,654	20.74%
Transportation	5	4.00%	2,833	5.21%	169	3.94%	26	3.69%	602	3.42%
Communications and Other Public Utilities	6	4.80%	1,552	2.85%	57	1.33%	20	2.84%	568	3.22%
Wholesale Trade	3	2.40%	3,361	6.18%	313	7.30%	34	4.83%	472	2.68%
Retail Trade	18	14.40%	9,533	17.52%	589	13.74%	82	11.65%	2,935	16.66%
Finance, Insurance and Real Estate	5	4.00%	2,712	4.98%	225	5.25%	37	5.26%	1,054	5.98%
Services	7	5.60%	5,003	9.19%	352	8.21%	49	6.96%	1,358	7.71%
Professional	32	25.60%	8,978	16.50%	811	18.91%	186	26.42%	4,412	25.04%
Public Administration	12	9.60%	1,699	3.12%	188	4.38%	29	4.12%	727	4.13%
OCCUPATION										
Managerial & Professional	41	32.80%	9,863	18.12%	1,492	34.79%	287	40.77%	3,569	20.26%
Tech., Sales, Adm. Supp.	28	22.40%	18,182	33.41%	1,439	33.56%	189	26.85%	5,658	32.12%
Service	20	16.00%	6,462	11.87%	408	9.51%	44	6.25%	2,274	12.91%
Farming, Forestry, Fishing	3	2.40%	402	0.74%	81	1.89%	6	0.85%	157	0.89%
Precision Prod, Craft, Repair	17	13.60%	10,266	18.86%	554	12.92%	114	16.19%	3,332	18.91%
Operators, Fabricators, Laborers	16	12.80%	9,248	16.99%	314	7.32%	64	9.09%	2,627	14.91%
CLASS OF WORKERS										
Private for Profit	73	58.40%	44,099	81.03%	3,259	76.00%	491	69.74%	12,759	72.42%
Private, Not for Profit	18	14.40%	1,968	3.62%	133	3.10%	38	5.40%	863	4.90%
Local Government	17	13.60%	3,368	6.19%	201	4.69%	71	10.09%	1,605	9.11%
State Government	3	2.40%	1,411	2.59%	170	3.96%	27	3.84%	1,149	6.52%
Federal Government	3	2.40%	835	1.53%	214	4.99%	20	2.84%	403	2.29%
Self-Employed	11	8.80%	2,550	4.69%	284	6.62%	48	6.82%	802	4.55%
Unpaid Family Workers	0	0.00%	192	0.35%	27	0.63%	9	1.28%	36	0.20%
MEDIAN HOUSEHOLD INCOME 1989	$41,250		$28,729		$34,658		$52,418		$26,144	
As percent of State Median		152.69%		106.34%		128.29%		194.03%		96.77%
PER CAPITA INCOME IN 1989	$18,978		$12,402		$18,959		$19,860		$11,794	
As percent of State Median		147.07%		96.11%		146.92%		153.91%		91.40%

Source: USBOC, 1990.
Note: Population characteristics not available from the 2000 Census.

3.19.4.4 Industry of Workers

The profile of industry employment is similar for the Houston CMSA and for the state. In order of employment, the major industries are: Professional (22%), Retail Trade (17%), Manufacturing (14%) and Services (10-11%). Another major industry in some of the area cities is Construction.

Table 3.19.4-1 shows major industries of the workers living in each area city. Galveston has a notably different profile than all the other counties; 41 percent of its workers are professional, while very few are in manufacturing (6%) and construction (5%).

3.19.4.5 Occupation

One-third of state and Houston CMSA workers are in technical, sales and administrative support occupations. This is followed by managerial and professional occupations, at 32 percent for the state and 18 percent for Houston CMSA. Farming, forestry and fisheries are a relatively small segment, with about 1 percent regionally and 3 percent statewide in those professions.

Galveston differs from other cities because it has a relatively high (20%) percentage of service workers and lower percentages of craft and fabricators professions. In contrast, the small communities of Beach City (8%) and Shoreacres (6%) have relatively few service industry workers. Morgan's Point, Seabrook and Shoreacres all have relatively high percentages of workers in managerial and professional occupations, with 33, 35, and 41 percent, respectively.

3.19.4.6 Class of Workers

Statewide, 71 percent of workers are employed by private, for-profit enterprises. That figure is higher in the Houston CMSA, at 77 percent. In area cities, that proportion falls to 55 percent in Galveston, where 21 percent are employed by State government; and to 58 percent in Morgan's Point, where 14 percent are employed by non-profit enterprises and 14 percent are employed by local government. Shoreacres and Texas City also have a relatively higher proportion of local government workers at 9 and 10 percent, respectively.

3.19.4.7 Median Household Income and Per Capita Income

Table 3.19.4-1 also shows median household income and per capita income for 1989. (Detailed data for 1999 were not yet available at the time of this writing.)

The greater Houston area had household incomes 17 percent higher than the state median. Several of the area cities also had higher medians: Baytown (12% higher), Beach City (54%), La Porte (54%), Morgan's Point (53%), Seabrook (28%) and Shoreacres (94%). Galveston had a median household income 23 percent lower than the state median. Texas City and Pasadena had medians which were close to the state median.

3.19.5 Leading Economic Sectors

Table 3.19.5-1 through Table 3.19.5-4 provide an area economic profile regarding the leading economic sectors of the state, the region, and the three primary counties in the study vicinity for 1997. These tables illustrate differences in the counties related to sector activity. Generally, the state pattern is similar to that for Harris County, while Chambers and Galveston counties have distinctive patterns (USBOC, 1997). According to the Texas Workforce Commission, the Texas Gulf Coast economy is led by large chemical and petroleum product manufacturers, education, government, health services, and shipping and international trade via ports along the Gulf of Mexico. The Galveston-Texas City MSA in particular is dominated by port activities, as well as insurance and finance, petrochemical plants, manufacturing, tourism, ship building, and commercial fishing. Although maritime industries are important in the Gulf Coast area, neither the State Comptroller nor the Texas Workforce Commission has data specific to maritime industries.

3.19.5.1 Number of Establishments

Table 3.19.5-1 shows the number of establishments for 1997. For all areas, the largest number of establishments was in the retail trade sector. This was followed by accommodation and food services for Chambers and Galveston Counties, and by Professional, scientific and technical services for Harris County. Wholesale trade and health care and assistance were also important sectors in Harris County.

3.19.5.2 Sales, Receipts or Shipments

Table 3.19.5-2 shows the dollar value of sales, receipts or shipments for each sector. Manufacturing represented the highest amount of sales for Chambers and Galveston counties, followed distantly by retail trade. For Harris County, wholesale trade had the greatest economic value, followed by manufacturing and retail trade.

3.19.5.3 Annual Payroll

The highest payroll in all geographic areas is for manufacturing. This is followed distantly in Chambers County by retail trade and in Galveston County by health care and social assistance and by retail trade. In Harris County, other major sectors in terms of payroll are professional, scientific and technical services and wholesale trade. These figures are shown in Table 3.19.5-3.

3.19.5.4 Paid Employees

Employment by sector is shown in Table 3.19.5-4. The largest number of employees in Chambers County are in the manufacturing sector, followed by accommodation and food services. In Galveston County, the largest employment is in health care and social assistance jobs, followed closely by retail trade. In Harris County, the major employment sectors are retail trade, manufacturing, and administrative and support and waste management and remediation services.

TABLE 3.19.5-1

AREA ECONOMIC PROFILE, 1997
NUMBER OF ESTABLISHMENTS

Sector	Texas	Houston-Galveston-Brazoria CMSA	Chambers	Galveston	Harris
Mining	6,412	NA	NA	NA	NA
Utilities	1,816	311	NA	NA	NA
Construction	35,315	NA	NA	NA	NA
Manufacturing	21,808	5,387	15	160	4,374
Wholesale Trade	33,346	8,837	22	198	7,564
Retail Trade	74,105	15,173	83	921	11,596
Transportation & Warehousing	12,800	2,711	NA	NA	NA
Information	7,520	NA	NA	NA	NA
Finance & Insurance	28,074	6,210	NA	NA	NA
Real Estate & Rental & Leasing	20,753	4,932	15	224	4,039
Professional, Scientific & Technical Services	42,806	11,727	20	338	9,944
Management of Companies & Enterprises	3,899	NA	NA	NA	NA
Admin. & Support & Waste Mgmt. & Remediation Serv.	18,642	4,780	9	145	4,073
Educational Services	2,633	679	NA	23	489
Health Care & social Assistance	43,520	9,491	13	431	6,996
Arts, Entertainment & Recreation	4,893	997	5	113	589
Accommodation & Food Services	34,160	6,989	31	485	5,470
Other Services Except Public Administration	34,885	7,638	20	436	5,209
Auxiliaries, Exc. Corp. Subsidiary & Reg. Managing Offices	1,094	NA	NA	NA	NA

Sources: USBOC, 1997.
NA - Not available.

TABLE 3.19.5-2

AREA ECONOMIC PROFILE, 1997
SALES, RECEIPTS OR SHIPMENTS ($1,000)

Sector	Texas	Houston-Galveston-Brazoria CMSA	Chambers	Galveston	Harris
Mining	$41,712,672	NA	NA	NA	NA
Utilities	$74,102,272	$51,045,972	NA	NA	NA
Construction	$60,069,004	NA	NA	NA	NA
Manufacturing	$297,657,003	$99,862,240	$1,989,717	$9,182,629	$73,227,741
Wholesale Trade	$323,111,661	$117,381,335	D	$561,291	$110,399,742
Retail Trade	$182,516,112	$39,877,001	$133,758	$1,786,931	$31,045,131
Transportation & Warehousing	$28,532,871	$10,622,234	NA	NA	NA
Information	$40,363,181	NA	NA	NA	NA
Finance & Insurance	NA	NA	NA	NA	NA
Real Estate & Rental & Leasing	$15,957,359	$4,691,286	$9,791	$128,543	$4,154,714
Professional, Scientific & Technical Services	$42,923,733	$17,046,581	$6,335	$131,636	$15,512,860
Management of Companies & Enterprises	$6,071,976	NA	NA	NA	NA
Admin. & Support & Waste Mgmt & Remediation Serv.	$25,299,232	$7,316,902	$14,161	$112,218	$5,963,674
Educational Services	$1,219,159	$321,780	NA	$3,594	$256,579
Health Care & social Assistance	$56,758,770	$13,107,314	$3,492	$792,652	$5,784,144
Arts, Entertainment & Recreation	$4,763,771	$1,365,253	$4,637	$124,575	$839,143
Accommodation & Food Services	$22,698,848	$5,330,396	$14,929	$301,528	$4,379,041
Other Services Except Public Administration	$17,073,985	$5,047,186	$6,817	$244,278	$3,189,500
Auxiliaries, Exc. Corp. Subsidiary & Reg. Managing Offices	$1,068,803	NA	NA	NA	NA

Sources: USBOC, 1997.
NA - Not available.
D - Withheld to avoid disclosure

TABLE 3.19.5-3

AREA ECONOMIC PROFILE, 1997
ANNUAL PAYROLL ($1,000)

Sector	Texas	Houston-Galveston-Brazoria CMSA	Chambers	Galveston	Harris
Mining	$4,333,593	NA	NA	NA	NA
Utilities	$2,817,483	$1,143,464	NA	NA	NA
Construction	$12,398,274	NA	NA	NA	NA
Manufacturing	$32,760,820	$7,901,450	$83,471	$392,507	$5,991,250
Wholesale Trade	$15,504,899	$4,566,511	D	$46,625	$4,129,694
Retail Trade	$16,197,114	$3,679,081	$9,421	$165,781	$2,921,864
Transportation & Warehousing	$6,137,066	$2,077,949	NA	NA	NA
Information	$8,605,583	NA	NA	NA	NA
Finance & Insurance	$13,833,550	$3,555,888	NA	NA	NA
Real Estate & Rental & Leasing	$3,119,182	$934,498	$2,129	$25,442	$829,527
Professional, Scientific & Technical Services	$16,186,823	$5,979,138	$1,945	$52,509	$5,478,161
Management of Companies & Enterprises	$13,110,358	NA	NA	NA	NA
Admin. & Support & Waste Mgmt. & Remediation Serv.	$12,559,687	$3,932,903	$7,189	$68,614	$2,992,737
Educational Services	$412,038	$108,786	NA	$884	$87,599
Health Care & social Assistance	$23,082,750	$5,170,035	$1,453	$330,850	$2,802,364
Arts, Entertainment & Recreation	$1,475,075	$398,944	$852	$26,413	$250,564
Accommodation & Food Services	$6,175,414	$1,420,622	$3,928	$82,424	$1,160,739
Other Services Except Public Administration	$4,496,989	$1,271,153	$2,163	$45,941	$978,407
Auxiliaries, Exc. Corp. Subsidiary & Reg. Managing Offices	$2,471,378	NA	NA	NA	NA

Sources: USBOC, 1997.
NA - Not available.
D - Withheld to avoid disclosure.

TABLE 3.19.5-4

AREA ECONOMIC PROFILE, 1997
PAID EMPLOYEES

Sector	Texas	Houston-Galveston-Brazoria CMSA	Chambers	Galveston	Harris
Mining	105,492	NA	NA	NA	NA
Utilities	57,717	19,652	NA	NA	NA
Construction	426,765	NA	NA	NA	NA
Manufacturing	959,665	202,631	1,499	7,279	158,572
Wholesale Trade	425,750	113,506	(100-249)	1,522	101,357
Retail Trade	950,848	215,892	648	10,591	168,038
Transportation & Warehousing	209,782	60,197	NA	NA	NA
Information	210,654	NA	NA	NA	NA
Finance & Insurance	352,019	80,212	NA	NA	NA
Real Estate & Rental & Leasing	128,915	38,177	84	1,160	33,808
Professional, Scientific & Technical Services	358,392	116,232	80	1,375	106,124
Management of Companies & Enterprises	224,279	NA	NA	NA	NA
Admin. & Support & Waste Mgmt. & Remediation Serv.	626,742	179,447	305	2,496	148,864
Educational Services	22,433	5,859	NA	82	4,650
Health Care & social Assistance	891,570	178,580	135	12,388	92,982
Arts, Entertainment & Recreation	85,707	20,176	56	1,849	11,654
Accommodation & Food Services	638,333	140,028	577	9,156	111,869
Other Services Except Public Administration	235,860	62,007	78	2,488	45,636
Auxiliaries, Exc. Corp. Subsidiary & Reg. Managing Offices	1,068,803	NA	NA	NA	NA

Sources: USBOC, 1997.
NA - Not available.

3.19.5.5 Historical Growth in Establishments and Employees

Table 3.19.5-5 provides historical detail, showing data for 1993 through 1997 for various industrial sectors. This table illustrates the power of the greater Houston area economy; the three counties examined in this study accounted for 19 percent of establishments in the state and 23 percent of employees. The region supplies over one-third of the state's mining sector employment.

Nevertheless, during the 1993 to 1997 period shown, the three-county area lagged behind economic growth in the state. Texas business establishments increased by 9 percent during the period, while the three-county area grew by 6 percent. The state increased by 15 percent in employment, while the study area region increased by only 10 percent.

Regionally, the largest numerical increases came in services, which added 2,668 establishments and 54,964 jobs, or more than half of all new employment. Following services in terms of growth were transportation and public utilities, wholesale trade, and retail trade. Construction also employed a large segment of the workers, although construction firms only make up 2 percent of business establishments.

3.19.6 Labor Force, Employment and Unemployment Rates

3.19.6.1 Labor Force

Table 3.19.6-1 shows labor force, employment, and unemployment rates for the study region for 1990-2000 (Texas Workforce Commission (TWC), 2001a). During that time period, the labor force in Texas grew by 20 percent, while in the Houston CMSA it grew by nearly 18 percent. This reflects the population growth of the same period.

There is considerable variation among study area counties. The smallest county, Chambers County, experienced a labor force growth rate of 22 percent, while the Galveston County labor force increased by only 4 percent. Harris County increased by 15 percent.

3.19.6.2 Employment

Employment in the state and in the study area grew at a faster rate than the labor force. The state's employment figures increased by 24 percent from 1990 to 2000, and employment in the Houston CMSA grew by almost 19 percent. Harris County increased by 16 percent, and even Galveston County, which experienced a modest increase in the labor force, produced more growth in its employment (5.5%) than in its labor force (4%). Only Chambers County had slightly slower employment growth (21%) than labor force growth (22%).

3.19.6.3 Unemployment Rates

Because employment growth has exceeded labor force growth over the past 10 years, unemployment rates have dropped during the period. Statewide, the unemployment rate dropped from 7.2 percent in 1990 to 4.2 percent in 2000. The unemployment rate for the study region has historically

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TABLE 3.19.5-5
COUNTY ESTABLISHMENTS AND EMPLOYEES

County / Industry	Total Number of Establishments					1993-1997 Change		Number of Employees					1993-1997 Change	
	1993	1994	1995	1996	1997	Number	%	1993	1994	1995	1996	1997	Number	%
TEXAS														
Agricultural Services, Forestry & Fishing	6,055	6,221	6,467	6,664	6,851	796	13.15%	38,762	40,217	44,413	47,501	50,439	11,677	30.12%
Mining	7,249	7,202	6,955	6,837	6,823	-426	-5.88%	147,416	153,313	183,762	140,121	150,533	3,117	2.11%
Construction	31,695	33,234	34,447	35,940	36,047	4,352	13.73%	343,143	356,806	388,558	413,791	428,411	85,268	24.85%
Manufacturing	22,213	22,568	22,880	23,450	23,536	1,323	5.96%	968,342	984,316	1,012,788	1,028,978	1,061,689	93,347	9.64%
Transportation & Public Utilities	18,823	19,799	20,771	21,680	22,199	3,376	17.94%	411,340	426,312	453,865	464,006	486,474	75,134	18.27%
Wholesale Trade	37,557	37,804	38,134	38,722	38,742	1,185	3.16%	446,593	452,663	476,759	481,682	499,152	52,559	11.77%
Retail Trade	101,035	102,950	103,250	104,100	104,478	3,443	3.41%	1,368,063	1,425,671	1,466,975	1,525,321	1,548,889	180,826	13.22%
Finance, Insurance & Real Estate	39,705	40,454	41,528	43,263	45,632	5,927	14.93%	426,356	438,017	440,607	447,655	467,269	40,913	9.60%
Services	151,530	155,887	158,992	164,825	171,136	19,606	12.94%	2,130,104	2,170,781	2,313,642	2,401,525	2,555,781	425,677	19.98%
Unclassified	4,757	3,852	4,838	2,053	3,580	-1,177	-24.74%	4,921	5,134	5,524	2,382	2,288	-2,633	-53.51%
Totals	420,619	429,971	438,262	447,534	459,024	38,405	9.13%	6,285,040	6,453,230	6,786,893	6,952,962	7,250,925	965,885	15.37%
CHAMBERS COUNTY														
Agricultural Services, Forestry & Fishing	8	10	9	12	10	2	25.00%	B	B	B	62	B	NA	
Mining	17	18	19	20	18	1	5.88%	557	618	629	647	584	27	4.85%
Construction	27	23	25	27	31	4	14.81%	247	175	201	228	331	84	34.01%
Manufacturing	12	13	12	17	16	4	33.33%	1,355	1,242	1,289	1,368	1,536	181	13.36%
Transportation & Public Utilities	29	31	34	36	41	12	41.38%	244	208	242	303	375	131	53.69%
Wholesale Trade	19	20	20	27	25	6	31.58%	C	106	88	152	245	NA	
Retail Trade	98	92	96	113	108	10	10.20%	882	913	942	1,027	1,065	183	20.75%
Finance, Insurance & Real Estate	28	24	26	27	32	4	14.29%	129	136	139	129	C	NA	
Services	89	95	92	102	101	12	13.48%	606	663	745	862	1,031	425	70.13%
Unclassified	2	2	2	2	1	-1	-50.00%	A	A	A	B	A	NA	
Totals	329	328	335	383	383	54	16.41%	4,201	4,124	4,338	4,778	5,360	1,159	27.59%
GALVESTON COUNTY														
Agricultural Services, Forestry & Fishing	71	68	67	71	80	9	12.68%	351	354	474	519	529	178	50.71%
Mining	27	31	26	21	21	-6	-22.22%	358	438	418	315	304	-54	-15.08%
Construction	351	353	363	374	374	23	6.55%	3,379	3,278	3,372	3,090	3,862	483	14.29%
Manufacturing	157	162	167	179	183	26	16.56%	8,207	7,911	7,796	7,972	7,816	-391	-4.76%
Transportation & Public Utilities	230	233	233	252	253	23	10.00%	3,878	4,329	4,401	3,813	3,690	-188	-4.85%
Wholesale Trade	215	208	216	242	240	25	11.63%	1,813	1,732	1,840	2,006	1,761	-52	-2.87%
Retail Trade	1,385	1,370	1,381	1,362	1,351	-34	-2.45%	17,518	18,452	18,871	18,198	18,419	901	5.14%
Finance, Insurance & Real Estate	383	381	381	390	408	25	6.53%	6,011	4,349	4,507	4,491	4,754	-1,257	-20.91%
Services	1,646	1,659	1,656	1,735	1,795	149	9.05%	22,500	23,513	23,606	23,554	23,339	839	3.73%
Unclassified	57	45	51	16	49	-8	-14.04%	78	47	58	11	39	-39	-50.00%
Totals	4,522	4,510	4,541	4,642	4,754	232	5.13%	64,093	64,403	65,343	63,969	64,513	420	0.66%
HARRIS COUNTY														
Agricultural Services, Forestry & Fishing	908	917	920	936	941	33	3.63%	8,012	8,469	8,645	8,697	9,267	1,255	15.66%
Mining	1,113	1,101	1,087	1,051	1,209	96	8.63%	47,419	49,665	87,207	45,474	54,199	6,780	14.30%
Construction	5,153	5,163	5,234	5,257	5,229	76	1.47%	97,446	97,009	102,674	108,954	110,109	12,663	12.99%
Manufacturing	4,469	4,460	4,495	4,528	4,578	109	2.44%	169,800	170,766	173,527	174,487	179,830	10,030	5.91%
Transportation & Public Utilities	3,422	3,466	3,634	3,711	3,781	359	10.49%	99,121	101,708	108,569	117,140	123,864	24,743	24.96%
Wholesale Trade	8,123	8,193	8,381	8,441	8,468	345	4.25%	106,487	108,952	113,593	114,044	117,274	10,787	10.13%
Retail Trade	16,407	16,802	16,806	16,734	16,652	245	1.49%	251,980	261,827	266,730	276,575	272,005	20,025	7.95%
Finance, Insurance & Real Estate	7,606	7,674	7,856	8,118	8,607	1,001	13.16%	94,054	94,521	91,242	92,346	99,945	5,891	6.26%
Services	29,650	30,250	30,844	31,366	32,157	2,507	8.46%	491,343	492,105	522,113	506,110	545,043	53,700	10.93%
Unclassified	854	635	777	338	655	-199	-23.30%	917	891	999	425	369	-548	-59.76%
Totals	77,705	78,661	80,034	80,480	82,277	4,572	5.88%	1,366,579	1,385,913	1,475,299	1,444,252	1,511,905	145,326	10.63%

TABLE 3.19.5-5
COUNTY ESTABLISHMENTS AND EMPLOYEES

County / Industry	Total Number of Establishments					1993-1997 Change		Number of Employees					1993-1997 Change	
	1993	1994	1995	1996	1997	Number	%	1993	1994	1995	1996	1997	Number	%
THREE COUNTIES (Number)														
Agricultural Services, Forestry & Fishing	987	995	996	1,019	1,031	44	4.46%	NA	NA	NA	9,278	NA	NA	NA
Mining	1,157	1,150	1,132	1,092	1,248	91	7.87%	48,334	50,721	88,254	46,436	55,087	6,753	13.97%
Construction	5,531	5,539	5,622	5,658	5,634	103	1.86%	101,072	100,462	106,247	112,272	114,302	13,230	13.09%
Manufacturing	4,638	4,635	4,674	4,724	4,777	139	3.00%	179,362	179,919	182,612	183,827	189,182	9,820	5.47%
Transportation & Public Utilities	3,681	3,730	3,901	3,999	4,075	394	10.70%	103,243	106,245	113,212	121,256	127,929	24,686	23.91%
Wholesale Trade	8,357	8,421	8,617	8,710	8,733	376	4.50%	NA	110,790	115,521	116,202	119,280	NA	NA
Retail Trade	17,890	18,264	18,283	18,209	18,111	221	1.24%	270,380	281,192	286,543	295,800	291,489	21,109	7.81%
Finance, Insurance & Real Estate	8,017	8,079	8,263	8,535	9,047	1,030	12.85%	100,194	99,006	95,888	96,966	NA	NA	NA
Services	31,385	32,004	32,592	33,203	34,053	2,668	8.50%	514,449	516,281	546,464	530,526	569,413	54,964	10.68%
Unclassified	913	682	830	356	705	-208	-22.78%	NA	NA	NA	NA	NA	NA	NA
Totals	82,556	83,499	84,910	85,505	87,414	4,858	5.88%	1,317,034	1,444,616	1,534,741	1,512,563	1,466,682	149,648	11.36%
THREE COUNTIES (Percent of Texas)														
Agricultural Services, Forestry & Fishing	16.30%	15.99%	15.40%	15.29%	15.05%			NA	NA	NA	19.53%	NA		
Mining	15.96%	15.97%	16.28%	15.97%	18.29%			32.79%	33.08%	48.03%	33.14%	36.59%		
Construction	17.45%	16.67%	16.32%	15.74%	15.63%			29.45%	28.16%	27.34%	27.13%	26.68%		
Manufacturing	20.88%	20.54%	20.43%	20.14%	20.30%			18.52%	18.28%	18.03%	17.87%	17.82%		
Transportation & Public Utilities	19.56%	18.84%	18.78%	18.45%	18.36%			25.10%	24.92%	24.94%	26.13%	26.30%		
Wholesale Trade	22.25%	22.28%	22.60%	22.49%	22.54%			NA	24.48%	24.23%	24.12%	23.90%		
Retail Trade	17.71%	17.74%	17.71%	17.49%	17.33%			19.76%	19.72%	19.53%	19.39%	18.82%		
Finance, Insurance & Real Estate	20.19%	19.97%	19.90%	19.73%	19.83%			23.50%	22.60%	21.76%	21.66%	NA		
Services	20.71%	20.53%	20.50%	20.14%	19.90%			24.15%	23.78%	23.62%	22.09%	22.28%		
Unclassified	19.19%	17.71%	17.16%	17.34%	19.69%			NA	NA	NA	NA	NA		
Totals	19.63%	19.42%	19.37%	19.11%	19.04%			20.96%	22.39%	22.61%	21.75%	20.23%		

Source: USBOC, 2001b.
(A)-(C), (E)-(M) - Employment-size classes are indicated as follows:
A - 0 to 19 B--20 to 99 C--100 to 249 E--250 to 499
F - 500 to 999 G--1,000 to 2,499 H--2,500 to 4,999
I - 5,000 to 9,999 J--10,000 to 24,999
K - 25,000 to 49,999 L--50,000 to 99,999
M - 100,000 or more
NA - USBOC confidential information not available

TABLE 3.19.6-1

REGIONAL CIVILIAN LABOR FORCE AND EMPLOYMENT ESTIMATES

ANNUAL AVERAGE, 1990-2000

Factor / Area	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	1990-2000 Change Number	1990-2000 Change %
CIVILIAN LABOR FORCE													
Texas	8,615,795	8,755,404	8,998,763	9,160,557	9,408,663	9,588,433	9,674,460	9,838,951	10,094,763	10,219,113	10,324,527	1,708,732	19.83%
Houston-Galveston-Brazoria CMSA	2,095,466	2,143,254	2,200,262	2,234,521	2,275,780	2,294,252	2,311,955	2,357,438	2,431,722	2,456,990	2,465,457	369,991	17.66%
Chambers County	9,833	9,896	9,991	10,313	10,526	10,822	11,067	11,375	11,739	11,755	12,017	2,184	22.21%
Galveston County	113,369	115,851	121,591	124,830	125,107	126,868	125,922	124,623	123,595	122,148	118,167	4,798	4.23%
Harris County	1,550,688	1,580,442	1,616,991	1,634,965	1,657,531	1,673,423	1,673,109	1,700,923	1,749,016	1,763,855	1,784,273	233,585	15.06%
EMPLOYMENT													
Texas	7,992,542	8,165,070	8,308,202	8,503,521	8,802,656	9,011,013	9,129,997	9,309,966	9,609,026	9,746,879	9,887,039	1,894,497	23.70%
Houston-Galveston-Brazoria CMSA	1,988,466	2,023,457	2,040,720	2,069,099	2,125,086	2,158,046	2,185,355	2,231,740	2,324,784	2,341,153	2,358,922	370,456	18.63%
Chambers County	9,463	9,448	9,375	9,488	9,829	10,220	10,492	10,771	11,235	11,244	11,462	1,999	21.12%
Galveston County	105,423	107,465	110,712	114,114	114,567	117,321	115,738	114,486	115,384	114,174	111,165	5,742	5.45%
Harris County	1,471,529	1,490,724	1,497,895	1,510,994	1,546,017	1,573,304	1,581,413	1,611,754	1,674,506	1,681,183	1,708,190	236,661	16.08%
UNEMPLOYMENT RATE													
Texas	7.2%	6.7%	7.7%	7.2%	6.4%	6.0%	5.6%	5.4%	4.8%	4.6%	4.2%		-41.42%
Houston-Galveston-Brazoria CMSA	5.1%	5.6%	7.3%	7.4%	6.6%	5.9%	5.5%	5.3%	4.4%	4.7%	4.3%		-15.38%
Chambers County	3.8%	4.5%	6.2%	8.0%	6.6%	5.6%	5.2%	5.3%	4.3%	4.3%	4.6%		22.74%
Galveston County	7.0%	7.2%	8.9%	8.6%	8.4%	7.5%	8.1%	8.1%	6.6%	6.5%	5.9%		-15.46%
Harris County	5.1%	5.7%	7.4%	7.6%	6.7%	6.0%	5.5%	5.2%	4.3%	4.7%	4.3%		-16.47%

Source: TWC, 2001a.

been lower than that of the state. Nevertheless, unemployment for the Houston CMSA dropped from 5.1 percent in 1990 to just 4.3 percent in 2000, which also reflects the change for Harris County. Galveston County also experienced a decline in unemployment, from 7.0 percent to 5.9 percent. Only Chambers County saw an increase in unemployment rates, rising from a low 3.8 percent in 1990 to 4.6 percent in 2000. Despite the increase, Chambers County unemployment rates are nevertheless indicative of a healthy level of employment.

3.19.7 Personal Income and Wages

3.19.7.1 Per Capita Personal Income

Table 3.19.7-1 shows per capita personal income for the period of 1970 to 1999 (U.S. Bureau of Economic Analysis, 1999). Throughout that period, Harris County has consistently shown a per capita income of 20-25 percent higher than the state average, while Chambers County has often had incomes somewhat lower than the statewide incomes. Galveston County shows incomes generally similar to those of the state.

3.19.7.2 Wages

Average wages per job are shown in Table 3.19.7-2 (U.S. Bureau of Economic Analysis, 1998). Both Harris and Chambers Counties generally show average wages higher than those statewide, while wages in Galveston County fall below state averages.

3.19.8 Tourism

3.19.8.1 General Tourism

Table 3.19.8-1 presents economic indicators of the impact of travel on Texas and on the Gulf Coast. The Gulf Coast region represents 20 to 25 percent of Texas expenditures, earnings, employment, and tax receipts. Over the 1994 through 1999 period, growth in Gulf Coast tourism exceeded growth in that sector for the state (Texas Department of Economic Development, 2001).

3.19.8.2 Ecotourism

The study region is located within the Central Flyway for coastal and trans-oceanic bird migration and is thus an attraction for ecotourism and birding, in particular. Texas City was declared, by City ordinance, to be a bird sanctuary. A study commissioned by the TPWD (Eubanks, 1999) found that an average visitor to the Great Texas Coastal Birding Trail in the Gulf Coast region spent approximately 9 days and 8 nights recreationally, spending $78.52 per person per day in coastal areas. Annually, each visiting birder spent an average of 31.23 days per year birding along the Trail, thus averaging $2,452.18 of direct coastal spending per person annually.

TABLE 3.19.7-1

PER CAPITA PERSONAL INCOME

1970-1999

Factor / Location	1970	1975	1980	1985	1990	1995	1999
PER CAPITA PERSONAL INCOME							
Texas	$3,618	$5,663	$9,840	$13,470	$16,749	$21,526	$26,834
Chambers County	$3,454	$6,510	$10,503	$12,813	$15,006	$20,119	$25,012
Galveston County	$3,835	$6,324	$10,472	$13,486	$17,347	$21,807	$25,296
Harris County	$4,338	$7,068	$12,639	$16,195	$20,145	$26,529	$33,864
PER CAPITA PERSONAL INCOME AS PERCENT OF STATE							
Chambers County	95.47%	114.96%	106.74%	95.12%	89.59%	93.46%	93.21%
Galveston County	106.00%	111.67%	106.42%	100.12%	103.57%	101.31%	94.27%
Harris County	119.90%	124.81%	128.45%	120.23%	120.28%	123.24%	126.20%

Source: U.S. Bureau of Economic Analysis, 1999.

TABLE 3.19.7-2
AVERAGE WAGE PER JOB
1970-1999

Factor / Location	1970	1975	1980	1985	1990	1995	1999
AVERAGE WAGE PER JOB							
Texas	$6,263	$8,928	$14,148	$19,120	$22,479	$26,405	$32,254
Chambers County	$6,158	$10,119	$17,616	$21,940	$24,327	$28,768	$33,370
Galveston County	$6,748	$9,688	$14,544	$18,882	$21,739	$25,748	$27,757
Harris County	$7,369	$10,839	$17,380	$22,796	$26,587	$31,422	$38,309
AVERAGE WAGE AS PERCENT OF STATE							
Chambers County	98.32%	113.34%	124.51%	114.75%	108.22%	108.95%	103.46%
Galveston County	107.74%	108.51%	102.80%	98.76%	96.71%	97.51%	86.06%
Harris County	117.66%	121.40%	122.84%	119.23%	118.27%	119.00%	118.77%

Source: U.S. Bureau of Economic Analysis, 1998.

TABLE 3.19.8-1

TRAVEL IMPACT

1994-1999

Area	1994	1995	1996	1997	1998	1999	1994-1999 Change $	1994-1999 Change %
TOTAL SPENDING ($000)								
Texas	$27,318,434	$29,244,912	$31,037,181	$32,500,619	$34,102,000	$36,694,314	$9,375,880	34.3%
Gulf Coast Region	$6,042,485	$6,611,580	$7,257,570	$7,906,813	$8,436,534	$9,197,982	$3,155,497	52.2%
Chambers County	$8,886	$9,177	$9,677	$11,217	$11,442	$12,612	$3,726	41.9%
Galveston County	$331,833	$342,065	$364,018	$385,584	$402,515	$436,495	$104,662	31.5%
Harris County	$5,201,880	$5,724,729	$6,294,915	$6,867,713	$7,340,966	$8,023,117	$2,821,237	54.2%
DESTINATION SPENDING ($000)								
Texas	$19,399,622	$20,476,728	$21,909,309	$23,146,203	$24,391,330	$25,885,721	$6,486,099	33.4%
Gulf Coast Region	$4,170,838	$4,391,676	$4,746,359	$5,070,831	$5,387,185	$5,668,010	$1,497,172	35.9%
Chambers County	$8,662	$9,177	$9,677	$11,217	$11,442	$12,612	$3,950	45.6%
Galveston County	$313,532	$325,088	$347,640	$372,762	$389,340	$423,315	$109,783	35.0%
Harris County	$3,349,562	$3,522,980	$3,802,277	$4,048,133	$4,308,958	$4,519,713	$1,170,151	34.9%
EARNINGS ($000)								
Texas	$6,410,975	$6,746,167	$7,107,469	$7,530,438	$8,133,754	$8,773,417	$2,362,442	36.8%
Gulf Coast Region	$1,437,747	$1,546,166	$1,687,611	$1,869,151	$2,053,831	$2,246,881	$809,134	56.3%
Chambers County	$1,450	$1,468	$1,516	$1,784	$1,879	$2,072	$622	42.9%
Galveston County	$68,486	$69,711	$74,131	$78,351	$82,673	$89,579	$21,093	30.8%
Harris County	$1,263,945	$1,363,226	$1,488,083	$1,652,120	$1,818,891	$1,995,901	$731,956	57.9%
EMPLOYMENT								
Texas	426,093	431,346	443,253	450,414	459,065	470,174	44,081	10.3%
Gulf Coast Region	85,992	88,263	92,633	96,236	99,760	101,712	15,720	18.3%
Chambers County	166	171	173	187	195	207	41	24.7%
Galveston County	6,009	6,112	6,614	6,802	6,821	7,097	1,088	18.1%
Harris County	69,422	71,064	74,159	77,318	80,293	81,872	12,450	17.9%
STATE TAX RECEIPTS ($000)								
Texas	$1,455,395	$1,578,674	$1,674,524	$1,769,225	$1,875,318	$1,976,405	$521,010	35.8%
Gulf Coast Region	$314,819	$341,297	$365,010	$389,952	$416,701	$435,319	$120,500	38.3%
Chambers County	$679	$747	$762	$881	$915	$997	$318	46.8%
Galveston County	$21,649	$22,771	$24,349	$26,086	$27,131	$29,512	$7,863	36.3%
Harris County	$255,974	$277,566	$296,254	$315,544	$338,012	$352,009	$96,035	37.5%
LOCAL TAX RECEIPTS ($000)								
Texas	$436,919	$462,877	$498,011	$534,698	$590,625	$623,006	$186,087	42.6%
Gulf Coast Region	$110,839	$115,990	$127,114	$138,726	$155,700	$161,821	$50,982	46.0%
Chambers County	$48	$70	$186	$258	$231	$270	$222	462.5%
Galveston County	$6,675	$6,535	$7,016	$8,263	$9,713	$10,723	$4,048	60.6%
Harris County	$96,190	$100,515	$110,071	$119,180	$133,326	$137,853	$41,663	43.3%

Source: Texas Department of Economic Development, 2001.

3.19.8.3 Recreational Fishing

As a destination for anglers, the Texas Gulf Coast enjoys economic benefits from recreational fishing. According to the 1996 National Survey of Fishing, Hunting and Wildlife-Associated Recreation (FWS, 1998), approximately 862,000 recreational anglers over 15 years old participated in 13.03 million days of saltwater fishing on the Texas coast, with an average of 15 days per angler. Approximately 94 percent of those anglers are Texas residents. Those anglers spent $725.4 million, including $202.6 million for food and lodging. On average, each spent $841, including $235 for food and lodging, in the Gulf coast region. Thus, recreational fishing is a major source of tourism income for the region.

3.19.9 Oil and Gas Production

Oil and gas production is a major industry in the Houston CMSA. Table 3.19.9-1 shows the number of oil and gas wells, by county, for February 2001 (RCT, 2001). The Houston CMSA contains 3.1 percent of the state's oil wells and 2.8 percent of its gas wells.

Table 3.19.9-2 shows oil and gas production statistics for 1996 through 1999 (RCT, 2001). During that period, 5-6 percent of gas well gas was produced in the Houston CMSA, as well as 3 to 6 percent of casinghead. Three percent of the state's crude oil was pumped in the Houston CMSA and 8 to 11 percent of condensate was produced in the region. See Section 3.6 for additional information.

3.19.10 Public Finance

Table 3.19.10-1 shows tax rate and appraisal information for the major taxing jurisdictions in the vicinity of the project area.

3.19.11 Environmental Justice

This document is in compliance with the requirements of Executive Order (EO) 12898 – Federal Action to Address Environmental Justice (EJ) in Minority Populations and Low-Income Populations. The EO, signed on 11 February 1994 by President Clinton, requires all Federal agencies to address the impact of their programs with respect to EJ. The EO requires that minority and low-income populations not receive disproportionately high or adverse human health or environmental impacts and requires that representatives of any low-income or minority populations that could be affected by the project be involved in the community participation and public involvement process.

To comply with the EO, a two-part study was performed. The first part of the study employed the EJ Index Methodology, which is a base analysis created by the U.S. Environmental Protection Agency, Region 6. The EJ Index helps determine if further investigation of a study area is needed. This methodology is discussed below (see EJ Index Methodology).

Further analyses were performed using the U.S. Bureau of Census tract and block level data. This methodology is also discussed below (see Census Tract Analysis).

TABLE 3.19.9-1
OIL AND GAS WELLS BY TYPE
FEBRUARY 2001

Description	Texas	Houston-Galveston-Brazoria CMSA (1)	Chambers	Galveston	Harris
OIL WELLS					
Regular Producing	160,733	2,351	248	122	506
Shut-In	81,876	5,623	604	211	652
Injection	31,066	398	49	22	78
Total	273,675	8,372	901	355	1,236
Percent of Total Texas		*3.1%*	*0.3%*	*0.1%*	*0.5%*
GAS WELLS					
Regular Producing	59,234	961	104	51	217
Not Eligible for Allowance	1,521	36	13	4	6
Temporarily Abandoned	3,190	141	27	22	20
Shut-In	744	968	205	60	129
Injection	14,846	47	7	7	11
Miscellaneous	1,071	127			62
Total	80,606	2,280	356	144	445
Percent of Total Texas		*2.8%*	*0.4%*	*0.2%*	*0.6%*

(1) Houston-Galveston-Brazoria CMSA consists of Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery and Waller Counties.

Source: RCT, 2001.

Oil Well Types:
Regular Producing - Well That Is Capable of Producing Oil.
Shut-in - Inactive Well.
Injection - Well Used to Inject Fluid (Water, Air, Co2) into a Productive Formation.

Gas Well Types:
Regular Producing - Well That Is Capable of Producing Gas Well Gas.
Not Eligible for Allow - Well Is Lacking Required Form, Has Serious Rules Violation, or Permit Restriction.
Temporarily Abandoned - Well Not Being Produced and Does Not Have Wellhead Pressure.
Shut-in - Well Not Being Produced but Has Wellhead Pressure.
Injection - Well Used to Inject Fluid (Water, Air, Co2) into a Productive Formation - Does not Include Gas Well Gas Injection.
Misc - Well Is Being Used as Observation, Domestic Gas Supply, Etc.

Note: This report does not include wells that have been plugged and abandoned.

TABLE 3.19.9-2
OIL AND GAS WELLS PRODUCTION
1996-1999

Description	1996	1997	1998	1999
TEXAS				
Gas Well Gas (mcf)	4,676,681,555	4,742,580,593	4,803,638,408	4,660,221,042
Condensate (barrels)	38,395,741	38,761,922	38,790,963	34,431,473
Crude Oil (barrels)	495,377,973	488,859,964	457,499,130	406,815,325
Casinghead (mcf)	1,093,573,093	1,072,164,140	968,441,421	878,718,388
HOUSTON-GALVESTON-BRAZORIA CMSA (1)				
Gas Well Gas (mcf)	251,904,346	249,532,218	290,737,068	246,656,566
Condensate (barrels)	3,166,539	3,256,227	4,020,307	3,877,234
Crude Oil (barrels)	15,216,243	14,445,374	13,214,993	11,569,159
Casinghead (mcf)	61,114,545	56,652,936	48,566,157	30,173,042
CHAMBERS COUNTY				
Gas Well Gas (mcf)	55,160,656	50,971,963	58,787,071	38,077,964
Condensate (barrels)	275,382	480,229	657,766	575,143
Crude Oil (barrels)	1,858,366	1,441,684	1,310,381	1,311,830
Casinghead (mcf)	4,867,034	4,304,746	4,884,325	4,516,316
GALVESTON COUNTY				
Gas Well Gas (mcf)	17,508,544	13,008,193	21,894,064	36,384,456
Condensate (barrels)	176,414	137,256	849,332	1,383,920
Crude Oil (barrels)	1,156,506	942,057	889,040	835,793
Casinghead (mcf)	1,755,278	1,223,074	1,279,687	913,333
HARRIS COUNTY				
Gas Well Gas (mcf)	57,650,791	50,683,932	51,209,203	84,864,222
Condensate (barrels)	633,982	575,712	619,383	749,090
Crude Oil (barrels)	3,505,415	3,457,884	3,104,779	2,326,864
Casinghead (mcf)	41,498,730	39,963,512	34,720,633	20,178,529

(1) Houston-Galveston-Brazoria CMSA consists of Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery and Waller Counties.

Source: RCT, 2001.

TABLE 3.19.10-1

TAX RATE AND APPRAISAL VALUES FOR
MAJOR TAXING JURISDICTIONS IN THE STUDY AREA REGION

Jurisdiction	2000 Tax Rate	2000 Net Taxable Valuation
CHAMBERS CO.	0.54429	4,316,438,570*
Barbours Hill ISD	1.52990	
Goose Creek ISD	1.71120	
Lee College	0.21930	
Navigation District	0.02850	
GALVESTON CO.	0.5326	13,043,571,436*
City of Galveston	0.548600	
City of Texas City	0.328750	
Clear Creek Drainage District	0.155000	
County Road and Flood	0.12400	
County Road and Flood	0.0124	
Galveston Co. College	0.197800	
Galveston Co. Emergency Service	0.094199	
Galveston ISD	1.52000	
Mainland College	0.218000	
Navigation District #1	0.041136	
Texas City ISD	1.611800	
HARRIS CO.	0.64802	153,785,680,313*
Bayport		
Harris County		
Clear Creek ISD	1.70080	
Goose Island ISD	1.71120	
La Porte ISD	1.63000	
Flood Control District	0.06173	
Port of Houston Authority	0.01830	
Lee Jr. College	0.21930	
City of La Porte	0.71000	
City of Morgans Point	0.29000	

Sources: Chambers County Appraisal District, 2001a, 2001b; Galveston Central Appraisal District, 2001a, 2001b; Harris County Appraisal District, 2001a, 2001b; Harris County Tax Office, 2001.

* Net Taxable Valuation figures reflect value before exemptions.

3.19.11.1 EJ Index Methodology

The EPA, Region 6, has created a computer-assisted environmental assessment model to assist in the determination of EJ areas, and it was used in this EJ analysis. The model, or EJ Index Methodology (EJ Index) graphically depicts a survey of ethnicity and income in each of the alternative site areas (EPA, 2001c). The information is based on 1990 U.S. Bureau of Census (USBOC) block level data (PL 94-171) for ethnicity, and block group level data (Summary Tape File 3A) for income.

The EJ Index is a modification of the Region's Human Health Risk Index Formula. The methodology defines demographic criteria by using a Geographic Information System (GIS) and census data to analyze a buffer area. Using the EPA risk based algorithm, the EPA created a formula that calculates the degree of vulnerability for the area based on population density and two socioeconomic criteria: a community's percentage minority population and percentage of economically stressed households. This information is then compared with the calculated state index and a ranking criterion is established. The proposed project at Shoal Point and the five alternative sites were evaluated using the formula and each was ranked on a scale of 1 to 100.

There are potential limitations associated with the EJ Index. The scale of 1 to 100 is not a linear scale, and the non-intuitive nature of the scale may cause misinterpretation by the researcher. Depending on the size of the population and the degree of vulnerability (based on income and minority status) a study area with a low EJ Index ranking could appear to be free of EJ concerns; however, further analyses of census data could show that the study area potentially poses an EJ concern if the population involved is very small and is either predominantly minority or economically stressed (EPA, 1994). Another limitation of the methodology is that it does not take into consideration factors beyond population, race and income. Other factors, such as education, employment or proximity to the proposed project could affect the EJ determination. Disproportionately high or adverse effects to minority or low-income populations cannot be accurately determined based on the EJ Index without conducting a more in-depth study (Carney, 2002). Furthermore, both the 1- and 50-square-mile analysis zones use a fixed coordinate as the centerpoint of a circular study area. This area may or may not include the actual areas potentially affected by the proposed project. (In each of the six proposed alternative sites, the majority of the area shown in the EJ Index 50-square-mile map is water.) Lastly, this basic analysis does not take into consideration whether or not the study population is receiving disproportionately high or adverse human health or environmental impacts. The EJ Index is intended to be used as a baseline indicator of the possibility of EJ concerns. Once the EJ Index maps are consulted, further studies may be needed.

The EJ Index is limited to a radial analysis. Although analysis of a 1-square-mile (0.56-mile radius) (based on the center of the project site) was provided by EPA, only the 50-square-mile (4.0-mile radius) analysis area is addressed in this discussion. The decision to use the 50-square-mile analysis area was based on guidance from the EPA which states, "Although EJ studies can be statistically analyzed using standard methods, obtaining statistical significance for study areas with few census blocks is more difficult than for larger areas" (EPA, 1994). To obtain the most statistically significant data available, the 50-square-mile analysis area was used.

Three levels of analysis are provided in the EJ Index, as defined below:

Minority Status Degree of Vulnerability

EPA Minority Status Degree of Vulnerability (DVMAV) maps portray the degree of vulnerability for minority status by census blocks. This factor is derived by comparing the area's percentage of minority population (based on census block data) with the state percentage (39.4%). Minority status is defined to include all non-white as well as Hispanic-origin households.

Economic Status Degree of Vulnerability

The EPA Economic Status Degree of Vulnerability (DVECO) maps show the potential degree of vulnerability based on household income (the risk group is defined as households with incomes less than $15,000 per year). The state's percentage of such households is 27.6 percent.

Potential Environmental Justice Index

The EPA Potential Environmental Justice Index maps show a composite index incorporating population density, income and ethnicity factors. As this number is a relative determination based on several factors, there is no state EJ index number for comparison purposes.

3.19.11.2 Census Tract Analysis

The data used in this study to determine the potential for disproportionate effects to low-income and/or minority populations within the vicinity of each of the alternative sites are presented in Tables 3.19.11-1 and 3.19.11-2. The information is based on 1990 USBOC county, census tract, and block level data for ethnicity and income (see figures 3.19.11-1 through 3.19.11-4, Project Area Census Tracts). The decision regarding which census tracts and blocks to use was based on the proximity to the each of the alternative sites and the possibility of beneficial or adverse effects potentially accruing to a particular population (e.g., for the Shoal Point alternative, Tract 1229.22, block 1 was used because of the possibility of increased traffic). This in-depth look at the demographics of each alternative site is considered necessary to get a more accurate and site-specific result than achieved by using the EJ Index maps exclusively (Carney, 2002). The census tract and block level data were compared with county level data. A threshold of 10 percent over the county's average percentage of ethnic minorities and economically stressed persons was used to evaluate whether a disproportionate percentage of such groups live within the potentially affected areas. The discussion below analyzes the average percentage of various demographic groups within each of the proposed alternative sites; however, individual census tracts within each alternative site can be markedly different from one another. Please refer to tables 3.19.11-1 and 3.19.11-2 for specific census tract and block level data.

A sensitivity analysis of the Shoal Point alternative showed that using a threshold of either 5 or 15 percent yielded no difference in the findings of each of the demographic groups or economically stressed populations. Therefore, the 10 percent threshold was deemed reasonable, and was used as the threshold for each alternative site.

TABLE 3.19.11-1

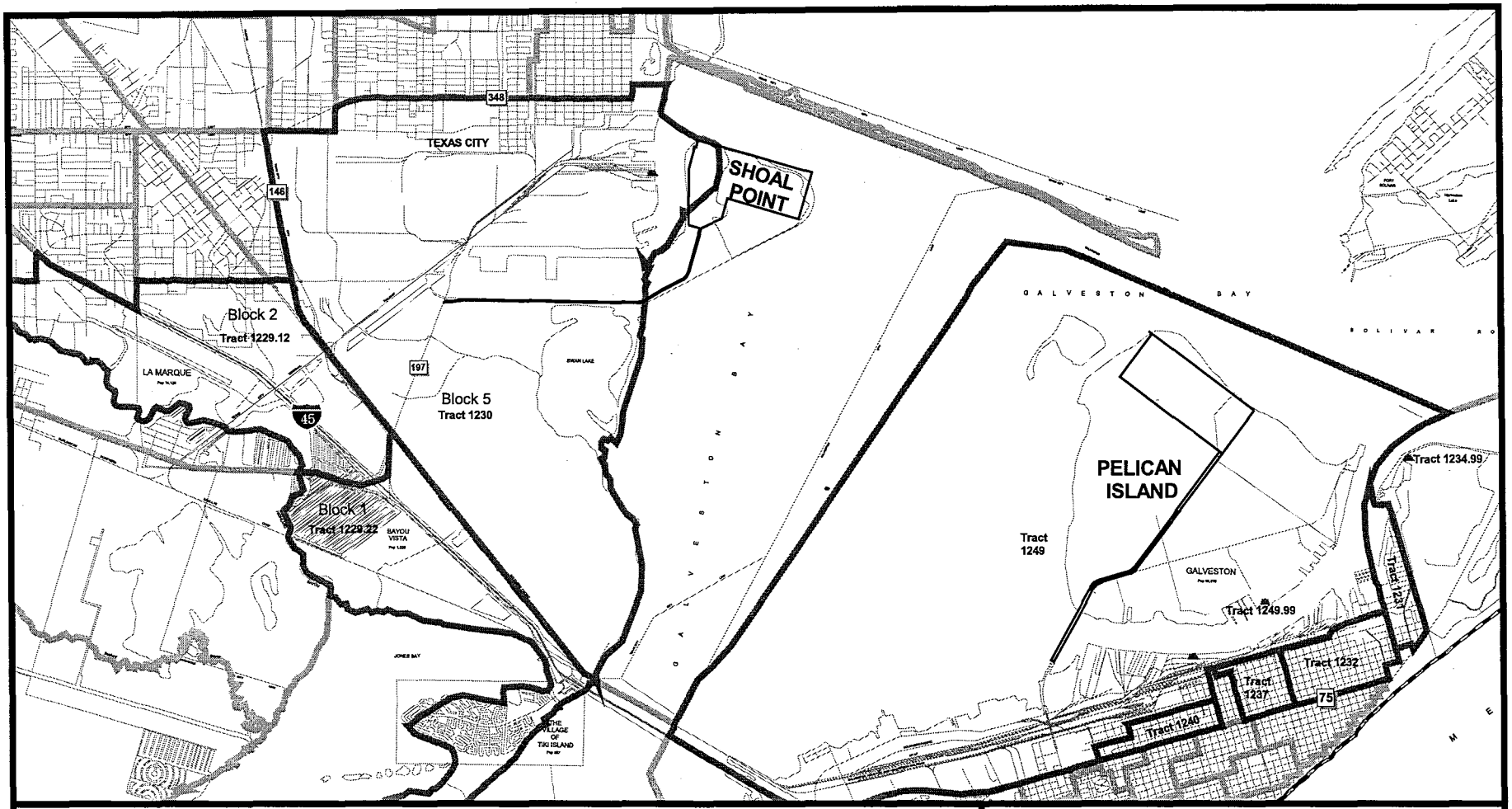
DETAILED 1990 POPULATION CHARACTERISTICS BY PROJECT AREA CENSUS TRACTS

Alternatives	Census Tract	Population	Number White	% White	Number African-American	% African-American	Hispanic Origin	% Hispanic	Number Other	% Other	Number Below Poverty	% Below Poverty
Shoal Point	Tract 1229.12 Blk 2	1,043	652	62.5%	308	29.5%	54	5.2%	29	2.8%	313	30.0%
	Tract 1229.22, Blk 1	1,448	1,371	94.7%	0	0.0%	52	3.6%	25	1.7%	42	2.9%
	Tract 1230, Blk 5	12	0	0.0%	12	100.0%	0	0.0%	0	0.0%	0	0.0%
	Total/Average	2,503	2,023	80.8%	320	12.8%	106	4.2%	54	2.2%	355	14.2%
Pelican Island	1231	3,543	2,279	64.3%	529	14.9%	423	11.9%	312	8.8%	520	14.7%
	1232	4,841	2,209	45.6%	762	15.7%	1,646	34.0%	224	4.6%	1,295	26.8%
	1234.99	64	45	70.3%	0	0.0%	19	29.7%	0	0.0%	0	0.0%
	1237	953	448	47.0%	320	33.6%	160	16.8%	25	2.6%	179	18.8%
	1240	3,837	103	2.7%	3,371	87.9%	363	9.5%		0.0%	2,701	70.4%
	1249	1,622	672	41.4%	715	44.1%	203	12.5%	32	2.0%	521	32.1%
	1249.99	72	62	86.1%	0	0.0%	0	0.0%	10	13.9%	0	0.0%
	Total/Average	14,932	5,818	39.0%	5,697	38.2%	2,814	18.8%	603	4.0%	5,216	34.9%
Bayport	366.02	3,393	2,736	80.6%	165	4.9%	432	12.7%	60	1.8%	389	11.5%
	366.41	1,570	1,357	86.4%	99	6.3%	79	5.0%	35	2.2%	126	8.0%
	367	927	859	92.7%	0	0.0%	48	5.2%	20	2.2%	87	9.4%
	368.01	6,387	5,800	90.8%	121	1.9%	228	3.6%	17	0.3%	266	4.2%
	368.02	3,118	2,733	87.7%	40	1.3%	193	6.2%	152	4.9%	364	11.7%
	369	4,604	4,202	91.3%	74	1.6%	188	4.1%	0	0.0%	58	1.3%
	Total/Average	19,999	17,687	88.4%	499	2.5%	1,168	5.8%	284	1.4%	1,290	6.5%
Spillman's Island	364	517	433	83.8%	20	3.9%	62	12.0%	2	0.4%	68	13.2%
	365.01	1,298	512	39.4%	753	58.0%	24	1.8%	9	0.7%	282	21.7%
	365.02	3,084	2,142	69.5%	244	7.9%	682	22.1%	6	0.2%	484	15.7%
	Total/Average	4,899	3,087	63.0%	1,017	20.8%	768	15.7%	17	0.3%	834	17.0%
Alexander Island	264	3,035	420	13.8%	758	25.0%	1,841	60.7%	16	0.5%	963	31.7%
	264.99	Uninhabited										
	273	4,652	1,571	33.8%	538	11.6%	2,537	54.5%	6	0.1%	853	18.3%
	362	23	23	100.0%	0	0.0%		0.0%	0	0.0%	0	0.0%
	364	517	433	83.8%	20	3.9%	62	12.0%	2	0.4%	68	13.2%
	Total/Average	8,227	2,447	29.7%	1,316	16.0%	4,440	54.0%	24	0.3%	1,884	22.9%
Cedar Point	1101.02	5,181	4,688	90.5%	239	4.6%	225	4.3%	29	0.6%	277	5.3%
	Total/Average	5,181	4,688	90.5%	239	4.6%	225	4.3%	29	0.6%	277	5.3%

TABLE 3.19.11-2

DETAILED 1990 POPULATION CHARACTERISTICS BY STATE AND COUNTY

	Population	Number White	% White	Number African-American	% African-American	Hispanic Origin	% Hispanic	Number Other	% Other	Number Below Poverty	% Below Poverty
Chambers County	20,088	16,344	81.4%	2,437	12.1%	1,000	5.0%	307	1.5%	2,470	12.3%
Galveston County	217,399	145,266	66.8%	37,483	17.2%	30,407	14.0%	4,243	2.0%	33,165	15.3%
Harris County	2,818,199	1,533,307	54.4%	532,735	18.9%	634,648	22.5%	117,509	4.2%	436,716	15.5%
Texas	16,986,510	10,320,879	60.8%	1,988,995	11.7%	4,294,120	25.3%	382,516	2.3%	3,000,515	17.7%



1990 Census Tracts

Galveston County

County Line

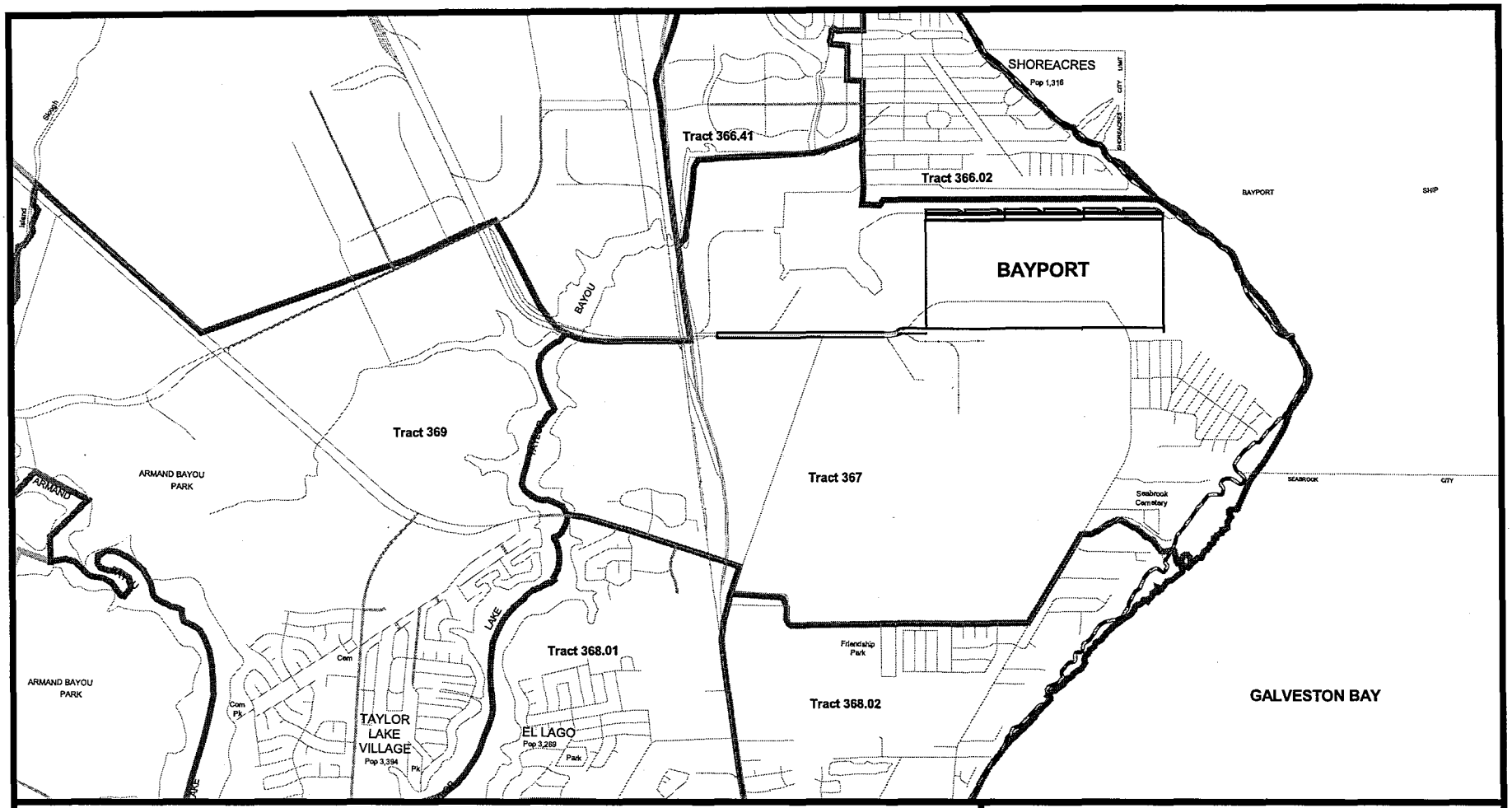
N
W E
S

8000 0 8000 Feet

SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.19.11-1
Shoal Point and Pelican Island Census Tracts

Prepared for: USACE	
Job No.: 440622	Scale: 1"=8000'
Prepared by: Matt Qualls	Date: July 2, 2002
File: N:\440622\arcview\census_6sites.apr (shoalpointpelican_a_land layout)	



1990 Census Tracts

Harris County

County Line

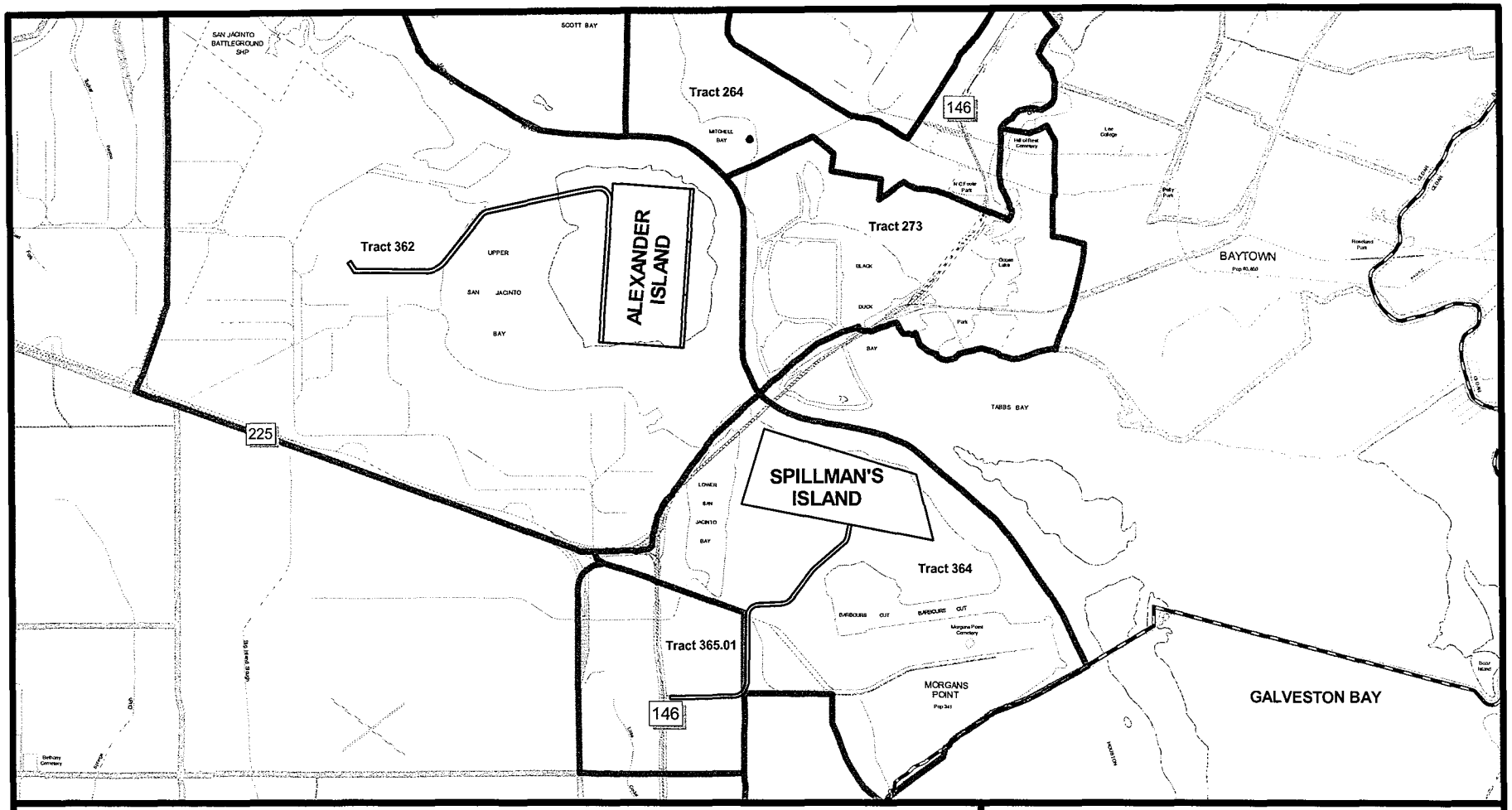
N
W E
S

4000 0 4000 Feet

SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.19.11-2
Bayport
Census Tracts

Prepared for: USACE	
Job No.: 440622	Scale: 1"=4000'
Prepared by: Matt Qualls	Date: July 2, 2002
File: N:\440622\arcview\census_6sites.apr (shoalpointpelican_a_land layout)	



1990 Census Tracts

Harris County

County Line

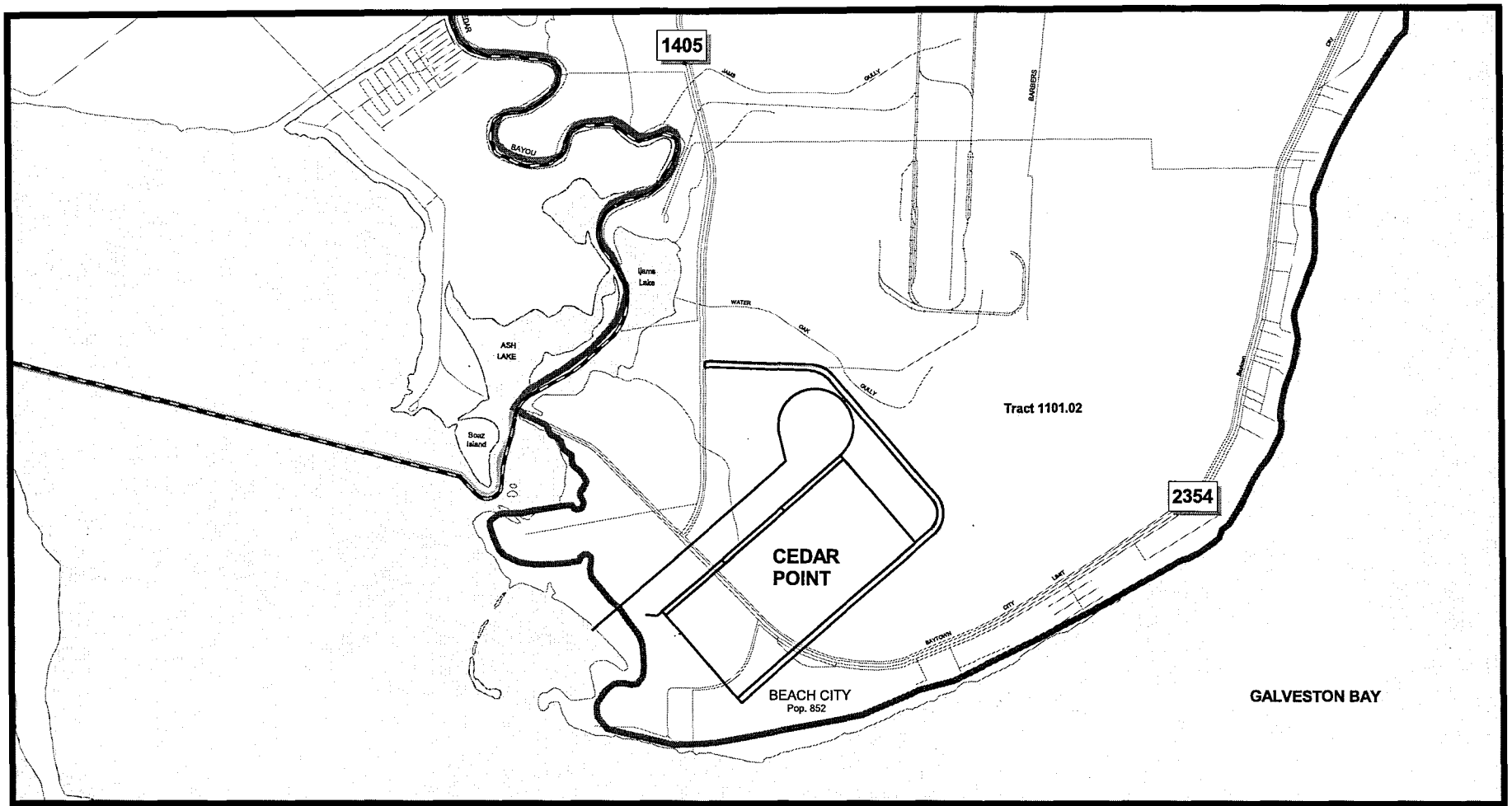
N
W E
S

6000 0 6000 Feet

SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.19.11-3
Alexander and Spillman's Island Census Tracts

Prepared for: USACE	
Job No.: 440622	Scale: 1"=6000'
Prepared by: Matt Qualls	Date: July 2, 2002
File: N:\440622\arcview\census_6sites.apr (shoalpointpelican_a_land layout)	



1990 Census Tracts

Chambers County

County Line

N
W E
S

4000 0 4000 Feet

SHOAL POINT CONTAINER TERMINAL EIS

Figure 3.19.11-4
Cedar Point
Census Tracts

Prepared for: USACE	
Job No.: 440622	Scale: 1"=4000'
Prepared by: Matt Qualls	Date: July 2, 2002
File: N:\440622\arcview\census_6sites.apr (shoalpointpelican_a_land layout)	

3.20 COMMUNITY INFRASTRUCTURE AND MUNICIPAL SERVICES

This section is a compilation of information regarding utility providers, stormwater and drainage services, and major streets and public transportation facilities currently available at the alternative sites, based on personal communication with a number of sources in the area (Beach City Office, 2001; Bosworth, 2001; Galveston City Public Works Office, 2001; La Porte City Public Works Office, 2001; Shoreacres Public Works City Office, 2001; Texas City Public Works City Office, 2001; Waste Corporation of America, 2001; Waste Management of America District Office, 2001).

3.20.1 Utilities

Table 3.20.1-1 lists the utility services providers at each alternative site. Pipelines and electric substation and transmission facilities are discussed below. Existing utilities at each alternative site are also discussed in sections 2.4.2 through 2.4.7, and pipelines are discussed and illustrated in Section 3.6.

Shoal Point

An existing 16-inch-diameter wastewater line traverses the proposed project site. It is owned by Gulf Coast Waste Disposal Authority and maintained by Sterling Chemicals. A pipeline bridge crosses the Galveston County Discharge Canal near the Gulf Coast Waste Disposal Authority's property. An existing high-voltage transmission substation is located at the intersection of Loop 197 and the Galveston County Discharge Canal. According to representatives from Texas New Mexico Power, the substation is insufficient to handle the demand that the terminal is expected to draw, but there are alternative sources within 5 miles.

Pelican Island

Several pipelines in the area may require movement depending on the exact location of the terminal. No high-voltage transmission substation currently exists at this project site.

Bayport

Several substations are located within a 5-mile radius of this alternative site and are assumed to be viable options for the site.

Spillman's Island

An existing high-voltage transmission line is located in the vicinity and several pipelines exist in the area. No high-voltage transmission substation currently exists at this project site.

TABLE 3.20.1-1

EXISTING UTILITY SERVICE PROVIDERS IN VICINITY OF PROPOSED AND ALTERNATIVE SITES

Utility	Shoal Point	Pelican Island	Bayport	Spillman's Island	Alexander Island	Cedar Point
Water	City of Texas City	City of Galveston	City of Shoreacres or private wells	LaPorte Area Water Authority	LaPorte Area Water Authority	Private Wells
Sewage	City of Texas City	City of Galveston	City of Shoreacres	City of LaPorte Water Dept.	City of LaPorte Water Dept.	Private Septic Systems
Gas	Reliant EnTex	Southern Union Gas	Reliant EnTex	Reliant EnTex	Reliant EnTex	Private Tanks
Electricity	Reliant TNP	Reliant TNP	Reliant HL&P	Reliant HL&P	Reliant HL&P	Reliant HL&P
Telephone	Various Providers	Various Providers	Various Providers	Various Providers	Various Providers	Various Providers
Cable	Time Warner	Time Warner	Time Warner	Time Warner	Time Warner	Time Warner

Alexander Island

Several pipelines occur in the area. No high-voltage transmission substation currently exists at this project site; however, an existing transmission corridor passes in proximity to the project site and may have the capacity to handle the demand for the terminal.

Cedar Point

No high-voltage transmission substation currently exists at this project site; however, an existing substation is located within approximately 3 miles of the site.

3.20.2 Stormwater and Drainage

Stormwater and drainage are handled by a series of ditches that carry stormwater runoff from each alternative site to bayous and to the bay.

3.20.3 Solid Waste Collection

Shoal Point

Best Waste is responsible for refuse collection. Refuse is taken to the BFI Galveston County landfill. Industrial hazardous waste is shipped to Lake Charles Chemical Waste Management in Lake Charles, Louisiana.

Pelican Island

The City of Galveston contracts with many local and national collectors (Priced Right, Dillan, TrashMasters, Swanson's, Bay Area, Waste Management and BFI) for refuse collection. Refuse is taken to the BFI Galveston County landfill. Industrial hazardous waste is shipped to Lake Charles Chemical Waste Management in Lake Charles, Louisiana.

Bayport

BFI is responsible for refuse collection. Industrial hazardous waste is shipped to Lake Charles Chemical Waste Management in Lake Charles, Louisiana.

Spillman's Island

The City of La Porte is responsible for refuse collection. Refuse is taken to the landfills owned by Waste Corporation of America and Waste Management of America. Industrial hazardous waste is shipped to Lake Charles Chemical Waste Management in Lake Charles, Louisiana.

Alexander Island

The City of La Porte is responsible for refuse collection. Refuse is taken to the landfills owned by Waste Corporation of America and Waste Management of America. Industrial hazardous waste is shipped to Lake Charles Chemical Waste Management in Lake Charles, Louisiana.

Cedar Point

Residents of this area are responsible for collecting and delivering their solid waste to the Chambers County landfill. Industrial hazardous waste is shipped to Lake Charles Chemical Waste Management in Lake Charles, Louisiana.

3.20.4 Fire, Police, Emergency Medical Services, and Port Security

3.20.4.1 Fire Protection

Numerous volunteer and paid fire departments exist throughout the three-county area (Texas Commission on Fire Protection, 2001) (Table 3.20.4-1). Fire departments which operate within cities in the study area are specifically noted in Table 3.20.4-1. The Pelican Island site would have protection from the Galveston Fire Department. Shoal Point would receive fire protection from Texas City. Spillman's Island would receive protection from La Porte Fire Department, and Alexander Island would likely receive protection from La Porte Fire Department or Baytown Fire & Rescue. The Bayport site would receive protection from the Pasadena Volunteer Fire Department, and the Cedar Point site would be served by the Beach City Volunteer Fire Department. Various other departments throughout the county might be available in severe emergency situations.

3.20.4.2 Police

Table 3.20.4-2 shows the number of police officers in each county and the ratio of population to officers (*Dallas Morning News*, 1999). Largely rural Chambers County has about 719 persons per officer, while more urban Galveston and Harris Counties have 313 and 350 persons per officer, respectively. The average for the three-county area is 348 persons per officer.

3.20.4.3 Emergency Medical Services

Table 3.20.4-3 shows service information for emergency medical services (EMS) by county for 1999 (TDH, 1999). Chambers County has 8 permitted emergency vehicles, or one for every 2,605 residents. Urban Galveston County has 32 vehicles, or one per 7,298 persons, and Harris County has 466 vehicles, or one per 7,013 persons. The three-county total is 506 emergency vehicles, averaging one vehicle per 6,961 residents.

There are a total of 6,608 certified EMS personnel in the area, including 90 in Chambers County (one per 232 residents); 309 in Galveston County (one per 309 residents); and 567 in Harris County (one per 567 residents). For the three-county area, there are an average of 533 residents per EMS personnel.

TABLE 3.20.4-1

FIRE DEPARTMENTS

Area	Department	Type	City
Chambers County	Anahuac VFD	Volunteer	Anahuac
	Barbers Hill VFD	Volunteer	Mont Belvieu
	Cove VFD	Volunteer	Baytown
	Hankamer VFD	Volunteer	Hankamer
	Mont Belvieu Fire Dept	Volunteer	Mont Belvieu
	Oak Island Dbl Bayou VFD	Volunteer	Anahuac
	Old River-Winfree VFD	Volunteer	Mont Belvieu
	Smith Point VFD	Volunteer	Anahuac
	Wallisville VFD	Volunteer	Wallisville
	Winnie Stowell VFD	Volunteer	Winnie
Galveston County	Algoa VFD	Volunteer	Alvin
	Alta Loma VFD	Volunteer	Santa Fe
	Arcadia VFD	Volunteer	Santa Fe
	Bacliff VFD	Volunteer	Bacliff
	Bayou Vista VFD	Volunteer	Hitchcock
	Clear Lake Shores VFD	Volunteer	Kemah
	College of the Mainland -- Fire Training Academy	Volunteer	Texas City
	Crystal Beach VFD/EMS	Volunteer	Crystal Beach
	Dickinson VFD	Volunteer	Dickinson
	Forest Bend VFD	Volunteer	Friendswood
	Friendswood Fire Dept	Paid / Volunteer	Friendswood
	Friendswood VFD	Volunteer	Friendswood
	Galveston College	Volunteer	Galveston
	Galveston Fire Dept	Volunteer	Galveston
	Gilchrist VFD	Volunteer	Gilchrist
	High Island VFD	Volunteer	High Island
	Highland Bayou VFD	Volunteer	Hitchcock
	Hitchcock VFD	Volunteer	Hitchcock
	Jamacia Beach VFD	Volunteer	Galveston
	Kemah VFD	Volunteer	Kemah
	La Marque Fire/Rescue	Paid	La Marque
	League City VFD	Volunteer	League City
	Port Bolivar VFD	Volunteer	Port Bolivar
	San Leon Fire Dept	Volunteer	Dickinson
	San Leon VFD	Volunteer	Dickinson
	Santa Fe Fire & Rescue	Volunteer	Santa Fe
	Texas City Fire Dept	Paid	Texas City
	Tiki Island VFD	Volunteer	Galveston
	West Isle VFD	Volunteer	Galveston
Harris County	Aldine VFD	Volunteer	Houston
	Alief Community VFD	Volunteer	Alief
	Atascocita VFD	Volunteer	Atascocita
	Barker West I-10 Fire Dept	Volunteer	Barker
	Barrett Station VFD	Volunteer	Crosby
	Baytown Fire & Rescue	Paid	Baytown
	Cove VFD	Volunteer	Baytown
	Beach City VFD	Volunteer	Baytown
	Beaumont Road VFD	Volunteer	Houston
	Bellaire Fire Dept	Paid	Bellaire Fire Dept
	Bunker Hill Village VFD	Volunteer	Houston
	Channelview VFD	Volunteer	Channelview
	Clear Lake VFD	Volunteer	Houston
	Cloverleaf Fire Dept	Volunteer	Houston
	Cloverleaf VFD	Volunteer	Houston
	Compaq Emer Response Team	Volunteer	Houston
	Crosby VFD	Volunteer	Crosby
	Cy-fair VFD	Volunteer	Cypress
	Cypress Creek VFD	Volunteer	Houston
	Deer Park Fire/Police Dept	Paid / Volunteer	Deer Park
	Eastex Freeway VFD	Volunteer	Humble
	El Lago VFD	Volunteer	Seabrook
	Ellington Field Fire Dept	Paid	Houston
	Fire Training Academy	Volunteer	Houston
	Forest Bend VFD	Volunteer	Webster
	Forest Cove VFD	Volunteer	Kingwood
	Galena Park Fire Dept	Paid	Galena Park

TABLE 3.20.4-1 (Concluded)

FIRE DEPARTMENTS

Area	Department	Type	City
	Harris Co Fire & Emer Svcs	Volunteer	Houston
	Harris Co RFPD #16	Volunteer	Klein
	Highlands VFD	Volunteer	Highlands
	Hillshire Village VFD	Volunteer	Houston
	Houston Fire Dept	Paid	Houston
	Houston VFD	Volunteer	Houston
	Huffman VFD	Volunteer	Huffman
	Humble Fire Dept	Paid	Humble
	Jacinto City Fire Dept	Paid	Jacinto City
	Jacinto City VFD	Volunteer	Jacinto City
	Jersey Village Fire Dept	Volunteer	Jersey Village
	Johnson Space Center Fire Dept	Volunteer	Houston
	Klein VFD	Volunteer	Klein
	La Porte Fire Dept	Paid	La Porte Fire Dept
	Lee College	Volunteer	Baytown
	Little York VFD	Volunteer	Houston
	Mc Nair VFD	Volunteer	Highlands
	Nassau Bay VFD	Volunteer	Nassau Bay
	Northeast Fire & Rescue	Volunteer	Humble
	Pasadena VFD	Volunteer	Pasadena
	Ponderosa VFD	Volunteer	Houston
	Port of Houston Auth Fire Dept	Paid	Houston
	Rosehill Fire Department	Volunteer	Tomball
	Rushwood VFD	Volunteer	Houston
	S Houston VFD	Volunteer	Houston
	San Jacinto College Cntrl -- Fire Protection Technology	Paid	Pasadena
	Seabrook VFD	Volunteer	Seabrook
	Sheldon VFD	Volunteer	Houston
	Southeast VFD	Volunteer	Houston
	Southside Place VFD	Volunteer	Houston
	Spring VFD	Volunteer	Spring
	Taylor Lake Village VFD	Volunteer	Seabrook
	Tomball VFD	Volunteer	Tomball
	Village Fire & Rescue	Paid	Houston
	W University Place Fire Dept	Paid	Houston
	Webster Fire Dept	Paid / Volunteer	Houston
	Westfield Road VFD	Volunteer	Houston
Baytown	Baytown Fire & Rescue	Paid	Baytown
	Cove VFD	Volunteer	Baytown
	Lee College	Volunteer	Baytown
Beach City	Beach City VFD	Volunteer	Baytown
Galveston	Galveston College	Volunteer	Galveston
	Galveston Fire Dept	Volunteer	Galveston
	Jamacia Beach VFD	Volunteer	Galveston
	Tiki Island VFD	Volunteer	Galveston
	West Isle VFD	Volunteer	Galveston
La Porte	La Porte Fire Dept	Paid	La Porte
Pasadena	Pasadena VFD	Volunteer	Pasadena
Seabrook	El Lago VFD	Volunteer	Seabrook
	Seabrook VFD	Volunteer	Seabrook
	Taylor Lake Village VFD	Volunteer	Seabrook
Texas City	College of the Mainland -- Fire Training Academy	Volunteer	Texas City
	Texas City Fire Dept	Paid	Texas City

Source: Texas Commission on Fire Protection, 2001.

TABLE 3.20.4-2

COMMISSIONED POLICE OFFICERS, 1999

County	Number of Agencies	Number of Commissioned Officers	Population per Officer
Chambers	2	29	718.66
Galveston	15	747	312.65
Harris	36	9,333	350.17
Three-County Total	53	10,109	348.45

Note: Includes officers employed by sheriffs offices and police departments of municipalities, universities and colleges, transit systems, park departments and medical facilities.

Sources: *The Dallas Morning News*, 1999; Texas State Data Center, 1999.

TABLE 3.20.4-3

EMERGENCY MEDICAL SERVICES, BY COUNTY, 1999

County	Permitted Emergency Vehicles	Population per Vehicle	Certified EMS Personnel	Population per EMS Personnel
Chambers	8	2,605	90	232
Galveston	32	7,298	756	309
Harris	466	7,013	5,762	567
Three-County Total	506	6,961	6,608	533

Source: TDH, 1999b.

3.20.4.4 Port Security

Because of its deep water port, Texas City has been, for over 60 years, host to one of the largest petrochemical refining and manufacturing complexes in the U.S. Over those years, major events in the port area have raised the priority of port safety and security, which are specifically addressed in the City's Emergency Management Plan. Additionally, increased global concern regarding acts of international terrorism and organized crime has led to heightened domestic and international security at U.S. ports.

The U.S. Customs Service (USCS) has led efforts to improve domestic security at our nation's ports by addressing issues throughout the entire supply chain, from a container's point of origin to its arrival at port. Recently, USCS has initiated a joint government-business initiative to build cooperative relationships that strengthen overall supply chain and border security. This initiative is referred to as the Customs Trade Partnership Against Terrorism (C-TPAT) and is essentially asking businesses to ensure the integrity of their security practices and communicate their security guidelines to their business partners within the supply chain. This practice would ensure a more secure supply chain for employees, suppliers, and customers (USCS, 2002a). Additionally, USCS has a four-step Container Security Initiative that: 1) identifies high-risk containers; 2) pre-screens containers prior to port arrival; 3) uses technology to pre-screen high-risk containers; and 4) uses smart and secure containers with devices such as electronic seals and locator devices (USCS, 2002b).

In regards to international security, the World Customs Organization (WCO) has taken the lead to ensure security in the container supply chain. A Task Force, which comprises USCS administrators, intergovernmental organizations, trade associations, and those involved in air and maritime transport, has been organized by the WCO. The goal of the Task Force is to secure and protect the international supply chain from terrorism while facilitating legitimate trade (WCO, 2002). Working in cooperation with USCG, efforts will require terminal owners/operators to ensure safety prior to loading by verifying manifests, examining containers for physical integrity, and erecting restricted areas to secure cargo.

The U.S. Coast Guard (USCG) has also taken an active role in improving homeland security along our nation's coastlines. Maritime Safety and Security Teams that consist of highly trained, strategically located, and specially equipped Federal maritime Special Weapons and Tactics (SWAT) teams have been deployed to provide an extra layer of security at key ports, waterways, and facilities, including the Houston-Galveston area (USCG, 2002a). Prior to the events of September 11, 2001, the Office of the Port Commander in Galveston housed a large fleet with numerous vessels, aircraft, and crews responsible for monitoring vessels destined for ports along the Texas coast. Since September 11, 2001, as part of a U.S. military operation referred to as Operation Noble Eagle, additional vessels and trained personnel with more offensive and defensive capabilities have been assigned to the task. As part of Operation Noble Eagle, the USCG has:

- redeployed additional cutter, aircraft, and small boats in ports,
- recalled 2,700 selected reservists,
- established security zones around critical facilities,

- deployed four Port Security Units to domestic ports,
- extended vessel Notice of Arrival from 24 to 96 hours, and
- provided on-board Sea Marshals and USCG vessel escorts for high interest vessels (USCG, 2002b).

Operation Noble Eagle also involves joint agency coordination and cooperation to ensure the protection of our nation's borders.

The USCG has also implemented a program called Operation Neptune Shield for protection of the six major coastal ports along a 200-mile-long stretch of the Gulf of Mexico in southeast/central Texas and southwest Louisiana (USCG, 2002c). Maritime Homeland Security (MHLS) concepts and strategies have been integrated into the daily operations of the ports in this geographic area through coordination of USCG resources and partnerships with the maritime community and local law enforcement agencies. Operation Neptune Shield involves security sweeps of terminal facilities to ensure that security measures are in place to receive incoming vessels; vessel security boardings by law enforcement teams prior to entry into U.S. waters; helicopter overflights of ship routes to search for suspicious vessels or activities; USCG escort and protection of vessels by moving security zones; harbor patrols, facility security checks, and dockside boardings of ships loading hazardous cargos by USCG Marine Safety Office (MSO) teams in port areas; and USCG enforcement of security zones that restrict access to highly industrialized waterways throughout ports in the area (USCG, 2002c).

MHLS strategies are based on increasing awareness, controlling movement of high-risk or high-interest military and commercial vessels, enhancing USCG presence and response capabilities, focusing on critical infrastructure, and conducting extensive outreach with local, national, and international maritime law enforcement and intelligence communities (USCG, 2002c). Table 3.20.4-4 lists some of the specific activities used to accomplish this strategy.

The USCG established the Regional Fusion Center (RFC) to coordinate MHLS activity in a manner that minimizes impact on commerce and integrates security measures into daily port operations. The RFC consists of three branches, or task units, as described below (USCG, 2002c):

1. The Vessel Targeting Branch receives and screens information from agents and shipping interests. It targets vessels for security boardings based on USCG criteria; coordinates with INS and USCS on other vessel, cargo, and crew issues; and produces the daily vessel approach list, cleared to enter list, and lightering zone activity list.

2. The Operations Center maintains location and status information of USCG vessels and aircraft, partner agency resources, and high-interest vessels. Tactical assignments for USCG resources (teams) are made at the Operations Center. This task unit also ensures that all vessels entering Galveston Bay have been cleared for entry. The Operations Center is considered the information lifeline for USCG and Navy vessels executing the MHLS mission in near- and off-shore zones.

3. The Information and Analysis Branch is the central point for gathering, analyzing, and disseminating information from government and non-government sources, and maintaining liaison with local law enforcement, intelligence, and industry partners.

TABLE 3.20.4-4
MARITIME HOMELAND SECURITY ACTIVITIES
IN THE HOUSTON-GALVESTON AREA

Offshore (beyond 12 nautical miles from shoreline)	**Near Shore** (shoreline to 12 nautical miles)	**In Shore** (inside shoreline)
• 96-hour advanced notice of arrival including crew lists and cargo manifests • USCG air patrols • Maritime Security Squadron (MSS) surface patrols • MSS patrol of lightering areas • Security boardings in lightering areas • Liaison with national/ international intelligence communities	• 96-hour advanced notice of arrival including crew lists and cargo manifests • USCG air patrols • MSS surface patrols • At-sea security boardings of High-Interest Vessels • Sea Marshal escorts • Vessel escorts • Security Zones/Naval Protection Zones • Coordination with Federal, state, and local law enforcement agencies • Crew & Stowaway Control Plans • Vessel Traffic Service (VTS) traffic control and surveillance	• USCG and USCG Auxiliary air patrols • Surface patrols by USCG, local law enforcement, industry • In-port security boardings of High-Interest Vessels • Sea Marshal escorts • Vessel escorts • Security Zones/Naval Protection Zones • Coordination with Federal, state, and local law enforcement agencies • Crew & Stowaway Control Plans • Passenger terminal security sweeps • Port facility security standards • Port facility security checks • Vehicle Harbor patrols • "Port Watch" • VTS traffic control & surveillance

Source: USCG, 2002c.

The focus of the USCG's MHLS partnering effort has been to increase the local network of and interaction between local, state, and Federal law enforcement and intelligence agencies, and to engage the maritime community in planning and executing the security mission. Key partnering initiatives have included: 1) the corporate security/law enforcement agency outreach program, which links law enforcement and corporate security personnel with USCG security and intelligence personnel; 2) establishment of the Houston-Galveston Port Intelligence Team to facilitate exchange of information between government agencies having operational oversight in ports served by the HSC; and 3) formation of the Port Security Committee of the Houston-Galveston Navigational Safety Advisory Council, which aided the integration of MHLS requirements into the function of the port and facilitated cooperation with the maritime community (USCG, 2002c).

In cooperation with local industry, the State of Texas and U.S. government entities such as the USCG, Federal Bureau of Investigation (FBI), and Homeland Security, Texas City's port security has attained model status. As such, the port is often the site for training and exercises in emergency preparedness for any emergency situation, including terrorism.

Security improvements continue as new methodologies and technologies emerge. Texas City was awarded U.S. government grant monies in July 2002 to fund additional security. In August 2002, the City began pursuing an opportunity to experiment with an innovative security system. The new security system was developed by a U.S. military contractor working with the USCG on enhancing security in the Texas City, Houston and Galveston ship channels. One of the safeguards that has been implemented by the USCG is physical inspections of vessels that enter the Texas City ship channel. Any crewmember that is not a U.S. citizen is restricted to the vessel while in port. The USCG has also restricted the Texas City ship channel to only commercial vessels calling on the Texas City port. Pleasure vessels are prohibited.

3.20.5 Hospitals/Medical Services

3.20.5.1 Hospitals

Hospitals in the three-county study area are shown in Table 3.20.5-1 (TDH, 2001; UTMB, 2001). Chambers County is served by Bayside Community Hospital in Anahuac, with 148 beds. Galveston County has two licensed general and specialty hospitals: Mainland Medical Center in Texas City, with 220 beds, and the Shriners Burn Hospital in Galveston, with 30 beds. The University of Texas Medical Branch is also located in Galveston, with 797 available beds in 2000. In addition, Galveston County has Devereaux Texas Treatment Network, a psychiatric hospital with 88 beds. Harris County has a large number of hospitals and provides regional and statewide medical services. Within the study area, Baytown has Baycoast Medical Center with 191 beds, and San Jacinto Methodist Hospital with 342 beds. Pasadena has Bayshore Medical Center with 368 beds, Kindred Hospital with 46 beds, and Vista Medical Center with 41 beds.

Chambers County averages 1,489 residents per hospital bed and Galveston County averages 206 residents per bed. Harris County averages 221 persons per bed, but serves a much larger area than Harris County alone with its specialized medical centers. For the three-county area, there are an average of 221 persons per bed.

3.20.5.2 Medical Personnel

Table 3.20.5-2 displays data on the number of medical personnel for chosen medical fields for each county in the study region for 1999 (TDH, 1999). Chambers County had 5 direct care physicians, with 5,236 residents per doctor. Galveston County had 369 direct care physicians, with 672 persons per doctor, and Harris County had 5,927 direct care physicians, with a ratio of 549 residents per doctor. For the three-county region, there were a total of 6,301 direct care physicians, at a ratio of 560 residents per physician. Chambers County has a significantly greater number of residents per physician than the other two counties.

TABLE 3.20.5-1

LICENSED HOSPITALS, 2001

County	City	Hospital	Beds
Chambers	Anahuac	Bayside Community	14
		Population per Bed	*1,489*
Galveston	Texas City	Mainland Medical Center	220
	Galveston	Shriners Burn Hospital	30
	League City	Devereax Texas Treatment Network*	88
	Galveston	University of Texas Medical Branch	797
		Total	1,135
		Population per Bed	*206*
Harris	Baytown	Baycoast Medical Center	191
	Houston	Bayou City Medical Center	526
	Pasadena	Bayshore Medical Center	368
	Houston	Beacon Health Ltd.	24
	Houston	Bellaire General	349
	Houston	Ben Taub General	647
	Houston	Casa	60
	Nassau Bay	Christus St. John	135
	Houston	Christus St. Joseph	792
	Katy	Christus St. Catherine	58
	Webster	Clear Lake Regional Medical Center	520
	Houston	Cypress Creek*	94
	Houston	Cypress Fairbanks Medical Center	140
	Houston	Diagnostic Center	226
	Houston	Doctors Hospital	263
	Houston	Dubuis	30
	Houston	East Houston Regional	121
	Webster	Healthsouth Clear Lake Rehabilitation	60
	Houston	Heathsouth Hospital for Specialized Surgery	7
	Humble	Heathsouth Rehabilitaion Hospital	90
	Houston	Houston Northwest Medical Center	498
	Houston	IHS	59
	Houston	Intracare*	142
	Houston	Intracare North*	90
	Houston	Kindred	84
	Pasadena	Kindred	46
	Houston	LBJ General	332
	Houston	Memorial Hermann Continuing Care	125
	Houston	Memorial Hermann Continuing Care - South	50
	Houston	Memorial Hermann	796
	Houston	Memorial Hermann Memorial City	520
	Houston	Memorial Hermann Northwest	183
	Houston	Memorial Hermann Southeast	249
	Houston	Memorial Hermann Southwest	554
	Houston	Methodist Willowbrook	64
	Humble	Northeast Medical Center	237

TABLE 3.20.5-1 (Concluded)

LICENSED HOSPITALS, 2001

County	City	Hospital	Beds
	Houston	Northside General	39
	Houston	Park Plaza	468
	Houston	Plaza Specialty	57
	Houston	Riverside General	98
	Baytown	San Jacinto Methodist	342
	Houston	SCCI	40
	Houston	Select Specialty - Houston Heights	300
	Houston	Shriners Hospital for Children	40
	Houston	Spring Branch Medical Center	351
	Houston	St. Lukes Episcopal	948
	Houston	Texas Childrens	715
	Houston	Texas Orthopedic	49
	Houston	Institute for Rehabilitation and Research	70
	Houston	Methodist	1,204
	Houston	Specialty Hospital of Houson	185
	Houston	Womans Hospital of Texas	275
	Houston	TIRR Lifebridge	46
	Tomball	Tomball Regional	205
	Houston	TOPS Surgical Specialty	20
	Houston	Triumph Hospital - North	130
	Houston	Triumph Hospital - East	93
	Pasadena	Vista Medical Center	41
	Houston	West Houston Medical Center	225
	Houston	West Oaks*	144
		Total	14,815
		Population per Bed	*221*
Three-County Area			15,964
		Population per Bed	*221*

Source: TDH, 2001; UTMB Healthcare Financial Management Office, 2001.
* Psychiatric Hospital

TABLE 3.20.5-2

MEDICAL PERSONNEL IN SELECTED FIELDS, 1999

Field	Chambers	Galveston	Harris	Three-County Area
Direct Care Physicians	5	369	5,927	6,301
Population per Physician	5,236	672	549	560
Registered Nurses	48	2,501	22,581	25,130
Population per Registered Nurse	545	99	144	140
Dentists	2	96	1,681	1,779
Population per Dentist	13,091	2,583	1,934	1,982

Source: TDH, 1999.

In regard to registered nurses, Chambers County had 48 (545 persons per nurse), Galveston County had 2,501 (99 residents per nurse), and Harris County had 22,581 (144 residents per nurse). For the three counties, there were 25,130 nurses, with a regional average of 140 residents per nurse. Again, rural Chambers County has a significantly greater number of persons per nurse than the two urbanized counties.

Chambers County has only two dentists for its population of over 26,000. Galveston County had 96 dentists, with a ratio of 2,583 residents per dentist. Harris County had 1,681 dentists, with an average of 1,934 residents per dentist. For the region, there were 1,779 dentists with an average of 1,982 residents per dentist.

3.20.6 Schools

The primary independent school districts within the region are Goose Creek Consolidated Independent School District (ISD) in Chambers County; Galveston, La Marque, and Texas City ISDs in Galveston County; and Clear Creek and La Porte ISDs in Harris County. Information regarding enrollment and staffing is shown in Table 3.20.6-1 (Texas Education Agency, 2001). For the region, there are, on average, 15.8 students per teacher and 8.2 students per staff.

3.20.7 Libraries

There are libraries in the larger communities in the study region, including Baytown, Pasadena and Texas City, as well as La Porte and Seabrook, which have branch libraries of the Harris County Public Library system. Information about each library and system is shown in Table 3.20.7-1 (Texas State Library, 1999). Regionally, there are 1.38 books per capita and 2.01 total resources per capita (excluding the Galveston Rosenberg Library, which distorts the regional average). Each librarian serves 12,234 residents, and each other library staff person serves 6,274 residents. On average, there are 0.30 square feet of library space per capita.

3.20.8 Parks and Recreation Facilities

Existing parks and recreational facilities are discussed above in Section 3.18.3, and park amenities are presented in Table E-1.

3.20.9 Streets and Public Transportation

Shoal Point

Loop 197 is an existing roadway that is 82 feet in width and consists of four 12-foot lanes, two 10-foot shoulders, as well as one 14-foot interior turning lane.

No rail access exists on the proposed project site. Nearby rail traffic uses the UPRR and BNSF yards (see Figure 3.2.2-1).

TABLE 3.20.6-1

PUBLIC SCHOOLS

Description	Chambers Co	Galveston Co			Harris Co		Region
	Goose Creek CISD	Galveston ISD	La Marque ISD	Texas City ISD	Clear Creek ISD	La Porte ISD	
Enrollment by Grade. 2000-01							
Pre-Elementary	2,072	948	373	612	2,549	763	7,317
1-5	7,168	3,924	1,556	2,407	11,574	2,868	29,497
6-8	3,967	1,948	900	1,333	7,241	1,830	17,219
9-12	4,838	2,090	1,239	1,598	8,595	2,184	20,544
Total	18,045	8,910	4,068	5,950	29,959	7,645	74,577
Staff							
Total Teacher FTE	1,124	670	277	396	1,785	460	4,712
Total Staff FTE	2,190	1,395	514	836	3,153	972	9,060
Rarios							
Students per Teacher	16.1	13.3	14.7	15.0	16.8	16.6	15.8
Students per Staff	8.2	6.4	7.9	7.1	9.5	7.9	8.2

Source: Texas Education Agency, 2001.

TABLE 3.20.7-1

PUBLIC LIBRARIES, 1999

Description	Baytown Sterling Municipal Library	Galveston Rosenberg Library	La Porte Seabrook Branch of Harris Co. Library	Pasadena Public Library	Texas City Municipal Library	Region
Population Served	93,304	70,251	1,178,553	133,964	50,109	1,526,181
Total Books	189,493	220,763	1,193,541	374,076	126,271	2,104,144
Total Items	224,911	2,860,482	2,094,238	472,686	135,286	5,787,603
Librarians	8.75	9.00	89.00	13.00	5.00	124.75
Other Staff	24.49	39.00	141.25	27.00	11.50	243.24
Square Footage	50,500	100,000	246,860	45,300	21,000	463,660
Books per Capita	2.03	3.14	1.01	2.79	2.52	1.38
Items per Capita	2.41	40.72	1.78	3.53	2.70	3.79
Persons per Librarian	10,663	7,806	13,242	10,305	10,022	12,234
Persons per Staff	3,810	1,801	8,344	4,962	4,357	6,274
Square Footage per Capita	0.54	1.42	0.21	0.34	0.42	0.30

Source: Texas State Library, 1999.

Pelican Island

An existing roadway and two-lane bascule bridge provide access to Pelican Island. Both are owned and maintained by Galveston County.

No rail access exists in the immediate vicinity of the Pelican Island site. The area is currently served by the nearby UPRR, BNSF, and Barbours Cut intermodal yards (see Figure 3.2.2-1)

Bayport

Port Road provides access from the alternative terminal location site at Bayport to SH 146. Port Road is an existing two-lane collector street. An existing interchange is located at the intersection of SH 146 and Port Road. It is assumed that this interchange would remain unchanged as a result of the project and would be studied at a later date by TxDOT to determine whether the current configuration is acceptable with the increased traffic generated by the terminal. Todville Road, a two-lane road, currently serves the residents of El Jardin Del Mar.

No rail access exists in the immediate vicinity of the Bayport site. The existing Barbours Cut intermodal yard facility is within 10 miles of the proposed terminal location. Additional intermodal yards owned by UPRR and BNSF are located in the greater Houston area (see Figure 3.2.2-1).

Spillman's Island

It is assumed that a terminal access road at this alternative site would tie-in with the existing network of roadway systems currently available at the Barbours Cut terminal.

No rail access exists in the immediate vicinity of the Spillman's Island site. The existing Barbours Cut intermodal yard facility is within 10 miles of the proposed terminal location. Additional intermodal yards owned by UPRR and BNSF are located in the greater Houston area (see Figure 3.2.2-1).

Alexander Island

There is no current roadway access to Alexander Island.

No rail access exists in the immediate vicinity of this alternative site. The existing Barbours Cut intermodal yard facility is approximately 3 miles from this alternative site. Additional intermodal yards owned by UPRR and BNSF are located in the greater Houston area (see Figure 3.2.2-1).

Cedar Point

Roadway access to the site is available via FM 1405 and Beach Road. Both roadways are two-lane arterials.

No rail access exists on this alternative site; however, a rail spur is located approximately 2.5 miles from the site.

3.20.10 Residential Property Values

Much of the research work performed in the area of traffic impacts on property values has focused on the element of noise. According to "The External Damage Cost of Noise Emitted from Motor Vehicles" (Delucchi and Hsu, 1998), property values may decrease from 0.2-1.5% for every dBA above 55 dBA, which was established as the threshold "below which most people will not be annoyed and above which most will be annoyed".

Existing noise levels for sensitive receptors are presented in Section 3.3.2 and in the appropriate impact discussions in Section 4.0. For all alternatives, existing noise levels exceed 55 dBA for most receptors; thus current residential property values reflect the impact of current noise levels on property valuation. Some residences proximate to the Bayport alternative site had current ambient noise levels as low as 51.3 dBA L_{dn} and some residences near the Cedar Point alternative site had current ambient noise as low as 49.9 dBA L_{dn}. According to the findings of the Delucchi study, those residences have property values that are currently unaffected by noise.

SECTION 4

ENVIRONMENTAL CONSEQUENCES

4.0 ENVIRONMENTAL CONSEQUENCES

Section 4.0 presents a discussion of environmental consequences likely to result from selection of the No-Action alternative and from construction and operation of the proposed project at each of the alternative sites described in Section 2.0. The discussion is organized by alternative, with the No-Action (or No-Build) alternative discussed first, followed by the applicant's proposed alternative (Shoal Point), and the remaining alternative sites (Pelican Island, Bayport, Spillman's Island, Alexander Island, and Cedar Point). Details regarding existing conditions at each alternative site are provided in this section as appropriate (or reference is made to baseline descriptions in Section 3.0) to facilitate comparison of the baseline conditions and projected environmental consequences associated with each alternative. Regulatory background information is provided in Section 3.0 and required permits are listed in Section 2.0.

4.1 NO-ACTION ALTERNATIVE

4.1.1 Air Quality

Under the No-Action alternative, air quality impacts associated with the dredging, construction, and operation of the proposed container terminal facility would not occur. However, emissions associated with vessels and cargo transport for the HGA would probably not remain the same. With increased demand and need for products and goods, containers would still be brought into the area. As the existing container terminal at Barbours Cut nears capacity, additional containers would likely be trucked or railed into the area from an out-of-state port. Cargo from such a port would be transported into the HGA, contributing to air emissions in the area. These emissions will vary depending on the distance traveled, operating speeds, and number of trips. Air contaminant emissions from the combustion of fuel in these vehicles would result in emissions of particulate matter, VOCs, NO_x, SO_2, and CO as products of combustion. Thus, it is expected that even if the proposed project is not built, air contaminant emissions in the HGA would still increase. These types of emissions should be factored into the SIP (State Implementation Plan) which makes allowances for increased vehicular traffic in the HGA.

4.1.2 Roadway Traffic Impact Analysis

For the traffic impact analysis of the No-Action alternative, intersections and main corridors near the proposed and alternative sites were analyzed using a normal growth rate for the area (as defined by H-GAC). The results of this analysis are presented as the No-Build scenario in the traffic impacts sections that follow for each alternative in sections 4.2 through 4.7. These sections address the existing conditions and potential traffic impacts of each alternative, as well as No-Build analysis results in order to allow for a comparative analysis of the existing, Build, and No-Build scenarios.

In general, the No-Action analysis indicates that future traffic generated by normal growth in the area (combined with existing conditions) would result in an overall level of service (LOS) of E on the existing at-grade intersection transportation network (see Section 4.2.2, Table 4.2.2-3). Of the twelve intersections included in the analysis, seven would remain at acceptable levels of service (A, B, C, or D) in 2025, while five would reach poor levels of service (E or F) in 2025.

The No-Action analysis of major corridors in the vicinity of Shoal Point indicates that most of the main corridor sections analyzed would be operating at acceptable levels of service in 2025 (see Section 4.2.2, Table 4.2.2-4). However, four of the thirteen sections would be operating at poor levels of service. In most of these cases, the LOS of these sections is poor even under existing (2001) conditions. Some of the sections analyzed show improvements in LOS due to the inclusion of scheduled roadway improvements in the traffic model used by H-GAC to generate the LOS analysis.

Under the assumptions associated with the No-Action alternative for this project, no new container terminal facilities would be constructed in the Galveston Bay region. Container cargo originating from or destined for the Houston area that could not be accommodated at existing container terminals in the area would likely pass through container terminals in Louisiana. The IH 10 corridor is the most probable route that truckers would drive to transport the cargo to and from the Houston area. Thus, an increase in truck traffic on IH 10 between Louisiana and Houston could be anticipated. In addition, rail traffic between these origin/destination points would also likely increase.

4.1.3 Noise

Under the No-Action alternative, container terminal shipments would dock at existing container terminals (e.g., in Louisiana) rather than at the proposed facility at Shoal Point. For the container cargo to arrive in or depart from Houston, Texas, the IH 10 corridor is the most probable route truckers would drive. This would likely cause an increase in the IH 10 corridor traffic between Houston and Louisiana.

Under the No-Action alternative, it is assumed that main corridors and individual intersections near the Shoal Point Container Terminal site would experience a normal growth rate and a resultant increase in traffic-related noise levels. The predicted noise levels for the No-Action alternative (normal growth rate) are presented as the No-Build scenario in the noise analysis results in Sections 4.2 through 4.7.

4.1.4 Physiography, Topography, and Bathymetry

The No-Action alternative assumes that the proposed project would not be developed and, therefore, the alternative would have no impact on physiography, topography, and bathymetry. However, alterations to bathymetry from maintenance dredging of existing ship channels and from future channel deepening and/or widening projects, in addition to topographic changes from the placement of dredged materials at DMPAs, would continue under the No-Action scenario.

4.1.5 Geology

The No-Action alternative would not impact geology within the project area.

4.1.6 Energy and Mineral Resources

The No-Action alternative would not impact energy and mineral resources within the project area.

4.1.7 Surface Soils

Any impact of the No-Action alternative on surface soils would depend on the type of future development that would take place on the project site.

4.1.8 Groundwater Hydrology

The No-Action alternative would not impact groundwater hydrology within the project area. Any groundwater quality impacts are contingent upon the amount and type of development that would take place in lieu of a marine cargo terminal on the project sites.

4.1.9 Hazardous Materials

The No-Action alternative assumes that the proposed project would not be developed. Therefore, it would have no direct impacts on hazardous material sites within Chambers, Harris, and Galveston counties.

4.1.10 Surface Water

The No-Action alternative would result in no change in container vessel traffic. All growth in container shipments would be accommodated by ports outside the region; thus, trucks and/or trains would move the higher volumes of containers to and from the Houston area. With the No-Action alternative, no changes in port operations and/or channel improvements associated with container traffic are expected, so there should be no project-related effects on surface water.

Water quality effects associated with dredging would be part of the No-Action future. The existing Federal 40-foot project to Texas City and 45-foot project in the rest of Galveston Bay will continue to be dredged periodically. In addition, efforts are underway to reactivate a Federal project to deepen the entire Texas City Channel to 45 feet. These efforts are independent of the Shoal Point Container Terminal Project permit application to dredge a portion of the channel. Water quality impacts associated with these Federal actions would be part of the No-Action future scenario.

4.1.11 Texas Coastal Management Program (TCMP) Consistency Determination

A TCMP consistency review would not be necessary for the No-Action alternative.

4.1.12 Vegetation

The No-Action alternative should have no direct adverse impact to plant communities because no habitat would be disturbed. Some of the habitats may change over time on active portions of the DMPAs.

4.1.13 Section 404/Section 10 Jurisdictional Areas (Wetlands and Open Water)

The No-Action alternative should have no direct adverse impact to wetland plant communities because no habitat would be disturbed; however, some of the habitats may change over time on active portions of the DMPA.

4.1.14 Terrestrial Wildlife

The No-Action alternative would result in no immediate direct impacts to the wildlife habitats or wildlife species at the proposed project site. Some of the habitats may change over time on active portions of the DMPAs. For instance, a nesting colony of Forster's terns on Shoal Point may be lost if placement occurs during the nesting season.

4.1.15 Aquatic Ecology

The No-Action alternative would result in no immediate direct impacts to the freshwater habitats on the proposed project site. Waterbodies on Shoal Point may be filled in over time since it would continue to function as a DMPA.

No direct effects to the existing aquatic marine habitats are expected as a result of the No-Action alternative. Continued dredging and placement of dredged material in the bay could result in increased sedimentation, salinity changes, and altered hydrology. These actions and associated impacts are expected to occur independent of the USACE decision on the permit action.

4.1.15.1 Essential Fish Habitat

In the No-Action scenario, dredging required for regular maintenance of the Texas City Channel to –40 feet MLT would continue, and placement of the dredged maintenance material in cells on Shoal Point would continue as long as capacity is available. As discussed in Section 2.4.1, a Federal feasibility study is currently underway to address the deepening of the Texas City Channel. If this activity proceeds as a Federal project, the potential impacts to EFH that are associated with dredging activities to deepen the Texas City Channel (as described in Section 4.2.15.5 for the Shoal Point alternative) may also occur under the No-Action alternative.

4.1.16 Endangered and Threatened Species

4.1.16.1 Plants

No endangered, threatened, rare or SOC species should be impacted by the No-Action alternative.

4.1.16.2 Fish and Wildlife

The No-Action alternative would result in no immediate direct impacts to any endangered species habitat or endangered species at the proposed project site, although some of the habitats are likely to change over time since it is an active DMPA. Commercial development and continued dredging

and placement of dredged material occurring in the area could result in increased sedimentation, salinity changes, and altered hydrology, which could have an impact on sea turtles. It would be expected that boat traffic in the area would increase over time, possibly impacting any sea turtles in the area. Such increase in sedimentation or boat traffic would be less under the No-Action alternative than under any of the Build alternatives.

4.1.17 Cultural Resources

No adverse impacts to known, or as of yet unknown, cultural resource sites are anticipated from the No-Action alternative.

4.1.18 Commercial and Recreational Navigation

In the No-Action future postulated for this analysis there would be no increases in container traffic to Galveston Bay. Projected increases in container receipts and shipments would be met by existing ports, with containers moved in and out of the Houston metropolitan area by truck or rail. Accordingly, there would be no major changes in commercial vessel traffic and no effects on commercial or recreational navigation. However, within the context of the Shoal Point site on the Texas City Channel, increases in non-containership traffic are expected. These are described in their respective sections. The No-Action future for the Texas City Channel may also include a Federal project to deepen the channel to 45 feet. This action would be analyzed by the USACE in a separate assessment and would likely result in dredging impacts similar to those discussed for the Shoal Point project.

4.1.19 Land Use/Recreation/Aesthetics

4.1.19.1 Land Use

If the proposed project is not built, no change in land use would be anticipated for the Shoal Point site. Residential, commercial, and public land uses in the region would likely increase proportionate to population growth trends discussed in Section 4.1.20.1. Based on standard land use requirements per 100 persons (Eisner, 1993), Table 4.1.19-1 shows the estimated acreages of land uses likely to be needed by the populations projected by the H-GAC for the region.

4.1.19.2 Recreation

Without the proposed project, no project-related impacts on recreation would be anticipated. The demand for recreational facilities for the existing population of the region, without the project, is discussed in Section 4.1.21.8.

4.1.19.3 Aesthetics

If the project is not built, there will be no change in the aesthetic environment relative to the project, for either construction or operation-related activities.

TABLE 4.1.19-1
LAND USE ACREAGE, 2005-2025

Area / Alternative	2005	2010	2015	2020	2025
Chambers County (Cedar Point)					
Residential	1,091.63	1,175.32	1,268.55	1,373.51	1,486.45
Commercial	102.34	110.19	118.93	128.77	139.35
Public, Semipublic and Parks	1,162.48	1,251.61	1,350.88	1,462.65	1,582.93
Streets	1,075.88	1,158.37	1,250.25	1,353.70	1,465.01
Total	3,432.32	3,695.49	3,988.62	4,318.62	4,673.75
Galveston County (Pelican Island, Shoal Point)					
Residential	11,556.19	12,388.65	13,321.86	14,376.75	15,513.68
Commercial	1,083.39	1,161.44	1,248.92	1,347.82	1,454.41
Public, Semipublic and Parks	12,306.23	13,192.72	14,186.50	15,309.86	16,520.58
Streets	11,389.51	12,209.96	13,129.72	14,169.40	15,289.93
Total	36,335.32	38,952.76	41,887.00	45,203.83	48,778.59
Harris County (Alexander Island, Bayport, Spillmans Island)					
Residential	143,451.11	151,689.24	153,192.50	170,152.28	180,142.77
Commercial	13,448.54	14,220.87	14,361.80	15,951.78	16,888.38
Public, Semipublic and Parks	152,761.64	161,534.46	163,135.28	181,195.82	191,834.73
Streets	141,382.10	149,501.42	150,982.99	167,698.16	177,544.56
Total	451,043.40	476,945.98	481,672.57	534,998.03	566,410.43
Total Three-County Region					
Residential	156,098.92	165,253.21	167,782.91	185,902.54	197,142.90
Commercial	14,634.27	15,492.49	15,729.65	17,428.36	18,482.15
Public, Semipublic and Parks	166,230.35	175,978.78	178,672.66	197,968.33	209,938.23
Streets	153,847.50	162,869.75	165,362.96	183,221.25	194,299.49
Total	490,811.04	519,594.24	527,548.18	584,520.48	619,862.77
HGAC RAZ 88, 89: Alexander Island, Spillmans Island Area					
Residential	781.71	816.07	857.63	907.09	961.58
Commercial	73.28	76.51	80.40	85.04	90.15
Public, Semipublic and Parks	832.44	869.03	913.29	965.96	1,023.99
Streets	770.43	804.30	845.26	894.01	947.72
Total	2,457.86	2,565.90	2,696.57	2,852.09	3,023.44
HGAC RAZ 91, 92: Bayport Area					
Residential	1,585.67	1,720.04	1,869.50	2,037.65	2,219.24
Commercial	148.66	161.25	175.27	191.03	208.05
Public, Semipublic and Parks	1,688.58	1,831.67	1,990.84	2,169.90	2,363.27
Streets	1,562.80	1,695.23	1,842.54	2,008.26	2,187.23
Total	4,985.70	5,408.19	5,878.15	6,406.85	6,977.79
HGAC RAZ 180, 184: Shoal Point Area					
Residential	1,338.69	1,372.22	1,418.98	1,479.42	1,548.19
Commercial	125.50	128.65	133.03	138.70	145.14
Public, Semipublic and Parks	1,425.57	1,461.28	1,511.07	1,575.44	1,648.67
Streets	1,319.38	1,352.43	1,398.51	1,458.08	1,525.86
Total	4,209.14	4,314.57	4,461.59	4,651.64	4,867.85

TABLE 4.1.19-1 (Concluded)
LAND USE ACREAGE, 2005-2025

Area / Alternative	2005	2010	2015	2020	2025
HGAC RAZ 186, 187: Pelican Island Area					
Residential	2,538.18	2,623.59	2,732.91	2,867.74	3,018.58
Commercial	237.95	245.96	256.21	268.85	282.99
Public, Semipublic and Parks	2,702.92	2,793.87	2,910.29	3,053.86	3,214.50
Streets	2,501.57	2,585.75	2,693.50	2,826.38	2,975.04
Total	7,980.63	8,249.16	8,592.91	9,016.83	9,491.11
HGAC RAZ 191: Cedar Point Area					
Residential	315.62	347.73	382.47	420.70	461.34
Commercial	29.59	32.60	35.86	39.44	43.25
Public, Semipublic and Parks	336.10	370.30	407.29	448.01	491.29
Streets	311.07	342.72	376.95	414.63	454.69
Total	992.38	1,093.36	1,202.58	1,322.78	1,450.57

Assumes land use acreages per 100 persons from Eisner, 1993:

Residential:	4.16
Commercial:	0.39
Public, Semipublic and Parks:	4.43
Streets:	4.10
Total:	13.08

HGAC RAZ - Houston-Galveston Area Council Regional Analysis Zone

4.1.20 Socioeconomics

4.1.20.1 Population

Methodology. The economic assessment of the various project alternatives produced an estimate of primary and secondary job creation both for the local work force and for skilled workers from outside the immediate study region. Short-term construction-related effects on inmigration and local growth were assessed as well as the longer-term operations-related inmigration stimulus to local population growth. Construction and operations-related employment growth include both workers and family members, if appropriate. Population growth related to the project was then added to population growth which would occur without the project. Without the project, there would be no population impacts related to the project, either for construction or operations-related activities. Population forecasts for the No-Action alternative are discussed below.

Population Forecasts Without Project. The H-GAC, the council of governments for the greater Houston area, has produced population projections for Houston CMSA (H-GAC, 2001). Projections have not been developed for individual cities, but have been disaggregated to large subregions and to counties. Projections for the state are supplied by the Texas State Data Center (2001). Table 4.1.20-1 shows population projections for the subregions which lie in the study area, as well as state and county population projections. The H-GAC has not updated its projections since the 2000 Census, thus these projections are likely to change in the near future.

During the 2000-2025 period, the state as a whole is expected to grow by 53 percent, while the study area counties are forecasted to increase collectively by almost 29 percent. Growth is projected to be led by Harris County, which is expected to increase by almost 930,000 residents over 25 years, with a 25-year growth rate of 27 percent. Galveston County is expected to grow 49 percent with a forecasted population increase of 123,000. Chambers County is anticipated to add 9,700 residents, an increase of 37 percent.

There are two H-GAC Regional Analysis Zones (RAZ) in the area of Bayport and Morgan's Point, which lie in the general location of the Spillman's Island and Alexander Island alternatives. In this area, population is expected to increase by almost 4,700 persons, for a 25-year growth rate of 25 percent.

RAZ 91 and RAZ 92 are in the vicinity of the Bayport site and include areas of La Porte, Shoreacres, and Seabrook. Population in this area is projected to increase by 49 percent, or approximately 17,500 persons.

The Shoal Point alternative is proximate to RAZ 180 and RAZ 184, which are anticipated to grow by 15 percent, or almost 5,000 residents, over 25 years.

The Galveston area is represented by RAZ 186 and RAZ 187, which are expected to grow by 21 percent or 12,500 residents. This would represent a reversal of Galveston's 30-year decline in population.

TABLE 4.1.20-1
POPULATION PROJECTIONS, 2000-2025, NO-ACTION ALTERNATIVE

Area / Alternative	2000	2005	2010	2015	2020	2025	2000-2025 Change	
							Population	%
Texas	20,851,820	22,369,770	24,420,249	26,689,929	29,183,018	31,864,080	11,012,260	*52.8%*
Chambers County (Cedar Point)	26,031	26,241	28,253	30,494	33,017	35,732	9,701	*37.3%*
Galveston County (Pelican Island, Shoal Point)	250,158	277,793	297,804	320,237	345,595	372,925	122,767	*49.1%*
Harris County (Alexander Island, Bayport, Spill. Isl.)	3,400,578	3,448,344	3,646,376	3,682,512	4,090,199	4,330,355	929,777	*27.3%*
Total Three-County Region	3,676,767	3,752,378	3,972,433	4,033,243	4,468,811	4,739,012	1,062,245	*28.9%*
Percent Change		*2.1%*	*5.9%*	*1.5%*	*10.8%*	*6.0%*		
HGAC RAZ 88 (Alexander Island, Spillmans Island)	7,108	7,236	7,538	7,905	8,343	8,824	1,716	*24.1%*
HGAC RAZ 89 (Alexander Island, Spillmans Island)	11,314	11,555	12,079	12,711	13,462	14,291	2,977	*26.3%*
Subtotal Alexander Island, Spillmans Island Area	18,422	18,791	19,617	20,616	21,805	23,115	4,693	*25.5%*
Percent Change		*2.0%*	*4.4%*	*5.1%*	*5.8%*	*6.0%*		
HGAC RAZ 91 (Bayport)	15,561	16,052	16,905	17,896	19,047	20,297	4,736	*30.4%*
HGAC RAZ 92 (Bayport)	20,289	22,065	24,442	27,044	29,935	33,050	12,761	*62.9%*
Subtotal Bayport Area	35,850	38,117	41,347	44,940	48,982	53,347	17,497	*48.8%*
Percent Change		*6.3%*	*8.5%*	*8.7%*	*9.0%*	*8.9%*		
HGAC RAZ 180 (Shoal Point)	26,124	25,787	26,211	26,892	27,834	28,930	2,806	*10.7%*
HGAC RAZ 184 (Shoal Point)	6,136	6,393	6,775	7,218	7,729	8,286	2,150	*35.0%*
Subtotal Shoal Point Area	32,260	32,180	32,986	34,110	35,563	37,216	4,956	*15.4%*
Percent Change		*-0.2%*	*2.5%*	*3.4%*	*4.3%*	*4.6%*		
HGAC RAZ 186 (Pelican Island)	58,064	58,947	60,878	63,369	66,455	69,912	11,848	*20.4%*
HGAC RAZ 187 (Pelican Island)	1,972	2,067	2,189	2,326	2,481	2,650	678	*34.4%*
Subtotal Pelican Island Area	60,036	61,014	63,067	65,695	68,936	72,562	12,526	*20.9%*
Percent Change		*1.6%*	*3.4%*	*4.2%*	*4.9%*	*5.3%*		
HGAC RAZ 191 (Cedar Point)	6,957	7,587	8,359	9,194	10,113	11,090	4,133	*59.4%*
Percent Change		*9.1%*	*10.2%*	*10.0%*	*10.0%*	*9.7%*		

Source: H-GAC, 2001; USBOC, 2001a.
HGAC RAZ = Houston Galveston Area Council Regional Analysis Zone

Cedar Point lies in RAZ 191, which has a forecasted growth rate of 59 percent, or 4,100 population.

4.1.20.2 Environmental Justice

No evaluation of Environmental Justice is required for the No-Action alternative since no disproportionate impact on minority and economically stressed populations would occur.

4.1.20.3 Community Values

The Texas City Vision 2020 comprehensive planning effort has the development of a MegaPort and an intramodal shipping center as two of its major goals. If the project is not built at the Shoal Point site, these objectives would not be achieved.

4.1.20.4 Housing

Based on new housing starts projected by the Texas Comptroller of Public Accounts, housing needs for the state through the year 2025 were estimated and are shown in Table 4.1.20-2 (Texas Comptroller of Public Accounts, 2000). In addition, for each of the subregions shown in Table 4.1.20-1, the number of projected households, as projected by H-GAC, is shown (H-GAC, 2001). In all areas, household sizes are projected to decline, resulting in a demand for housing that would grow faster than the population.

4.1.20.5 Leading Economic Sectors

Similar to employment effects (which are discussed in Section 4.1.20.6), project-related expenditures would have both primary and secondary income effects as project money is spent and re-spent in the economy. Some of this multiple-income effect would be realized at the local level while other income effects would be realized regionally, nationally, and internationally.

A standard technique for estimating the "ripple effects" of new employment and income generation are the income and employment multipliers calculated from regional economic input-output models that simulate the purchasing and spending interrelationships within an economy. Economic multipliers from the Texas Input-Output Model were utilized to estimate the total income effect on various sectors (Texas Comptroller of Public Accounts, 1989).

As a point of comparison, the Texas Comptroller of Public Accounts has developed various economic projections at the statewide level which represent the No-Action projected income by sector. Local projections have not been produced by the Comptrollers office (Texas Comptroller of Public Accounts, 2000). As discussed in Section 3.19.5, socioeconomic characteristics of the Houston CMSA generally reflect statewide conditions, thus state-level projections are likely to be a reasonable proxy for future growth in economic activity in the greater Houston area.

The gross state product by sector is shown in Table 4.1.20-3 (Texas Comptroller of Public Accounts, 2000). The total state product is expected to increase by 284 percent during the 25-year period

TABLE 4.1.20-2
HOUSING NEEDS, 2000-2025
NO-ACTION ALTERNATIVE

Area / Alternative	2000	2005	2010	2015	2020	2025	2000-2025 Change	
							Housing Units	%
Texas	7,008,999	7,779,399	8,643,799	9,529,599	10,761,999	11,886,199	4,877,200	*69.6%*
Persons per Household	*2.98*	*2.88*	*2.83*	*2.80*	*2.71*	*2.68*		
Chambers County (Cedar Point)	8,837	9,474	10,362	11,365	12,508	13,757	4,920	*55.7%*
Galveston County (Pelican Island, Shoal Point)	102,092	108,576	118,165	129,061	141,544	155,194	53,102	*52.0%*
Harris County (Alexander Island, Bayport, Spillmans	1,246,076	1,311,891	1,406,573	1,510,431	1,621,113	1,739,534	493,458	*39.6%*
Total Three-County Region	1,357,005	1,429,941	1,535,100	1,650,857	1,775,165	1,908,485	551,480	*40.6%*
Persons per Household	*2.71*	*2.62*	*2.59*	*2.44*	*2.52*	*2.48*		
HGAC RAZ 88 (Alexander Island, Spillmans Island)	2,385	2,469	2,625	2,810	3,028	3,269	884	*37.1%*
HGAC RAZ 89 (Alexander Island, Spillmans Island)	4,061	4,195	4,453	4,759	5,121	5,522	1,461	*36.0%*
Subtotal Alexander Island, Spillmans Island Area	6,446	6,664	7,078	7,569	8,149	8,791	2,345	*36.4%*
Persons per Household	*2.86*	*2.82*	*2.77*	*2.72*	*2.68*	*2.63*		
HGAC RAZ 91 (Bayport)	5,314	5,577	5,994	6,478	7,040	7,657	2,343	*44.1%*
HGAC RAZ 92 (Bayport)	8,710	9,518	10,630	11,860	13,241	14,739	6,029	*69.2%*
Subtotal Bayport Area	14,024	15,095	16,624	18,338	20,281	22,396	8,372	*59.7%*
Persons per Household	*2.56*	*2.53*	*2.49*	*2.45*	*2.42*	*2.38*		
HGAC RAZ 180 (Shoal Point)	9,668	9,666	9,985	10,413	10,959	11,579	1,911	*19.8%*
HGAC RAZ 184 (Shoal Point)	2,535	2,673	2,875	3,109	3,381	3,680	1,145	*45.2%*
Subtotal Shoal Point Area	12,203	12,339	12,860	13,522	14,340	15,259	3,056	*25.0%*
Persons per Household	*2.64*	*2.61*	*2.57*	*2.52*	*2.48*	*2.44*		
HGAC RAZ 186 (Pelican Island)	24,683	25,372	26,627	28,175	30,050	32,143	7,460	*30.2%*
HGAC RAZ 187 (Pelican Island)	459	480	513	551	595	645	186	*40.5%*
Subtotal Pelican Island Area	25,142	25,852	27,140	28,726	30,645	32,788	7,646	
Persons per Household	*2.39*	*2.36*	*2.32*	*2.29*	*2.25*	*2.21*		
HGAC RAZ 191 (Cedar Point)	2,402	2,655	2,973	3,325	3,719	4,147	1,745	*72.6%*
Persons per Household	*2.90*	*2.86*	*2.81*	*2.77*	*2.72*	*2.67*		

Source: H-GAC, 2001; Texas Comptroller of Public Accounts, 2000.
HGAC RAZ = Houston Galveston Area Council Regional Analysis Zone

TABLE 4.1.20-3
PROJECTED GROSS STATE PRODUCT, 2000-2025, NO-ACTION ALTERNATIVE
BY MAJOR ECONOMIC SECTOR ($Billions, 2001 Dollars)

Major Economic Sector	2000	2005	2010	2015	2020	2025	2000-2025 Change	
							$	%
Agriculture	$10.02	$16.75	$13.69	$16.75	$20.97	$26.82	$16.80	167.7%
Mining (Oil and Gas)	$42.02	$75.60	$62.26	$75.60	$89.18	$104.99	$62.97	149.9%
Construction	$33.25	$66.96	$53.84	$66.96	$85.65	$108.10	$74.85	225.1%
Manufacturing	$110.36	$240.35	$193.07	$240.35	$299.33	$371.09	$260.73	236.3%
Transportation and Public Utilities	$84.56	$234.91	$171.79	$234.91	$321.77	$441.04	$356.48	421.6%
Wholesale Trade	$61.06	$145.77	$111.71	$145.77	$191.34	$250.28	$189.22	309.9%
Retail Trade	$63.63	$138.84	$108.24	$138.84	$178.79	$228.50	$164.87	259.1%
Finance, Insurance and Real Estate	$112.77	$220.13	$191.13	$220.13	$282.57	$360.16	$247.39	219.4%
Services	$144.31	$368.22	$273.55	$368.22	$496.43	$667.72	$523.41	362.7%
Government	$78.16	$173.75	$134.34	$173.75	$224.74	$288.01	$209.85	268.5%
Total	$740.14	$1,681.28	$1,313.62	$1,681.28	$2,190.77	$2,846.71	$2,106.57	284.6%

Source: Texas Comptroller of Public Accounts, 2000.

of 2000-2025. The leading sector is projected to be services, with an increase of $523 billion (363%) in 2000 dollars. This is followed by the transportation and public utilities sector, which is anticipated to increase by $356 billion (422%). The slowest growth is forecast for agriculture and mining (oil and gas).

4.1.20.6 Employment by Sector

Methodology. An evaluation was made of the regional and local labor force to ascertain if the greater Houston area can provide a sufficient quantity of skilled, semi-skilled and unskilled labor to meet the proposed project's construction and operation employment demand. Coupled with total project-related employment needs, this locally available labor force data was used to ascertain whether the number and types of jobs generated by the proposed project can be filled by the local labor force, or alternately may draw temporary or permanent inmigration to the area.

In addition to the effects of local versus inmigrating workers directly associated with the project, the primary project employment and spending would generate secondary employment effects both locally and elsewhere in the economy. While the secondary effects are widespread, these indirect and induced effects are usually manifested to the greatest extent in construction, wholesale and retail trade, and service sectors. This secondary employment stimulus would also be met with employees from the local area and possible inmigrants. Both primary and secondary employment effects have been estimated as part of the study effort.

Projected Employment by Area. Table 4.1.20-4 shows projected employment by sector for Texas (Texas Comptroller of Public Accounts, 2000), area counties, and various H-GAC Regional Analysis Zones in the vicinities of the alternative project sites (H-GAC, 2001).

Statewide, employment is expected to grow by 5.5 million jobs between 2000 and 2025, a 58 percent growth rate. In the three-county study region, more than 537,000 jobs are expected to be added over the 25-year period, a growth rate of 26 percent. Of that growth, 506,000 new jobs are projected in Harris County, and 24,000 are projected in Galveston County. Chambers County employment is expected to increase by 78 percent, or 6,000 jobs.

In the vicinity of Spillman's Island and Alexander Island, RAZ 88 and RAZ 89 are expected to add over 3,100 jobs, with an employment growth rate of 37 percent. Employment in the Bayport site vicinity is expected to be more than twice as high with the addition of 7,500 jobs and an employment growth rate of 50 percent over 25 years.

In contrast, the Texas City and Galveston areas near the Shoal Point and Pelican Island alternatives, respectively, show virtually no employment growth over the next 25 years.

In Chambers County, RAZ 191 in the vicinity of Cedar Point, is expected to add all the county's jobs, with an increase of 119 percent.

Projected State Employment by Sector. Table 4.1.20-5 contains projections of non-farm employment growth for the state by major economic sector (Texas Comptroller of Public Accounts, 2000). Over the next 25 years, employment in the state is expected to grow by 58 percent. Leading this

TABLE 4.1.20-4
EMPLOYMENT PROJECTIONS, 2000-2025, NO-ACTION ALTERNATIVE

Area / Alternative	2000	2005	2010	2015	2020	2025	2000-2025 Change	
							Employment	%
Texas	9,388,300	10,478,700	11,551,800	12,468,700	13,630,200	14,865,400	5,477,100	*58.3%*
Chambers County (Cedar Point)	8,743	10,215	11,784	13,109	14,340	15,571	6,828	*78.1%*
Galveston County (Pelican Island, Shoal Point)	91,588	97,306	102,006	107,562	111,644	115,597	24,009	*26.2%*
Harris County (Alexander Island, Bayport, Spillmans	1,949,749	2,077,119	2,199,128	2,294,125	2,377,158	2,456,100	506,351	*26.0%*
Total Three-County Region	2,050,080	2,184,640	2,312,918	2,414,796	2,503,142	2,587,268	537,188	*26.2%*
Percent Change		*6.6%*	*5.9%*	*4.4%*	*3.7%*	*3.4%*		
HGAC RAZ 88 (Alexander Island, Spillmans Island)	1,374	1,645	1,921	2,146	2,350	2,547	1,173	*85.4%*
HGAC RAZ 89 (Alexander Island, Spillmans Island)	7,079	7,610	8,098	8,464	8,775	9,064	1,985	*28.0%*
Subtotal Alexander Island, Spillmans Island Area	8,453	9,255	10,019	10,610	11,125	11,611	3,158	*37.4%*
Percent Change		*9.5%*	*8.3%*	*5.9%*	*4.9%*	*4.4%*		
HGAC RAZ 91 (Bayport)	9,694	11,332	12,983	14,308	15,490	16,632	6,938	*71.6%*
HGAC RAZ 92 (Bayport)	5,123	5,272	5,402	5,497	5,576	5,647	524	*10.2%*
Subtotal Bayport Area	14,817	16,604	18,385	19,805	21,066	22,279	7,462	*50.4%*
Percent Change		*12.1%*	*10.7%*	*7.7%*	*6.4%*	*5.8%*		
HGAC RAZ 180 (Shoal Point)	6,779	6,779	6,779	6,779	6,779	6,779	0	*0.0%*
HGAC RAZ 184 (Shoal Point)	7,273	7,286	7,296	7,303	7,308	7,313	40	*0.5%*
Subtotal Shoal Point Area	14,052	14,065	14,075	14,082	14,087	14,092	40	*0.3%*
Percent Change		*0.1%*	*0.1%*	*0.0%*	*0.0%*	*0.0%*		
HGAC RAZ 186 (Pelican Island)	28,332	28,332	28,332	28,332	28,332	28,332	0	*0.0%*
HGAC RAZ 187 (Pelican Island)	2,845	2,845	2,845	2,845	2,845	2,845	0	*0.0%*
Subtotal Pelican Island Area	31,177	31,177	31,177	31,177	31,177	31,177	0	*0.0%*
Percent Change		*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*		
HGAC RAZ 191 (Cedar Point)	5,733	7,205	8,774	10,099	11,330	12,561	6,828	*119.1%*
Percent Change		*25.7%*	*21.8%*	*15.1%*	*12.2%*	*10.9%*		

Source: H-GAC, 2001; Texas Comptroller of Public Accounts, 2000.
HGAC RAZ = Houston Galveston Area Council Regional Analysis Zone

TABLE 4.1.20-5
TEXAS NON-FARM EMPLOYMENT PROJECTIONS, 2005-2025, NO-ACTION ALTERNATIVE
BY MAJOR ECONOMIC SECTOR

Major Economic Sector	2000	2005	2010	2015	2020	2025	2000-2025 Change	
							Employment	%
Mining	145,100	140,600	140,300	139,300	135,200	131,700	-13,400	-9.2%
Construction	538,800	586,000	634,500	671,600	729,700	782,600	243,800	45.2%
Manufacturing	1,094,300	1,179,000	1,207,700	1,221,700	1,245,200	1,272,600	178,300	16.3%
Transportation and Public Utilities	580,700	695,200	800,500	908,300	1,036,100	1,187,800	607,100	104.5%
Wholesale Trade	548,100	609,600	666,800	721,700	786,400	858,300	310,200	56.6%
Retail Trade	1,687,200	1,855,400	2,038,200	2,202,800	2,392,500	2,584,200	897,000	53.2%
Finance, Insurance and Real Estate	530,700	572,600	613,500	581,500	620,500	659,800	129,100	24.3%
Services	2,691,100	3,123,000	3,566,000	3,982,700	4,469,200	4,994,400	2,303,300	85.6%
Government	1,572,300	1,717,300	1,884,300	2,039,100	2,215,400	2,393,900	821,600	52.3%
Total	9,388,300	10,478,700	11,551,800	12,468,700	13,630,200	14,865,300	5,477,000	58.3%

Source: Texas Comptroller of Public Accounts, 2000.

growth is the service sector, adding 2.3 million jobs and growing by 85 percent. This is followed by retail trade (897,000; 53% growth) and government (821,600; 52% growth). Only the mining sector is expected to decline, losing 13,400 jobs, or 9 percent.

Projected Workforce by Sector. Table 4.1.20-6 shows projections of the Houston-area workforce during the next 25 years, based on population projections in Table 4.1.20-1, projected employment by county and RAZ subareas in Table 4.1.20-4, and historical employment by sector. Workforce projections are made for the construction and transportation sectors, which would be the major sectors affected by the proposed project.

There is projected to be a future labor pool for the construction and transportation sectors in all counties and subregions. For the construction sector in Chambers County, the available labor pool rises from a projected 15 in 2001, to 18 in 2016, the last year of construction. For Galveston County, the construction labor pool is expected to increase annually, beginning with 301 projected unemployed construction workers in 2001 and escalating to 381 by 2016. In Harris County, the large labor pool is projected to increase steadily throughout the 2000-2016 period, from 6,362 to 6,969.

Houston-Galveston Area Council RAZ subregions were also examined because they represent the potential labor pool which lies within 20 to 30 minutes of the proposed and alternative project sites. All of these areas are projected to have a small construction labor pool which gradually increases over the construction phase.

For the transportation sector, similar patterns occur. Chambers County is projected to have an available labor force of 17 to 23 from 2001 to 2025. For Galveston County, the available transportation sector labor force is projected to be 357 in 2001, rising to 489 by 2025. Harris County is projected to increase from an available labor pool of 6,783 in 2001 to 8,091 in 2025. The H-GAC RAZ subregions are expected to have small labor pools of transportation sector workers.

4.1.20.7 Personal Income Effects

Projected total personal income and per capita personal income for the state of Texas, prepared by the Texas Comptroller of Public Accounts, are shown in Table 4.1.20-7 (Texas Comptroller of Public Accounts, 2000). Between 2000 and 2025, total annual personal income is expected to increase by $1,864.1 trillion. Adjusted for inflation, total personal income in the state in 2025 is expected to be $743.8 billion higher than in 2000.

On a per capita basis, personal income, when adjusted for inflation, is expected to increase from $27,798 in 2000 to $43,990 in 2025, a 58 percent increase over 25 years. Per capita income figures are not available discretely for the Houston area.

4.1.20.8 Residential Property Values

According to "The External Damage Cost of Noise Emitted from Motor Vehicles" (Delucchi and Hsu, 1998), property values may decrease from 0.2–1.5 percent for every dBA above 55 dBA.

TABLE 4.1.20-6

LABOR FORCE PROJECTIONS, 2005-2025, NO-ACTION ALTERNATIVE
BY MAJOR ECONOMIC SECTOR

Factor /Location	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
RESIDENTS EMPLOYED IN PMSA													
Houston-Galveston-Brazoria CMSA	2,237,184	2,271,233	2,305,282	2,339,330	2,373,379	2,407,427	2,440,554	2,473,680	2,506,807	2,539,934	2,573,060	2,599,180	2,625,299
Chambers County	5,464	5,511	5,558	5,604	5,650	5,695	5,776	5,857	5,938	6,019	6,101	6,168	6,236
Galveston County	73,666	75,820	77,987	80,169	82,364	84,572	85,699	86,826	87,954	89,081	90,209	91,135	92,062
Harris County	1,547,198	1,562,385	1,577,457	1,592,419	1,607,271	1,622,017	1,638,904	1,655,802	1,672,711	1,689,630	1,706,559	1,701,861	1,697,365
Three County Area	1,626,329	1,643,716	1,661,003	1,678,191	1,695,284	1,712,283	1,730,379	1,748,486	1,766,603	1,784,731	1,802,869	1,799,164	1,795,662
RAZ 88,89: Alexander Island, Spillmans Island Area	8,382	8,474	8,566	8,657	8,748	8,839	8,907	8,975	9,044	9,112	9,181	9,231	9,281
RAZ 91,92: Bayport Area	16,311	16,633	16,955	17,279	17,604	17,929	18,214	18,498	18,783	19,067	19,351	19,594	19,837
RAZ 180, 184: Shoal Point Area	9,500	9,561	9,622	9,681	9,740	9,797	9,836	9,874	9,913	9,953	9,992	10,012	10,034
RAZ 186, 187: Pelican Island Area	17,679	17,861	18,041	18,220	18,398	18,575	18,680	18,786	18,892	18,998	19,104	19,172	19,241
RAZ 191: Cedar Point Area	1,460	1,497	1,534	1,571	1,609	1,647	1,678	1,710	1,742	1,773	1,805	1,832	1,860
PMSA WORKFORCE UNEMPLOYED													
Houston-Galveston-Brazoria CMSA	126,400	128,324	130,247	132,171	134,095	136,018	137,890	139,762	141,633	143,505	145,377	146,852	148,328
Chambers County	290	293	295	298	300	302	307	311	315	320	324	327	331
Galveston County	5,562	5,724	5,888	6,053	6,218	6,385	6,470	6,555	6,640	6,725	6,811	6,881	6,950
Harris County	87,732	88,593	89,448	90,296	91,138	91,974	92,932	93,890	94,849	95,808	96,768	96,502	96,247
Three County Area	93,584	94,610	95,631	96,646	97,656	98,662	99,709	100,756	101,805	102,853	103,903	103,710	103,528
RAZ 88,89: Alexander Island, Spillmans Island Area	475	481	486	491	496	501	505	509	513	517	521	523	526
RAZ 91,92: Bayport Area	925	943	961	980	998	1,017	1,033	1,049	1,065	1,081	1,097	1,111	1,125
RAZ 180, 184: Shoal Point Area	717	722	726	731	735	740	743	745	748	751	754	756	758
RAZ 186, 187: Pelican Island Area	1,335	1,348	1,362	1,376	1,389	1,402	1,410	1,418	1,426	1,434	1,442	1,447	1,453
RAZ 191: Cedar Point Area	78	79	81	83	85	87	89	91	92	94	96	97	99

TABLE 4.1.20-6 (Cont'd)

LABOR FORCE PROJECTIONS, 2005-2025, NO-ACTION ALTERNATIVE
BY MAJOR ECONOMIC SECTOR

Factor /Location	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
PROJECTED UNEMPLOYED CONSTRUCTION													
Houston-Galveston-Brazoria CMSA	8,611	8,742	8,873	9,004	9,136	9,267	9,394	9,522	9,649	9,777	9,904	10,005	10,105
Chambers County	15	15	15	15	16	16	16	16	16	17	17	17	17
Galveston County	293	301	310	319	327	336	341	345	350	354	359	362	366
Harris County	6,300	6,362	6,423	6,484	6,544	6,604	6,673	6,742	6,811	6,880	6,949	6,930	6,911
Three County Area	6,608	6,678	6,748	6,818	6,887	6,956	7,030	7,103	7,177	7,250	7,324	7,309	7,294
RAZ 88,89: Alexander Island, Spillmans Island Area	25	25	25	25	26	26	26	26	27	27	27	27	27
RAZ 91,92: Bayport Area	48	49	50	51	52	53	53	54	55	56	57	57	58
RAZ 180, 184: Shoal Point Area	37	37	38	38	38	38	38	39	39	39	39	39	39
RAZ 186, 187: Pelican Island Area	69	70	70	71	72	73	73	73	74	74	75	75	75
RAZ 191: Cedar Point Area	4	4	4	4	4	5	5	5	5	5	5	5	5
PROJECTED UNEMPLOYED TRANSPORTATION													
Houston-Galveston-Brazoria CMSA	8,531	8,661	8,791	8,921	9,051	9,181	9,307	9,433	9,560	9,686	9,812	9,912	10,012
Chambers County	17	18	18	18	18	18	18	19	19	19	19	20	20
Galveston County	347	357	367	377	388	398	403	409	414	419	425	429	433
Harris County	6,717	6,783	6,849	6,914	6,978	7,042	7,116	7,189	7,262	7,336	7,409	7,389	7,369
Three County Area	7,082	7,158	7,234	7,309	7,384	7,458	7,537	7,616	7,695	7,774	7,853	7,837	7,823
RAZ 88,89: Alexander Island, Spillmans Island Area	29	29	29	29	30	30	30	31	31	31	31	31	32
RAZ 91,92: Bayport Area	56	57	58	59	60	61	62	63	64	65	66	67	68
RAZ 180, 184: Shoal Point Area	43	43	44	44	44	44	45	45	45	45	45	45	45
RAZ 186, 187: Pelican Island Area	80	81	82	83	83	84	85	85	86	86	87	87	87
RAZ 191: Cedar Point Area	5	5	5	5	5	5	5	5	6	6	6	6	6

TABLE 4.1.20-6 (Cont'd)

LABOR FORCE PROJECTIONS, 2005-2025, NO-ACTION ALTERNATIVE
BY MAJOR ECONOMIC SECTOR

Factor /Location	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
RESIDENTS EMPLOYED IN PMSA													
Houston-Galveston-Brazoria CMSA	2,651,419	2,677,538	2,703,658	2,726,707	2,749,756	2,772,806	2,795,855	2,818,904	2,840,998	2,863,092	2,885,185	2,907,279	2,929,373
Chambers County	6,303	6,370	6,438	6,503	6,568	6,634	6,699	6,764	6,830	6,897	6,963	7,029	7,095
Galveston County	92,988	93,914	94,840	95,738	96,635	97,531	98,426	99,320	100,234	101,147	102,058	102,967	103,875
Harris County	1,693,064	1,688,949	1,685,013	1,711,528	1,737,895	1,764,120	1,790,208	1,816,165	1,825,532	1,834,962	1,844,450	1,853,996	1,863,597
Three County Area	1,792,355	1,789,233	1,786,290	1,813,769	1,841,099	1,868,284	1,895,333	1,922,249	1,932,597	1,943,005	1,953,471	1,963,992	1,974,566
RAZ 88,89: Alexander Island, Spillmans Island Area	9,331	9,382	9,433	9,482	9,532	9,581	9,632	9,682	9,735	9,787	9,841	9,894	9,948
RAZ 91,92: Bayport Area	20,080	20,322	20,563	20,802	21,040	21,277	21,514	21,749	21,993	22,236	22,477	22,718	22,958
RAZ 180, 184: Shoal Point Area	10,056	10,078	10,102	10,124	10,147	10,171	10,195	10,220	10,248	10,277	10,306	10,336	10,366
RAZ 186, 187: Pelican Island Area	19,312	19,383	19,456	19,525	19,595	19,666	19,738	19,811	19,890	19,969	20,049	20,130	20,211
RAZ 191: Cedar Point Area	1,887	1,914	1,941	1,967	1,994	2,020	2,046	2,072	2,098	2,124	2,150	2,176	2,202
PMSA WORKFORCE UNEMPLOYED													
Houston-Galveston-Brazoria CMSA	149,804	151,280	152,755	154,058	155,360	156,662	157,964	159,267	160,515	161,763	163,012	164,260	165,508
Chambers County	335	338	342	345	349	352	356	359	363	366	370	373	377
Galveston County	7,020	7,090	7,160	7,228	7,296	7,363	7,431	7,498	7,568	7,636	7,705	7,774	7,842
Harris County	96,003	95,770	95,546	97,050	98,545	100,032	101,511	102,983	103,514	104,049	104,587	105,128	105,673
Three County Area	103,358	103,198	103,048	104,623	106,190	107,748	109,298	110,841	111,445	112,052	112,662	113,275	113,892
RAZ 88,89: Alexander Island, Spillmans Island Area	529	532	535	538	540	543	546	549	552	555	558	561	564
RAZ 91,92: Bayport Area	1,139	1,152	1,166	1,180	1,193	1,206	1,220	1,233	1,247	1,261	1,275	1,288	1,302
RAZ 180, 184: Shoal Point Area	759	761	763	764	766	768	770	772	774	776	778	780	783
RAZ 186, 187: Pelican Island Area	1,458	1,463	1,469	1,474	1,479	1,485	1,490	1,496	1,502	1,508	1,514	1,520	1,526
RAZ 191: Cedar Point Area	100	102	103	104	106	107	109	110	111	113	114	116	117

TABLE 4.1.20-6 (Concluded)

LABOR FORCE PROJECTIONS, 2005-2025, NO-ACTION ALTERNATIVE
BY MAJOR ECONOMIC SECTOR

Factor /Location	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
PROJECTED UNEMPLOYED CONSTRUCTION													
Houston-Galveston-Brazoria CMSA	10,206	10,306	10,407	10,496	10,584	10,673	10,762	10,850	10,935	11,020	11,106	11,191	11,276
Chambers County	17	17	18	18	18	18	18	19	19	19	19	19	19
Galveston County	370	373	377	381	384	388	391	395	398	402	406	409	413
Harris County	6,894	6,877	6,861	6,969	7,076	7,183	7,289	7,395	7,433	7,472	7,510	7,549	7,588
Three County Area	7,281	7,268	7,256	7,367	7,478	7,589	7,699	7,808	7,850	7,893	7,935	7,978	8,020
RAZ 88,89: Alexander Island, Spillmans Island Area	27	28	28	28	28	28	28	28	29	29	29	29	29
RAZ 91,92: Bayport Area	59	60	60	61	62	62	63	64	64	65	66	67	67
RAZ 180, 184: Shoal Point Area	39	39	39	40	40	40	40	40	40	40	40	40	40
RAZ 186, 187: Pelican Island Area	75	76	76	76	77	77	77	77	78	78	78	79	79
RAZ 191: Cedar Point Area	5	5	5	5	5	6	6	6	6	6	6	6	6
PROJECTED UNEMPLOYED TRANSPORTATION													
Houston-Galveston-Brazoria CMSA	10,111	10,211	10,310	10,398	10,486	10,574	10,662	10,750	10,834	10,918	11,003	11,087	11,171
Chambers County	20	20	21	21	21	21	21	22	22	22	22	22	23
Galveston County	438	442	446	451	455	459	463	468	472	476	480	485	489
Harris County	7,351	7,333	7,316	7,431	7,545	7,659	7,772	7,885	7,926	7,967	8,008	8,049	8,091
Three County Area	7,808	7,795	7,783	7,902	8,021	8,139	8,257	8,374	8,419	8,465	8,511	8,556	8,603
RAZ 88,89: Alexander Island, Spillmans Island Area	32	32	32	32	32	33	33	33	33	33	33	34	34
RAZ 91,92: Bayport Area	68	69	70	71	72	72	73	74	75	76	77	77	78
RAZ 180, 184: Shoal Point Area	46	46	46	46	46	46	46	46	46	47	47	47	47
RAZ 186, 187: Pelican Island Area	88	88	88	88	89	89	89	90	90	91	91	91	92
RAZ 191: Cedar Point Area	6	6	6	6	6	6	7	7	7	7	7	7	7

PERCENT BY SECTOR	Construction	Transportation
Houston-Galveston-Brazoria CMSA	6.81%	6.75%
Chambers County	5.17%	6.00%
Galveston County	5.26%	6.23%
Harris County	7.18%	7.66%

Source data:
For counties and regional analysis zone projections: H-GAC, 2001;
For Texas and for 1990 counties: Texas State Data Center, 2001; also Texas Workforce Commission, Labor Market Department, Civilian Labor Force Estimates, Actual Series, 1990-2000.

TABLE 4.1.20-7
PERSONAL INCOME PROJECTIONS, 2000-2025, NO-ACTION ALTERNATIVE
(Current Dollars)

Factor	2000	2005	2010	2015	2020	2025	2000-2025 Change	
							Income	%
Total Personal Income ($ Billions)	$568.1	$762.9	$1,024.1	$1,360.3	$1,823.6	$2,432.2	1,864.1	328.1%
Per Capita Income, Adjusted for Inflaton	$568.1	$677.6	$800.0	$939.3	$1,112.9	$1,311.9	743.8	130.9%
Per Capita Income	$27,798	$34,405	$42,453	$52,540	$65,465	$81,553		
Per Capita Income, Adjusted for Inflaton	$27,798	$30,558	$33,165	$36,278	$39,952	$43,990	16,192	58.2%

Source: Texas Comptroller of Public Accounts, 2000.

Construction and Operations

Under the No-Action Alternative, the project site would likely continue to serve as a DMPA (see Section 2.4.1); therefore, no residential property value effects would be expected.

Traffic

For ease of comparison with noise levels generated under various alternatives, noise levels for residential receptors for the No-Action Alternative are presented in the appropriate impact discussions in Section 4.0. All residential receptors are projected to experience noise levels of 1–3 dBA above current levels by 2025 under the No-Action Alternative, due to increases in traffic volumes from anticipated growth in the area. Thus, by 2025, residential properties within the vicinity of major roadways throughout the region may be expected to have property values 0.2–4.5 percent lower than comparable properties that do not experience similar noise increases. With the No-Action Alternative, there would be no additional traffic noise generated by the project and thus no residential property value effects.

4.1.21 Community Infrastructure and Municipal Services

4.1.21.1 Utilities

With the No-Action alternative, there would be no impacts to public utilities related to the proposed project. Demand on public utilities would grow commensurate with population growth and commercial and industrial development, as discussed in Section 4.1.20.1. Water demand projections have been developed by the TWDB. These are shown for study region counties for both municipal and non-municipal uses in Table 4.1.21-1 (TWDB, 2001). Chambers County uses considerable amounts of water for irrigation, and thus has relatively large non-residential demand relative to municipal demand. In Galveston County, manufacturing uses are significant, while in Harris County, municipal uses are the predominant demand. Regionally, municipal use is expected to increase by 20 percent, while non-municipal uses increase by 10 percent. For municipal demand, average usage is expected to amount to approximately 163 gallons per capita daily, based on TWDB projections for 2000 through 2030.

4.1.21.2 Stormwater and Drainage

With the No-Action alternative, there would be no stormwater and drainage impacts related to the proposed project. The need for stormwater collection facilities and drainage facilities would depend on the location and nature of future growth patterns.

4.1.21.3 Wastewater Collection

With the No-Action alternative, there would be no impacts to wastewater collection related to the proposed project. The need for wastewater facilities would increase commensurate with population growth and commercial and industrial development, as discussed in Section 4.1.20.1 and displayed in Table 4.1.21-1. Wastewater flows are projected at an average of 100 gallons per capita.

TABLE 4.1.21-1

COMMUNITY SERVICE NEEDS PROJECTIONS, 2005-2025, NO-ACTION ALTERNATIVE

Services/Area	2005	2010	2015	2020	2025	2000-2025 Change	
						#	%
Chambers County							
Municipal Water Demand (ac ft)	4,223	4,509	4,886	5,262	5,512	1,289	30.52%
Non-Municipal Water Demand (ac ft)	146,490	144,751	144,305	143,858	143,634	-2,856	-1.95%
Sewer Utility (mgd)	2.6	2.8	3.0	3.3	3.6	0.9	36.17%
Fire Fighters	30.70	33.06	35.68	38.63	41.81	11	36.17%
Police Officers	75	81	88	95	103	27	36.17%
Emergency Vehicles	4	4	4	5	5	1	36.17%
EMS Personnel	49	53	57	62	67	18	36.17%
Hospital Beds	119	128	138	149	162	43	36.17%
Direct Care Physicians	47	50	54	59	64	17	36.17%
Registered Nurses	187	202	218	236	255	68	36.17%
Dentists	13	14	15	17	18	5	36.17%
Teachers	356	384	414	448	485	129	36.17%
Public School Staff	685	738	796	862	933	248	36.17%
Library Books	36,178	38,952	42,042	45,521	49,264	13,085	36.17%
LibraryTotal Items	99,511	107,141	115,640	125,207	135,503	35,992	36.17%
Librarians	2	2	2	3	3	1	36.17%
Other LibraryStaff	4	5	5	5	6	2	36.17%
Library Square Footage	7,972	8,583	9,264	10,031	10,856	2,883	36.17%
Galveston County							
Municipal Water Demand (ac ft)	44,412	46,149	48,391	50,632	53,440	9,028	20.33%
Non-Municipal Water Demand (ac ft)	79,849	82,984	85,399	87,814	90,072	10,223	12.80%
Sewer Utility (mgd)	27.8	29.8	32.0	34.6	37.3	9.5	34.25%
Fire Fighters	325.02	348.43	374.68	404.35	436.32	111	34.25%
Police Officers	798	856	920	993	1,072	273	34.25%
Emergency Vehicles	40	43	46	50	54	14	34.25%
EMS Personnel	521	559	601	648	700	178	34.25%
Hospital Beds	1,257	1,348	1,449	1,564	1,687	430	34.25%
Direct Care Physicians	496	532	572	617	666	170	34.25%
Registered Nurses	1,984	2,127	2,287	2,469	2,664	680	34.25%
Dentists	140	150	162	174	188	48	34.25%
Teachers	3,772	4,044	4,348	4,693	5,064	1,292	34.25%
Public School Staff	7,253	7,775	8,361	9,023	9,737	2,484	34.25%
Library Books	382,993	410,582	441,510	476,471	514,151	131,158	34.25%
LibraryTotal Items	1,053,450	1,129,336	1,214,407	1,310,570	1,414,211	360,761	34.25%
Librarians	23	24	26	28	30	8	34.25%
Other LibraryStaff	44	47	51	55	59	15	34.25%
Library Square Footage	84,395	90,474	97,289	104,993	113,296	28,901	34.25%
Harris County							
Municipal Water Demand (ac ft)	688539.5	720323	760222.5	800122	824256.5	135717	19.71%
Non-Municipal Water Demand (ac ft)	439,903	457,032	471,361	485,689	498,278	58,375	13.27%
Sewer Utility (mgd)	345	365	368	409	433	88	25.58%
Fire Fighters	4,035	4,266	4,309	4,786	5,067	1,032	25.58%
Police Officers	9,909	10,478	10,582	11,753	12,444	2,535	25.58%
Emergency Vehicles	495	524	529	588	622	127	25.58%
EMS Personnel	6,470	6,841	6,909	7,674	8,124	1,655	25.58%

TABLE 4.1.21-1 (Concluded)

COMMUNITY SERVICE NEEDS PROJECTIONS, 2005-2025, NO-ACTION ALTERNATIVE

Services/Area	2005	2010	2015	2020	2025	2000-2025 Change	
						#	%
Hospital Beds	15,603	16,499	16,663	18,508	19,594	3,991	25.58%
Direct Care Physicians	6,158	6,511	6,576	7,304	7,733	1,575	25.58%
Registered Nurses	24,631	26,046	26,304	29,216	30,931	6,300	25.58%
Dentists	1,740	1,840	1,858	2,064	2,185	445	25.58%
Teachers	46,824	49,513	50,004	55,540	58,801	11,977	25.58%
Public School Staff	90,031	95,202	96,145	106,789	113,059	23,028	25.58%
Library Books	4,754,228	5,027,254	5,077,075	5,639,153	5,970,255	1,216,028	25.58%
LibraryTotal Items	13,076,854	13,827,833	13,964,869	15,510,905	16,421,627	3,344,773	25.58%
Librarians	282	298	301	334	354	72	25.58%
Other LibraryStaff	550	581	587	652	690	141	25.58%
Library Square Footage	1,047,621	1,107,784	1,118,762	1,242,619	1,315,579	267,959	25.58%
Three-County Region							
Municipal Water Demand (ac ft)	737,175	770,981	813,499	856,016	883,208	146,034	19.81%
Non-Municipal Water Demand (ac ft)	666,242	684,767	701,064	717,361	731,984	65,742	9.87%
Sewer Utility (mgd)	375	397	403	447	474	99	26.29%
Fire Fighters	4,390	4,648	4,719	5,229	5,545	1,154	26.29%
Police Officers	10,783	11,415	11,590	12,841	13,618	2,835	26.29%
Emergency Vehicles	539	571	579	642	681	142	26.29%
EMS Personnel	7,040	7,453	7,567	8,384	8,891	1,851	26.29%
Hospital Beds	16,979	17,975	18,250	20,221	21,443	4,464	26.29%
Direct Care Physicians	6,701	7,094	7,202	7,980	8,463	1,762	26.29%
Registered Nurses	26,803	28,375	28,809	31,920	33,850	7,047	26.29%
Dentists	1,893	2,004	2,035	2,255	2,391	498	26.29%
Teachers	50,953	53,941	54,766	60,681	64,350	13,397	26.29%
Public School Staff	97,969	103,715	105,302	116,674	123,729	25,760	26.29%
Library Books	5,236,732	5,544,978	5,634,225	6,240,832	6,619,910	1,383,178	26.41%
LibraryTotal Items	14,130,306	14,957,172	15,179,278	16,821,477	17,835,841	3,705,535	26.22%
Librarians	309	327	332	368	390	81	26.36%
Other LibraryStaff	594	629	638	707	750	156	26.22%
Library Square Footage	1,132,016	1,198,258	1,216,051	1,347,612	1,428,876	296,860	26.22%

4.1.21.4 Fire, Police, Emergency Medical Service, and Port Security

Based on the population projections discussed in Section 4.1.20.1, the number of police and fire/EMS personnel and emergency vehicles are projected in Table 4.1.21-1.

A recent study by James Duncan Associates (1998) determined that approximately 1.17 firefighters are required per 1,000 individuals. Based on that standard, the number of firefighters needed for the three-county area are shown for the No-Action alternative.

The number of police officers needed was based on the regional standard of 348 persons per police officer. This is a significantly lower ratio than the current Chambers County ratio, but it is anticipated that over the next 25 years population growth in Chambers County may necessitate a lower ratio than current conditions.

For emergency services, a regional standard of 6,961 persons per emergency vehicle and 533 residents per EMS personnel was used.

Port security measures described in Section 3.20.4.4 would continue at the Texas City port under the No-Action scenario.

An assessment of security risks related to container cargo should be based on the difference between the number of containers that would enter the Houston area without the proposed project (i.e., the No-Build scenario) and the number that would enter the area with the proposed project (i.e., the Build scenario). It is assumed for purposes of this EIS that the demand for container cargo in the Houston area would be market driven and would therefore be the same with or without the proposed project. It is anticipated that without the proposed project, container cargo destined for the Houston area would arrive at a more distant port (e.g., New Orleans), and be transported to the Houston market via truck or rail. While some container cargo that would be transported into or through the Houston area in the Build scenario probably would not enter the area in the No-Build scenario, it is anticipated that this difference would be relatively small, therefore indicating only a slight impact on the risk of security issues such as terrorist actions. In fact, with the new security measures that have been put in place by the WCO, USCG, Homeland Security Agency, and local agencies over the past year, the risk of a successful terrorist action has likely decreased.

4.1.21.5 Hospitals/Medical Services

Based on the population projections discussed in Section 4.1.20.1, the number of hospital beds and medical personnel needed by projected populations are shown in Table 4.1.21-1.

Regional averages were used to estimate future needs for hospital beds (221 residents per bed), direct care physicians (560 persons per physician), registered nurses (140 persons per nurse) and dentists (2,259 residents per dentist, based on Galveston and Harris counties).

4.1.21.6 Schools

Based on the population projections discussed in Section 4.1.20.1, the number of teachers and staff which would be needed to serve school age populations are projected in Table 4.1.21-1. On average, throughout the Houston CMSA, approximately 21.5 percent of the population is enrolled in public school. Based on that percentage of future population growth shown in Table 4.1.20-1 and a student-to-teacher ratio of 15.8 and a student-to-staff ratio of 8.2 (Table 3.20.6-1), the number of school children were projected, along with needed teachers and staff.

4.1.21.7 Libraries

Based on the population projections discussed in Section 4.1.20.1, the number of library resources which would be needed by the future population are projected in Table 4.1.21-1.

4.1.21.8 Parks and Recreation Facilities

Based on the population projections discussed in Section 4.1.20.1, the need for various recreational resources and the acreage of associated parkland is projected in Table 4.1.21-2, using the methodology provided by TPWD (1996). The need for various types of parks and recreational facilities is expected to increase by 29 percent between 2000 and 2025, consistent with population growth. Overall, in the three-county study region, approximately 0.79 acre of various types of parkland uses would be needed for every 100 persons.

4.1.21.9 Streets and Public Transportation

Potential impacts on streets and other transportation facilities are discussed in Section 4.1.2.

4.1.21.10 Impacts on Local Tax Revenues

With the No-Action alternative, the additional local tax revenues related to the project would not enter the region. Governmental revenues for all levels of government are projected in Table 4.1.20-3.

4.2 SHOAL POINT – APPLICANT'S PROPOSED SITE

4.2.1 Air Quality

For this alternative, direct and indirect air quality impacts associated with the construction and operation of the proposed project on Shoal Point were evaluated. Shoal Point is located in Galveston County, Texas, which is included in the HGA. The EPA has determined Galveston County to be in severe nonattainment for the 1-hour ozone air quality standard. Sources in this area are subject to the TNRCC SIP requirements for the control of ozone precursors, NO_x and VOC.

Based on the most recent available air emissions inventory information provided by the EPA, Table 4.2.1-1 provides a summary of emissions for Galveston County. The emissions information

TABLE 4.1.21-2
PARKS AND RECREATIONAL NEEDS, 2000-2025, NO-ACTION ALTERNATIVE
(in acres)

Activity	2000	2005	2010	2015	2020	2025	Change	% Change
Baseball Fields	1,489	1,519	1,608	1,633	1,809	1,919	430	
Basketball Goals	89	91	97	98	109	115	26	
Boat Ramp Lanes Freshwater	177	181	192	195	216	229	51	
Boat Ramp Lanes - Seawater	166	170	180	183	202	215	48	
Campsites	1,431	1,461	1,547	1,570	1,740	1,845	414	
Fishng Structure, Freshwater Linear Yards	59	60	63	64	71	76	17	
Fishing Structure, Seawater Linear Yards	291	297	314	319	354	375	84	
Football Fields	921	940	995	1,010	1,119	1,187	266	
Golf Holes	7,428	7,581	8,025	8,148	9,028	9,574	2,146	
Hiking Trail Miles	1,155	1,179	1,248	1,267	1,404	1,488	334	
Horseback Riding Trail Miles	3,031	3,094	3,275	3,325	3,684	3,907	876	
Lake Acres	0	0	0	0	0	0	0	
ORV Riding Acres	4,177	4,263	4,513	4,583	5,077	5,384	1,207	
Picnic Tables	419	428	453	460	509	540	121	
Playground Areas	376	384	407	413	458	485	109	
Soccer Fields	853	870	921	935	1,036	1,099	246	
Softball Fields	1,512	1,543	1,633	1,658	1,837	1,948	437	
Swimming, Freshwater Sq Yds	380	388	410	417	462	490	110	
Swimming, Seawater Sq Yds	2,519	2,571	2,722	2,764	3,062	3,247	728	
Swimming Pool, Sq Yds	273	278	295	299	332	352	79	
Tennis Courts	345	352	372	378	419	444	100	
Trail Miles	1,958	1,998	2,115	2,148	2,379	2,523	566	
Total	29,049	29,647	31,385	31,866	35,307	37,442	8,393	28.9%

Derived from methodology in TPWD, 1985.

for each pollutant is broken out by area source, non-road mobile, on-road mobile, and point source emissions based on emissions inventory information for 1999. In assimilating data for $PM_{2.5}$ emissions, the EPA database was accessed. As this database appears to provide more current and comprehensive emissions information, the database was used as a basis for emissions information in the EIS. Although this emissions inventory is not current, it is the most recent data available and it provides a relative basis from which to compare the proposed project emissions.

TABLE 4.2.1-1
SUMMARY OF AIR EMISSIONS FOR GALVESTON COUNTY (1999)
BY SOURCE CATEGORY

Air Contaminant	Area (tpy)	Non-Road Mobile (tpy)	On-Road Mobile (tpy)	Point Source (tpy)	Total (tpy)
NO_x	966	88,732	7,363	31,573	128,634
VOC	4,373	5,924	5,343	15,217	30,857
CO	1,741	33,987	42,349	13,901	91,978
SO_2	6	6,489	324	10,470	17,289
PM_{10}	13,615	1,128	273	1,679	16,695
$PM_{2.5}$	2,598	1,038	213	1,198	5,047

-- Not available.
Source: EPA, 2002a.

Air monitoring data in the area of this alternative are limited. Air quality monitoring stations closest to the project site are located in Texas City at 2700½ 13th Avenue North, the corner of 17th and 5th Avenue, and at 2516½ Texas Avenue. Existing localized air quality for the Texas City area based on the data from the Texas City monitoring sites for the monitoring year 2000 is summarized on Table 4.2.1-2.

TABLE 4.2.1-2
SUMMARY OF AIR QUALITY MONITORING VALUES FOR TEXAS CITY
MONITORING YEAR 2000

Air Contaminant	Averaging Period	Highest Monitored Value	NAAQS	% of NAAQS
Ozone	1-hr (ppm)	0.127	0.12	106
Ozone	8-hr (ppm)	0.090	0.08	113
NO_2	Annual (ppm)	--	0.053	--
SO_2	24-hr (ppm)	0.037	0.14	26.4
SO_2	Annual (ppm)	0.004	0.03	13.3
PM_{10}	24-hr ($\mu g/m^3$)	53	150	35.3
PM_{10}	Annual ($\mu g/m^3$)	26.5	50	53.0
$PM_{2.5}$*	24-hr ($\mu g/m^3$)	44.5	65	68.5
$PM_{2.5}$*	Annual ($\mu g/m^3$)	14.56	15	97.1
CO	1-hr (ppm)	--	35	--
CO	8-hr (ppm)	--	9	--

Source: EPA, 2001d; TNRCC, 2001a and 2002h.
-- Not available.
* Available $PM_{2.5}$ monitoring data for 2001 used.

As shown, monitoring of ozone concentrations in the Texas City area indicates ozone levels above the NAAQS. All other pollutants monitored were below the NAAQS.

4.2.1.1 Impacts

The evaluation of air quality impacts associated with the proposed terminal facility at Shoal Point is based on the identification of air contaminants and estimated emission rates for the project (JD Consulting, L.P. (JDC), 2002). Air emissions for this alternative were analyzed for construction and operating emission sources. Emissions inventories were estimated for project-related activities based on the schedule, capacity, and other construction related assumptions provided by the project sponsors. Detailed emissions estimates are contained in the reference document (JDC, 2002).

The construction emission sources included emissions associated with the access to the site, the construction of the terminal itself, and the dredging activities, as follows:

- Access – included the embankment, paving, and employee traffic
- Terminal – included the site preparation, improvements to the yard, wharves, and building
- Dredging – included the berths, turning basis and the channel deepening.

Construction activities associated with the channel deepening would be primarily combustion products from project dredging support and reuse/disposal equipment. Activities at reuse/disposal sites would also involve use of earth-moving equipment, such as bulldozers, loaders, rollers, backhoes, and end-dump trucks.

The estimate of emissions for the construction activities considered the use of appropriate emissions reduction methods, including equipment, operational, and regulatory restrictions. These included:

- Maximum use of electric dredging – to the extent feasible, dredging of the channel would be done with the use of an electric dredge.
- Waterborne construction material delivery.
- Incorporation of controls required by the SIP (approved by the TNRCC on 6 December 2000 and by EPA in October 2001) including speed limit controls, cleaner diesel, and appropriate diesel emissions reductions as provided under Texas Senate Bill 5 which establishes the Texas Emissions Reduction Plan (TERP). SB5 requires the TNRCC to revise the SIP to substitute the TERP for the currently required early purchase of Tier 2 and Tier 3 equipment. The TERP is to be designed to provide sufficient emission reductions to replace the early Tier 2 and Tier 3 equipment.

If the USACE issues a permit for this project, it would be conditioned to include the use of electric dredging of the channel to the maximum extent feasible.

The use of electric dredging would essentially eliminate emissions from the dredging activities on portions of the project area and channel where electric dredging is feasible. Some emissions would still occur at the facilities generating the power required to operate the dredges. However, facilities contributing power to the grid in the Texas City area are permitted, well-controlled sources. The permitting

of such sources is done pursuant to the SIP to ensure that they do not cause or contribute to violations of the NAAQS. In addition, diesel generation equipment would be required to support a portion of the electric dredging operation extending greater than 15,000 linear feet from shore, as the power line connected to the electric dredge cannot be supported beyond that distance. The estimate of emissions was broken down on an annual basis for each year of construction. A summary of these emissions is shown in the reference document (JDC, 2002).

The main source of long-term operations-related emissions will be fuel combustion from container vessels, trucks, and trains associated with this project. Operating emissions for the project were estimated for landside, marine, and terminal activities, as follows:

- Landside – includes air contaminant emissions from trucks, rail, and automobiles
- Marine – includes air emissions from ships, tugs, and harbor vessels (bunkering)
- Terminal – includes air emissions from mobile cranes, hustlers (light diesel), forklifts, maintenance activities, and cleaning/repair activities

Emissions from container vessel calls would be generated by the increased vessel traffic in the form of combustion emissions emitted during vessel transit, maneuvering, and hoteling modes. In addition, tugs would be required to assist the vessels during maneuvering and berthing operations.

Truck trips would be required to handle the container cargo, including trips to the rail yard and truck trips for local deliveries within the HGA. In addition, train trips would be required to handle a portion of the container cargo.

Estimates were provided for the activity of terminal equipment required to handle the containers that will arrive at the proposed container port. These estimates helped define emissions for terminal sources such as forklifts used to load, stack and move containers in the terminal area. Quayside cranes would be electric, hence they would not contribute to air emissions.

Estimates of emissions considered appropriate emissions reduction credits associated with operational parameters and equipment and regulatory requirements, including:

- MARPOL Treaty – Consistent with the provisions of this proposed treaty, ships being built now and in the future under this treaty will use engines designed to produce lower NO_x emissions.
- Low sulfur diesel and truck emissions required by the EPA which would result in reduced NO_x emissions.
- Efficient scheduling.
- SIP controls including speed limit controls, auto inspections, cleaner diesel, and the accelerated purchase of Tier 2/3 equipment.

The operating emissions were calculated on an annual basis for each year of activity from the year 2004 to 2025.

The following is a general discussion of the basis and methodology used to calculate air contaminant emission rates from the project. Detailed emissions summaries and material balances for the project are located in the reference document (JDC, 2002). The basis for emissions included the following:

- Project description as outlined in the "Preliminary Project Description & Environmental Document to Support USACE Permit Application #21979 for the Shoal Point Container Terminal," 11 July 2000, as updated.
- The project construction would be in three phases.
- Emissions controls required by the TNRCC SIP for the HGA, as approved on 6 December 2000, were considered and applied to emissions from various sources.
- Emissions from dredge support operations were estimated based on the dredged material quantities documented in the project description. This consisted of 3 mcy for Phase I, 6.25 mcy for Phase II, and 2.6 mcy for Phase III.
- Mobile emissions were calculated with the use of the EPA Mobile 5b and Part 5 mobile emission factor models.
- Emissions from construction and terminal equipment (operation) were calculated using the EPA NONROAD emission factor model, Version 2.0.0.
- Emissions from oceangoing vessels were calculated based on the methodology outlined in the "Houston-Galveston Area Vessel Emissions Inventory (HGA VEI)," November 2000, Starcrest Consulting Group, LLC. Prepared for the Port of Houston Authority and the TNRCC.
- It was assumed that 80 percent of the containers received at the proposed container port would be delivered within the Houston, Harris County, area.
- Ships were assumed to have diesel, direct-drive propulsion.
- Harbor vessel (tender tugs, pilot vessels, etc.) emissions were estimated assuming that the ratio of VOC and NO_x emissions to ship emissions is the same as documented for 1997 on Table ES-1 of the HGA VEI.
- Bunkering emissions were calculated using an assumed ratio of tow boat emissions to ship emissions. The ratio was calculated by assuming that 10 percent of the tow boat emissions documented in Appendix C of the HGA VEI were due to unit tows involved in bunkering.
- Diesel truck emissions include credit for the 21 December 2000 final EPA emission standards for heavy-duty engine and vehicle and highway diesel fuel sulfur control requirements.
- Container cleaning and repair emissions were estimated assuming the repair of 2 percent of the containers with an average consumption of 2 gallons of paint and 0.2 gallons of solvent per repaired container.
- Terminal maintenance emissions were estimated at 20 percent of the container cleaning and repair emissions.
- The dredging equipment, including any auxiliary dredge equipment, is assumed to be electric. An exception is for dredging the Texas City Channel for the Shoal Point site. A portion of the channel dredging is too far to use an electrical umbilical cord so a diesel generator would be required.

- For determining the emissions which would be considered subject to USACE program responsibility for the SIP Conformity determination, emissions from activities in jurisdictional areas were evaluated for the Shoal Point site. The underlying basis consisted of a construction schedule listing the diesel equipment-hours for specific types of equipment by task and subtask. Specific subtasks were reviewed to determine whether they were subject to USACE program responsibility. Dredging, dredge support, and marginal wharf tasks/subtasks were considered to be 100 percent subject to USACE responsibility. With regard to wetlands associated with the access road, terminal, and yard areas, jurisdictional wetland delineations documented in Appendix A of this document were reviewed to determine the percent of specific subtasks subject to USACE responsibility. Percentages were assigned based on the area of wetlands compared with the total area of land associated with a specific subtask. Building construction was not considered to be subject to USACE program responsibility.

Additional information regarding the basis of emissions is located in the document cited (JDC, 2002).

Pollutant emissions from construction activities may result in short-term impacts on air quality in the immediate vicinity of the project site, including increased levels of particulate matter and vehicular exhaust emissions. As shown on Table 4.2.1-3, construction of the proposed project would result in a relative increase in emissions above those resulting from existing sources in the county. Emissions of NO_x, VOC, CO, and SO_2 (highest during Phase II) are expected to result in a less than one percent increase over existing emissions. Emissions of particulate matter from construction activities may result in increased localized concentrations in the ambient air surrounding the facility. The highest emission rates for PM_{10} and $PM_{2.5}$ emissions for this alternative would occur during Phase III of construction. Construction emissions during other phases of construction would be below these peak levels.

TABLE 4.2.1-3
PEAK ANNUAL CONSTRUCTION EMISSIONS SUMMARY
COMPARISON WITH GALVESTON COUNTY EMISSIONS
SHOAL POINT ALTERNATIVE

Air Contaminant	Maximum Annual Construction Emissions (tpy)	Peak Year	Galveston County Emissions (tpy)	Site Emissions % of Galveston County Emissions
NO_x	58.9	2002	128,634	0.05
VOC	10.1	2006	30,857	0.03
CO	39.3	2006	91,978	0.04
SO_2	31.6	2006	17,289	0.18
PM_{10}	307.6	2013	16,695	1.8
$PM_{2.5}$	41.8	2013	5,048	0.83

The peak annual operating emissions for this alternative were compared with Galveston County emissions as shown on Table 4.2.1-4. As shown on this table, emissions of PM_{10} and $PM_{2.5}$ within the county may increase by less than 1 percent above existing Galveston County emissions. These emissions will be primarily attributable to the combustion of diesel fuel in terminal mobile equipment and

on-site maintenance activities. It is estimated that NO_x, VOC, CO, and SO_2 emissions will also result in a small percent increase (less than 1 percent) over the existing Galveston County emissions. To minimize emissions, terminal sponsors will comply with the requirements of the SIP including low emission diesel and idling restrictions as well as reductions based on diesel fuel sulfur control requirements. Total operating emissions would be expected to contribute less than 1 percent to total emissions for this county.

TABLE 4.2.1-4
COMPARISON OF PEAK ANNUAL ONSITE OPERATING
EMISSIONS WITH GALVESTON COUNTY EMISSIONS
SHOAL POINT ALTERNATIVE

Air Contaminant	Maximum Annual Operating Emissions (tpy)	Peak Year	Galveston County Emissions (tpy)	% of Galveston County Emissions
NO_x	48.8	2006	128,634	0.04
VOC	137.4	2026	30,857	0.45
CO	43.6	2026	91,978	0.05
SO_2	56.1	2026	17,289	0.32
PM_{10}	50.3	2026	16,695	0.30
$PM_{2.5}$*	48.9	2026	5,048	0.97
TOTAL	33.6		285,453	0.12

* $PM_{2.5}$ emissions are a subset of PM_{10} emissions and are not included in emissions total.

Motor vehicle traffic emissions would be greater for this alternative than for the other alternatives (except Pelican Island), because the Shoal Point alternative is farther than the other alternatives from the Houston area, where the bulk of the containers are expected to go. The train trip distances would be longer because of the additional rail segments needed to distribute cargo from this site. Because Shoal Point is closer to the entrance of the Gulf of Mexico, the average ship travel distance would be reduced. As these transportation-related emissions are more regional in nature, they may be compared with emissions from the HGA, as shown on Table 4.2.1-5.

TABLE 4.2.1-5
TRANSPORTATION EMISSIONS SUMMARY OF
SHOAL POINT ALTERNATIVE COMPARED WITH HGA TRANSPORTATION EMISSIONS (1999)

Air Contaminant	Peak Transportation Emissions* During Operation - 2026 (tpy)	HGA Transportation Emissions (tpy)	Transportation Emissions % of HGA Transportation Emissions
NO_x	2,132	295,613	0.7
VOC	319	84,130	0.4
CO	920	593,057	0.2
SO_2	1,407	26,720	5.3
PM_{10}	129	7,697	1.7
$PM_{2.5}$	113.3	6,363	1.8

* Transportation emissions would peak after full build-out in 2026.

Because these are non-stationary sources, and because the background concentrations (except for ozone) in the project area are well below the NAAQS, it is expected that ambient air contaminant concentrations for PM_{10}, CO, and SO_2 would not be large enough to cause or contribute to an exceedance of an ambient air quality standard in this region, although localized SO_2 and PM_{10} concentrations may increase. VOC and NO_x emissions from the operation of container terminals, ocean-going vessels, mobile emissions, and associated activities are also included in the inventory for the SIP. These pollutants are not expected to impede attainment of the ozone standard in the HGA. In addition, because of the distance and prevailing southeast winds, emissions from this alternative would not be expected to have a major impact on the nearest Class I air quality areas described in Section 3.1.3.

4.2.1.2 State Implementation Plan (SIP) Conformity Review

For comparison with the thresholds defined in the General Conformity Rule as discussed in Section 3.1.1, the emissions from the portion of the construction activities subject to USACE responsibility for this alternative location are summarized on Table 4.2.1-6 below for each phase of the project:

TABLE 4.2.1-6
SUMMARY OF MAXIMUM ANNUAL CONSTRUCTION EMISSIONS
SUBJECT TO USACE RESPONSIBILITY

Air Contaminant	Phase I (tpy)	Phase II (tpy)	Phase III (tpy)
NO_x	26.7	46.2	9.2
VOC	2.9	8.9	1.8
CO	17.2	34.9	12.3
SO_2	8.9	27.8	7.6
PM_{10}	27.9	15.5	12.1
$PM_{2.5}$	4.9	4.3	2.2

For this alternative, the NO_x emissions for Phase I and Phase II of the project construction emissions would exceed the 25 tpy emission rate for requiring a General Conformity Determination. Under this alternative, emissions of NO_x from Phase I and Phase II would account for approximately 0.3 and 0.5 percent, respectively, of the construction budget in the SIP (8,827.5 tpy) based on the Post-1999 Rate of Progress and Attainment Demonstration SIP approved by the EPA in October 2001. Based on previous discussions with the TNRCC and EPA, it is likely they would determine that the project construction emissions at this site would be included in the recently approved Attainment SIP.

For Phase III, the VOC and NO_x emissions for project construction emissions would not exceed the 25 tpy rates for requiring a General Conformity Determination. As the emissions from each phase of the project would be less than an increase of 10 percent of the VOC and NO_x emissions SIP inventories for the entire nonattainment area, the project would not be regionally significant for purposes of General Conformity.

Because 1) the project construction emissions during Phase III would be exempt from the General Conformity Rule, 2) emissions during Phase I and II are expected to be accounted for in the SIP, and 3) the project is not regionally significant, emissions from the project construction should not:

- cause or contribute to any new violation of any of the NAAQS in the project area;
- increase the frequency or severity of any existing violation of any NAAQS in the project area; or
- delay timely attainment of the NAAQS or any required interim emission reduction in the project area.

The TNRCC has confirmed that emissions from this alternative would comply with the requirements of the General Conformity Rule and would be in conformity with the Texas SIP (see TNRCC letter dated September 9, 2002, in Appendix H-9).

The TNRCC staff has indicated that the proposed Shoal Point Container Terminal construction project (using electric dredging) is not unusual in scope for an area like the HGA. In addition, it has provided conditional certification by letter dated September 9, 2002 (see Appendix H-9), that the project construction emissions are included in the previously approved SIP and the recent Attainment SIP. As the SIP is intended to demonstrate attainment with the ozone standard during the years 2005, 2006, and 2007, the TNRCC has requested by letter dated March 18, 2002 (see Appendix J-1), that:

1. The applicant commit to a contract requirement requesting all contractors to make an attempt at securing equipment not currently available on the market that would reduce emissions of NO_x. This equipment, once available, could be purchased through a grant appropriated under Texas Senate Bill 5, recently passed by the State Legislature to encourage the use of innovative technology to reduce emissions.
2. The sponsors commit that the portion of dredging that requires a diesel generator to complete be carried out only during the October 31 to April 1 time-frame of each year (i.e., the time of the year when ozone production is less sensitive to NO_x emissions.
3. The sponsors commit to require all future tenants and users of the Shoal Point facilities to utilize Best Management Practices (BMPs) and implement the latest technology possible.

In response to the TNRCC's request, the Shoal Point Container Terminal project sponsors (City of Texas City) and the investors (Texas City International Terminal) have committed to the following:

1. To maximize shore-powered electric dredging during the construction of the project and utilize diesel generator-powered dredging only as necessary and only between the October 31 to April 1 time frame of each year.
2. To require the use of low-NO_x emissions technology on land-based diesel construction equipment. Construction contracts governing work occurring in calendar year 2005 and beyond will include language to require Tier 2/Tier 3 diesel equipment and add-on NO_x control technologies, or more stringent requirements that might be in place at the time of construction. Contract documents will also require contractors to apply for the SB5 grant (or equivalent) to modify or purchase diesel equipment with low-NO_x diesel emissions technology. Compliance with this requirement and/or efforts to seek other funding for this purpose and/or efforts to reduce NO_x emissions by other technologies or methodologies will be used as evaluation criteria in selecting contractors.
3. To direct through language contained in lease agreements or other contractual documents, all owners, tenants, and/or operators of the Shoal Point facilities to

exercise BMPs relative to complying with the National Air Quality Standards and implementing the latest NO_x control technologies. A list of BMPs proposed for implementation by TCIT is attached to the City of Texas City letter in Appendix H-9. More BMPs that may be available from other terminal operators or that may be developed in the future may be added.

Based on the TNRCC's preliminary comment letter, the TNRCC will provide a positive General Conformity Determination if these commitments are found to be satisfactory.

4.2.2 Roadway Traffic Impact Analysis

This section presents analyses for the unsignalized intersections, signalized intersections, and major corridors that would potentially be affected by construction of the proposed project at the applicant's proposed site. The traffic impact analysis was conducted for the years 2001, 2005, 2015, and 2025. Existing conditions are represented by the 2001 traffic information. The following sections describe the potential impacts of the proposed project in terms of the differences in traffic LOS between the No-Build and Build conditions for the Shoal Point alternative.

The applicant's proposed alternative is located on Shoal Point, a DMPA on Lower Galveston Bay in Texas City. A four-traffic-lane road with shoulders would be constructed as the landside access corridor to connect the proposed terminal on Shoal Point to the existing traffic infrastructure network. The access corridor would tie into Loop 197 approximately 0.7 mile south of the Loop 197 at FM 519 intersection. The main corridors potentially affected by this alternative would be IH 45, SH 225, and SH 146. Major and minor intersections potentially affected by the proposed project at Shoal Point are listed in Section 3.2.2 and below in Section 4.3.2.2.

Due to concerns expressed by area residents during the scoping process for this EIS, additional analyses were performed for the Shoal Point site to address railroad crossing impacts, traffic issues at the IH 45/SH 6 Interchange, potential impacts of the project on hurricane evacuation, construction traffic, and traffic safety. These topics, in addition to the intersection and main corridor analyses, are discussed in the following sections.

4.2.2.1 Container Distribution

The major corridors and other transportation facilities by which container cargo is expected to be distributed to and from the market are indicated in Table 4.2.2-1. The percentage of container traffic expected to use each corridor in the years 2005, 2015, and 2025 is provided in the table. The anticipated distribution of traffic is based on the results of modeling performed by H-GAC.

Intermodal distribution involves transportation by more than one form of carrier during a single journey (e.g., truck and rail). The H-GAC EMME-2 model runs were based on the estimate of an 80/20 intermodal split in 2025. This means 80 percent of the container traffic would travel by highway and 20 percent of the container traffic would travel by rail in the year 2025. In the early phases of the project, intermodal traffic is expected to utilize existing intermodal rail facilities in the Houston area and at Barbours Cut (see Figure 3.2.2-1). Truck traffic carrying this cargo would travel between the container

terminal and the intermodal facilities on major roadway corridors (e.g., IH 45 and SH 146). Therefore, the percentage distribution of traffic on these corridors is higher in 2005 and 2015. By 2025, a new intermodal facility is expected to be available near the proposed container terminal, as indicated by the container distribution information in Table 4.2.2-1 (i.e., lower percentages of traffic are expected on IH 45 and SH 146 in 2025).

TABLE 4.2.2-1
CONTAINER DISTRIBUTION

Corridor	Distribution (% of Container Traffic) 2005	2015	2025
IH 45	50	48	42
SH 146	39	42	28
SH 6	2	2	2
SH 3	3	3	3
New Intermodal Railway Facility	0	0	20
Other routes	6	6	5

As indicated by Table 4.2.2-1, IH 45 is projected to be the primary corridor used, representing 50, 48, and 42 percent of the container terminal traffic for years 2005, 2015, and 2025, respectively. SH 146 would carry 39, 42, and 28 percent of the container terminal traffic for years 2005, 2015, and 2025, respectively. SH 6, SH 3, and other roadways would carry the remaining container traffic.

Table 4.2.2-2 summarizes the projected truck movement for the proposed project by presenting the total daily truck volume (highway and intermodal) for each phase of construction. The data in Table 4.2.2-2 indicate the number of daily truck trips that would be generated by the container terminal during each phase year. The definition of a trip, according to the Institute of Transportation Engineers Trip Generation Manual (3rd Edition, 1997), is a single or one-direction vehicle movement with either the origin or the destination (exiting or entering) inside a study site. The truck trip volumes are important because they directly affect the transportation network. Over 10,000 daily truck trips are expected to be generated in 2025 by the proposed container terminal. Table 4.2.2-2 is derived from the Shoal Point traffic movement spreadsheet developed by Berger/Abam Engineering. The spreadsheet can be found in Appendix C.

TABLE 4.2.2-2
DAILY TRUCK MOVEMENT SUMMARY

Phase of Operation	Year	Total Daily Truck Trips (Highway and Intermodal)
Phase I (first full year)	2005	2,234
Phase II (at capacity)	2015	3,723
Phase III (ultimate design)	2025	10,350

4.2.2.2 Intersection Analysis

Intersection analysis is typically based on seconds of delay and presented in terms of LOS. The delay values represent the average stopped delay per vehicle during an analysis period of 15 minutes. The LOS criteria are defined in Section 3.2.2.

Table 4.2.2-3 exhibits the LOS for Build and No-Build scenarios for each major and minor intersection potentially impacted by the proposed project at the Shoal Point site for existing conditions (2001) and for the years 2005, 2015, and 2025. Existing (2001) conditions are displayed on Figure 4.2.2-1 and 2025 projected conditions are displayed on Figure 4.2.2-2. The intersection Synchro output data is included in the traffic study document that supports this analysis (PBS&J, 2001).

As indicated by the information presented in Table 4.2.2-3 and Figure 4.2.2-1 for existing conditions, the only intersection near the Shoal Point area that currently has a poor LOS is SH 146 at Red Bluff Road, with an LOS of E. The overall existing intersection LOS is B in 2001, which is a good LOS.

Based on the results of the traffic analysis, in the year 2005 (Phase I of the proposed project) an overall LOS of C would be anticipated on the existing at-grade intersection transportation network in the vicinity of Shoal Point. As indicated in Table 4.2.2-3, this LOS can be expected with or without the proposed project. Normal growth anticipated for the area and factored into the model (i.e., the No-Build data presented in Table 4.2.2-3) would generate traffic levels at the intersections evaluated, resulting in the delays indicated in the table. The incremental impact of the additional traffic generated by the proposed container terminal is represented by the differences in delays or LOS between the Build and No-Build scenarios. In 2005, the differences in delays between the Build and No-Build scenarios would generally be small, with the largest difference being 8 seconds of delay. This level of difference may or may not be enough to change the LOS to the next level, depending on the type of intersection (signalized or two-way stopped controlled) and the LOS criteria (as defined in Section 3.2.2). In 2005, the SH 146 at Red Bluff intersection would go from its current LOS of E to an LOS of F in either the Build or No-Build scenario. The SH 146 at NASA Road 1 intersection would go from its current LOS of D to an LOS of E in 2005. The additional traffic generated by the proposed container terminal in 2005 would change the SH 3 at Loop 197 and SH 146 at El Mar intersections by one LOS, from B in the No-Build scenario to C in the Build scenario.

As indicated in Table 4.2.2-3, in the year 2015 (during Phase II of the proposed project) an overall LOS of D would be expected on the intersection transportation network under both the Build and No-Build scenarios. SH 146 at NASA Road 1 and SH 146 at Red Bluff intersections would each have an F LOS in 2015 under either the Build or No-Build scenarios. The SH 146 at Shoreacres intersection would have an LOS of E in 2015. As discussed above, the poor LOS would not be solely due to the container terminal. The traffic generated by the normal growth of the region would be the primary reason for the poor LOS. Table 4.2.2-3 reveals that the LOS for some of the Build and No-Build intersections in Phase II would not be the same. The largest difference between Build and No-Build intersection LOS is 24 seconds of delay. The additional traffic generated by the proposed container terminal would change the SH 3 at Loop 197 intersection by two levels of service (from B in the No-Build scenario to D in the Build Scenario) in 2015. The impact of the container terminal would also change the SH 146 at El Mar

TABLE 4.2.2-3

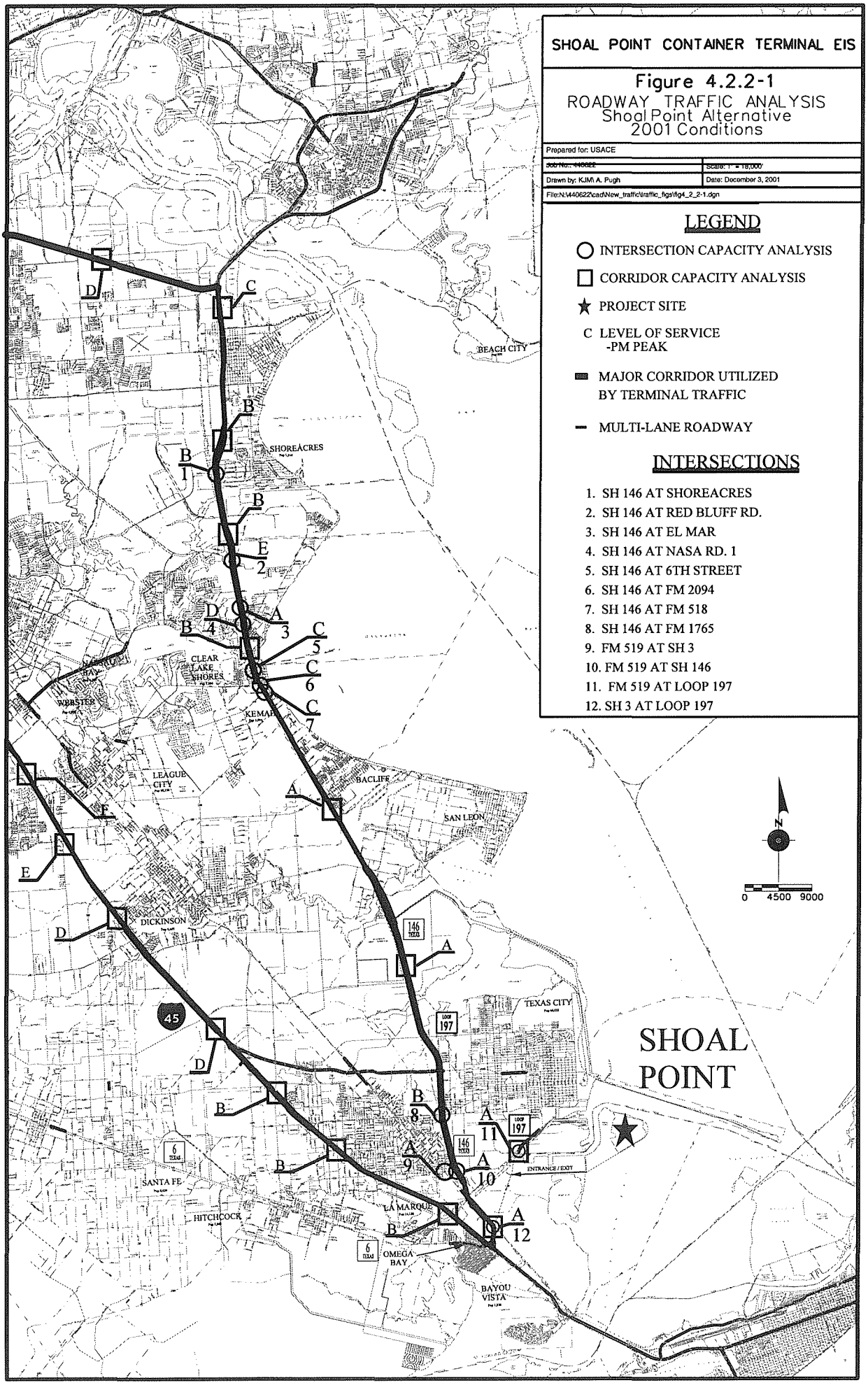
SHOAL POINT INTERSECTION TRAFFIC ANALYSIS

Major Intersections	Year 2001 Existing		Year 2005 Build		Year 2005 No Build		Year 2015 Build		Year 2015 No Build		Year 2025 Build		Year 2025 No Build	
	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)
FM 519 at Loop 197	A	5	A	10	A	8	B	14	B	12	B	19	B	14
FM 519 at SH 3	A	8	A	9	A	8	A	9	A	9	A	9	A	9
FM 519 at SH 146	A	8	A	10	A	9	C	16	B	11	C	25	B	15
SH 146 at FM 1765	B	14	C	30	C	25	D	45	D	35	E	67	D	49
SH 3 at Loop 197	A	10	C	22	B	14	D	40	B	16	E	60	B	18
SH 146 at NASA Rd 1	D	38	**E**	**58**	**E**	**55**	**F**	**92**	**F**	**81**	**F**	**129**	**F**	**128**

Minor Intersections	Year 2001 Existing		Year 2005 Build		Year 2005 No Build		Year 2015 Build		Year 2015 No Build		Year 2025 Build		Year 2025 No Build	
	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)
SH 146 at FM 2094	C	21	C	27	C	24	C	35	C	30	D	40	D	39
SH 146 at 6th Street	C	27	D	40	D	35	**E**	**70**	**E**	**55**	**F**	**93**	**F**	**81**
SH 146 at FM 518	C	20	C	35	C	27	D	55	D	42	E	**76**	E	**68**
SH 146 at El Mar	A	7	C	19	B	12	D	38	C	20	D	45	C	28
SH 146 at Red Bluff Rd.	**E**	**71**	**F**	**82**	**F**	**81**	**F**	**126**	**F**	**120**	**F**	**161**	**F**	**160**
SH 146 at Shoreacres	B	11	C	33	C	25	**E**	**70**	**E**	**55**	**F**	**94**	**F**	**85**
Overall Level of Service	B		C		C		D		D		**E**		**E**	

- Change in Level of Service

BOLD - Poor Level of Service


SHOAL POINT CONTAINER TERMINAL EIS
Figure 4.2.2-1
ROADWAY TRAFFIC ANALYSIS
Shoal Point Alternative
2001 Conditions
Prepared for: USACE
Job No.: 440622
Scale: 1" = 18,000'
Drawn by: KJM/ A. Pugh
Date: December 3, 2001
File:N:\440622\cad\New_traffic\traffic_figs\fig4_2_2-1.dgn
LEGEND
INTERSECTION CAPACITY ANALYSIS
CORRIDOR CAPACITY ANALYSIS
PROJECT SITE
C LEVEL OF SERVICE -PM PEAK
MAJOR CORRIDOR UTILIZED BY TERMINAL TRAFFIC
MULTI-LANE ROADWAY
INTERSECTIONS
1. SH 146 AT SHOREACRES
2. SH 146 AT RED BLUFF RD.
3. SH 146 AT EL MAR
4. SH 146 AT NASA RD. 1
5. SH 146 AT 6TH STREET
6. SH 146 AT FM 2094
7. SH 146 AT FM 518
8. SH 146 AT FM 1765
9. FM 519 AT SH 3
10. FM 519 AT SH 146
11. FM 519 AT LOOP 197
12. SH 3 AT LOOP 197
BEACH CITY
SHOREACRES
CLEAR LAKE SHORES
WEBSTER
KEMAH
LEAGUE CITY
BACLIFF
SAN LEON
DICKINSON
TEXAS CITY
SHOAL POINT
SANTA FE
HITCHCOCK
LA MARQUE
OMEGA BAY
BAYOU VISTA
ENTRANCE / EXIT
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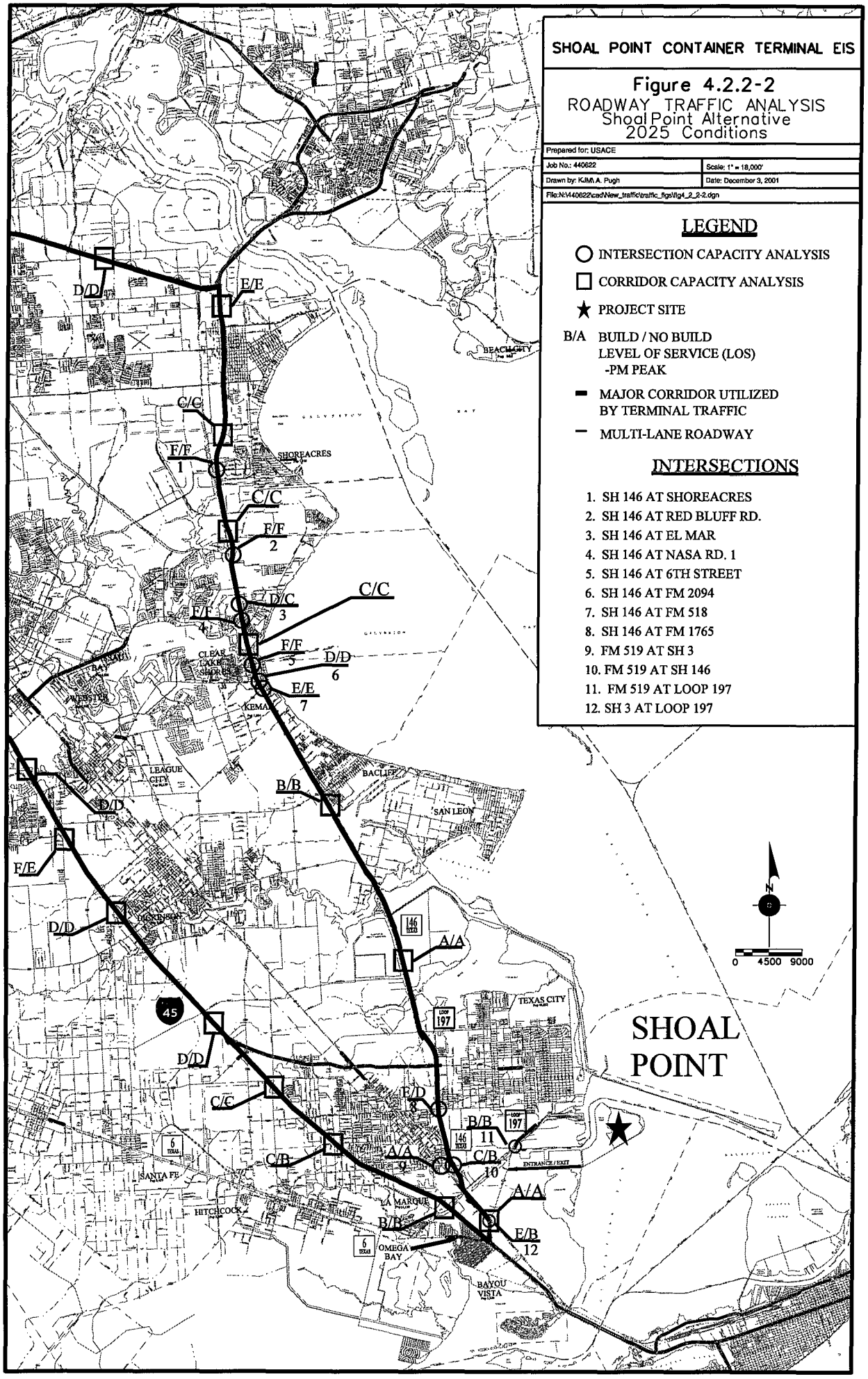

SHOAL POINT CONTAINER TERMINAL EIS
Figure 4.2.2-2
ROADWAY TRAFFIC ANALYSIS
Shoal Point Alternative
2025 Conditions
Prepared for: USACE
Job No.: 440622
Scale: 1" = 18,000'
Drawn by: KJM/A. Pugh
Date: December 3, 2001
File:N:\440622\cad\New_traffic\traffic_figs\fig4_2_2-2.dgn
LEGEND
INTERSECTION CAPACITY ANALYSIS
CORRIDOR CAPACITY ANALYSIS
PROJECT SITE
B/A BUILD / NO BUILD LEVEL OF SERVICE (LOS) -PM PEAK
MAJOR CORRIDOR UTILIZED BY TERMINAL TRAFFIC
MULTI-LANE ROADWAY
INTERSECTIONS
1. SH 146 AT SHOREACRES
2. SH 146 AT RED BLUFF RD.
3. SH 146 AT EL MAR
4. SH 146 AT NASA RD. 1
5. SH 146 AT 6TH STREET
6. SH 146 AT FM 2094
7. SH 146 AT FM 518
8. SH 146 AT FM 1765
9. FM 519 AT SH 3
10. FM 519 AT SH 146
11. FM 519 AT LOOP 197
12. SH 3 AT LOOP 197
SHOAL POINT
ENTRANCE / EXIT
0 4500 9000
N
BEACHCITY
SHOREACRES
CLEAR LAKE SHORES
KEMAH
BACLIFF
SAN LEON
LEAGUE CITY
MORGANS POINT
TEXAS CITY
SANTA FE
HITCHCOCK
LA MARQUE
OMEGA BAY
BAYOU VISTA
146 TEXAS
LOOP 197
45
6 TEXAS

and FM 519 at SH 146 intersections by one LOS (see Table 4.2.2-3). The overall LOS under the Build and No-Build scenarios would be D in 2015.

Results presented in Table 4.2.2-3 for the year 2025 (during Phase III of the proposed project) indicate that an overall LOS of E would be anticipated on the intersection transportation network in the vicinity of Shoal Point. In this time frame, portions of the intersection transportation network capacity would be exceeded, primarily as a result of normal growth. For most of the intersections in the vicinity of Shoal Point, the impact of the terminal would be small enough that the LOS would not change relative to the No-Build scenario. The impact of the terminal would change the SH 3 at Loop 197 intersection by three levels of service in 2025 (from B in the No-Build scenario to E in the Build scenario). Delays at this intersection would differ by 42 seconds between the Build and No-Build scenarios. The impact of the terminal would also change the FM 519 at SH 146, SH 146 at FM 1765, and SH 146 at El Mar intersections by one LOS in 2025. In the case of the SH 146 at FM 1765 intersection, the LOS would drop to E, a poor LOS. An LOS of F is expected at four intersections under either the Build or No-Build scenario in 2025 (see Table 4.2.2-3 and Figure 4.2.2-2). The overall LOS under the Build and No-Build scenarios would be E in 2025.

Proposed intersection improvements that would be needed to accommodate normal growth and the proposed Shoal Point Container Terminal project are discussed below in Section 4.2.2.4.

4.2.2.3 Main Corridor Analysis

The main corridor analysis is based on density. Density is derived from ADT (Average Daily Traffic), which represents bi-directional daily traffic volumes. Density is the number of vehicles occupying a given length of a lane or roadway at a particular instant. Density is averaged over time and is expressed as passenger cars per mile per lane (pc/mi/ln). The analysis results are presented in terms of LOS (defined in Section 3.2.2).

Table 4.2.2-4 exhibits the LOS for Build and No-Build scenarios for each main corridor potentially impacted by the proposed project at the Shoal Point site for existing conditions (2001) and for the years 2005, 2015, and 2025. Existing (2001) conditions are displayed on Figure 4.2.2-1, and 2025 projected conditions are displayed on Figure 4.2.2-2. The HCS main corridor analysis, which accounts for future improvements according to H-GAC, is described below and further documented in PBS&J, 2001. The list of future improvements is included below in Section 4.2.2.4.

The existing conditions for the freeway transportation network surrounding the Shoal Point area can be seen in Table 4.2.2-4 and Figure 4.2.2-1 which show LOS ranges for the various freeway sections analyzed. Currently, the IH 45 segment between Beltway 8 and FM 646 and the SH 225 segment between Beltway 8 and Center Road have a poor LOS. Overall, the existing condition of the freeway system in 2001 is adequate in the vicinity of the project.

According to Table 4.2.2-4, in the year 2005 (during Phase I of the proposed project) the LOS would range from A to F on the existing main corridor freeway network under the Build as well as the No-Build scenarios. The existing infrastructure can accommodate the additional traffic generated by

TABLE 4.2.2-4. SHOAL POINT FREEWAY LEVEL OF SERVICE (LOS) ANALYSIS

Option	Roadway	Limits	Year 2001			Year 2005			Year 2015			Year 2025		
			ADT	Density	LOS	ADT	Density	LOS	ADT	Density	LOS	ADT	Density	LOS
No-Build	IH 45	Beltway 8 to FM 2351	203,913	*	*F*	214,146	*	*F*	232,834	38.5	*E*	262,171	56.8	*F*
		FM 2351 to Nasa Road 1	157,680	*	*F*	160,321	*	*F*	175,134	25.2	D	187,142	27.2	D
		Nasa Road 1 to FM 518	155,520	*	*F*	159,542	*	*F*	173,112	24.8	D	183,115	26.5	D
		FM 518 to FM 646	104,760	32.7	*E*	122,154	45.3	*F*	142,362	33.2	*E*	160,145	42.4	*F*
		FM 646 to FM 517	83,428	24.7	D	97,664	29.6	D	116,158	25.4	D	122,164	27.0	D
		FM 517 to FM 1764	82,080	24.2	D	93,121	27.9	D	107,764	23.4	C	118,631	26.1	D
		FM 1764 to FM 1765	55,080	16.0	B	60,821	17.7	C	70,124	14.9	B	77,096	16.4	C
		FM 1765 to FM 519	52,920	15.4	B	59,245	17.2	C	66,172	14.1	B	73,504	15.6	B
		FM 519 to State Highway 6	46,440	13.5	B	51,771	15.0	B	57,273	12.2	B	65,728	14.0	B
	SH 225	Beltway 8 to Center Road	111,080	36.1	*E*	122,191	27.0	D	131,524	29.5	D	142,823	33.4	*E*
		Center Road to SH 146	90,700	27.0	D	95,062	20.5	C	105,019	22.8	C	112,986	24.7	D
	SH 146	SH 225 to Shoreacres	73,880	21.7	C	84,108	24.9	D	96,612	29.2	D	112,354	36.9	*E*
		Shoreacres to Port Road	44,112	12.8	B	48,523	14.1	B	58,227	17.1	C	69,873	20.4	C
		Port Road to Red Bluff	39,252	11.4	B	43,177	12.6	B	51,740	15.1	B	66,489	19.5	C
		Red Bluff to FM 518	34,980	10.1	B	38,478	11.2	B	46,173	13.4	B	55,408	16.1	C
		FM 518 to FM 517	23,100	6.7	A	25,410	7.4	A	30,492	8.9	A	36,590	10.7	B
		FM 517 to Loop 197	17,490	5.1	A	19,239	5.6	A	23,011	6.7	A	27,704	8.1	A
		Loop 197 to FM 519	15,264	4.4	A	16,790	4.9	A	20,148	5.9	A	24,178	7.0	A
Build	IH 45	Beltway 8 to FM 2351	Not Applicable			216,106	*	*F*	234,701	39.5	*E*	266,601	62.1	*F*
		FM 2351 to Nasa Road 1				163,141	*	*F*	177,158	25.5	D	191,472	28.0	D
		Nasa Road 1 to FM 518				160,941	*	*F*	175,181	25.2	D	187,112	27.2	D
		FM 518 to FM 646				124,111	47.7	*F*	144,781	34.1	*E*	164,710	46.1	*F*
		FM 646 to FM 517				98,902	30.1	D	117,982	25.9	D	126,871	28.2	D
		FM 517 to FM 1764				94,984	28.6	D	109,101	23.8	C	124,012	27.5	D
		FM 1764 to FM 1765				62,174	18.0	C	72,174	15.4	B	81,012	17.3	C
		FM 1765 to FM 519				60,870	17.7	C	68,704	14.6	B	76,179	16.2	C
		FM 519 to State Highway 6				53,771	15.6	B	59,210	12.6	B	69,124	14.7	B
	SH 225	Beltway 8 to Center Road				123,100	27.2	D	132,200	29.8	D	144,820	34.1	*E*
		Center Road to SH 146				95,962	20.7	C	105,900	23.0	C	114,210	25.0	D
	SH 146	SH 225 to Shoreacres				85,948	25.2	D	98,752	30.1	D	116,354	39.7	*E*
		Shoreacres to Port Road				49,363	14.4	B	59,367	17.3	C	72,873	21.5	C
		Port Road to Red Bluff				44,017	12.8	B	52,880	15.4	B	69,489	20.2	C
		Red Bluff to FM 518				39,718	11.4	B	47,913	13.9	B	58,908	17.2	C
		FM 518 to FM 517				26,850	7.8	A	32,132	9.3	A	39,890	11.6	B
		FM 517 to Loop 197				20,879	6.1	A	24,851	7.2	A	31,204	9.1	A
		Loop 197 to FM 519				17,930	5.2	A	21,788	6.3	A	27,978	8.1	A

Year 2001: Analysis based on TxDOT Provided ADT and Existing Geometry
Years 2005, 2015, and 2025: Analysis based on H-GAC Model Traffic and Geometry
No-Build: Existing Traffic Generators
Build: Existing Traffic Generators and Terminal Operation

Peak Hour Factor: 0.90
K factor: 10
Directional Distribution: 50-50
Percent Truck Traffic: 10%

ADT: Average Daily Traffic (Bi-directional Daily Traffic Volume)
Density: Passenger Cars per Mile per Lane
LOS: Level of Service (Qualitative Measure of Effectiveness)
- Change in Level of Service
ITALICS - Poor Level of Service
* - Density out of range

normal growth and the Shoal Point Container Terminal project during Phase I, except along IH 45 from Beltway 8 to FM 646. This roadway section has a poor LOS under current (2001) conditions and would continue to experience poor conditions primarily because of the normal growth anticipated in the region. The difference between Build and No-Build freeway LOS in Phase I would be relatively small, as indicated by the ADT and density values presented in Table 4.2.2-4. The impact of the container terminal would not result in a change in LOS over the No-Build conditions in 2005.

As indicated in Table 4.2.2-4, in the year 2015 (during Phase II of the proposed project), the LOS would range from A to E on the existing main corridor freeway network under both the Build and No-Build scenarios. The LOS for the main corridors potentially affected by the proposed terminal are shown in Table 4.2.2-4. Phase II of the Shoal Point Container Terminal would introduce traffic onto a transportation network that is already at capacity caused by normal growth in the area. To accommodate the anticipated traffic levels, infrastructure improvements would need to be constructed prior to 2015. The specific improvement projects planned and included in the model are indicated in Table 4.2.2-5. Even with these improvements, the freeway sections of IH 45 between Beltway 8 and FM 2351 and between FM 518 and FM 646 are both projected to have a poor LOS in 2015 under the Build and No-Build scenarios. The traffic generated by the normal growth of the region is the primary reason for the poor LOS on these facilities. The analysis indicates that the impact of the container terminal would not result in a change in LOS over the No-Build conditions in 2015.

According to Table 4.2.2-4, in the year 2025 (during Phase III of the proposed project) the LOS would range from B to F on the existing main corridor freeway network under the Build and No-Build scenarios. The LOS for the main corridors potentially affected by the proposed terminal are shown in Table 4.2.2-4 and on Figure 4.2.2-2. The impact on the main freeway corridor network between the Build and No-Build scenarios is relatively small. The normal growth of the region is the primary contributing factor to the change in the LOS. The freeway sections that would have a poor LOS in 2025 are along IH 45 between Beltway 8 and FM 2351, IH 45 between FM 518 and FM 646, SH 225 between Beltway 8 and Center Road, and SH 146 between SH 225 and Shoreacres. Building the terminal would change the LOS along IH 45 between FM 1765 and FM 519 from a B to a C, and along IH 45 between FM 518 and FM 646 from an E to an F. The build density on the latter segment would be 46 pc/mi/ln, which is near the threshold of an E LOS. An E LOS threshold is a density of 45 pc/mi/ln. Therefore, densities projected for the Build and No-Build scenarios are relatively close.

4.2.2.4 Proposed Intersection and Roadway Improvements

Prior to the construction of Phase II, intersection rebuilding, road expansions, new signal timings, and other improvements would have to be undertaken to accommodate traffic generated by normal growth and the Shoal Point Container Terminal. These improvements would be needed primarily to accommodate the normal growth of the region. At a minimum, the specific projects listed in Table 4.2.2-5 would need to be implemented. Table 4.2.2-5 lists the specific projects scheduled for improving the Texas City area according to the 2022 Metropolitan Transportation Plan (MTP). The information presented in this table was obtained from H-GAC on June 25, 2001 (see original H-GAC spreadsheet in Appendix C).

TABLE 4.2.2-5

2022 MTP - PROPOSED TRANSPORTATION IMPROVEMENTS IN TEXAS CITY AREA

Roadway	From Location	To Location	Project Description	Cost	Approx. Let Date	Lead Agency
IH 45 S	FM 517	FM 1764	Widen to 8 main lanes with two 2 lane frontage roads	$44,870,000	9/1/10	TxDOT
IH 45 S	FM 519	Texas City Wye	Widen to 8 main lanes with two 2 lane frontage roads	$27,240,000	8/1/10	TxDOT
IH 45 S	Texas City Wye	Intersection	Reconstruct IH 45/SH 3/SH 6 Interchange	$70,000,000	8/1/10	TxDOT
IH 45 S	FM 1764	FM 519	Widen to 8 main lanes with two 2 lane frontage roads	$47,710,000	8/1/10	TxDOT
SH 146	Harris County Line	SH 6 / IH 45	Widen & Upgrade to 6 lane divided	$150,000,000	8/1/08	TxDOT
SH 146	FM 519	TCT RR	Const. RR O/P & Widen to 6 lane	$6,400,000	6/1/02	TxDOT
SH 146	Loop 197	Intersection	Construct grade separation	Unknown	Not Available	TxDOT
SH 146*	Fairmont Parkway	Red Bluff Road	Widen to 6 main lanes	$16,000,000	1/1/08	TxDOT/ Texas City
SH 146*	Red Bluff Road	NASA 1	Upgrade Existing roadway to 6 lanes divided	$20,000,000	1/1/08	TxDOT
SH 146*	NASA Road 1	Gal C/L	Widen & Upgrade to 6 lane divided	$10,000,000	Not Available	TxDOT
SH 3	North County Line of Texas City	FM 1764	Reconstruct & Widen to 4 main lanes divided Raised Median	$6,733,000	4/1/01	TxDOT
SH 146*	Dickinson Bayou	Bridge	Construct 2-lane frontage road bridge on the West side	Unknown	Not Available	TxDOT

* Projects that would need to be implemented before 2015 to accommodate normal growth and the Shoal Point Container Terminal Project.

4.2.2.5 Railroad Crossing Impact

This section describes the railroad cargo volumes and impacts associated with the highway-rail crossings. Existing average delays were calculated from rail traffic data provided by UPRR.

Table 4.2.2-6 is derived from the Shoal Point rail traffic movement spreadsheet developed by Berger/Abam Engineering (2000). The spreadsheet can be found in Appendix C. Table 4.2.2-6 describes the total daily rail volume projected for each phase of operation.

During the beginning phases of construction, the rail traffic is expected to be distributed evenly between the UPRR, BNSF, and Barbours Cut intermodal yards. During the later phases of construction, a new intermodal yard is expected to be constructed. Construction of the intermodal yard would be driven by the growth of the terminal.

TABLE 4.2.2-6
DAILY RAIL CAR MOVEMENT SUMMARY

Phase of Operation	Year	Total Rail Car Traffic
Phase I	2004	97
Phase II	2008	115
Phase III	2016	177
Ultimate Design	2025	470

Table 4.2.2-7 exhibits the delay associated with each railroad intersection potentially impacted by the Shoal Point terminal. The data indicate that from 2001 to 2025, the delay would increase at the railroad crossings, but the existing infrastructure can accommodate the additional train activity. In general, the impact of normal growth and the terminal in 2025 is approximately two to three times the existing total vehicle delay in 2001. The difference between the Build and No-Build scenarios would be four trains per day at ultimate build-out (2025). The delays are averaged over a 24-hour period. The average difference in 2025 between Build and No-Build is approximately 0.5 second of delay per vehicle in a 24-hour period.

TABLE 4.2.2-7
RAILROAD INTERSECTION TRAFFIC DELAY PROJECTIONS

	2001		2025 Build		2025 No-Build	
Intersection	Existing Average Delay(sec/veh)	Train Activity (trains per day)	Future Average Delay(sec/veh)	Train Activity (trains per day)	Future Average Delay(sec/veh)	Train Activity (trains per day)
SH 3 at NASA Road 1	0.55	8	1.28	17	0.92	13
SH 3 at FM 518	0.49	8	1.41	17	0.93	13
SH 3 at FM 517	0.55	8	1.10	17	1.04	13
SH 3 at FM 1765	0.47	8	1.88	17	0.88	13

4.2.2.6 IH 45/SH 6 Interchange

To address the concerns of residents in the vicinity of the IH 45/SH 6 interchange, traffic counts, intersection analysis, capacity analysis, weaving analysis, queue length analysis, and safety analysis were performed on the existing IH 45 frontage road at this location. Details of these data collection and analysis efforts are documented in the traffic study report for this project (PBS&J, 2001). The results of the analyses are presented in the following tables. A vicinity map of the interchange area and Omega Bay subdivision is included in Appendix C. TxDOT has future plans to widen the IH 45 main lanes and redesign the IH 45, SH 6, and SH 3 interchange (Texas City Wye). These improvements may take the container traffic over or under IH 45, thereby lessening the container traffic impact on the IH 45 frontage road.

Delay Analysis

Table 4.2.2-8 exhibits the projected delay associated with the IH 45 frontage road at the Omega Bay entrance/exit intersection in 2025 for the Build and No-Build scenarios during the morning peak hour. The data in this table indicate that the Omega Bay entrance/exit would not be severely impacted by the container terminal. A 2.7-second difference in delay would be experienced between the Build and No-Build scenarios at this intersection. An acceptable intersection LOS of B would result in 2025 in both the Build and No-Build scenarios.

TABLE 4.2.2-8
IH 45 FRONTAGE ROAD INTERCHANGE DELAY ANALYSIS

	2025			
	Build		No-Build	
Intersection	LOS	Delay*	LOS	Delay*
IH 45 Frontage Road at Omega Bay Entrance	B	12.9	B	10.2

* Seconds/vehicle

Capacity Analysis

Table 4.2.2-9 presents the results of a capacity analysis that indicates a projected increase to the daily volume of the IH 45 southbound frontage road due to the container terminal project. While the daily traffic volumes would increase in the Build and No-Build scenarios, the existing design of the frontage road can accommodate the additional volume. Based on this analysis, the LOS for the roadway would remain A in either scenario in 2025.

TABLE 4.2.2-9
CAPACITY ANALYSIS

	2001			2025			
	Existing			Build		No-Build	
Roadway	Traffic Volume/ Day	Peak Hour	% Trucks	Traffic Volume/ Day	% Trucks	Traffic Volume/ Day	% Trucks
IH 45 Frontage Road at Omega Bay Entrance	1,840 LOS A	7:00 A.M. (198 Veh.)	10%	5,895 LOS A	43%	2,852 LOS A	10%

Queue Length Analysis

Table 4.2.2-10 provides the results of the queue length analysis. This analysis was conducted at the IH 45 frontage road at SH 6 intersection to evaluate the effects of the proposed project at Shoal Point on the queue length at this intersection. Trucks traveling to Shoal Point would exit southbound IH 45 at Exit 7, travel south along the two-lane IH 45 frontage road, converge into a single turn lane, and then maneuver a 90-degree left turn under IH 45. According to the Synchro modeling analysis, in the year 2025, traffic at the IH 45 frontage road at SH 6 intersection would generate a 600-foot to 1,000-foot queue length of traffic north of the intersection along the IH 45 frontage road. The distance from the intersection to the Omega Bay entrance/exit is approximately 1,600 feet. Omega Bay residents should not experience truck traffic blocking their entrance/exit.

Long queue lengths would also be experienced at the SH 3 and Loop 197 intersection. According to the Synchro modeling analysis, in the year 2025, traffic at the intersection of Loop 197 at SH 3 would generate a queue length of approximately 600 to 1,000 feet south of the intersection along SH 3. The distance between the Loop 197 at SH 3 intersection and the IH 45, SH 6, and SH 3 interchange is approximately 2,500 feet. Therefore, according to the Synchro model, Omega Bay residents should not experience truck traffic stacking up near the Omega Bay entrance/exit.

TABLE 4.2.2-10
QUEUE LENGTH ANALYSIS

Intersection	2025 Queue Lengths (ft)
IH 45 Frontage Road at SH 6	600-1,000 (north of intersection)
SH 3 at Loop 197	600-1,000 (south of intersection)

Weaving Analysis

Table 4.2.2-11 presents the results of the weaving analysis at the IH 45 frontage road and Omega Bay entrance in terms of LOS in 2025 under Build and No-Build scenarios. According to the Highway Capacity Manual, weaving is the crossing of two or more traffic streams traveling in the same direction along a significant length of highway, without the aid of traffic control devices (except for guide signs). This analysis predicts that the LOS on the IH 45 frontage road due to weaving between the IH 45 on/off ramps and the frontage road would be B in either scenario. The analysis indicates that the speed would be 2 mph less and the density would be 6.6 pc/mi/ln greater if the proposed container terminal is built at Shoal Point. The LOS would remain a B in both the Build and No-Build scenarios.

TABLE 4.2.2-11
WEAVING ANALYSIS – IH 45 FRONTAGE ROAD AT OMEGA BAY ENTRANCE

	2025					
	Build			No-Build		
Weaving Analysis	LOS	Speed (mph)	Density* (pc/mi/ln)	LOS	Speed (mph)	Density* (pc/mi/ln)
IH 45 Frontage Road at Omega Bay Entrance	B	48	16.9	B	50	10.3

* pc/mi/ln = passenger car per mile per lane

Table 4.2.2-12 provides the results of the weaving analysis at the IH 45 frontage road at SH 6 intersection. As indicated in Table 4.2.2-12, the subject intersection could accommodate traffic generated by normal growth (indicated by the No-Build scenario) in the region with no improvements. However, in the Build scenario, LOS gradually degrades from a B in 2001 to an F in 2025. This suggests that improvements would be needed at this intersection prior to 2025 to avoid a poor LOS. A traffic signal at this location would not provide a complete solution because, although it would eliminate weaving, it would increase the queue length of vehicles at the intersection. TxDOT has future plans to widen the IH 45 main lanes and redesign the IH 45, SH 6, and SH 3 interchange (Texas City Wye). Because the geometry of potential improvements at the intersection has not yet been determined by TxDOT, the existing conditions were used in this weaving analysis. These improvements may take the container traffic over or under IH 45, thereby lessening the container traffic impact on the IH 45 frontage road.

TABLE 4.2.2-12
WEAVING ANALYSIS – IH 45 FRONTAGE ROAD AT SH 6

	Build							
	2001		2005		2015		2025	
Weaving Analysis	Not Applicable		LOS	Density* (pc/mi/ln)	LOS	Density* (pc/mi/ln)	LOS	Density* (pc/mi/ln)
IH 45 Frontage Road at SH 6			C	22.2	D	29.3	F	45.7
	No-Build							
	2001		2005		2015		2025	
Weaving Analysis	LOS	Density* (pc/mi/ln)	LOS	Density* (pc/mi/ln)	LOS	Density* (pc/mi/ln)	LOS	Density* (pc/mi/ln)
IH 45 Frontage Road at SH 6	B	10.7	B	13.3	B	15.8	B	19.0

* pc/mi/ln = passenger cars per mile per lane

Table 4.2.2-13 provides the results of the weaving analysis on SH 3/SH 146 from IH 45 to Loop 197 and from Loop 197 to IH 45. As indicated in the table, this section of roadway could accommodate traffic generated by normal growth in the region (i.e., the No-Build scenario) and maintain a good LOS. Under the Build scenario, the LOS for this segment of roadway would be good until 2025 when the LOS drops to D. The weaving analysis suggests that improvements may be needed on this section of roadway to avoid a poor LOS.

4.2.2.7 Hurricane Evacuation

In the event of a hurricane, with ample warning from the National Weather Service, the terminal would coordinate efforts of the Port Operations Manager, Terminal Managers, and Shop Foreman to activate its Hurricane Preparedness Plan (HPP). The HPP would be coordinated with and would be on file with the City of Texas City's emergency management systems and the USCG's Commander of the Port prior to a hurricane event. Within the HPP, a point of contact would be established with whom the City and USCG would share information prior to, during, and after the hurricane. The goal of the HPP is to allow the terminal to have all equipment and facilities secured and evacuated by the time the USCG's Commander of the Port closes the HSC to vessel traffic.

TABLE 4.2.2-13

WEAVING ANALYSIS – SH 3 / SH 146 BETWEEN IH 45 AND LOOP 197

	Build							
	2002		2005		2015		2025	
Weaving Analysis	Not Applicable		L.O.S.	Density* (pc/mi/ln)	L.O.S.	Density* (pc/mi/ln)	L.O.S.	Density* (pc/mi/ln)
IH 45 to Loop 197			A	11.82	B	19.44	D	32.42
	No-Build							
	2002		2005		2015		2025	
Weaving Analysis	L.O.S.	Density* (pc/mi/ln)	L.O.S.	Density* (pc/mi/ln)	L.O.S.	Density* (pc/mi/ln)	L.O.S.	Density* (pc/mi/ln)
IH 45 to Loop 197	A	6.63	A	7.03	A	8.74	B	12.03

	Build							
	2002		2005		2015		2025	
Weaving Analysis	Not Applicable		L.O.S.	Density* (pc/mi/ln)	L.O.S.	Density* (pc/mi/ln)	L.O.S.	Density* (pc/mi/ln)
Loop 197 to IH 45			B	12.87	B	20.58	D	32.8
	No-Build							
	2002		2005		2015		2025	
Weaving Analysis	L.O.S.	Density* (pc/mi/ln)	L.O.S.	Density* (pc/mi/ln)	L.O.S.	Density* (pc/mi/ln)	L.O.S.	Density* (pc/mi/ln)
Loop 197 to IH 45	A	7.42	A	7.91	A	9.8	B	13.4

* pc/mi/ln = passenger cars per mile per lane

The HPP comprises a three-step conditional process defined by estimated time to landfall, as determined by the National Weather Service. Steps would be taken at 72, 48, and 24 hours prior to landfall to ensure the protection and safety of containers, equipment, facilities, and personnel. These steps include the following measures:

- No additional ships would be accepted at the wharf.
- Ships loaded with containers at the wharf would be expedited to facilitate their departure.
- Equipment would be stored, secured, or removed from the premises.
- Stacking arrangements in the container yard would be reduced by grounding the containers, where possible.
- Empty containers would be surrounded by full containers to prevent loss into the channel.

Implementation of the HPP is expected to have only minimal impact to the hurricane evacuation transportation network.

4.2.2.8 Construction Traffic

Most of the construction traffic to build the Shoal Point Container Terminal would occur on site, and most of the raw materials would be barged to the terminal site. The primary source of off-site traffic during construction of the terminal would be from the daily workers. Therefore, minimal construction traffic impact to the transportation network would be anticipated.

4.2.2.9 Traffic Safety

Due to concerns expressed by area residents regarding traffic safety, accident data from 1997 to 2000 were obtained from TxDOT's Master Accident Listing files for the IH 45 at SH 3 and SH 6 (Texas City Wye) intersections. A listing of accidents per year, with a breakdown of the number of truck-related accidents, is presented in Table 4.2.2-14. During the 4-year period indicated, no accidents correctable by a signal installation occurred at the intersection, so a traffic signal at this location would not be expected to reduce accidents. No fatalities were recorded during the same 4-year period. Improvements in the future would change the geometry of the intersections to an interchange. TxDOT has proposed $70 million to improve the IH 45 at SH 3 and SH 6 interchange. The TxDOT accident data is documented in PBS&J, 2001.

TABLE 4.2.2-14
TRAFFIC ACCIDENT DATA

Year	IH 45 at SH3 and SH 6 Accidents	Truck-Related Accidents	Fatal Accidents
1997	6	2	0
1998	4	2	0
1999	11	7	0
2000	12	0	0

The number of accidents that may be projected to occur at the IH 45 at SH 3 and SH 6 interchange was estimated for the years 2005, 2015, and 2025 for the No-Build and Build scenarios. These estimates are presented in Table 4.2.2-15. For the No-Build scenario, the potential total accident estimates were derived from the percentage increase of traffic for years 2005, 2015, and 2025 (using ADT data presented in Table 4.2.2-4, No-Build scenario) in the vicinity of IH 45 between FM 519 and SH 6. The baseline for the potential total accidents in the No-Build scenario is the existing accident data for the intersection for the year 2000 (i.e., the potential total accidents are increased from the year 2000 accident data). The potential truck-related accidents for the No-Build scenario are derived from the existing data, in which approximately 33.3 percent of total accidents are truck related. The estimates of fatal truck-related accidents are derived from information presented in Appendix C-8, which indicates that approximately 0.07 percent of total accidents are fatal truck accidents. Both truck-related and fatal truck-related accidents are derived from the estimated total accidents. For this analysis, it is assumed that no improvements are made to the intersection. For the Build scenario, the same assumptions and methods described for the No-Build scenario were used, except that the ADT data for the Build scenario were used to develop the potential total accident estimates for years 2005, 2015, and 2025.

Based on the results of the intersection analysis, capacity analysis, weaving analysis, queue length analysis, and safety analysis, the Omega Bay subdivision would experience moderate impact from operation of the proposed Shoal Point Container Terminal. The impact would not severely increase delay, would not block the Omega Bay entrance/exit onto the IH 45 frontage road, and would not create traffic volumes greater than the IH 45 frontage road capacity. By 2025, improvements to the interchange would be needed in order to avoid a poor weaving LOS. The terminal may increase the potential for truck-related accidents due to the increase in truck traffic.

The existing infrastructure can accommodate normal anticipated growth and the additional container terminal traffic volume for Phase I and the beginning of Phase II. Prior to Phase III construction, TxDOT has plans to widen the IH 45 main lanes and redesign the IH 45, SH 6, and SH 3 interchange (Texas City Wye). The improvements implemented by TxDOT would be designed for the growth of the region and would consider additional traffic generated by the Shoal Point Container Terminal.

Area residents recommended building a new interchange north of the IH 45, SH 3, and SH 6 interchange and a new road from the interchange north of Omega Bay approximately 2 miles to the Shoal Point Container Terminal entrance. In response to public comments regarding this alternative, public officials representing Galveston County and the cities of Texas City and La Marque have initiated discussions with TxDOT regarding the possibility of developing an alternative truck route. During the public hearing on the DEIS for this project, several public officials spoke on this issue (see public hearing transcript in Appendix J). These officials stated their support of an alternative truck route and their plans to discuss the option of an alternative route with TxDOT and to work together to obtain funding for this option. Galveston County and Texas City representatives and elected officials have met with TxDOT to discuss alternative routes to the proposed container terminal and the status of TxDOT roadway improvements in the vicinity. Galveston County, the City of Texas City, and the City of La Marque have sent letters to the USACE stating that they have retained a consultant to study the feasibility of, and to identify, an alternative truck route (see letters in Appendix H-15).

TABLE 4.2.2-15

PROJECTED TRAFFIC ACCIDENTS FOR IH 45 AT SH 3 AND SH 6

	No-Build				Build		
Year	Total Accidents	Potential Truck-Related Accidents	Potential Fatal Truck-Related Accidents	Year	Total Accidents	Potential Truck-Related Accidents	Potential Fatal Truck-Related Accidents
2005	13	4.4	0.01	2005	14	4.6	0.01
2015	15	4.9	0.01	2015	15	5.0	0.01
2025	17	5.6	0.01	2025	18	5.9	0.01

4.2.3 Noise

Noise associated with the proposed project would be generated during the construction phase and during the operation of the facility. Major noise sources associated with the proposed project would include the construction equipment, the loading equipment used during operations, and truck traffic. In the following sections, potential impacts at the nearest noise sensitive receptors are quantified.

4.2.3.1 Construction

Noise associated with construction activities is primarily generated by the engines of the construction equipment. Analyses by the U.S. Department of Transportation (USDOT) and the EPA have found that the typical noise levels of construction equipment can vary from 74 dBA to 101 dBA at a distance of 50 feet from the source (USDOT, 1995). Typical construction noise decreases by approximately 6 dB as the distance from the source is doubled. For example, if noise generated from a bulldozer is 85 dB at 50 feet, the noise level would decrease to approximately 79 dB at 100 feet and decrease to approximately 73 dB at 200 feet. Typical noise levels generated by construction equipment are listed in Table 4.2.3-1. Construction activities associated with the proposed project include the excavation and dredging of the channel, the moving and grading of placement fill, and the construction of the loading docks and berths.

Dredging within the Shoal Point project area would occur along the northern shoreline of the project site and within the Texas City Channel. Dredging activities during the construction phase of the project could occur as much as 24 hours a day, 7 days a week. Electric dredging equipment would be used where feasible within the project area in order to reduce air emissions. Depending on engine components and configuration, noise levels associated with electric dredges range from 65 dBA to 85 dBA at a distance of 50 feet (USACE, 2001a). Calculations indicate that the nearest residential receptors, located approximately 4,500 feet to the northwest, would be exposed to noise levels ranging from 26 dBA to 46 dBA. These levels do not exceed the existing noise environment and would therefore not result in a noise impact.

Construction of the facilities at the proposed project site would also include the use of typical construction equipment, some of which is included in Table 4.2.3-1. Propagated noise levels associated with construction of the project would range between 35 dBA and 62 dBA at the nearest residential receptors.

4.2.3.2 Operations

The nearest residential receptors are located approximately 4,500 feet northwest of the proposed facility's container berths. Results from the noise monitoring program conducted at the Barbours Cut Terminal (USACE, 2001a) indicate that these receptors would be most influenced by activities occurring dockside, along the container berths; however, the combined sound level of all operations and activities occurring within the facility would contribute.

TABLE 4.2.3-1

CONSTRUCTION EQUIPMENT NOISE EMISSION LEVELS

Equipment	Typical Noise Level (dBA) 50 feet from Source
Air Compressor	81
Backhoe	80
Ballast Equalizer	82
Ballast Tamper	83
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Derrick	88
Crane, Mobile	83
Dozer	85
Generator	81
Grader	85
Impact Wrench	85
Jack Hammer	88
Loader	85
Paver	89
Pile Driver (Impact)	101
Pile Driver (Sonic)	96
Pneumatic Tool	85
Pump	76
Rail; Saw	90
Rock Drill	98
Roller	74
Saw	76
Scarifier	83
Scraper	89
Shovel	82
Spike Driver	77
Tie Cutter	84
Tie Handler	80
Tie Inserter	85
Truck	88

Source: USDOT, 1995.

A L_{dn} of 59.0 dBA recorded at a distance of approximately 2,000 feet from the berths (USACE, 2001a) indicates that noise levels associated with dockside operations would not present an impact to residential receptors located approximately 4,500 feet from the proposed Shoal Point facility.

4.2.3.3 Traffic

As discussed in Section 3.3, a traffic noise analysis was conducted for representative residential structures (Category B receivers) located adjacent to the main roadways that could potentially be affected by operation of the proposed container terminal at the Shoal Point site. The results of this analysis are presented in Table 4.2.3-2. As indicated in the table, existing noise levels along most of the roadways included in the analysis for the Shoal Point site are currently approaching (i.e., within 1 dBA), meeting, or exceeding the NAC levels for Category B receivers, and are therefore already impacted under the absolute criterion (defined in Section 3.3). Based on the analysis, noise levels at three of the analyzed roadway segments are currently under the NAC level for residential structures (67 dBA). These segments are on SH 146, from FM 518 to FM 517, from FM 517 to Loop 197, and from Loop 197 to FM 519.

The noise analysis indicates that all of the roadway segments are expected to experience further noise level increases in 2025 as a result of traffic associated with normal growth in the area (i.e., the No-Build scenario). In this scenario, only the segment of SH 146 from Loop 197 to FM 519 would exhibit noise levels below and not approaching the NAC level.

In the Build scenario, the analysis indicates that noise levels on half (nine) of the segments analyzed for this alternative would not experience increases over the levels predicted for the No-Build scenario in 2025. This indicates that if the project were built, the noise levels would not be increased over the levels predicted for these road segments due to normal growth in the area. Noise levels on the remaining nine segments are expected to increase by 1 dBA as a result of the project. In the Build scenario, the SH 146 segment from Loop 197 to FM 519 is expected to experience a 1 dBA increase over the No-Build conditions, which constitutes an impact under the absolute criterion because the predicted noise level (66 dBA) would approach (i.e., would be within 1 dBA of) the NAC level of 67 dBA for Category B receivers.

4.2.3.4 Omega Bay

In response to citizen comments on the DEIS, a detailed noise analysis was performed using 24 representative receivers in Omega Bay (see Figure 4.2.3-1).

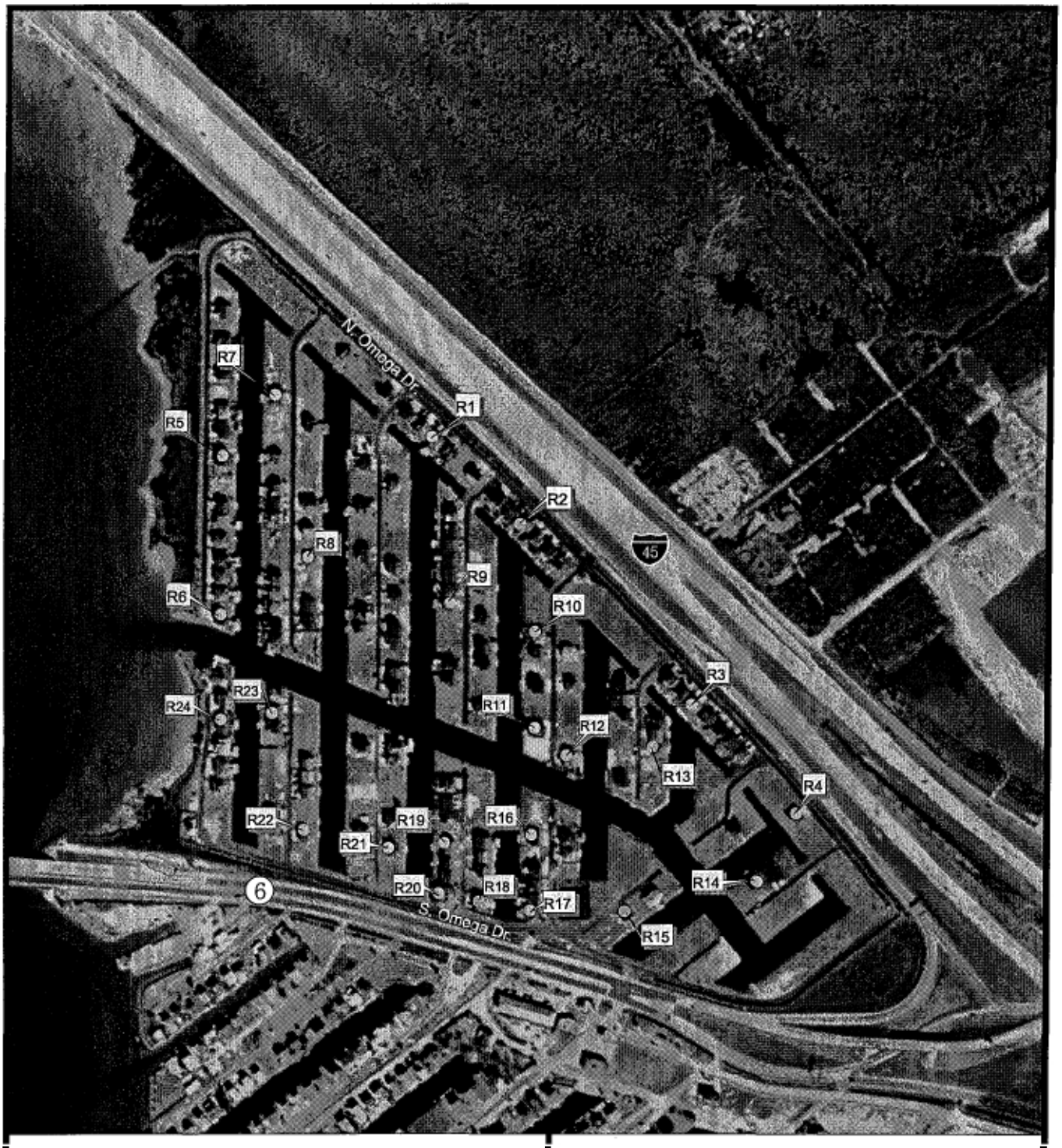
All of the receivers were residential (Category B) and were located along the main roadways and throughout the interior streets of Omega Bay. The results of this analysis are presented in Table 4.2.3-3. As indicated in the table, existing noise levels for 11 of the representative receivers in the Omega Bay neighborhood are currently approaching, meeting, or exceeding the NAC levels for Category B residential structures (67 dBA) and are therefore currently impacted under the absolute criterion (defined in Section 3.3). The receivers that are impacted under existing conditions are: R1, R2, R3, R4, R7, R9, R10, R11, R12, R13 and R14.

TABLE 4.2.3-2

EXISTING AND PREDICTED TRAFFIC NOISE LEVELS FOR SHOAL POINT ALTERNATIVE

Study Area	NAC Category	NAC Level (dBA)	Existing 2001 (dBA)	Noise Impact at Present (2001)	Predicted 2025/No Build (dBA)	Change (+/-) (dBA)	Noise Impact with "No-Build" Option	Predicted 2025/Build (dBA)	Increase in dBA over "No-Build" Conditions
IH 45 From Beltway 8 to FM 2351	B	67	74	Yes	75	+1	Yes	76	+1
IH 45 From FM 2351 to NASA Road 1	B	67	73	Yes	75	+2	Yes	75	+0
IH 45 From NASA Road 1 to FM 518	B	67	73	Yes	74	+1	Yes	74	+0
IH 45 From FM 518 to FM 646	B	67	71	Yes	74	+3	Yes	74	+0
IH 45 From FM 646 to FM 517	B	67	70	Yes	72	+2	Yes	72	+0
IH 45 From FM 517 to FM 1764	B	67	71	Yes	73	+2	Yes	73	+0
IH 45 From FM 1764 to FM 1765	B	67	69	Yes	71	+2	Yes	71	+0
IH 45 From FM 1765 to FM 519	B	67	68	Yes	70	+2	Yes	71	+1
IH 45 From FM 519 to SH 6	B	67	68	Yes	69	+1	Yes	70	+1
SH 225 From Beltway 8 to Center Rd.	B	67	72	Yes	73	+1	Yes	74	+1
SH 225 From Center Road to SH 146	B	67	71	Yes	72	+1	Yes	73	+1
SH 146 From SH 225 to Shoreacres	B	67	71	Yes	72	+1	Yes	73	+1
SH 146 From Shoreacres to Port Rd.	B	67	68	Yes	70	+2	Yes	70	+0
SH 146 From Port Rd. To Red Bluff	B	67	67	Yes	69	+2	Yes	68	-+1
SH 146 From Red Bluff to FM 518	B	67	67	Yes	69	+2	Yes	69	+0
SH 146 From FM 518 to FM 517	B	67	65	No	67	+2	Yes	67	+0
SH 146 From FM 517 to Loop 197	B	67	64	No	66	+2	Yes	67	+1
SH 146 From Loop 197 to FM 519	B	67	63	No	65	+2	No	66	+1*

* Noise level increase at this receptor meets the absolute criterion for impact. Therefore, this receptor which was not impacted under existing, or no-build conditions, would be impacted under the build scenario.



N
W
E
S

R1 Receiver Locations

500 0 500 Feet

SHOAL POINT CONTAINER TERMINAL EIS

Figure 4.2.3-1

Omage Bay Noise Receivers

Prepared for: USACE	
Job No.: 440622.00	Scale: 1"=500'
Prepared by: Tom Church	Date: June 27, 2002
File: N:\440622\arcview\vegetation.apr (Omega Bay a size layout)	

TABLE 4.2.3-3

TRAFFIC NOISE FOR RESIDENTIAL STRUCTURES,
CATEGORY B RECEIVERS, OMEGA BAY

Omega Bay Receivers	NAC Category	NAC Level (dBA)	Existing 2000 (dBA)	Predicted 2025/ No-Build (dBA)	Change (+/-) (dBA)	Noise Impact with No-Build Option	Predicted 2025/Build (dBA)	Increased dBA from No-Build Option	Additional Impact from No-Build Option
R1	B	67	75	77	+2	Yes	77	+0	No
R2	B	67	76	77	+1	Yes	77	+0	No
R3	B	67	75	77	+2	Yes	77	+0	No
R4	B	67	75	76	+1	Yes	76	+0	No
R5	B	67	65	67	+2	Yes	67	+0	No
R6	B	67	63	64	+1	No	64	+0	No
R7	B	67	69	70	+1	Yes	71	+1	No
R8	B	67	65	66	+1	Yes	67	+1	No
R9	B	67	68	69	+1	Yes	69	+0	No
R10	B	67	70	71	+1	Yes	71	+0	No
R11	B	67	67	68	+1	Yes	68	+0	No
R12	B	67	67	68	+1	Yes	68	+0	No
R13	B	67	70	71	+1	Yes	71	+0	No
R14	B	67	67	69	+2	Yes	69	+0	No
R15	B	67	64	65	+1	No	65	+0	No
R16	B	67	64	65	+1	No	65	+0	No
R17	B	67	62	63	+1	No	63	+0	No
R18	B	67	62	63	+1	No	63	+0	No
R19	B	67	62	63	+1	No	63	+0	No
R20	B	67	61	63	+2	No	63	+0	No
R21	B	67	61	62	+1	No	63	+1	No
R22	B	67	60	62	+2	No	62	+0	No
R23	B	67	62	63	+1	No	63	+0	No
R24	B	67	61	62	+1	No	62	+0	No

The detailed noise analysis shows that two additional receivers (in addition to the 11 representative receivers that are currently impacted) are expected to experience a noise impact by 2025 as a result of traffic associated with normal growth in the area (i.e., the No-Build scenario). The additional receivers projected to be impacted under the 2025 No-Build alternative are R5 and R8. Receivers R5 and R8 would be impacted under the absolute criterion. The increase would be attributable to the expected normal growth of the area.

In the Build scenario, the model predicts that three receivers (R7, R8, and R21) would experience an additional increase of 1 dBA over the levels predicted for the No-Build scenario. The 1 dBA increase in the Build scenario would not constitute an impact in addition to what is expected in association with normal growth. As stated in Section 4.1.3.2, a noise impact occurs when the conditions meet either the absolute criterion or the relative criterion. The absolute criterion is met when the predicted noise level at a receiver approaches, equals, or exceeds the NAC (specifically, if the predicted noise level is 66 dBA or greater). The relative criterion is met when the predicted noise level is increased by 10 dBA or more from the existing noise levels.

Since the model shows that noise levels R7, R8, and R21 are expected to be greater than 67 dBA in the No-Build scenario, they are already predicted to be impacted under the guidelines of an absolute criterion. Therefore, an addition of 1 dBA does not constitute an additional impact.

There are known causal relationships between various factors and noise levels (e.g., noise barriers, number and type of vehicles, traffic speed, highway grade, distance, etc.). Some of the more common causal relationships and their effects on noise levels are presented in Table 4.2.3-4. TxDOT recommends that the effects of causal relationships be examined as a method of double-checking noise calculations but cautions against using them in lieu of detailed noise studies (e.g., sound level measurements or computerized modeling) (TxDOT, 1996).

TABLE 4.2.3-4
CAUSE AND EFFECT RELATIONSHIP RELATED TO NOISE LEVELS*

Change **	Increase (dBA)	Decrease (dBA)
Traffic count doubled	3	
Speed limit lowered by 5 mph		1
Depressed highway		3–5
Elevated highway		3–5***
Distance doubled over pavement		3
Distance doubled over grass		4.5
Effects are Cumulative		
Speed limit lowered by 5 mph + distance doubled over grass		5.5

* These figures are approximations and are not to be used to calculate sound levels.

** Assumes that all other factors remain constant.

*** For nearby receivers; may actually increase slightly at more distant receivers because of possible reductions in shielding and/or surface absorption.

Noise levels are diminished with increased distance from the source. The term "doubling distance" means that each time the distance between the noise source and its receiver is doubled, the noise level will be decreased by between 3 and 5 dBAs.

After the computer model was completed, researchers compared the computer model findings with the changes expected to occur as a result of the doubling distance. The doubling distance results were found to strongly corroborate the computer model findings.

Doubling distances were calculated for each of the 24 representative receivers using existing conditions, the No-Build scenario, and the Build scenario (a total of 72 calculations). Results from the doubling distance calculations did not provide a 100 percent positive correlation to the computer model results; however, they were extremely close. Slight differences were found in three of the 72 calculations.

Under existing conditions, receivers R21 and R24 differed from the computer model. The computer model calculated an L_{eq} of 61 for receivers R21 and R24, and the doubling distance analysis showed each of these receivers to have an L_{eq} of no more than 60. Similarly, in the Build scenario, receiver R21 was projected to have an L_{eq} of 63 by the computer model, and the doubling distance analysis projected an L_{eq} of no more than 62.

Because only three of the 72 doubling distance calculations were found to deviate from the computer modeling calculations, and because only a 1 dBA difference was found in each of the three differences, the computer modeling analysis is considered to be accurate. Furthermore, because neither the computer model results nor the doubling distance results would ultimately result in a noise impact, the differences are not expected to influence the results of this analysis.

4.2.4 Physiography, Topography, and Bathymetry

Dredging and grading activities are required for construction of the proposed project at Shoal Point. Detailed information regarding construction requirements are presented in appendices A and B. The most significant effects on bathymetry would be related to permanent alterations resulting from dredging to deepen the existing Texas City Channel and to create new berths and a turning basin for cargo ships. The proposed container terminal would be constructed in three phases that would occupy approximately 400 acres on Shoal Point. The existing Texas City Channel would be deepened from 40 to 45 feet, from the Shoal Point Terminal site to the Houston Ship Channel. The current channel bottom width of 400 feet would be maintained throughout its length. The new berthing area would be approximately 6,000 feet long and 825 feet wide. A total of approximately 651 acres of open water would be dredged resulting in about 12 mcy of dredge material. The dredge material would be utilized for site preparation, construction of containment levees, and creation of Beneficial Use sites near Shoal Point.

Surface topography changes would primarily be associated with site preparation activities for the wharf area, container yard and associated access road, and dredged material placement. A total of approximately 13 acres of natural shallow water, vegetated habitat as well as 38 acres of manmade wetlands would be filled during project construction and about 367 acres of open water habitat would be used for construction of Beneficial Use sites. While local changes would occur to bathymetry and topography during construction of the container terminal, these alterations would be expected to have

negligible impacts on the regional physiography, topography, and bathymetry of the submerged and subaerial portions of the project area.

4.2.5 Geology

The impacts on the local geology during dredging and construction activities associated with the proposed project would include redistribution of existing sediment, local increases in turbidity, and potential increases of local scouring and shoaling rates. Net impacts on local geology would be minimal from these operations.

4.2.6 Energy and Mineral Resources

The proposed project would have no impacts on the energy resources within the project area. There are petroleum resources in the region, but no active wells occur on the proposed project site. Relocation of existing petroleum pipelines in the area may be required but would not impact oil and gas resources. Remediation of impacted soil and/or groundwater related to pipeline spills or leaks may be required during relocation activities. Consumptive use of construction products such as sand, gravel, and cement would constitute an irretrievable commitment of these mineral resources.

4.2.7 Surface Soils

Shoal Point is an active DMPA and the majority of the site consists of poorly consolidated clayey dredged material. Due to the disturbed nature of the site, impacts to native surface soils within the project area would be minimal. During construction of the terminal, the site would require a soil consolidation program to minimize the amount of settlement that could occur after the terminal is in operation. The consolidation program would likely consist of the installation of wick drains, along with soil surcharge. Possible impacts to surface soils exist from the potential release of petroleum products during construction and hazardous material spills from hazardous cargo during facility operations and potential accidents during local highway transport. However, the proposed container terminal is expected to handle a minimal amount of containerized hazardous cargo and the use of BMPs for potential hazardous material spills that could occur at the terminal site would greatly minimize the potential for this type of impact.

Transportation of hazardous cargo is regulated by the U.S. Department of Transportation. Shippers of hazardous materials are required to properly packaging the cargo to reduce the potential of a release during transport and handling. In the event of a release during highway transport, city and local hazardous response teams are trained in spill containment and cleanup. Section 4.2.9 assesses in more detail the potential impact from a release of hazardous cargo due to increase traffic on highways near the site.

4.2.8 Groundwater Quality and Hydrology

Construction and operation activities associated with the proposed project are not expected to result in impacts to groundwater hydrology, quantity and quality. No groundwater withdrawals are anticipated for the project. Potable water would be piped to the proposed terminal site via existing supply mains located in the project vicinity.

In its current use as a DMPA, saltwater is periodically impounded at the site. The recharge of shallow groundwater underlying the site by precipitation and impounded saltwater would be reduced in areas at the terminal site occupied by impervious cover.

Other possible impacts to shallow groundwater exist from the potential release of petroleum products during construction and hazardous material spills from containerized hazardous cargo during facility operations and potential accidents during local highway transport. The proposed container terminal is expected to handle some containerized hazardous cargo; however, the pavement at the site and the use of BMPs for potential hazardous material spills that could occur at the terminal site would greatly minimize the potential for this type of impact to groundwater quality. BMPs which meet local, State, and Federal requirements would be developed and implemented as part of the Spill Response Plan for the project to address potential spills. In addition, packages for hazardous material must conform to standards set by Research and Special Programs Administration (RSPA) of the Department of Transportation and the International Maritime Organization (IMO). A carrier accepting hazardous cargo from a shipper or intermediary is obliged to exercise reasonable care to be sure that the shipment has been properly prepared. This obligation exists each time the cargo is handed off during the transportation process. Specific requirements apply to highway, rail, air and ocean transport. These procedures would greatly reduce the risk of impact to the underlying groundwater at the site. Section 4.2.9 assesses in more detail the potential impact from a release of hazardous cargo due to increase traffic on highways near the site.

4.2.9 Hazardous Materials Site Assessment

No known existing hazardous material sites occur within the Shoal Point project site boundary (see Section 3.9.1). However, according to the regulatory agency database search and site reconnaissance, several hazardous material sites occur adjacent to the project boundary. These facilities are located along the proposed access corridor and in the vicinity of the highly industrialized Texas City Harbour and Industrial Canal. The environmental impacts that have resulted from these facilities vary greatly; however, these sites do not appear to provide a significant environmental concern to the project.

The greatest potential for encountering contaminated media is in the northern end of Swan Lake (designated as operable unit OU 4 of the Tex-Tin Superfund site). The potential to encounter contaminated media along the uppermost portion of Swan Lake is considered to be minimal. However, if contaminated sediment is encountered the media would be segregated for characterization and proper disposal.

4.2.9.1 Hazardous Material Impacts to the Existing Environment from Project Construction Activities

The impacts from hazardous material use and handling during construction activities associated with the proposed project pose a minimal risk of impacts to the environment. Temporary aboveground storage tanks and equipment, vehicles, and machinery that contain oil and use diesel fuel are typically utilized during major construction projects. Impacts from the storage and handling of fuels and lubricants can be eliminated or minimized with the use of mitigation methods. Mitigation would involve

the implementation of a Spill Prevention Control and Countermeasure Plan (SPCC). The SPCC plan should effectively minimize impacts of spills that occur during the construction of the facility by requiring all potential contaminants to be stored, handled, and disposed of so that the risk of accidental releases to the environment is minimized. The SPCC plan utilizes effective best management practices (BMPs), containment and control methods, and cleanup operations. Appropriate BMPs may include secondary containment for storage tanks, and drip pans for refueling, maintenance and storage of vehicles and equipment. In the event of a spill, containment and cleanup may include sorbents such as pillows, mats and booms. The plan would include training personnel for spill prevention, operation of spill response equipment, material handling, equipment inspection and maintenance, refueling procedures, spill control and containment, and spill cleanup.

4.2.9.2 Hazardous Material Impacts to the Project from Operation Activities

Fueling of land-based and water-based equipment and vessels would take place on site. The operational component of the proposed container terminal would be expected to handle some hazardous cargo. The accidental spill of fuel, lubricants, or other potentially toxic material is inevitable; however, with proper precautions in place, the impacts to human health and the environment can be greatly reduced. Precautions include a SPCC plan that would be implemented for emergency response to hazardous material spills on the terminal site. The SPCC plan requires training personnel for proper spill prevention, notification, emergency response and containment. Extensive impervious cover and proper spill response should effectively minimize or eliminate significant impacts to soils and groundwater. The risk of impacts to surface water is greatest and may require additional safeguards. Additional information regarding accidental spills is included in Section 4.2.10.

4.2.9.3 Hazardous Materials Transport

The transport of hazardous material cargo presents the potential for impacts related to accidental spills. However, multimodal transportation is extensively regulated. In the United States, the authority is the Research and Special Programs Administration (RSPA) of the Department of Transportation. International shipments are covered by the International Maritime Organization (IMO) of the United Nations (UN) and adhere to the International Maritime Dangerous Goods Code (IMDG). Packages for hazardous material must comply with standards set by the RSPA and the UN. A carrier accepting a hazardous cargo from a shipper or intermediary is obliged to exercise reasonable care to be sure that the shipment has been properly prepared. This obligation exists with each change of custody throughout the transportation process. Specific requirements apply to sea, air, rail and highway.

The packaging requirements for hazardous material cargo have reduced environmental impacts during shipping; however, concerns remain regarding public safety issues while the cargo is in transport on local highways. To address these concerns, the increased probability of traffic accidents was assessed along the nearest major arterial highway providing access to the proposed and alternative sites. For the Shoal Point Alternative, the assessment used traffic and accident data provided by TxDOT for a segment of IH 45 between SH 6 and FM 519 (see Table 4.2.2-4). The results of the assessment, as shown on Table 4.2.9-1, indicate that under the No-Build scenario, the average daily traffic (ADT) of 46,440 vehicles (as recorded in 2001) would increase approximately 42 percent to 65,728 vehicles in the

year 2025. If the proposed cargo facility is constructed, the 2001 ADT is projected to increase an additional seven percent over baseline conditions to 69,124 vehicles by the year 2025. This increase in traffic would be incremental and would occur as each of the three phases of the cargo facility become operational.

TABLE 4.2.9-1
SHOAL POINT ALTERNATIVE AVERAGE DAILY TRAFFIC PROJECTIONS

			Year 2001	Year 2005		Year 2015		Year 2025	
Option	Roadway	Limits	ADT	ADT	% Truck Traffic Increase	ADT	% Truck Traffic Increase	ADT	% Truck Traffic Increase
No-Build	IH 45	FM 519 to SH 6	46,440	51,771	11%	57,273	23%	65,728	42%
Build	IH 45	FM 519 to SH 6		53,771	16%	59,210	27%	69,124	49%

For this analysis, it is assumed that an increase in traffic would result in an equivalent increase in traffic accidents. TxDOT reported an average of four truck accidents per year from 1997 through 1999 along the segment of IH 45 between SH 6 and FM 519. Under the No-Build scenario, with a 42 percent increase in traffic, the number of truck accidents in the year 2025 is projected to be 5.6 accidents. If the proposed cargo facility is constructed and traffic increases an additional 7 percent, the number of truck accidents in the year 2025 is projected to be 5.9 accidents. The increase in traffic accidents would also be incremental as each phase becomes operational. It is estimated that less than 5 percent of the truck traffic exiting the Barbours Cut facility is hauling hazardous material (USACE, 2001a). Therefore, while traffic accidents are projected to increase consistent with increased traffic, less than 5 percent of those accidents associated with project-related truck traffic would be expected to involve trucks hauling hazardous material cargo.

According to Federal Motor Carrier Safety Administration (March 2002), 16 percent of the traffic accidents involving trucks transporting hazardous material result in the release of the hazardous material to the environment. The level of impact to human health and the environment that could result from the release is directly proportional to several factors. These factors include the state of the spilled material (i.e., gas, liquid, or solid), the distance to the nearest occupied structures, the distance to the nearest surface water body, the response time of the hazardous material response team, and the amount of time the hazardous material was exposed to the environment. The spilled material is initially classified and is isolated to minimize widespread impacts. Isolation is used to prevent discharge to surface waters or recharge to groundwater. The cleanup of a hazardous material spill typically involves the physical removal of the spilled material. This process is performed by trained hazardous material response teams and is performed by either vacuum extraction or other methods to physically containerize the spilled material. Depending on the nature of the spilled material, an evacuation of the public within a specified radius may be performed. Once the recoverable material has been removed, any impacted soil is excavated and containerized for disposal. The excavated site is backfilled with clean fill.

4.2.10 Surface Water Quality and Hydrology

The project site for the applicant's proposed alternative is on the northern end of Shoal Point (formerly known as Snake Island), a confined DMPA. The docks would front on the Texas City Channel. This channel is considered water quality segment 2437 and has designated uses of High Quality Aquatic Habitat and Non-Contact Recreation.

The main effects of the proposed project on surface water hydrology and quality would include turbidity during construction dredging and earthwork on the project site, long-term changes in runoff characteristics, modifications in water circulation, and the introduction of new potential for accidental spills from both containers and containerships. This section describes the baseline conditions of existing dredging activities and the specific surface water effects of the Shoal Point Container Terminal construction and operation. It also includes a characterization of the net changes in habitat produced by the project over time.

4.2.10.1 Dredging

The Texas City Channel has been used for navigation since the start of the twentieth century and has required periodic maintenance dredging. Since the mid 1960s when the current 40-foot project channel was completed, maintenance dredging has employed two primary placement locations. Material dredged from the lower end of the channel tends to be sandy and is pumped to the north side of the Texas City Dike where it maintains the beach that protects the dike from erosion. Material used for beach nourishment enters the bay directly, without any special confinement for settling. Material dredged from the middle portion of the channel and into the harbor is placed in confined placement areas on Shoal Point. Water leaves the confined placement areas after most of the dredged material settles.

4.2.10.2 Construction Effects

Project construction would involve dredging to create berthing and turning areas (see Table 2-3). The second phase of the project could involve channel deepening of the Texas City Channel to the project site if it is not already accomplished in the Federal project. During the dredging process, higher turbidity and suspended solids concentration would be produced both in the area being dredged and in the area where the dredged material is placed. This would result in a short-term (i.e., from days in the area being dredged to a few months in the placement area) reduction in water quality and the water's ability to support its designated aquatic life use. Based on the elutriate test results discussed in Section 3.10.2, no exceedances of water quality standards for toxics are anticipated, especially considering that new work material, having not been exposed to anthropogenic processes, is far less likely to contain toxic substances than the maintenance material. It is technically possible for some liquid contaminants to migrate to a site through groundwater. However, the new work soils are predominantly stiff clays that tend to be impervious and resistant to groundwater movement. Testing of virgin materials reported in Appendix D has confirmed the expected absence of contamination.

4.2.10.3 Operational Effects

The upland portions of the Shoal Point project site consist of portions of confined placement area C, along with parts of areas A and B. Rainfall at these sites typically collects within the confined placement area levees. The only direct runoff that occurs when the water control weirs are in place is from rain falling on the outer face of the containment levees. Water that collects within the placement areas leaves over a longer time period by a combination of evapotranspiration and seepage into the ground and levees. On the other hand, if the water control structure is not in place, as might be the case when an effort is being made to dewater an area, then runoff can occur directly.

Direct runoff occurs during the time when maintenance dredging is actually being conducted. The period of use for portions of the site during active dredging is typically once every 3 years for a duration of several weeks. During that time, the water level in the placement area is up to the control weir elevation so that the addition of rain results in a fairly rapid outflow over the weir to maintain the site water level. The increased flow over the weir to compensate for the rain input must meet the discharge requirements for dredging.

After construction is complete, changes to surface water quality near the site would result from the addition of impervious cover (pavement and pier surface) and associated drainage structures where none currently exist. Impervious cover prevents rain from soaking into the ground where it can be used by plants during dry periods. Instead, most of the rain that falls on paved areas would be forced to run off of the site. In addition to reducing groundwater recharge, increased impervious cover can have adverse effects on receiving water bodies, causing erosion of the streambed (if the receiving water is a stream) and damaging aquatic habitat. While higher runoff and reduced recharge conditions would result from the project, the consequences should not be severe at this site. Since little groundwater recharge occurs at this site and drainage would be directly to the Texas City Channel and harbor, rather than to streams, effects would be negligible. The facility would be required to abide by the Texas Pollutant Discharge Elimination System (TPDES) construction and operation stormwater permits. Details of the stormwater system would be defined during final design of the project facilities.

Container vessels, like most oceangoing cargo ships, at times need to compensate for changes in cargo and fuel loads by taking on or discharging ballast water. Such water taken aboard in a foreign port could potentially transport and result in the introduction of non-native species to U.S. waters. To minimize this risk, U.S. regulations currently encourage exchange of ballast waters in the open ocean prior to entry and require reporting of any ballast water discharge in U.S. waters. Currently there are no special provisions for receiving and treating ballast waters in Texas ports, and none are planned for this project. However, if future regulations require such facilities, they would be provided. Given that ballast water discharges in port are now rare events, it is not clear that such discharges would change in proportion to future traffic.

Texas City Channel Federal Project

When the EIS process for the Shoal Point Container Facility was begun, the Federal project to deepen the Texas City Channel to 45 feet was not active, at the request of the local sponsor.

During the preparation of the EIS, this issue was re-evaluated and a request has been made to the USACE to initiate feasibility studies for deepening the Texas City Channel to 45 feet. Based on this, it appears likely that a Federal feasibility study will be carried out. A possible and reasonably foreseeable outcome of such a study is that a deepening would be justified. This expected outcome is based on previous feasibility study results showing that deepening to 50 feet was economically justified by a substantial margin even when the cost of a portion of the entrance channel deepening was included in the analysis. With the entrance channel dredging already performed and the current request proposing 45 feet, the economic justification would be substantially stronger.

4.2.10.4 Accidental Spills

The proposed project would introduce a higher potential for accidental spills than currently exists at the DMPA. The terminal would handle a large number of containers, some of which carry packaged liquid products that are toxic or hazardous in some measure. Data provided for the Barbours Cut container facility (USACE, 2001a) indicate that less than 5 percent of the containers include material classified as hazardous. Ruptures of these containers could result in harmful materials being released. To control such events, the facility would be designed with means to contain and collect spills. Oil-water separators would be built into the site drainage system. A facility emergency response plan and Spill Prevention Control and Countermeasures Plan that includes appropriate procedures for each type and location of event would be completed prior to facility operation.

Another type of spill event would be associated with the fueling operations of containerships. Since this type of activity does not currently exist at the site, the addition of fueling activity at the site would generate a new risk of water pollution from accidental spills. While such risk would increase relative to the present condition, fuel spills are rare and, typically, such spills are quite small, as can be seen from the summary of spills in the Texas City Harbor in Section 3.9.1, ERNS sites.

The SPILLS database maintained by the TNRCC includes information where emergency response is needed for cleanup of toxic substances. Since the database was established, spills reported at the Barbours Cut Terminal included a total of four releases that involved oil, paint, and alkylphenol. These reported spills occurred from 1989 to 1996. The facility currently handles almost a million TEUs per year. Two of the spills (1 gallon of oil and 4 gallons of paint) occurred on surface water. One release (10 gallons of oil) was contained on the ship, and the remaining release (20 gallons of alkylphenol) was contained within concrete containment on land. Appropriate emergency response actions were reportedly taken after each release to minimize impacts to the environment.

4.2.10.5 Hurricane Levee Pumpout Canal Hydrology

The area behind the Texas City Hurricane Levee is pumped out following heavy rains, and the discharge is carried to the Texas City Harbour in a drainage canal to the south of the Industrial Canal. The project plan is to use a portion of the canal's 150-foot ROW as the access corridor to the Shoal Point Container Terminal.

The main pumping into the canal is from three 150,000-gpm diesel pumps producing a combined flow of 1,000 cubic feet per second (cfs). With a bottom width of 40 feet, a design depth of

–7 feet MLT, and 2-horizontal to 1-vertical side slopes, the cross-sectional area of the canal would be approximately 450 square feet, yielding a design velocity of approximately 2 feet per second (ft/sec). For short periods of time associated with intense rains this should not produce significant scour in the canal sediments.

The only change in the discharge canal proposed is a slight reduction in cross-section in the immediate area of the Gulf Coast Waste Disposal Authority facility. Resulting hydraulic effects on the canal and on the operation of the levee pump-out system are expected to be minimal.

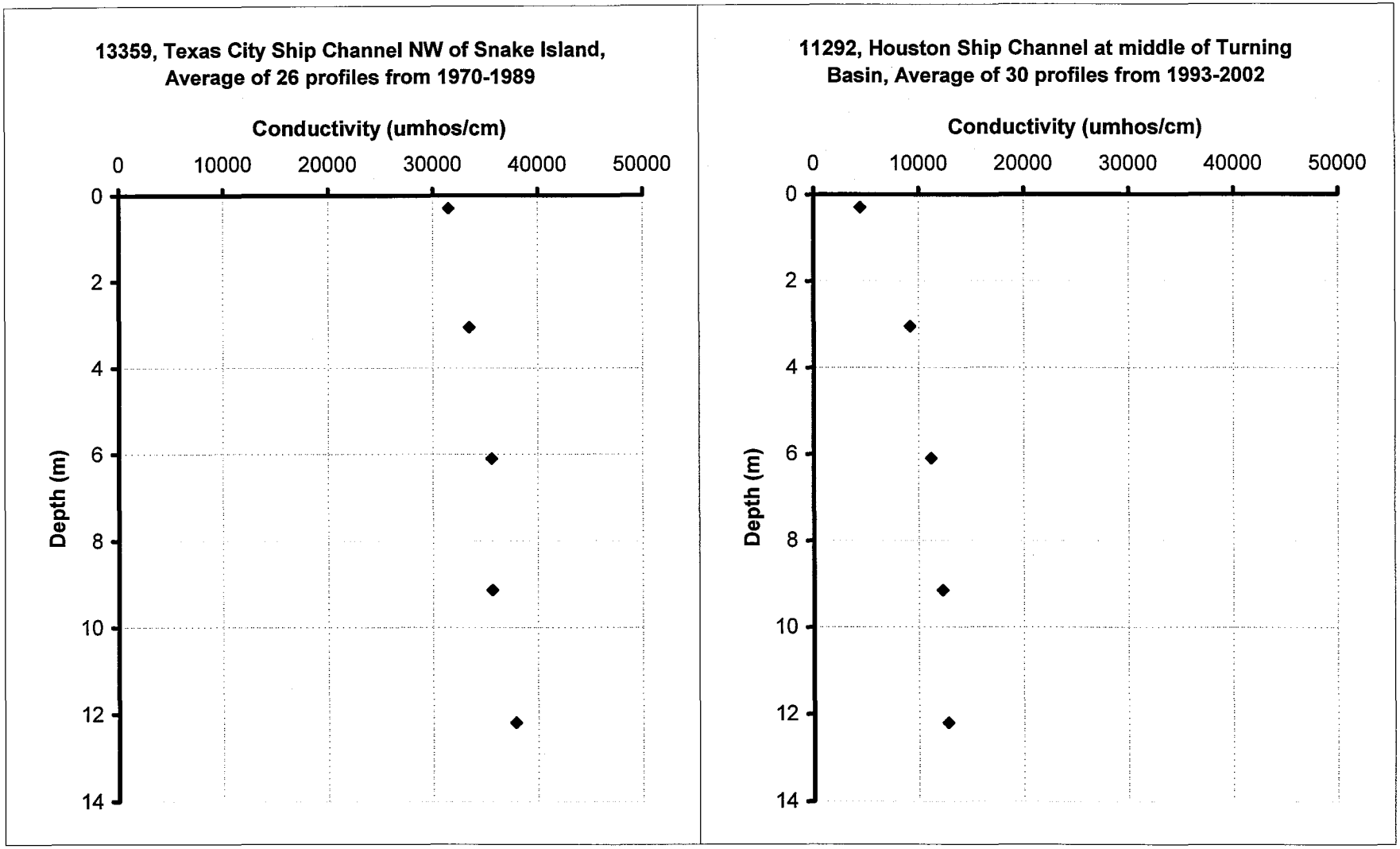
Numeric modeling for the Galveston County Discharge Canal was performed using the USACE Hydrologic Engineering Center River Modeling System (HEC-RAS) program. In general, the analysis suggests there are minimal impacts to the hydraulic performance of the canal system resulting from construction of the proposed access corridor. As an example, for the maximum pumping configuration (450,000 gpm), with the minimum tail water condition (2.07 MLT), the predicted free water surface measured at the Loop 197 bridge for the proposed access corridor template is approximately 0.24 feet higher than the theoretical (design) condition and 0.85 feet higher than the existing condition. The Loop 197 bridge is located approximately 12,100 feet upstream of the discharge point to the Industrial Canal.

4.2.10.6 Salinity and Circulation Effects of Channel Deepening

Phase II of the proposed project includes dredging of the Texas City Channel to 45 feet from the junction with the Houston Ship Channel to the proposed container facility, with no change in the 400-foot project width. When the concept was developed and the permit application filed, the Federal project to deepen the channel to 50 feet was inactive. During the EIS preparation process this situation changed, and the local sponsor of the Federal navigation project has now requested that the USACE reactivate the feasibility study of deepening the channel to 45 feet. While both the applicant and existing port interests have indicated support for the Federal channel deepening process, which would supercede the private deepening as far as Shoal Point, this private deepening is included in the permit application and the impacts must be assessed.

A deeper channel in an estuary typically allows the density current to be stronger and move more saline water upstream, increasing the salinity in the system. For example, in studies assessing the deepening of the Houston and Galveston Ship Channels (USACE, 1995), shifts in isohalines of several kilometers were projected with 3-D modeling. These shifts were up channel, counter to the source of freshwater inflows. The same basic process would occur with a deeper Texas City Channel, except that the freshwater inflows from the Texas City Harbor are very much smaller. Figure 4.2.10-1 compares the long-term average conductivity data at the main turning basins for the Houston and Texas City channels. The absolute levels of conductivity are much lower in the Houston Ship Channel. Also, the Houston conductivity data more than doubles between the surface and 10-foot depth, indicating strong freshwater flow, while the Texas City data show increases by only a small percentage over the same depth. As a consequence of the higher salinity and lower freshwater inflows, the density current effect from deepening the Texas City Channel would be expected to be substantially less than in the Houston Ship Channel.

FIGURE 4.2.10-1
AVERAGE VERTICAL CONDUCTIVITY PROFILES IN SHIP CHANNELS



The USACE (1987) evaluated the effects of deepening the channels in the Galveston Bay system to 45- and 50-foot depths using a 2-D model of the bay. This study predated the 1995 3-D evaluation of the effects of deepening the Houston and Galveston (but not Texas City) Ship Channels and gave generally similar results. These 1987 evaluations were focused on concurrent deepening of the Houston, Texas City, and Galveston channels. There was one comparison with a separate analysis of including and not including deepening the Texas City Channel, but this involved deepening both the entrance and the Texas City Channels to 50 feet, without including the HSC deepening. The result of that comparison was a 1 ppt increase in Galveston Bay and West Bay salinities in the steady spring and summer conditions analyzed. However, the comparison of a 50-foot Texas City Channel all the way to the Gulf with baseline is very different from a comparison of just deepening the Texas City Channel to 45 feet with the entrance channel and HSC already at 45 feet.

While there is little freshwater flow at the upstream end of the Texas City Channel, and the density current effect would be much less than deepening the Houston Ship Channel, some effect could be expected following heavy rains. In stable and dry conditions when salinities in Texas City and West Bay are essentially equal to those of the near-shore Gulf, one would expect the effect of channel deepening to be very small.

To quantify the effect under a near worst-case condition, a more sophisticated 2-D model (PBS&J, 2002) of the West Bay system (grid shown in Figure 4.2.10-2a) was employed to simulate the conditions following Tropical Storm Allison. The model is set up to focus on West Bay with the Galveston Bay boundary represented by a single cell that initially contains fresh water. The Gulf boundaries at Galveston Entrance and San Luis Pass are started with zero salinity on June 5, 2001, and set to increase linearly in the simulation at a rate of about 1 ppt per day as the Allison effects on the near-shore Gulf decay. The Gulf boundary salinity is held constant after it reaches 29.1 and 29.4 ppt at Galveston Entrance and San Luis Pass, respectively. These values were derived from the Texas Surface Water Quality Monitoring (SWQM) database maintained by the H-GAC under the Clean Rivers Program. Specifically, Station 16536 located at Gulf of Mexico East Beach near west entrance to Appfel Park was selected as the Galveston Entrance boundary, and Station 16537 located at Gulf of Mexico beach at the end of San Jacinto Drive was selected as the San Luis Pass boundary. These stations contain data from May 1997 to November 2000 and the average salinity values over this period are used in the modeling effort. Salinity from the model is compared with and without the deepened Texas City Channel to focus on the difference during this response condition.

At the start of the simulation, the entire bay was assumed to be substantially fresh. Over the days following the storm, salinity re-entered the Galveston Bay-West Bay system. During a period such as this, a deeper Texas City channel would allow higher salinity Gulf water to re-enter the Texas City Channel at a more rapid pace than would be the case with the existing water depth. The 2-D model approximates that effect using Okubo's formula (US EPA, 1985). While that formula includes channel depth, it does not represent the effect of the density current. To approximate that effect, the dispersion coefficients in the deeper channel segments were increased by a factor of 10. However, this turns out to be a small factor in this analysis as advective processes have a greater effect than was the case with the 1987 2-D model. That earlier 2-D model represented Galveston Bay using a 1-nautical-mile grid system,

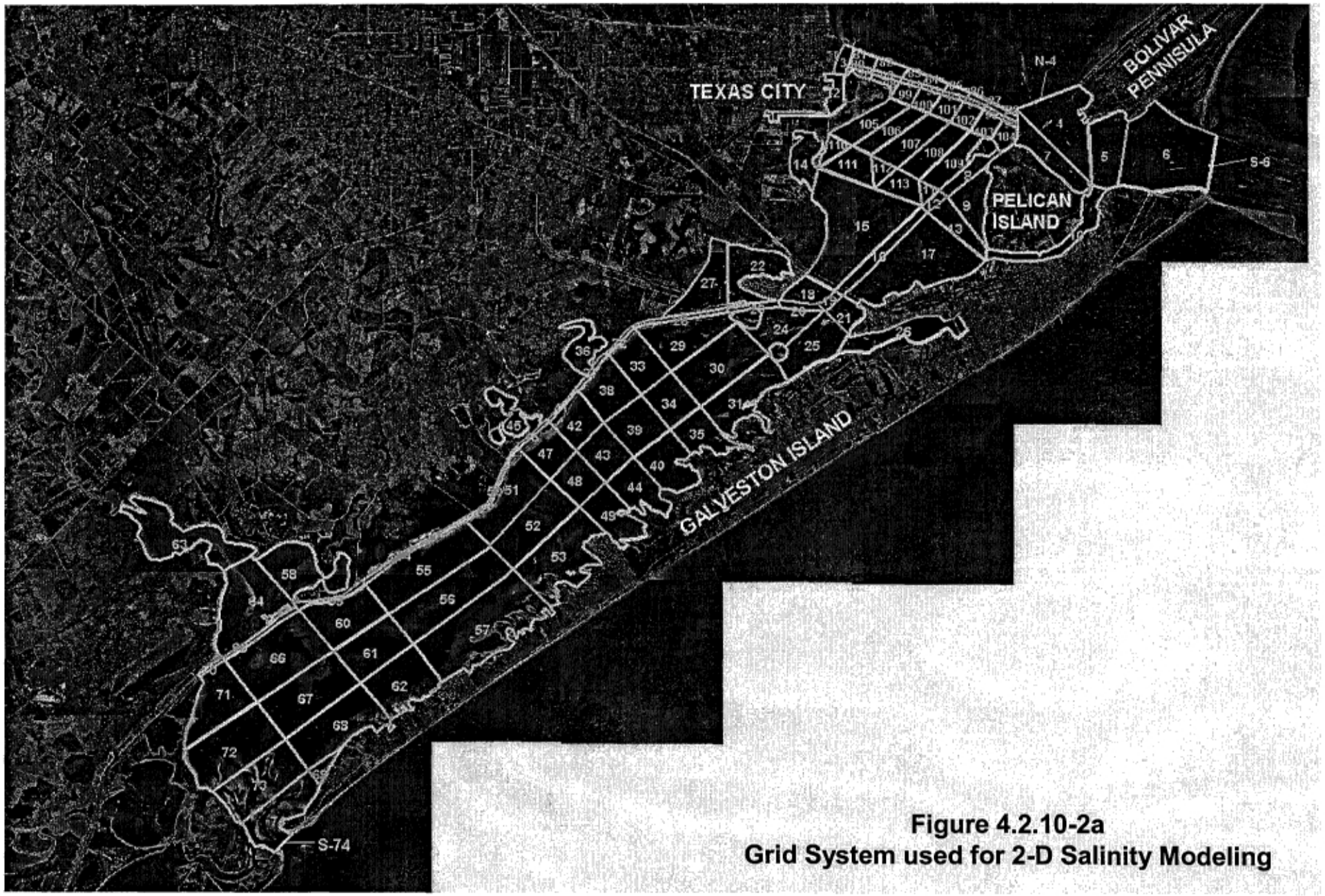


Figure 4.2.10-2a
Grid System used for 2-D Salinity Modeling

where the newer model has cells that more closely track the navigation channels. Freshwater inflow to the model was included from Chocolate Bayou based on gage data provided by the USGS. Wastewater flows into Texas City Harbor and other cells were also included, using data provided by the TNRCC that include a set of self-reporting data from October 1996 to January 2001. The wastewater flow to Texas City Harbor (151 cfs) is high because it reflects two major once-through cooling streams, but it was retained to accentuate the salinity differences.

To assess the effects on salinity, the model was run with both depths (40 and 45 feet) in the Texas City Channel cells 89-96 (see Figure 4.2.10-2b). The increase in the density current was represented using the relation developed by Ward (in USACE, 1987) where the dispersion coefficient is made a function of the depth increase to the 3rd power. In this case that is $(45/40)^3$ or 1.42. The differences in salinity during the response to Allison in several locations are shown in figures 4.2.10-3 through 4.2.10-6. Figure 4.2.10-3 shows the absolute salinity levels and differences between the two simulations at cell 95, near the end of the Texas City Dike. One salinity data point collected nearby (north of Pelican Island near the tip of the Texas City Dike) suggests the model is in reasonable agreement by late September. The salinity difference line (salinity at 45 feet minus salinity at 40-foot channel depth) indicates the effect of the channel deepening would be very small, about 0.1 ppt on average.

Figure 4.2.10-4 shows the same information for cell 91, part way up the Texas City Channel, and Figure 4.2.10-5 shows cell 3, inside the Texas City Harbor. There is a reduction with distance up the channel in the magnitude of salinity variation with each tidal cycle. This results from a combination of a smaller tidal excursion and a smaller salinity gradient with distance up the channel. As with cell 95, it is very difficult to discern the difference in salinity with the deeper channel, but it can be discerned with the difference plots. With the high freshwater flow in the harbor, there is an increase of about 0.2 ppt in the harbor, reflecting the effect of accelerated mixing from a larger channel. We would expect the difference to be smaller with lower freshwater inflows. The results for cell 52, near the center of West Bay, also show a slight increase during this salinity rebound period, as shown in Figure 4.2.10-6. There is also a salinity observation near this point in late September that is in reasonable agreement with the model. All of the salinity difference simulations show a measure of fluctuation in the first month of the simulation, with some cells showing more fluctuation than others. After this time the salinity differences tend to be stabilized at all stations.

Figures 4.2.10-7 and 4.2.10-8 show the water surface elevation and current velocities for a 2-week period in August. Figure 4.2.10-7 shows the water surface elevations at the North Jetty and San Luis Pass (Texas Coastal Oceanographic and Observation Network data) that are used to drive the model, and elevations at cell 95 produced by the model. Figure 4.2.10-8 shows existing and future tidal current velocities along Texas City Channel in cell 95 as simulated by the model. Both figures show reasonable levels and ranges of water levels and velocities. There are no readily visible differences in water surface elevations or currents with the deeper channel. The simulation illustrates the lags in the tides behind the North Jetty tide.

Overall, the effect of deepening the Texas City Channel would be to allow a small increase in the amount of tidal exchange, reflecting the greater cross-sectional area. The effect on salinity

Figure 4.2.10-2b Grid System Along Texas City Channel

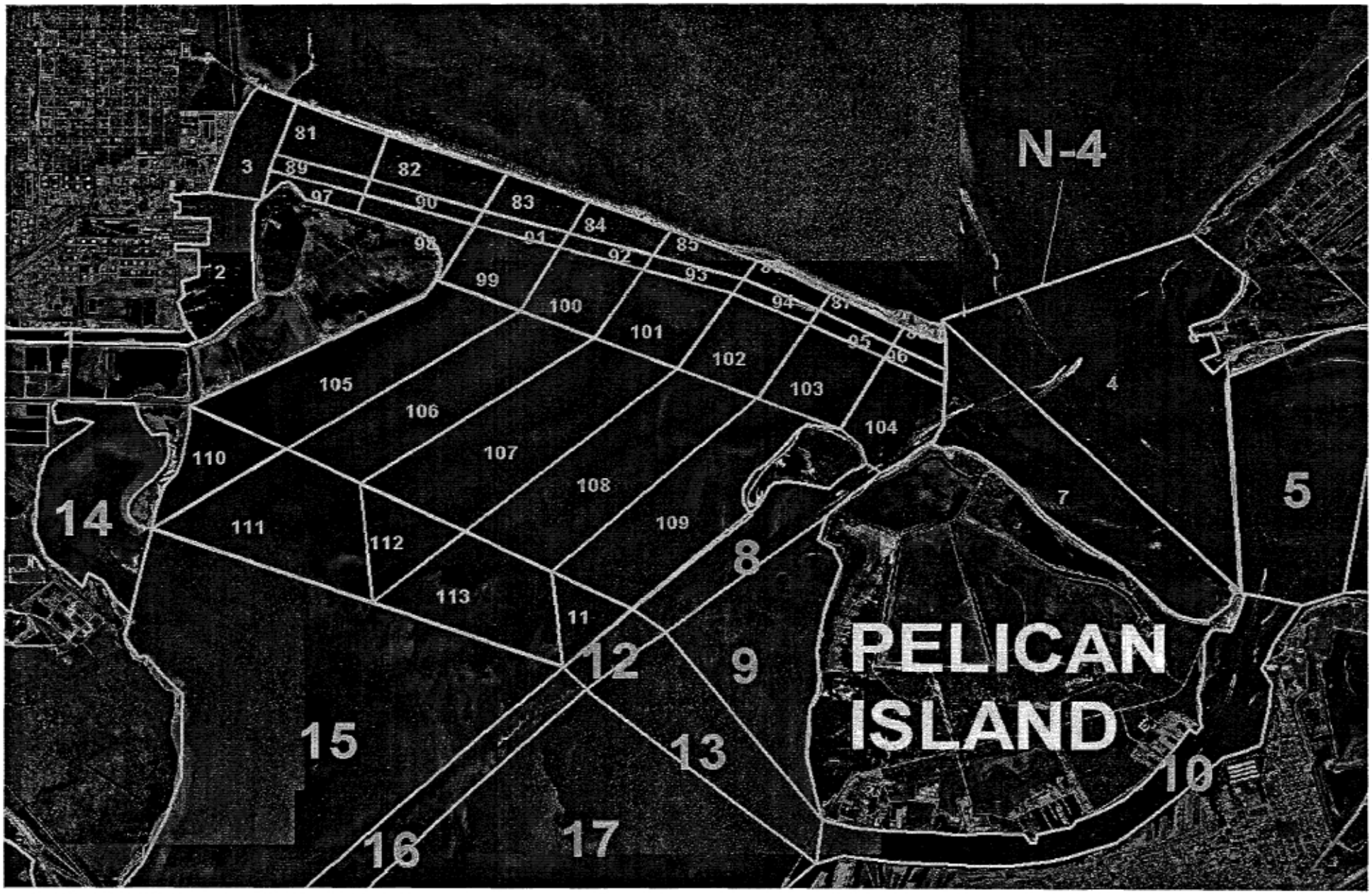


Figure 4.2.10-3 Salinity in Cell 95, Near Tip of Texas City Dike

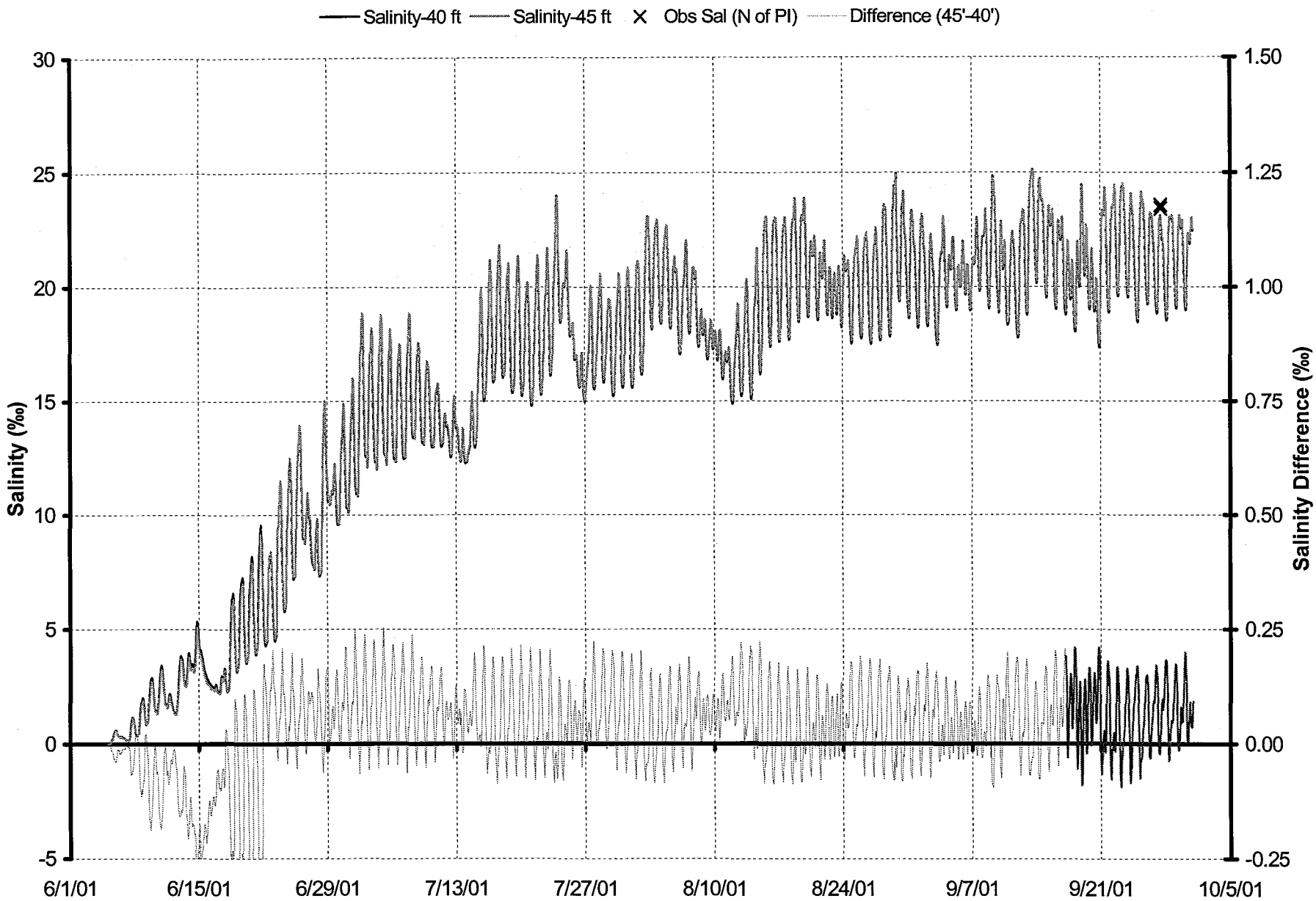


Figure 4.2.10-4 Salinity in Cell 91, middle of Texas City Channel

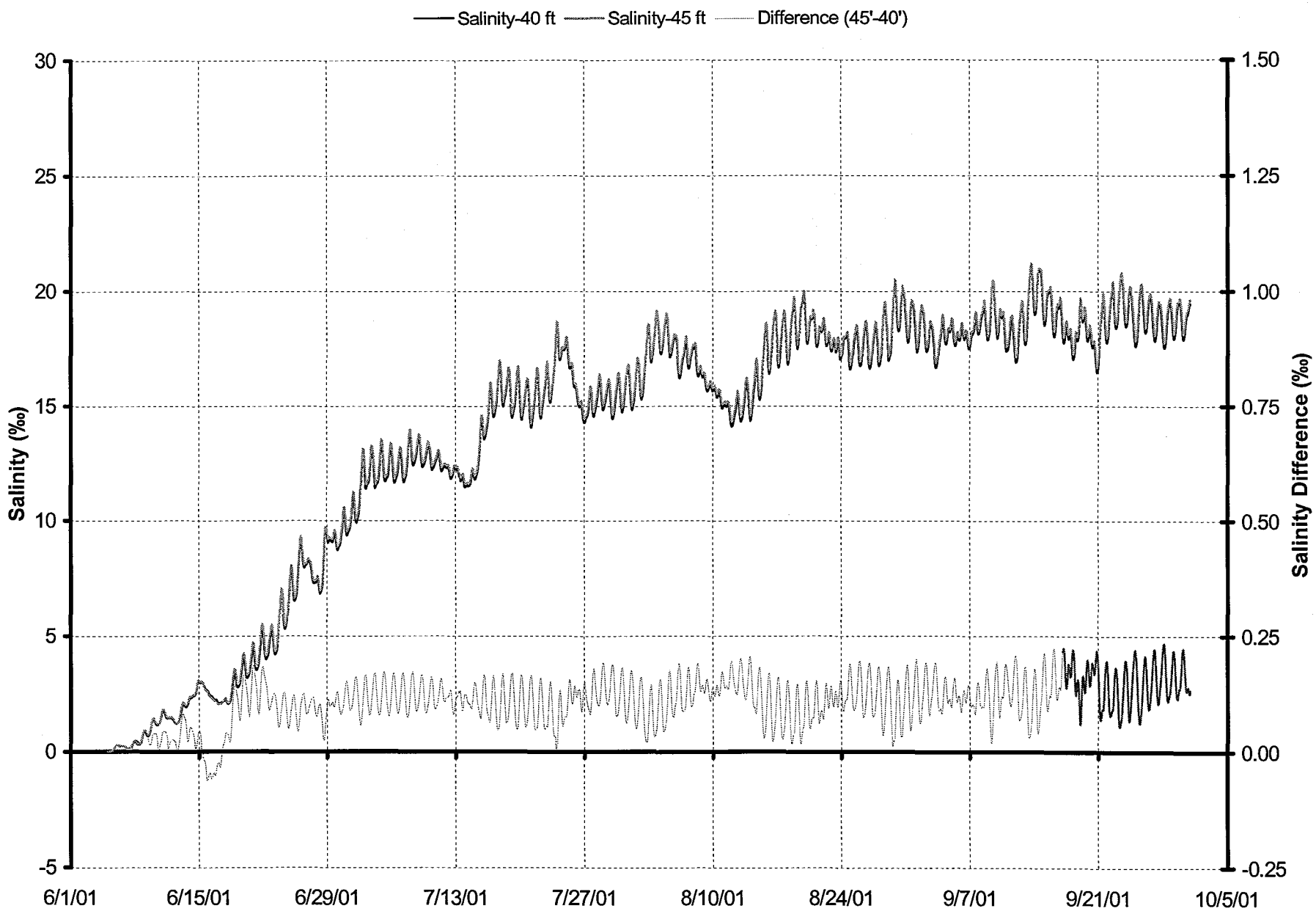


Figure 4.2.10-5 Salinity in Cell 03, Texas City Harbor

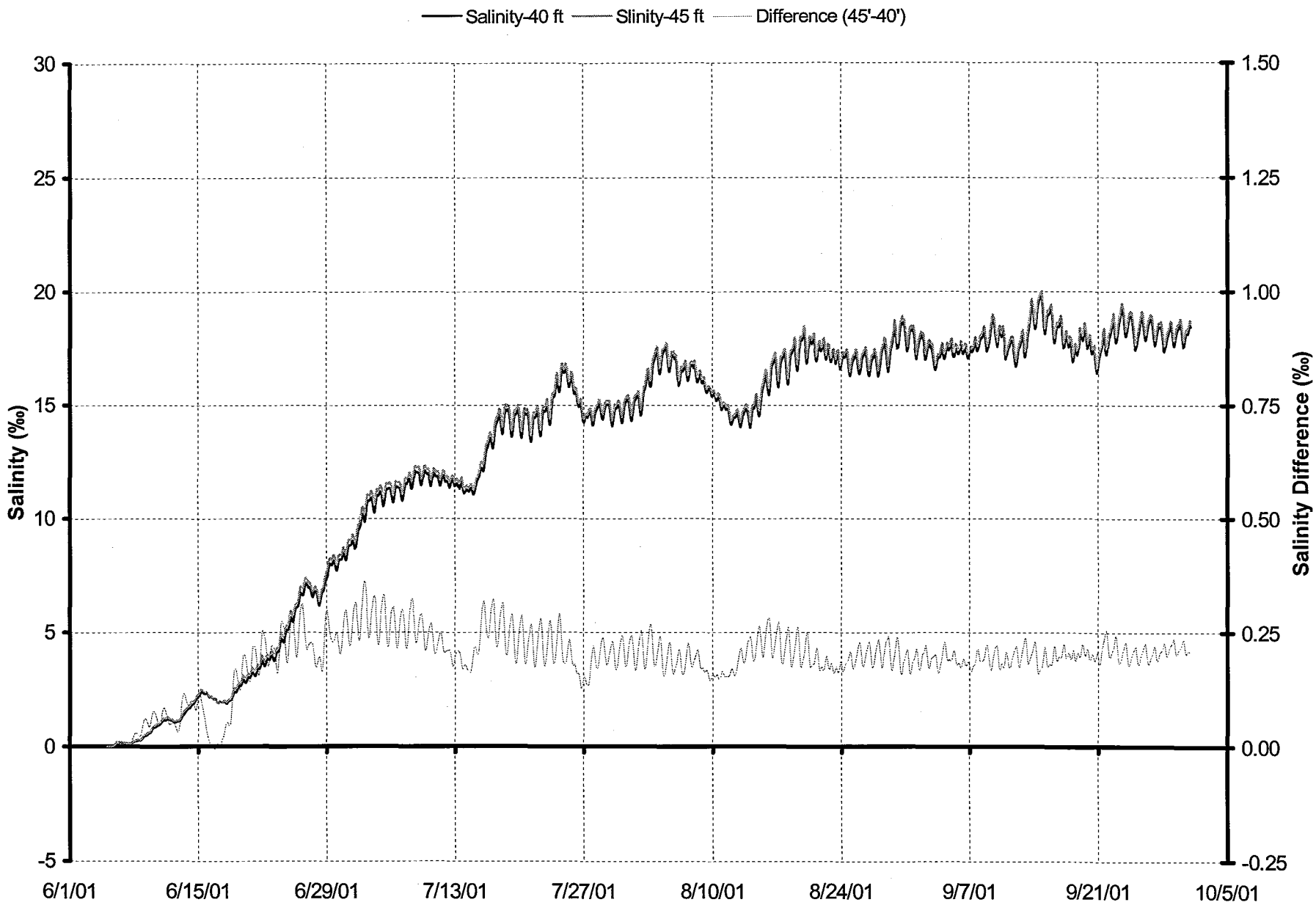


Figure 4.2.10-6 Salinity in Cell 52, center of West Bay

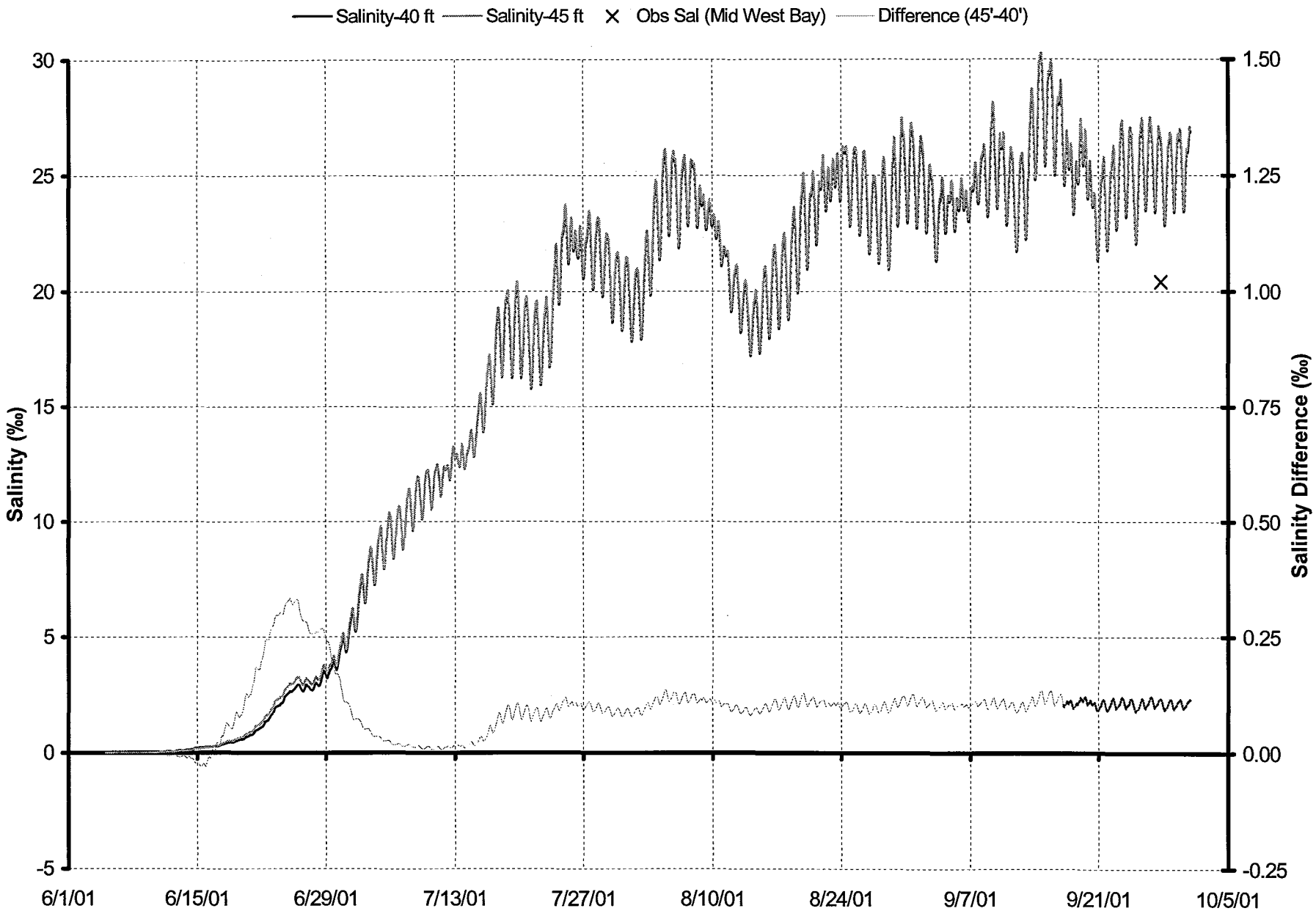


Figure 4.2.10-7 Example Water Surface Elevations

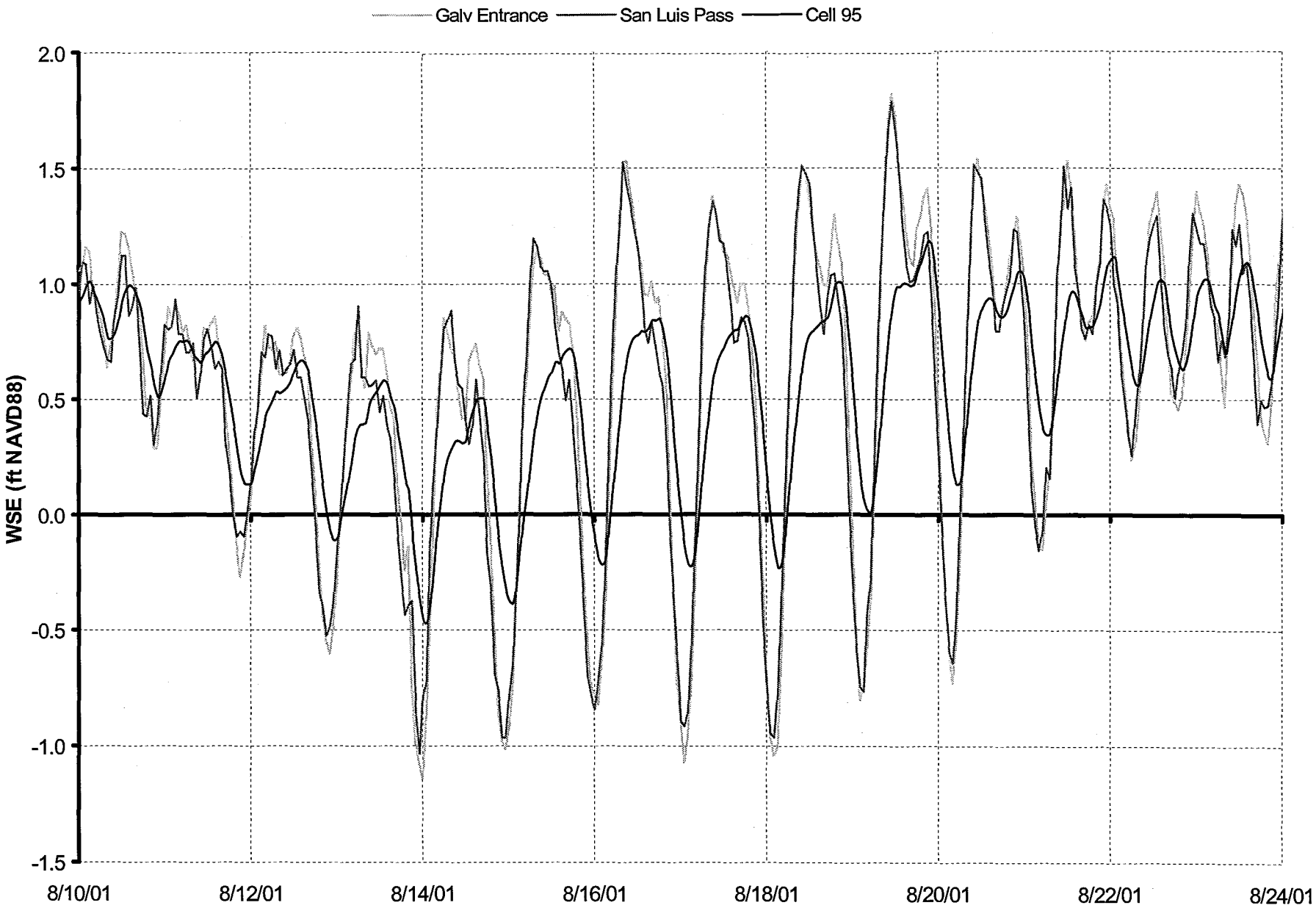
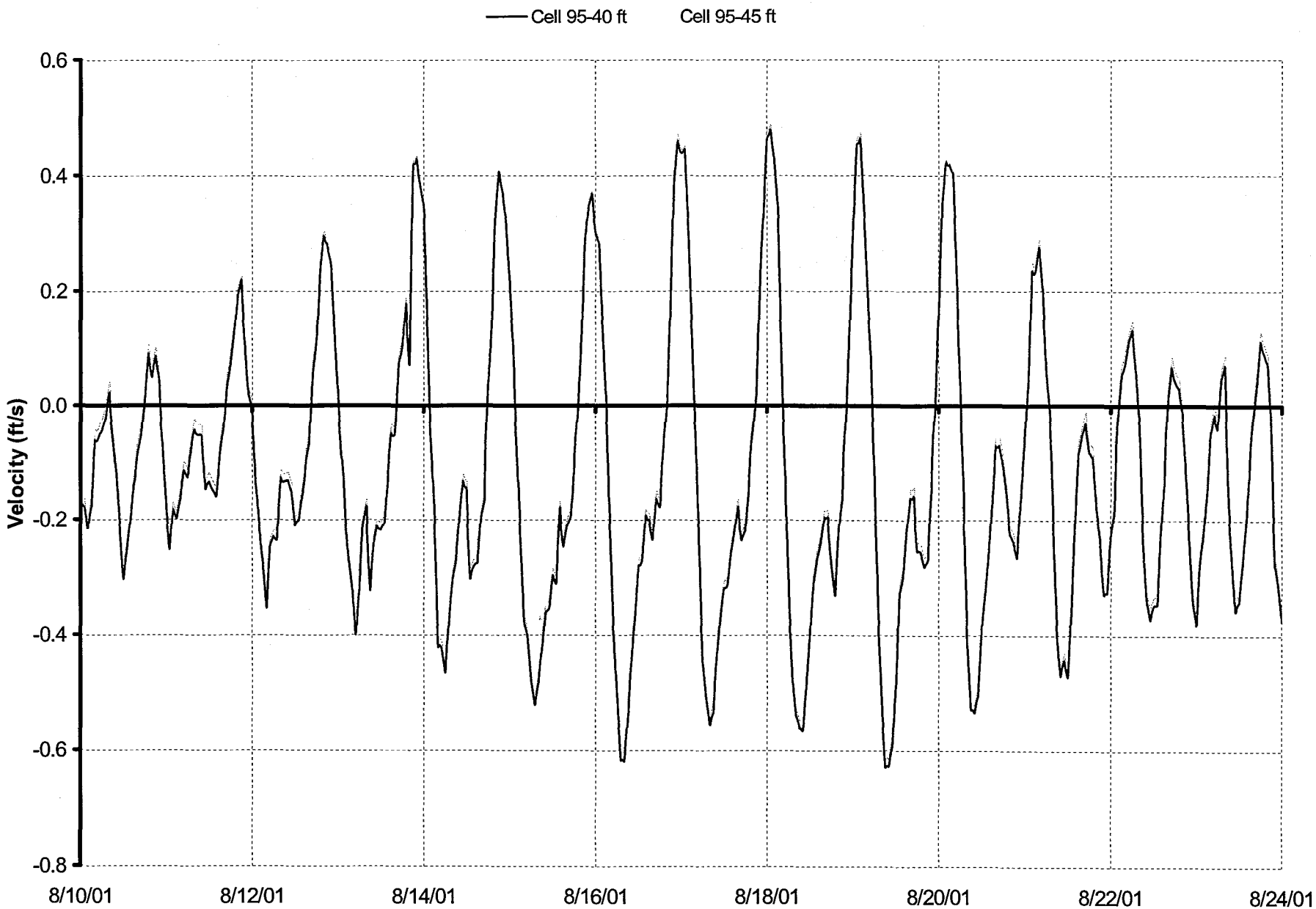


Figure 4.2.10-8 Example Current Velocities



would be to slightly reduce the difference between the Gulf and Texas City harbor areas. This would mean that on average, salinity in the Harbor would be slightly higher.

4.2.10.7 Habitat Changes

An important dimension of a project's effects on the environment, including surface water quality, is the net habitat change produced. Habitat changes are also discussed in sections 4.2.12 through 4.2.16 for the Shoal Point alternative and similar sections for other alternatives. Considerable effort was invested in project planning to have environmental aspects considered. Table 4.2.10-1 summarizes the net habitat changes over the three proposed project phases, and Figure 4.2.10-9 illustrates these changes over time. The main changes would include:

- converting Swan Lake's 363 acres of bay bottom to tidal wetland,
- changing 1,050 acres of additional bay bottom into 943 acres of marsh, with the remaining 107 acres being upland levee,
- changing 140 acres of bay bottom into deeper channel bottom, and
- converting 394 acres of upland Shoal Point land now used for dredged material placement into developed, primarily paved surface.

The tabulated changes include the jurisdictional wetlands that would be lost from the construction of the access road and modifications to the hurricane pumpout canal as well as losses in the terminal area. The Beneficial Use sites involve a confinement levee with the portion above water counted as upland area, but with the interior area counted as wetland after the area is converted to tidal wetland. The dredging of the Texas City Channel proposed in Phase II would not involve a change in channel width. However, because the greater depth would ultimately be reflected in the side slopes of the channel, an area 10 feet wide on each side of the channel is considered to be converted from bay bottom to channel bottom. This amounts to 15.4 acres over the length of the channel.

The net increase of 1,293 acres of tidal marsh would occur over approximately 25 years. During that time, portions of the bay bottom would be confined in levees, removed from the bay bottom habitat pool, and not functioning as wetlands. Nevertheless, there would be long-term net gains in tidal marsh habitat, offsetting to a degree the subsidence-related conversions of tidal marsh to bay bottom that has occurred in many parts of the bay.

4.2.11 Texas Coastal Management Program (TCMP) Consistency Determination

The permit application and DEIS automatically triggered a review by the GLO for consistency with the TCMP. As part of the original permit application to the USACE, the permittee submitted a TCMP consistency statement. A copy of this statement appears in Appendix H-7, Agency Coordination. Any concerns expressed by the GLO will be addressed in the ROD.

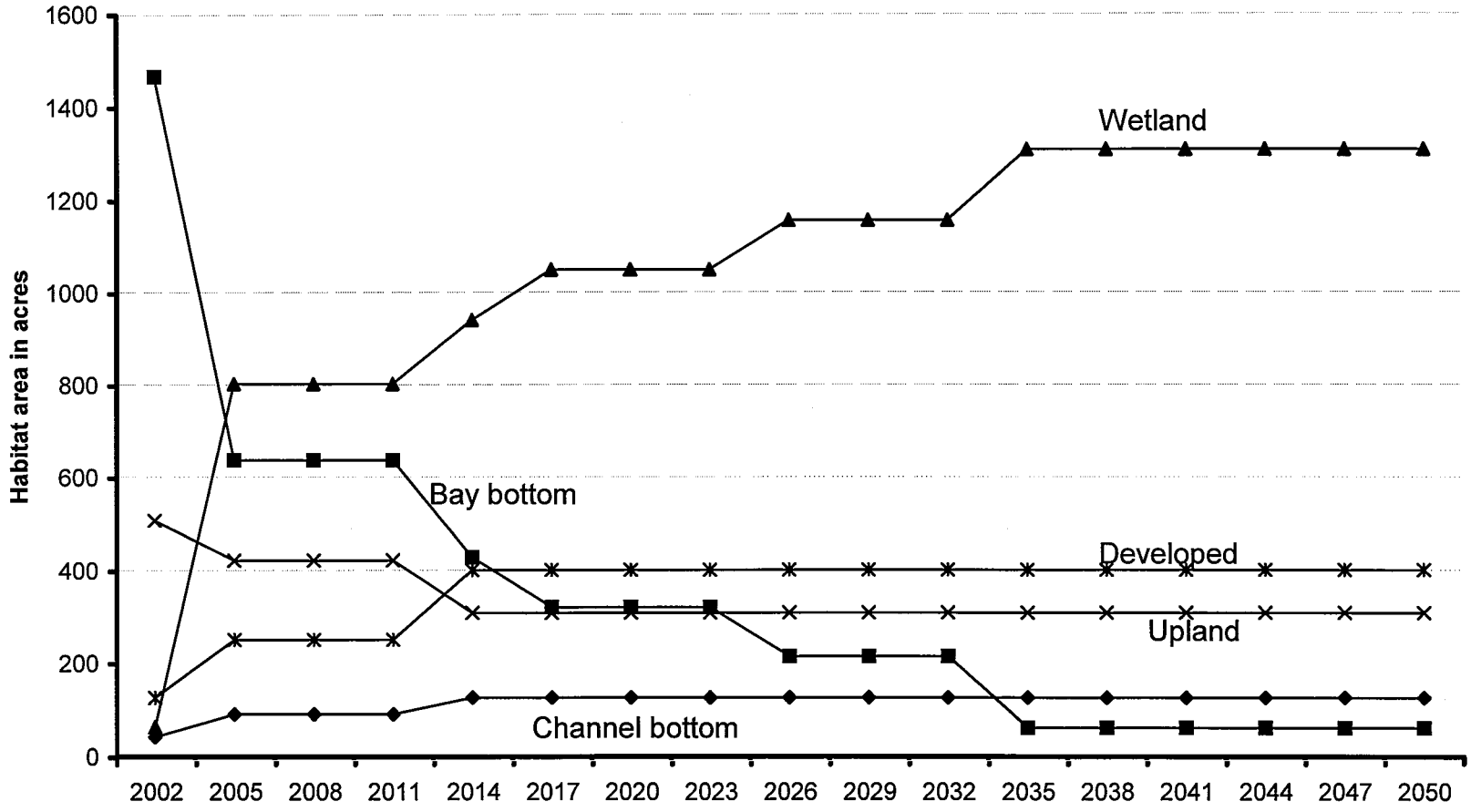
4.2.12 Vegetation

Vegetation communities that would be potentially impacted by the permit applicant's proposed Shoal Point alternative include natural and manmade wetland areas and disturbed or

TABLE 4.2.10-1
NET HABITAT CHANGES PRODUCED BY PROJECT

		HABITAT AREA IN ACRES				
		Channel Bottom	Bay Bottom	Wetland	Upland	Developed
PHASE 1 CHANGES						
Berthing Areas		42	-42		-7	7
Terminal		6.29		-6.54	-118	118.25
Access Road				-6.81		6.81
Swan Lake			-63	63		
BUS Area 1			-31		31	
Phase changes subtotal		48.3	-136.0	49.7	-94.0	132.1
PHASE 2 CHANGES						
Berthing Areas		38	-38		-7	7
Terminal					-118	118
Turning Basin		10	-10			
Swan Lake			-300	300		
BUS Area 1			-340	340		
BUS Area 3			-16.8		16.8	
BUS Area 4			-23.4		23.4	
Pelican BUS			-99	99		
TC Channel		15.4	-15.4			
Phase changes subtotal		63.4	-842.6	739.0	-84.8	125.0
PHASE 3 CHANGES						
Berthing Areas		35	-35		-6	6
Terminal					-144	144
BUS Area 2			-17.6		17.6	
BUS Area 5			-18.8		18.8	
BUS Area 3			-138	138		
Phase changes subtotal		35.0	-209.4	138.0	-113.6	150.0
LATER CHANGES						
BUS Area 4	2015		-108	108		
BUS Area 2	2024		-106	106		
BUS Area 5	2033		-152	152		
Later changes subtotal			-366	366	0	0
TOTAL CHANGES		147	-1554	1293	-292	407

FIGURE 4.2.10-9
HABITAT CHANGES PRODUCED BY PROJECT



regenerative upland areas. The manmade wetland areas include fringe wetlands on the shorelines of manmade channels, wetlands interior to leveed DMPAs, and the restored marsh in Swan Lake. Uplands are located on the levee and roadside along the hurricane channel, on the DMPA levee slopes, and inside the cell. Roadside and interior upland shrublands and grasslands include species such as annual yellow sweetclover (*Melilotus indicus*), goldenrod (*Solidago* sp.), germander (*Teucrium canadense*), bushy sea ox-eye (*Borrichia frutescens*), dewberry (*Rubus trivialis*), Hercule's club (*Zanthoxylum clava-herculis*), curly dock (*Rumex crispus*), annual sunflower (*Helianthus annuus*), canarygrass (*Phalaris caroliniana*), saltcedar (*Tamarix* sp.), gaura (*Gaura* sp.), lantana (*Lantana horrida*), and eastern baccharis (*Baccharis halimifolia*). The northern exterior slope of the levee is upland shrubland (marshhay and big leaf sumpweed (*Iva frutescens*)). Although this plant community (marshhay and big leaf sumpweed) is commonly called high brackish marsh, this site did not meet soil or hydrologic criteria to be considered a jurisdictional wetland. Upland grasslands and woodlands occur on the higher ground of the northwestern part of the interior of the cell. Species include yellow sweetclover, goldenrod, pepperweed (*Lepidium* sp.), dewberry, Hercule's club, annual sunflower, lantana, eastern baccharis, red mulberry (*Morus rubra*), and prickly pear cactus (*Opuntia* sp.).

Wetland communities that would be displaced by the proposed facility and land access corridor include jurisdictional wetlands and open waters (i.e., adjacent to Loop 197, the hurricane/stormwater channel, Swan Lake, and the exterior of Cell C) and nonjurisdictional wetlands and ponds (i.e., located within the leveed DMPA). The waters of the U.S. adjacent to Loop 197 and south of the hurricane/stormwater channel include a pond and wetland composed of saltmarsh bulrush/big leaf sumpweed (*Scirpus robustus/Iva frutescens*) brackish marsh with a narrow fringe of salt flat and high salt marsh (glasswort dominant). This wetland is tidally influenced and is part of a large marsh/open water complex that extends south of the Gulf Coast treatment plant and connects to Galveston Bay via Swan Lake. There is also a very narrow fringing low salt and brackish marsh along the hurricane channel. The proposed land access and transmission line corridor would also impact Swan Lake fringing low and high salt and brackish marshes, tidal flats, and open water. These plant communities are described in Section 3.11. Historical subsidence and erosion have extended the lake north to the raised bed of the road. This is an erosional shoreline except for a restored area of salt marshes and tidal flats on the east end that is separated from Galveston Bay by a wavebreak structure. The northern shoreline of the exterior of the leveed Cell C also supports low and high salt marshes. The western shoreline of the cell is an erosional bluff with a narrow shell beach, which becomes an armored shoreline on the southwestern perimeter. The northeastern part of Shoal Point is an armored shoreline of active DMPA Cell A. The interior of DMPA Cell C includes wetlands that are dominated by bushy sea ox-eye and big leaf sumpweed as well as bulrush/marsh elder/cattail/black willow wetlands that fringe two small ponds. Approximately 13 acres of natural salt/brackish marshes, tidal flats, and ponds will be impacted as well as 38 acres of manmade wetlands and open water within DMPA Cell C. In summary, 92 acres of uplands (disturbed grassland and shrubland) and 13 acres of tidal salt/brackish marshes would be lost.

4.2.13 Section 404/Section 10 Jurisdictional Areas (Wetlands and Open Water)

The jurisdictional areas within the study area total approximately 674 acres, consisting of 13.3 acres of wetlands and 661 acres of open water (651 acres dredged and 10 acres from access

corridor). Areas subject to Section 404 jurisdiction within the study area consist of estuarine brackish and saline marshes, tidal flats, and ponds. There are also wetland plant communities within the leveed, inactive (although not yet decommissioned) USACE DMPA, Cell C; however, these are not jurisdictional because they do not meet the criteria for adjacent wetlands as described by the USACE-Galveston District (USACE, 2001b).

Jurisdictional wetlands in the area are generally associated with estuarine shorelines. Historical land subsidence has caused the loss of many of these wetlands (GBNEP, 1992b; HGCSD, 1998) including the Swan Lake marshes. See the project plans (Appendix A), and the DMMP (Appendix B) for descriptions of proposed mitigation for the project. Construction of the port facility and berthing area would cause most of the wetland loss in the form of shoreline marshes. The access road and transmission line corridor would displace marshes on the northern shore of Swan Lake, the fringing marsh of the hurricane channel, and approximately 0.5 acre of brackish marsh adjacent to Loop 197 (see Appendix A).

4.2.14 Terrestrial Wildlife

The primary direct adverse impact of the proposed construction activities on wildlife at the Shoal Point site would result from the vegetation clearing and the subsequent loss of wildlife habitat. Construction activities might also result in the direct destruction of those organisms not mobile enough to avoid construction equipment. These would potentially include individuals of several species of reptiles, mammals and, if construction occurs during the breeding season, the young of some species, including nestling and fledgling birds. Fossorial animals (i.e., those that live underground), such as mice and shrews, may similarly be negatively impacted as a result of soil compaction caused by heavy machinery. For the most part, mobile wildlife species, particularly adult birds and larger mammals, would likely avoid the initial construction activity and move into available habitat outside the project area. Each species, however, is dependent upon available resources such as food, shelter, water, territory, and nesting sites in any given area of habitat (Dempster, 1975). It is assumed, for the purpose of impact analysis, that habitats are at their carrying capacity for the species that live there. Therefore, displaced wildlife populations are forced into competition with resident populations in adjoining habitats, creating an inevitable decreased birthrate and/or increased mortality rate until populations are reduced to numbers that the habitat can support. Thus, construction activity would ultimately result in a reduction in the local wildlife populations proportional to the amount of habitat preempted.

The noise of equipment and increased human activity during construction may disturb some local wildlife. In addition, fugitive dust associated with construction activities may have minor impacts on the vegetation, thus decreasing its value as wildlife habitat. Dredging activities may indirectly impact sea birds in the area by potentially reducing the availability of the food supply. Such impacts, however, should be temporary and without significant long-term implications.

As described in Section 3.13.1.3, many shore birds and wading birds were observed in the Shoal Point DMPA during site visits. Development of the Shoal Point site would eliminate the loafing habitat along the northern shoreline of Cell C, as well as the loafing/nesting habitat on the northern portion of Cell A. If construction took place during the nesting season, eggs or young of the Forster's tern, and

possibly other species, would be lost. It should be noted, however, that because Cell A is still active, the nest sites and loafing areas could be disturbed during dredged material placement activities, irrespective of whether this site is selected. The new access road would cross Cell B, resulting in possible loss of some foraging habitat for wading birds, and disturbance during construction. As with Cell A, Cell B is active and habitat impacts could occur during routine dredged material placement activities. Other habitat types that would be impacted by the Shoal Point alternative include upland areas such as shrublands and grasslands, natural and manmade wetland areas, and open water.

Swan Lake and the hurricane/stormwater channel are adjacent to the proposed access road. As described in Section 3.13.1.3, these areas are used as rookeries, nesting habitat, and loafing and foraging habitat by many avian species. While little habitat would be lost during construction of the access road in these areas, noise and human activity would likely decrease the attractiveness of the area, particularly if construction occurs during the breeding season.

Placement of the proposed transmission line along the discharge canal levee, within the footprint of the proposed access road, would minimize long-term effects resulting from habitat modification. Short-term effects resulting from physical disturbance during construction would occur as described above. However, timing construction of the transmission line simultaneously with other construction activities along the road would minimize these disturbances.

Once the facility is in operation, wildlife remaining in the area could be impacted by noise, lights, and human activity. Furthermore, an increase in vehicular traffic would increase the potential for collision mortality for some wildlife species. The increased possibility of chemical or oil spills poses a threat to the nekton community and, thus, the food source of many coastal birds in the area.

Transmission line structures can benefit some bird species, particularly raptors, by providing nest sites and hunting perches (Olendorff et al., 1981). However, transmission lines (both structures and wires) present a potential hazard to flying birds, particularly migrants and large, heavy-bodied birds. Most migrant species, including passerines, should be minimally affected during migration since their normal flying altitudes are greater than the heights of the proposed transmission structures (Willard, 1978; Gauthreaux, 1978). Large birds are more prone to collisions because their large wingspans and lack of maneuverability make avoiding obstacles more difficult (Avian Power Line Interaction Committee (APLIC), 1994). Resident birds, or those in an area for an extended period, learn the location of power lines and become less susceptible to wire strikes (Avery, 1978).

Power lines in the vicinity of daily use areas (areas used for feeding, roosting, resting, etc.) are responsible for most bird collisions. Waterfowl species are vulnerable because of their low altitude flight and high speed, and flocking species, such as blackbirds and many shorebirds, are also very vulnerable (APLIC, 1994). Waterfowl are among the birds most susceptible to wire strikes (Faanes, 1987) and yet, despite these hazards, it has been estimated that wire strikes (including distribution lines) account for less than 0.1% of waterfowl nonhunting mortality, compared to 88% from diseases and poisoning and 7.4% due to the weather (Stout and Cornwell, 1976).

The greatest danger of collision exists during periods of poor visibility, such as fog, precipitation, or a low ceiling, when birds are flying low, perhaps commencing or terminating flight, and may have difficulty seeing obstructions (APLIC, 1994). Raptors, typically, are uncommon victims of transmission line collisions due to their great visual acuity (Thompson, 1978).

Increasing the visibility of transmission line wires by using markers such as orange aviation balls, black-and-white ribbons or spiral vibration dampers, particularly at mid-span, can reduce the number of collisions. Beaulaurier (1981) reviewed 17 studies involving marking ground wires or conductors and found an average reduction in collisions of 45 percent compared with unmarked lines.

Because of the proximity of the proposed transmission line to the storm water channel, the Port of Texas City Ship Channel, Swan Lake and proposed Beneficial Use sites, there is a potential threat of avian wire strikes. The proposed transmission line would be marked with aviation balls over the length of the route. This would increase the visibility of the line and reduce the potential for avian wire strikes.

Shoal Point is not an officially recognized historic nesting site recorded in the Texas Colonial Waterbird Census database; however, there is a potential for some species to nest there. All necessary precautions must be made to avoid killing nesting birds. If nesting birds are present on Shoal Point, FWS recommends prohibiting all activity within 1,500 feet of the active colonial waterbird nesting areas from February 15 to September 1. Implementation of this restriction would ensure that the project does not violate the Migratory Bird Treaty Act.

Mitigation for unavoidable impacts to wetlands would include restoration of approximately 45 acres of marsh in Swan Lake, which would also serve as mitigation for impacts to wildlife species affected by the project.

4.2.15 Aquatic Ecology

4.2.15.1 Freshwater Habitats and Fauna

The Shoal Point site supports two small freshwater ponds that were formed by depressions in placement material. These areas retain rainwater, but are ephemeral and provide little habitat for fish (O'Brien, 2001). Both ponds lie within the site of the proposed terminal and would probably be filled during construction.

4.2.15.2 Open Bay/Open-Bay Bottom

Turbidity in estuarine waters is generally credited with having a complex set of impacts on a wide array of organisms (Hirsch et al., 1978; Stern and Stickle, 1978; EH&A, 1978). Suspended material can play both beneficial and detrimental roles in aquatic environments. Increased turbidity in the area can interfere with light penetration and thus reduce photosynthetic activity by phytoplankton. Such reductions in primary productivity would be localized around the immediate area of the dredging operations. Conversely, the decrease in primary productivity has been found to be offset by increased nutrient content (Morton, 1977).

Potential effects of elevated turbidities on the adult stages of various filter-feeding organisms such as oysters and copepods include reduction of pumping and filter rates and clogging of filtering mechanisms (Stern and Stickle, 1978). These effects are pronounced with high total suspended solids (TSS) levels, but are apparently reversible once turbidities return to ambient levels.

Water column turbidity would increase in open-bay habitats near the project site during dredging activities but the effects are expected to be temporary and local. Some studies of turbidity from TSS associated with dredging operations have concluded that dredging had no substantial effects on nekton (Ritchie, 1970; Stickney, 1972; Wright, 1978); however, other studies have shown that elevated TSS levels and prolonged exposure can suffocate and reduce growth rates in adult and juvenile nekton and reduce viability of eggs (Moore, 1977; Stern and Stickle, 1978). Elevated turbidities during construction and maintenance dredging may affect some aquatic organisms near the dredging activity; however, turbidities in the open-bay habitats can be expected to return to near ambient conditions after dredging ceases.

Initial placement of new work dredged material for construction of levees would be equivalent to open-bay disposal; however, once the levees are complete, the proposed Beneficial Use sites would be used for confined placement of dredged maintenance material. In the course of building the BUS levees, some of the material being placed would be relatively fine and thus tend to not settle immediately on the levee. The amount of these fines would be a function of the characteristics of the dredged material and the pumping distance. An analysis of Fluid Mud Flows (FLUMF) on the Atkinson Island levee on the Houston Ship Channel (Turner Collie & Braden, Inc., and Gahagan & Bryant Associates, Inc., 2001) suggested that an area ranging from about 1,400 feet to about 2,500 feet from the levee center would potentially be affected by fines. The depth of fines would range from over 1 foot near the levee to less than 2 inches at a distance of 2,500 feet. The report also notes some difficulty in distinguishing between the existing sediment and new FLUMF material. Using that estimate, an area approximately 1,400 to 2,500 feet wide around each of the proposed BUS sites could experience short-term habitat disruption following BUS levee construction. In an environmental assessment of open-water placement of dredged material, Ray and Clark (1999) reviewed previous studies and found that infaunal communities recovered within a period of 3 months to 1 year. Based on these results, recolonization of the sediments deposited around the proposed BUS sites can be expected to occur over a similar time period.

Within the Beneficial Use sites, benthic organisms which may have been used as a food source by local predators would be buried and smothered, and epibenthic nekton may be excluded from the immediate area as a result of dredged material placement. These areas constitute a relatively small area of the total bay system, and it has been shown that soft-bottom benthic communities recover within a year of dredging activity (Montagna et al., 1998). Benthic populations would eventually recover within the Beneficial Use sites once intertidal habitat is created. In the event an accidental spill should occur, benthic fauna may be killed and phytoplankton may be adversely affected. It is unlikely, however, that a spill in Galveston Bay would result in long-term adverse impacts to phytoplankton, zooplankton, or benthic communities. These communities have the ability to recover rapidly from a spill due primarily to the rapid rate of reproduction of the organisms and to the widespread distribution of the dominant species. Adult crustaceans (shrimp and crabs) and adult finfish are probably mobile enough to avoid most areas of high

concentrations of toxins. Larval and juvenile finfish and shellfish tend to be more susceptible to toxins than adults. Juveniles could be affected extensively by a spill during their period of active immigration. The potential for impacts from spills would be minimized by use of BMPs and spill control and prevention measures. Therefore, the impacts of dredging and placement of dredged material are both localized and temporary and are not expected to have long-term adverse impacts on the aquatic environment.

The deepening of the Texas City Channel would slightly increase habitat for nekton species common in deeper offshore waters, which periodically enter the bay through the deep channel corridor (Breuer, 1962). Channel deepening would also result in a slight increase in the availability of feeding and nursery area for demersal fish (Breuer, 1972). Adverse impacts to benthos affected by channel deepening would likely be short term due to their ability to recolonize the affected area relatively quickly. Even without the proposed channel deepening, the benthos populations in the channel are subject to disturbance due to regular channel maintenance activities. The additional habitat created by the Beneficial Use sites would also increase habitat for many of the common marine species which inhabit the bay system.

The impacts of contaminated dredged material depend on the nature of the biogeochemical environment and the contaminants. Common contaminants of sediment include heavy metals, chemical byproducts, petroleum, and organohalides. Contaminants bind to sediments which are in direct contact with benthic organisms and may be ingested (Montagna et al., 1998). Few studies have examined sediment contaminants in many areas of Galveston Bay, with the exception of the upper Houston Ship Channel, a well documented source of toxicity (GBNEP, 1994b). Based on GBNEP (1994b), elevated levels of contaminants do not occur near the Shoal Point alternative; therefore, impacts to benthic organisms and nekton from contaminated sediments are not expected. Stormwater runoff can carry toxic contaminants into surface waters, depositing them on sediments and potentially affecting the aquatic community. The potential for toxic runoff would increase with the building of the Shoal Point alternative; however, runoff from industrial point sources contributes less than 7 percent of the total loading of any pollutant, including heavy metals and biological oxygen demand, in Galveston Bay (GBNEP, 1994b). In addition, pollutant loading from the proposed project is expected to be minimal due to the type of facility (containerized cargo) and to the controls that would be implemented to control runoff and spills. Therefore, impacts from contamination are expected to be minimal.

4.2.15.3 Oyster Reefs

No live oyster reefs occur at or near the Shoal Point alternative; therefore, no live oyster reefs are expected to be impacted as a result of construction or dredging operations. Beneficial Use sites were selected to avoid areas of known or potential oyster reefs.

4.2.15.4 Recreational and Commercial Fisheries

The recreational and commercial fishery may be temporarily affected in the vicinity of dredging operations as a result of decreased water quality and increased turbidity during dredging, and the loss of attractiveness to fish in the area due to loss of benthic organisms. This is not a permanent condition; the quality of fishing in the project area should steadily improve after dredging is completed.

Recreational fishing impacts would be temporary, potentially resulting in local disturbances to both boat and wade-bank fishing, particularly along the edges of Shoal Point.

Currently, wade fishing in the proposed Beneficial Use sites is limited by water depth and substrate conditions. Recreational fishing at these locations, while locally important, constitutes a relatively small portion of the overall recreational fishing activity in the project vicinity. The additional habitat created by the Beneficial Use sites would enhance fishing in adjacent areas by providing additional nursery habitat for many of the commercially important species. However, the creation of the proposed Beneficial Use sites would limit boat use within the sites. Construction and dredging activities in this portion of the bay are not expected to have long-term adverse impacts on fishing in the project area.

If an accidental spill were to occur, adult finfish are mobile enough to avoid the area; however, larval and juvenile finfish and shellfish could be affected extensively. Serious impacts to shrimp could also affect the commercial shrimping industry in the area if the spill is severe and widespread. The potential for impacts from spills would be minimized by the use of BMPs and spill control and prevention measures. Impacts from stormwater runoff are expected to be minimal.

4.2.15.5 Essential Fish Habitat

EFH for adult and juvenile brown and white shrimp, red drum, and Spanish mackerel occurs in the vicinity of the Shoal Point alternative and may include estuarine emergent wetlands, estuarine mud, sand, sand and shell substrates, SAV, and estuarine water column. Approximately 651 acres of open-bay bottom would be affected by dredging of new berthing areas and a turning basin and by deepening of the Texas City Channel. Much of this area would be within the existing deep-water channel. Over the 50-year life of the DMMP, over 1,400 acres of open-bay bottom (including approximately 363 acres in Swan Lake) would be converted to Beneficial Use sites. The proposed project and associated DMMP avoids impacts to oyster reefs and uses dredged material in a beneficial manner, as recommended by NMFS and other natural resource agencies. As mitigation for the proposed project, approximately 45 acres of marsh habitat would be created in Swan Lake. In addition, intertidal habitat suitable for vegetative cover, marsh habitat and wildlife use would be created over time in the Beneficial Use sites. Ultimately, fisheries habitat and the overall ecology of Galveston Bay would be improved by creation of marshes in Swan Lake and the proposed Beneficial Use sites.

Dredging activities in open-bay bottom habitat would impact benthic communities in those areas. Although recovery of some benthic organisms would likely occur relatively quickly, the assemblage in the sediments at the bottom of the new berthing areas, turning basin, and Texas City Channel may differ from the assemblage that existed prior to construction.

Based on analysis presented in the GBNEP's Trends and Status of Wetland and Aquatic Habitats in the Galveston Bay System, Texas (White et al., 1993), a net loss in vegetated wetlands of approximately 32,400 acres (19%) occurred from 1950 through 1989. Both natural and artificial processes, including historical, human-induced subsidence and relative sea level rise as well as draining and filling wetlands for development have resulted in the conversion of wetland habitats to open water or upland habitat (White et al., 1993). Because of these losses, efforts are underway to preserve, restore,

and create intertidal (marsh) habitats in Galveston Bay. For the proposed project, such efforts include habitat restoration and creation through mitigation plans and through beneficial uses of the dredged material.

In the initial phase of the proposed project, new work material from dredging of the first two berthing areas would be used to create 45 acres of intertidal marsh habitat in Swan Lake as mitigation for project impacts. High marsh would constitute 9 of the 45 acres and would be unavailable to EFH managed species. In addition, approximately 200,000 cubic yards of new work material would be provided during Phase 1 to the State and Federal Natural Resource Trustee agencies (Trustees) for their use in the partial restoration of approximately 95 acres of marsh in Swan Lake. The remaining volume of material needed for restoration of the entire 363 acres of Swan Lake to intertidal marsh habitat (interspersed with open water as appropriate) would be provided by the project or may be provided by Federal channel deepening activities during Phase 2 of the project. This proposed restoration of marsh habitat in Swan Lake, to conditions approximating the habitats that were present before effects of subsidence converted the area to open water, is considered by the natural resource agencies to be the highest priority for use of dredged material in the vicinity of Shoal Point.

Initial placement operations would cover benthic organisms with dredged material. As discussed in Section 4.2.15.2, benthic populations are expected to recover in areas where intertidal habitat is created. The benthic organisms would not recover in upland portions of the marsh. There would be an initial loss of estuarine water column and estuarine mud bottoms during the creation of the marsh. In addition, while the Swan Lake Beneficial Use site is being filled and dewatered, the area would not be available for use by aquatic organisms. Marsh establishment would take time; however, once established, the marsh would provide habitat for numerous species that utilize estuaries during different life stages. Although benthic organisms would be impacted and bay bottom would be lost, there would ultimately be an overall gain in the ecology of the Galveston Bay system from restoration of the marshes in Swan Lake. This restoration project is expected to provide habitats which are likely to increase fisheries populations within the project vicinity.

Other Beneficial Use sites associated with the proposed Shoal Point project are the Pelican Island Beneficial Use site and Beneficial Use sites 1 through 5 (see Appendix B). While these Beneficial Use sites are not all required to accommodate dredged material from the proposed project, they are included in the proposed 50-year DMMP. New work material from project-related dredging activities would be used to create the levees for the Beneficial Use sites. Most of the maintenance material that would be placed in these sites, however, would be generated by the Federal maintenance dredging projects on the Texas City Channel. Plans for these sites include the conversion of 99, 357, 115, 138, 120, and 161 acres, respectively, of bay bottom to marsh habitat. High marsh would constitute approximately 198 acres of the 990 total acres of created marsh habitat and would therefore be unavailable to EFH managed species. Additionally, approximately 123 acres of bay bottom would be converted to upland (levees), which would also be unavailable for EFH use. Beneficial Use sites 1 through 5 would not be completed for several years following levee construction (7, 8, 4, 10, and 19 years, respectively) to allow for dredged material placement and dewatering. During this time, a total of approximately 891 acres of open water habitat would be unavailable for use by EFH managed species. The Pelican Island BUS site (99 acres) is scheduled to be decommissioned during the same year it is

created since capital grade (new work) material from channel deepening would be used to construct the interior of the site as well as the levees. Once the Beneficial Use sites are decommissioned, they are expected to develop similarly to nearby existing natural intertidal habitats and would be utilized by EFH managed species. The effects of these Beneficial Use sites on the aquatic environment are similar to the effects described above for Swan Lake.

All Beneficial Use sites would start as confined dredged material containment areas, which, after reaching a predetermined elevation, would be decommissioned, contoured, planted, and shaped to form intertidal habitat. Features would be constructed to minimize impacts to other natural habitats. Intertidal habitats would be created which encourage wildlife and plant growth and over time are expected to develop similarly to nearby existing natural intertidal habitats. Beneficial Use site planning would consist of goals, objectives, performance standards, monitoring methods, and remedial actions (see Appendix B). Monitoring would take place annually, post-dredge cycle, 5 years post-planting, and subsequently every 5 years to a maximum of 20 years. Monitoring would include structural integrity inspections, water quality and depth measurements, vegetative cover assessment, fish density census, and bird density and diversity assessments. Nearby natural marshes would be selected for comparison with dredged material intertidal habitats. All data collected during monitoring would be compared with the reference marshes. If the Beneficial Use sites do not meet the criteria established in the DMMP, remedial action would be required in order to ensure establishment of a successful intertidal habitat. It is expected that State and Federal agencies would provide technical reviews during the creation and completion of the Beneficial Use sites. For a more comprehensive description of the management, monitoring, and maintenance of these Beneficial Use sites, see Part D – Beneficial Use Sites in the DMMP (Appendix B).

Increased water column turbidity during construction and Beneficial Use site creation would be localized and temporary and the amount of open-bay bottom that would be disturbed is a small percentage of the total bay bottom. Material to be dredged is not contaminated and should not pose contamination issues with respect to EFH. Accidental spills have the potential to impact EFH, and larval and juvenile finfish could be affected extensively should a spill occur. The potential for adverse impacts from spills would be minimized, however, through the use of BMPs and spill control and prevention measures. Although there are adverse effects on EFH, the project as proposed would have an overall net benefit to managed species and the ecology of Galveston Bay.

The proposed project would have adverse impacts on adult and juvenile brown and white shrimp, and red drum. While the proposed mitigation site and Beneficial Use sites are being converted to marsh habitat, these areas would be less productive and unavailable for use by these species for several years; however, once the marsh becomes fully established, there would be an overall benefit to these species. The proposed project would result in the loss of over 1,400 acres of open-water habitat that may be used by Spanish mackerel. This open-water habitat would be converted to intertidal marsh, potentially resulting in adverse impacts to this species. However, Spanish mackerel are not considered estuarine dependent; adults infrequently occur in estuaries and juveniles are common in estuaries and marshes but found mainly offshore (Patillo et al., 1997; GMFMC, 1998). The proposed project would not have a direct benefit to this species; however, they may benefit indirectly from the creation of intertidal habitat at the proposed mitigation site and Beneficial Use sites, which would increase prey for mackerels.

4.2.16 Endangered and Threatened Species

4.2.16.1 Plants

No Federally listed endangered, threatened, or SOC plant species are known to occur within or near (less than 2 miles) the Shoal Point alternative. This site's upland grasslands may be able to support species including Texas prairie dawn, Houston machaeranthera, and Texas windmillgrass. However, prairie dawn is not known to occur in Galveston County, and Houston machaeranthera prefers sandy loam soils of the Clodine, Gessner and Wockley series, none of which occur on this site. Texas windmillgrass could occur in the upland grassland and roadside areas, but none were observed during field visits.

4.2.16.2 Fish and Wildlife

Loafing brown pelicans were encountered in two areas at the Shoal Point site. Eight pelicans (one adult and seven juveniles) were loafing on the beach and on wooden structures along the shoreline in the northern portion of Cell C, while six (four adults and two juveniles) were loafing on a rock berm on the eastern edge of Swan Lake, near the nesting Forster's terns just south of the proposed access road. The loafing habitat along the shoreline would be lost, although it is likely that brown pelicans would still frequent the terminal facility. While the loafing habitat along the rock berm would not be lost, it may become less attractive during construction of the access road because of increased noise and human activity.

The white-faced ibis and wood stork, both State-threatened, were encountered at the Shoal Point site. Several white-faced ibis were observed near foraging habitat in cells A and B in April 2001, while a wood stork was sighted perching on a wooden structure in the northwestern corner of Cell B near Cell C on 20 June 2001. Both species occurred in areas where little impact would result from development of the Shoal Point site.

While no other known Federally or State-listed species are known to occur within 2 miles of the project site, two species of sea turtle, Kemp's ridley and the loggerhead, have been recorded from Galveston Bay and, thus, may utilize the open water near the project site. If present in the area, dredging activities could have an impact on these species through an increase in sedimentation, turbidity, and resuspension of any toxic sediments. The sedimentation may impact food sources for the turtles, and the turbidity could affect primary productivity. This would be short-term, however. The increased possibility of chemical or oil spills could pose a threat to turtles both directly and indirectly through their food source. While adult sea turtles may be mobile enough to avoid areas of high oil or chemical concentrations, hatchlings, post-hatchlings, and juveniles in the area would be more susceptible. An increase in marine traffic may result in a higher incidence of collision with sea turtles. Sea turtles are not expected to nest at the site due to lack of suitable habitat.

4.2.17 Cultural Resources

There is a low probability for impacting unrecorded terrestrial cultural resource sites. Four potential cultural resource sites, located by a marine remote-sensing survey, might be affected by the

Shoal Point Alternative. All four of these potential sites are known only on the basis of their reported magnetic anomalies. Two might be affected by the placement of levees for Beneficial Use sites near Shoal Point. The other two might be affected, one only indirectly, by dredging activities proposed for the purpose of deepening the Texas City Channel.

The Shoal Point alternative is located on the Texas City, Port Bolivar, Virginia Point, and Galveston quadrangle maps. The TARL files did not identify any recorded cultural resource sites within the boundaries of the 400-acre plot for this alternative. One known site, 41GV117, was identified along the proposed access and transmission line corridor. It is described on the Site Form as an oyster shell midden that produced no cultural artifacts. The site extends approximately 2,200 feet into Galveston Bay and may be part of an oyster reef. The portion of the site that would be crossed by the corridor has been impacted by the construction of the existing levee and the levee road. A determination of the site's NRHP or SAL status does not appear to have been made. Because of the previous impacts and disturbance caused by the construction of the levee and levee road, it is not anticipated that the proposed project would impact previously unrecorded terrestrial sites at this location. There are no listed or determined eligible for listing NRHP sites or SAL designated sites within the boundaries of the 400-acre site.

A cultural resource remote-sensing survey was completed for all submerged portions of the Shoal Point Alternative. A letter report summarizing the preliminary results of that survey is included in Appendix H-10. A stand-alone technical report of the remote-sensing results (Jones et al., n.d.) is in preparation. The remote-sensing survey covered approximately 4,500 acres of bay bottom including the proposed berthing areas, turning basin, Beneficial Use sites, and the margins of the Texas City Channel seaward of the proposed turning basin. The survey also included large areas that would not be impacted by the proposed undertaking, including an area adjacent to Dollar Point, additional areas (outside of the proposed Beneficial Use sites) adjacent to both Shoal Point and the west side of Pelican Island, and an area north of Shoal Point on the north side of the Texas City Channel. The purpose of the expanded survey areas was to allow room for moving design footprints around to avoid environmental constraints as much as possible.

A total of eleven remote-sensing targets, interpreted from the large number of magnetic anomalies and side-scan sonar targets recorded by the remote-sensing survey (Jones et al., n.d.), were recommended as having potential cultural significance. These eleven targets share characteristics with remote-sensing signatures of documented submerged watercraft. Eight of these targets were reported in a letter of preliminary findings (see Appendix H-10). The other three were not recognized as potentially significant based upon the remote-sensing results alone due to the fact that their full anomaly signatures were not recorded by the survey. Their potential significance was determined after submittal of the Shoal Point interim letter report of findings (Appendix H-10), based upon higher resolution magnetic anomalies recorded by Espey, Huston & Associates, Inc. (now PBS&J) in a 1994 remote-sensing survey (Hoyt et al., 1998). A full description of all eleven targets will be reported in a stand-alone technical report of findings that is in preparation as of this writing (Jones et al., n.d.). Five of these targets are located in the Shoal Point survey area, one in the Pelican Island survey area, and five along the Texas City Channel. Four of the total eleven recommended targets would be potentially affected by the proposed undertaking as described below.

Anomaly SP2 falls beneath the proposed southwestern levee of the southernmost Shoal Point Beneficial Use site. Anomaly PI1 falls beneath the proposed western levee of the Pelican Island Beneficial Use site. Dredging would not impact either target, rather both would be sealed by the overburden of the levees. There is a potential that significant cultural resources, should they be present, would be impacted by compaction from the weight of the levees. The degree of detrimental impact from such compaction is uncertain.

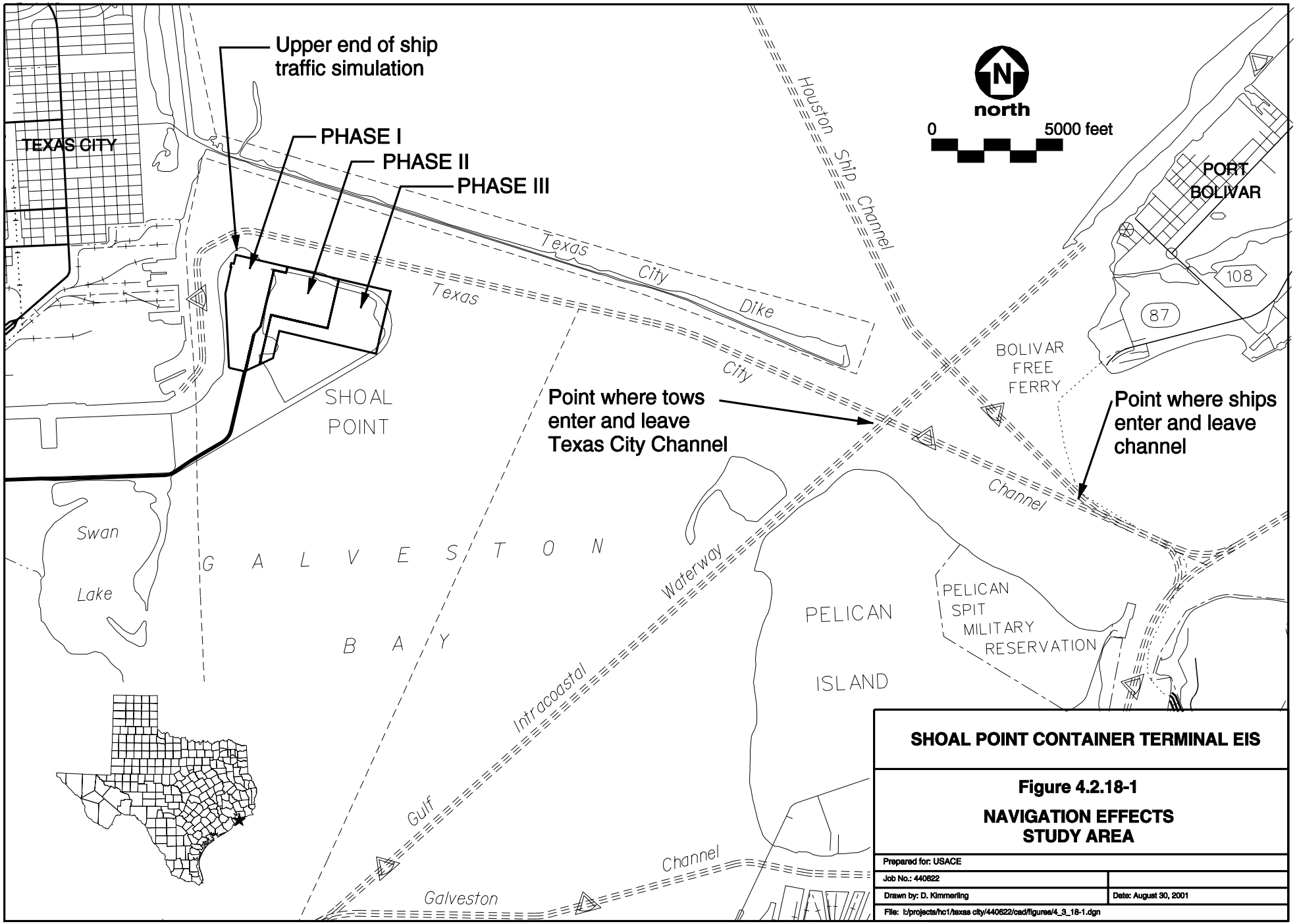
Anomaly TCC1 is located from 100 to 200 feet north of the northern channel toe at an elevation of –15 to –20 feet MLT. The existing channel top-of-slope at this location is estimated to be nearly 200 feet north of the toe at an elevation of approximately –15 feet MLT based upon existing channel cross-sections. Slumping may already have impacted anomaly TCC1, since it is located below the present top-of-slope. The proposed deepening may shift the top of slope an additional 25 feet northward, potentially causing the source of Anomaly TCC1 to slump further into the channel.

Anomaly TCC3 straddles the northern toe of the Texas City Channel near its eastern end at an elevation of –35 to –40 ft MLT. One third of the anomaly occupies the channel bottom, while two thirds are located on the lower slope of the channel. Evidence from a 1994 close-order remote-sensing survey (Hoyt et al., 1998) and a recent reassessment of historical maps indicate a high potential that this anomaly could be associated with the remnants of the USS *Westfield*, which wrecked in about 8 feet of water during the Battle of Galveston on January 1, 1863. Confederate forces salvaged portions of the *Westfield*'s machinery and armaments for reuse in the war. The wreck was reportedly demolished and removed by the Federal government in 1906, 4 years prior to widening of the Texas City Channel from 100 to 200 feet. By that time the wreckage was in about 25 feet of water due to improvements to both the Texas City and Houston ship channels. Proposed deepening of the Texas City Channel from –40 to –45 ft MLT might impact remnants of the *Westfield*; however, due to its history of salvage and demolition, it is not believed eligible for the NRHP and no further investigation is recommended.

4.2.18 Commercial and Recreational Navigation

This section presents a characterization of the existing commercial vessel traffic in the Texas City Channel and an analysis of the effects of the Shoal Point Project on this traffic. The delays and encounters experienced by the existing traffic as well as projected increases in this traffic are quantified by means of simulation. These quantifications serve as baseline conditions that are compared with corresponding calculations of the various Shoal Point project phases. The primary area of analysis is the Texas City Channel outside of the existing harbor turning area to the confluence with Bolivar Roads (approximately 6.8 miles) as shown on Figure 4.2.18-1. This is the area where commercial navigation would be affected by the proposed Shoal Point container facility.

In addition to effects to deep draft commercial navigation that is the primary element of the project, this as well as other alternatives would have some effect on commercial bay fishing and recreational boating. As noted in the baseline Section 3.17, Galveston Bay is actively used by both types of small craft--bay commercial fishing vessels and recreational boaters. The northern part of the bay has a major concentration of recreational boating activity. For a variety of navigation and safety reasons, deep draft traffic must have right-of-way over small craft in the restricted deep draft channels. Increases in deep



SHOAL POINT CONTAINER TERMINAL EIS

Figure 4.2.18-1

NAVIGATION EFFECTS STUDY AREA

Prepared for: USACE	
Job No.: 440622	
Drawn by: D. Kimmerling	Date: August 30, 2001
File: I:/projects/hc1/texas city/440622/cad/figures/4_3_18-1.dgn	

draft commerce will increase the amount of time that small craft traffic will experience some restrictions or the need to yield right-of-way in the deep channels. That would appear to be an unavoidable consequence. However, with very few exceptions, these small craft are not restricted to the dredged channels, so the limitation is small and avoidable. In addition, the amount of time that deep draft channels are actually occupied by deep draft vessels tends to be a very small portion of the day. Overall, there is a measure of use conflict between small craft and deep draft vessels, and increases in deep draft commerce will increase that conflict. However, the conflict is relatively small and will not significantly impact small craft uses.

4.2.18.1 Existing and Future Non-Container Traffic

This section presents the existing (year 2000) traffic in the Texas City Channel and the traffic expected at complete build-out. The existing traffic in the Texas City channel and harbor consists of oceangoing vessels that carry a pilot and tows and other smaller craft that do not carry a pilot. Four main sources of data were obtained to characterize this traffic. The first was records of the Harbormaster, operated by the Port of Texas City (POTC). The second was records of the USCG Vessel Traffic Service (VTS). Both sources provided traffic movements for calendar year 2000. The third was records of annual total numbers of inbound and outbound ship movements from the Galveston-Texas City Pilots for 1998 to 2000. The fourth was the Waterborne Commerce data provided by the USACE. The year 2000 data were not available at the time of this writing. Data from 1995 to 1999 were reviewed.

The Harbormaster data tended to focus more on individual barges and docks, possibly because one of the functions of the Harbormaster is to ensure that docks are available for commercial movements. The VTS data tended to be more focused on vessel movements and also provided good background data on vessel dimensions. The Waterborne Commerce data provide annual summaries of total tonnages and movements for the year, but not details of each movement.

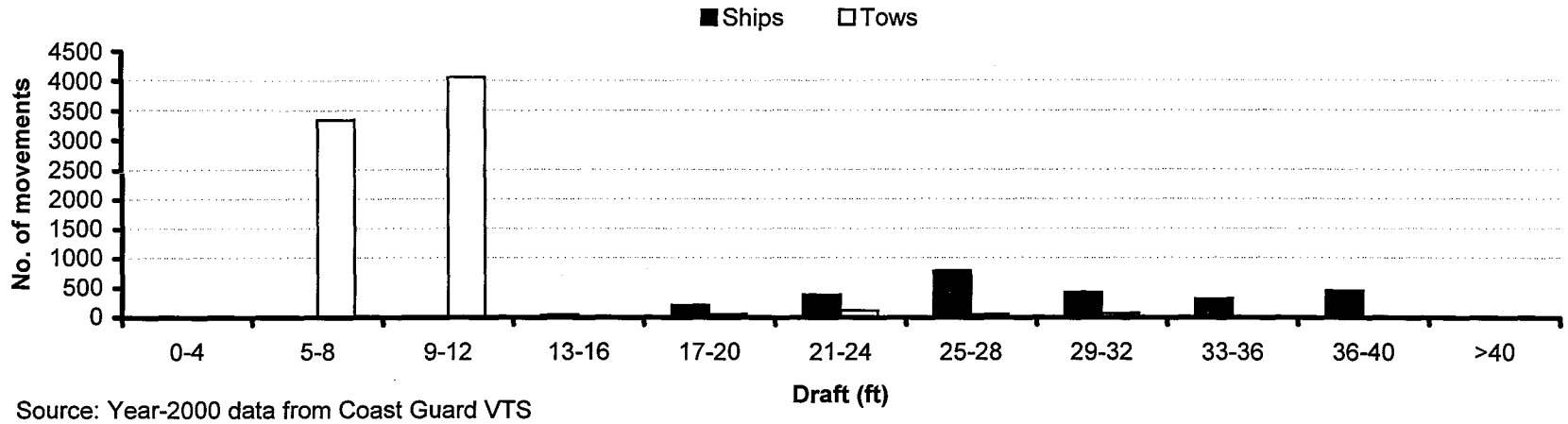
Figure 4.2.18-2 provides a distribution of vessel drafts, both ships and tows, for the year. Similar information is provided for vessel lengths in Figure 4.2.18-3 and beams in Figure 4.2.18-4.

The frequency of vessel movements can be derived from both the Harbormaster and VTS data, as both provide times of arrival and departure at each point. Figure 4.2.18-5 presents data on ship movements per day from the Harbormaster, while Figure 4.2.18-6 provides a similar distribution from VTS data. It can be seen that the two data sources appear to be roughly equivalent.

A characteristic of the existing Texas City traffic is that it tends to continue throughout the day and night. Figure 4.2.18-7 presents plots of vessel and tow movements at Texas City docks taken from VTS data. It can be seen that there is a little more activity in the morning and evening hours than in the middle of the night, but not by an overwhelming margin. This would appear to be a characteristic of bulk liquid operations that do not require a large labor force for cargo transfer and that can continue through the evening as well as the day.

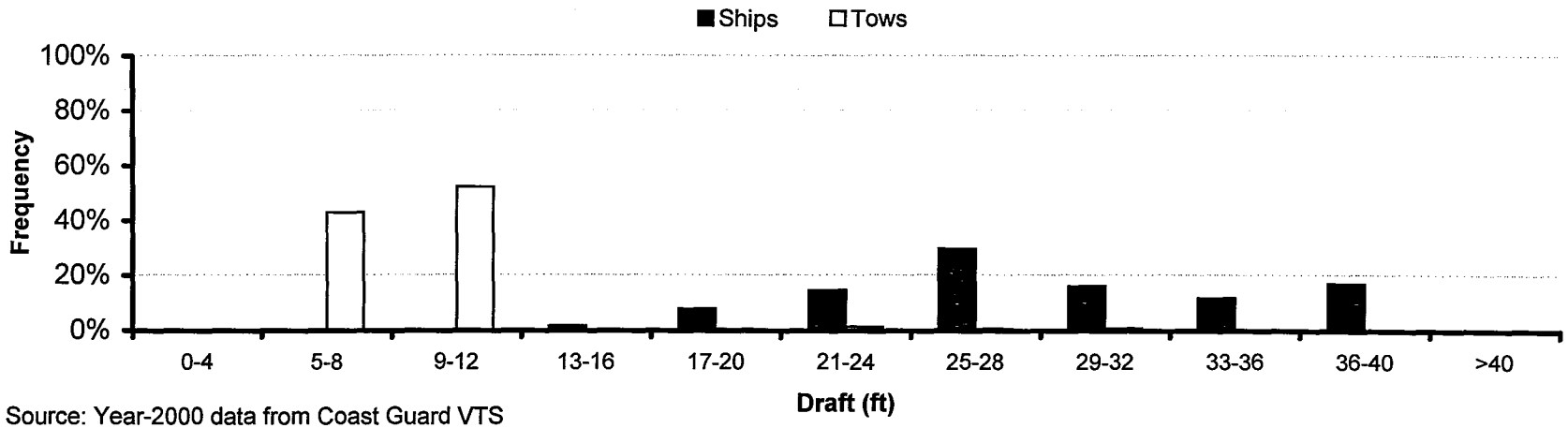
The total number of ship movements based on the VTS data was found to be about 15 percent less than that from the Harbormaster data. The Harbormaster ship data match closely the

FIGURES 4.2.18-2a
NUMBER OF MOVEMENTS BY VESSEL DRAFT



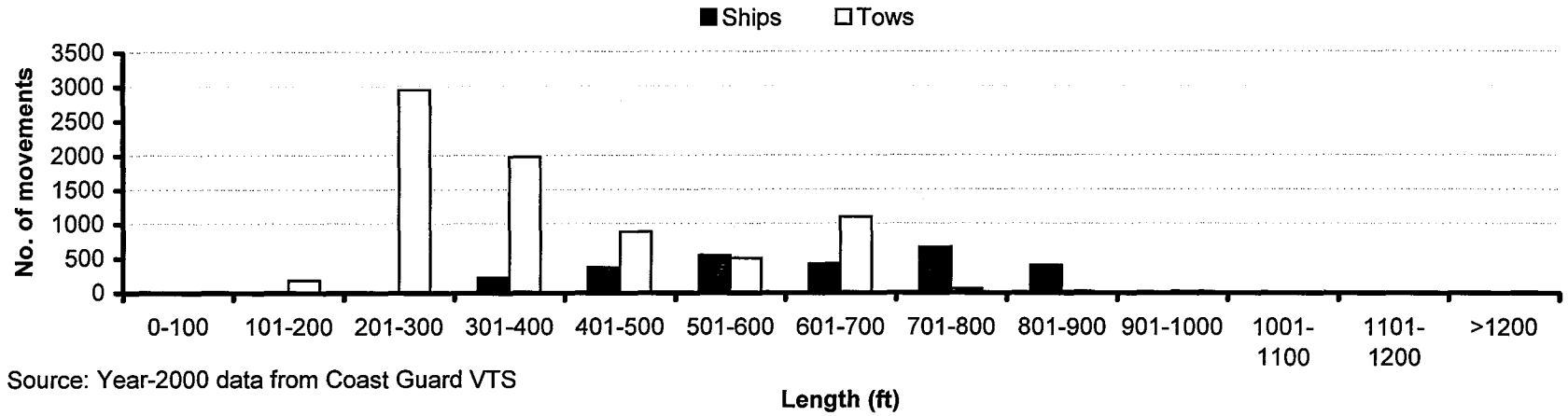
Source: Year-2000 data from Coast Guard VTS

FIGURE 4.2.18-2b
FREQUENCY DISTRIBUTION BY VESSEL DRAFT



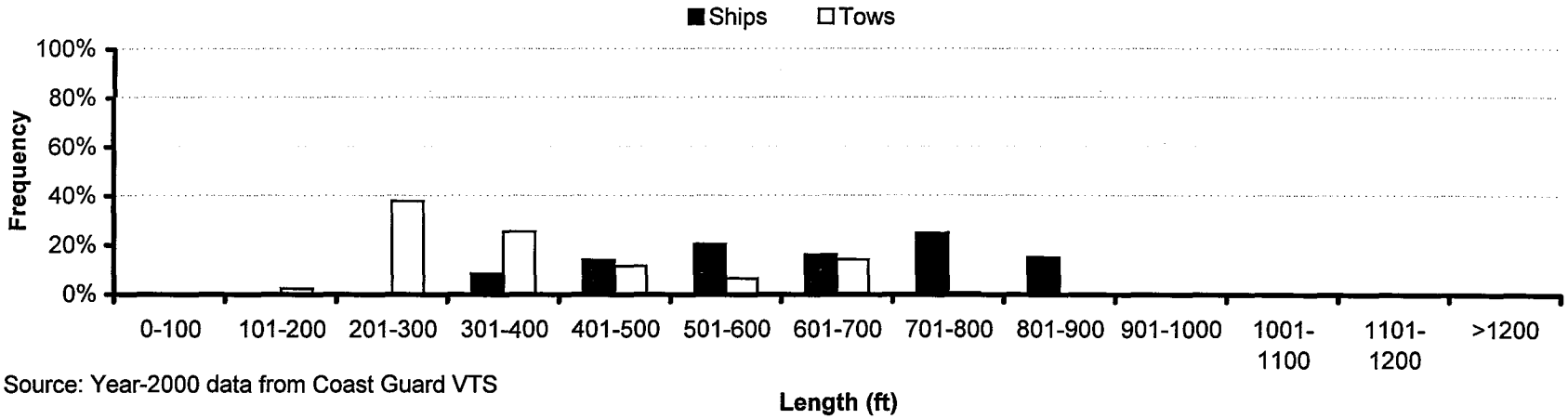
Source: Year-2000 data from Coast Guard VTS

FIGURE 4.2.18-3a
NUMBER OF MOVEMENTS BY VESSEL LENGTH



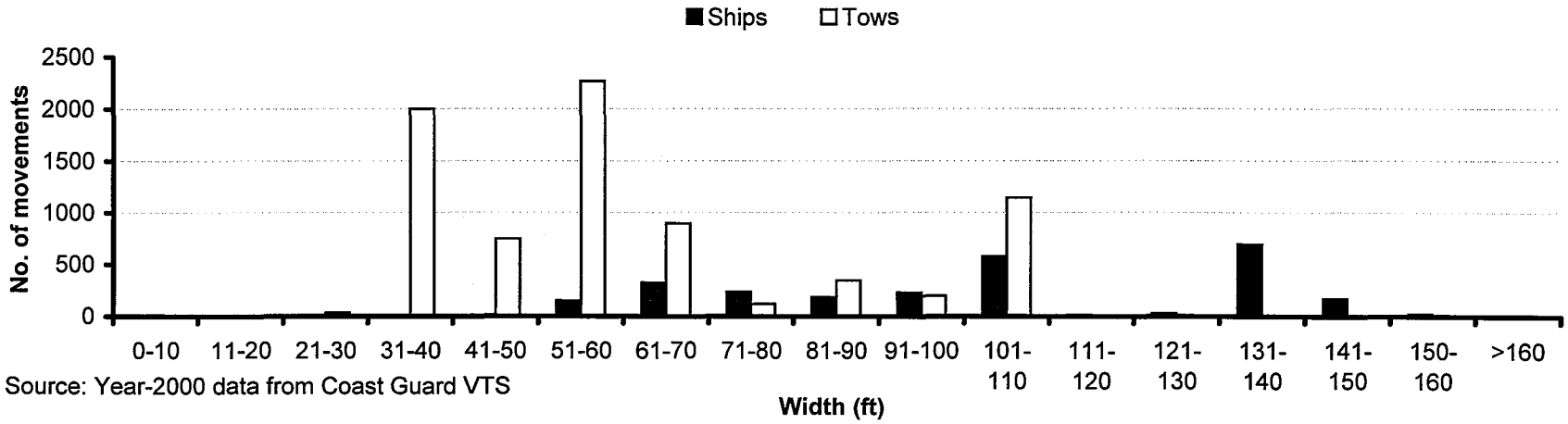
Source: Year-2000 data from Coast Guard VTS

FIGURE 4.2.18-3b
FREQUENCY DISTRIBUTION BY VESSEL LENGTH



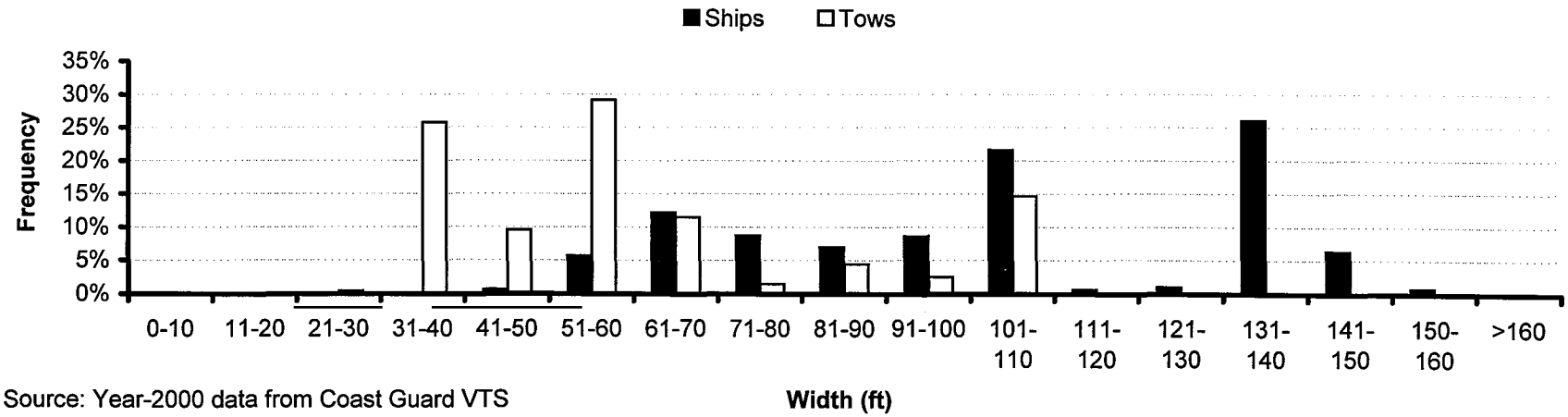
Source: Year-2000 data from Coast Guard VTS

FIGURE 4.2.18-4a
NUMBER OF MOVEMENTS BY VESSEL WIDTH



Source: Year-2000 data from Coast Guard VTS

FIGURE 4.2.18-4b
FREQUENCY DISTRIBUTION BY VESSEL WIDTH



Source: Year-2000 data from Coast Guard VTS

FIGURE 4.2.18-5
FREQUENCY OF DAILY SHIP ARRIVAL AND DEPARTURE FROM HARBORMASTER DATA

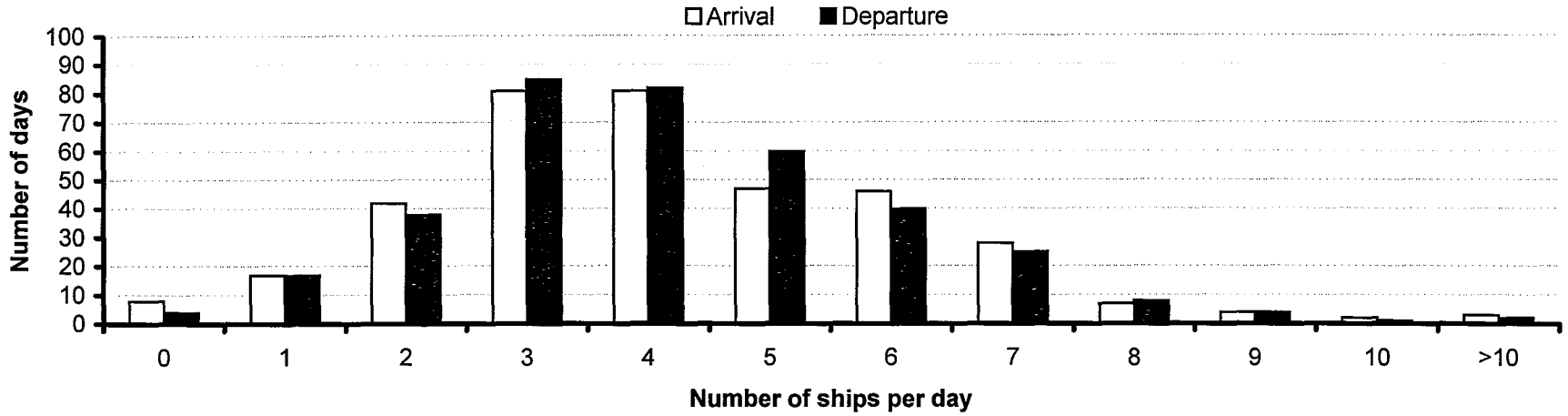


FIGURE 4.2.18-6
FREQUENCY OF DAILY SHIP ARRIVAL AND DEPARTURE FROM VTS DATA

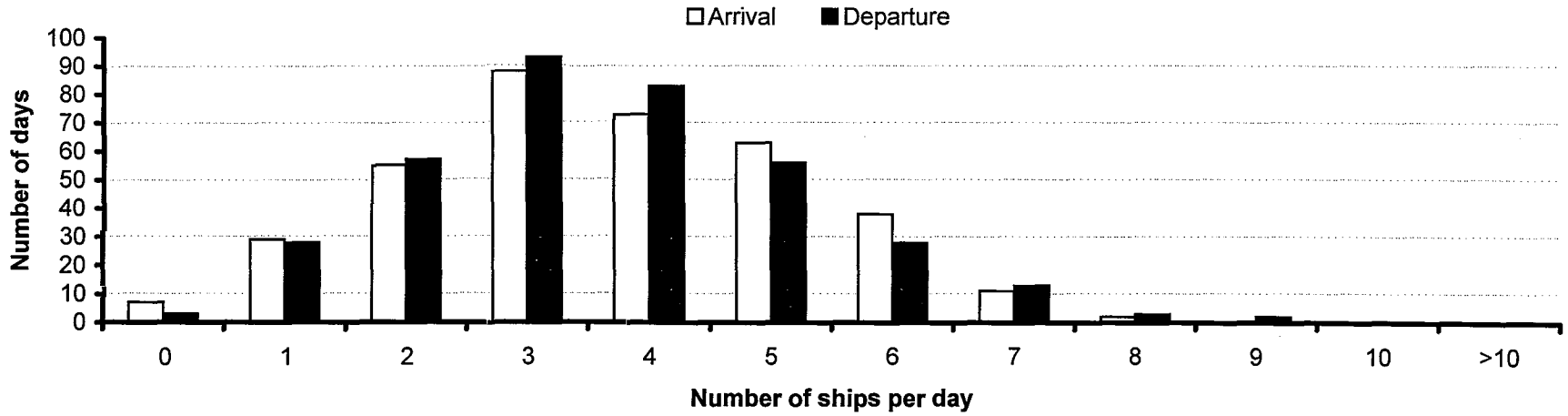
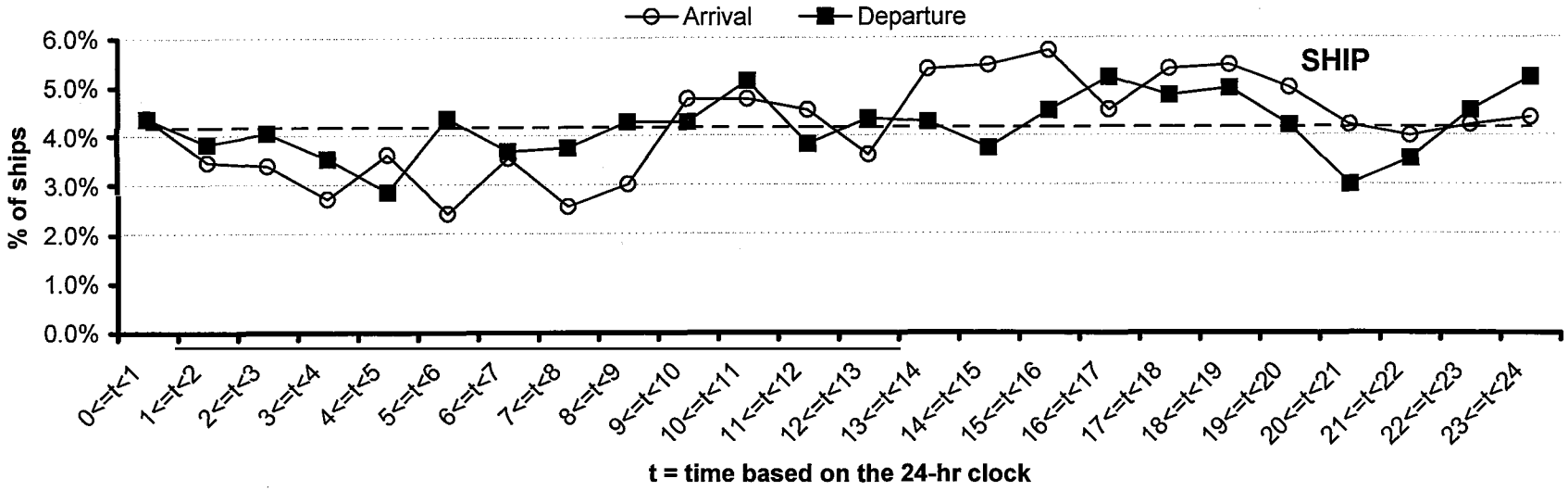
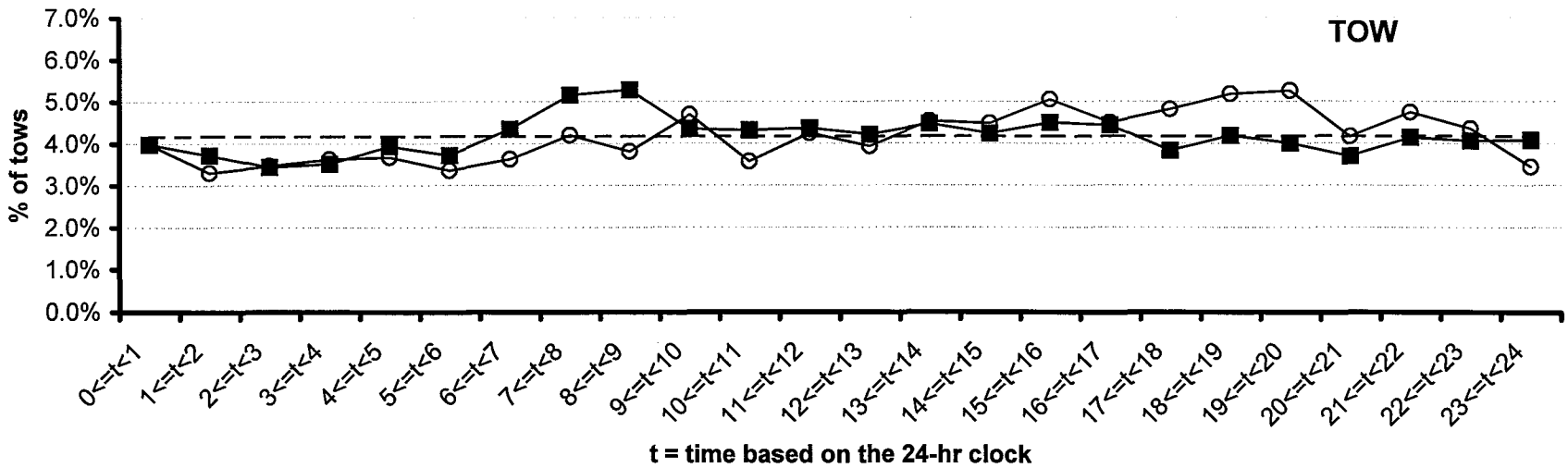


FIGURE 4.2.18-7
FREQUENCY DISTRIBUTION OF ARRIVAL AND DEPARTURE TIMES (VTS DATA)





information on vessel transits provided by the pilots. The VTS data include all the vessel movements in the Houston-Galveston area. Some of the vessel movements in the Texas City Channel may have been excluded due to uncertainty in the dock locations, or in some cases the dock code might have been entered incorrectly. As a result, the number of vessel movements sorted from the entire VTS database was initially undercounted. For all analyses that follow the undercount is corrected using Harbormaster data where possible.

The current traffic in the system consists of one-way traffic for piloted vessels, and two-way traffic for tows, subject to certain constraints. The one-way traffic for piloted vessels is in contrast to movements on the nearby Houston Ship Channel that does allow piloted vessels of moderate size to meet in the channel. The primary reason for this difference is that much of the piloted vessel traffic in Texas City is larger vessels, and the delay imposed by one-way traffic in the shorter Texas City Channel is generally tolerated. In contrast, two-way traffic is employed for most vessels on the 50-mile-long Houston Ship Channel.

The one-way traffic restriction on the Texas City Channel is accommodated through the Pilots, VTS, and Harbormaster communications. If a crude carrier is inbound at a time when a chemical carrier would like to get underway, the pilot will typically be informed and hold the chemical carrier at the dock until the channel is clear. In the other direction, an inbound vessel may hold by running at slow speed in Bolivar Roads until the channel is clear.

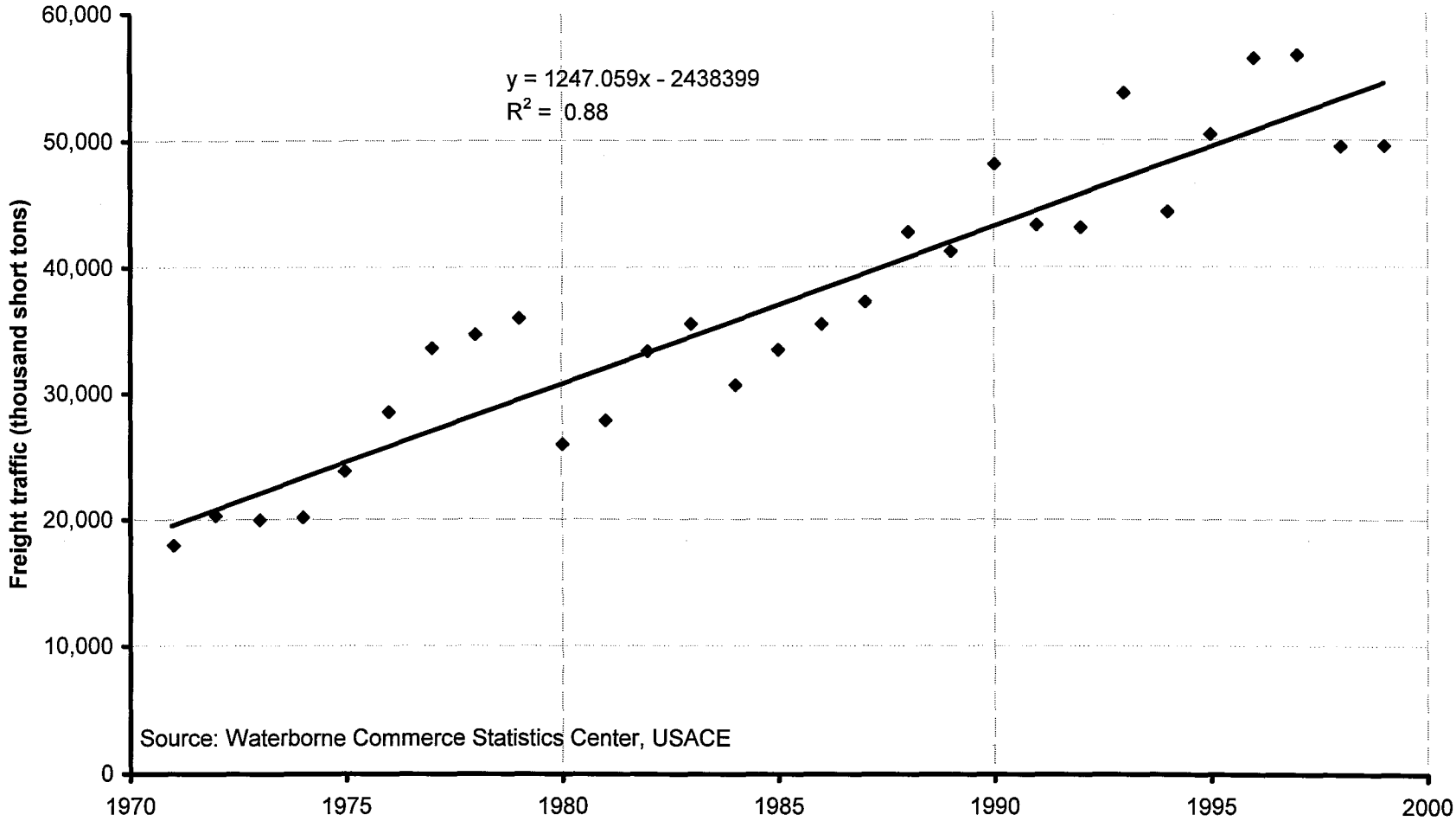
One-way traffic may also be required when large tows are operating during times of strong cross-channel winds. However, such conditions are considered by the navigation community to be rare and are not quantified in this study.

The following average daily arrival rates at the Texas City Channel were based on data from the Harbormaster pilots for ships and on VTS data for tows. The difference in the number of inbound and outbound tows occurs from different numbers of barges in a tow.

	Outbound vessel arriving at the Horn	Inbound vessel arriving at the Texas City Channel or GIWW confluence
Ships	4.20	4.20
Tows	10.70	10.55

While the year 2000 traffic level is a representative benchmark, it is not reasonable to expect this level of traffic to be constant into the future. For this study, a range of projections was evaluated. Historical commodity data compiled by the USACE and presented in Figure 4.2.18-8 suggest a reasonably steady pattern of increase in tonnage. Projecting this growth rate to the year 2020, the approximate time when the proposed Shoal Point Project will be at full build-out, suggests that tonnage will increase by 45 percent beyond the year 2000 level. A long-term trend towards larger vessel sizes would likely reduce the number of vessel movements below this percentage. However, to ensure a conservative analysis, this percentage increase is applied to both ships and tows to provide an estimate of future traffic.

FIGURE 4.2.18-8
FREIGHT TRAFFIC IN TEXAS CITY SHIP CHANNEL, 1971 TO 1999



In addition to this estimate, the Port of Texas City prepared a long-term traffic forecast for the year 2020 based on a 74 percent berth utilization rate and a 10 percent increase in berths. With those factors, the port was projected to handle 2,690 ships and 16,573 barges in the year 2020. The barge dockings were assumed to be handled in tows averaging two barges per tow or 8,286 tows arriving and departing during the year. Relative to year 2000 traffic, these are increases of 175 percent for ships (5,380 movements versus 3,077 in the year 2000) and 213 percent for tows (16,573 tow movements versus 7,780 in 2000).

4.2.18.2 Quantification of Navigation Effects

The basic method for quantifying the number of delays and encounters for the existing and No-Action scenarios is to employ a numerical model to simulate the system. The model tabulates delays and encounters for each scenario being evaluated.

Vessel departures from Texas City starting at the Horn (or the end of the 800-foot setback for scenarios with the terminal), and arrivals entering the system at the Texas City Channel (ships) or GIWW confluence (tows), are generated in the model using a random number generator along with a probability distribution that represents the existing traffic patterns.

Using the VTS data, the arrival times of outbound vessels at the Horn and the arrival times of inbound vessels at the Texas City Channel or GIWW confluence were estimated based on their approximate speeds in the harbor and in the channel. The arrival times are random variables with certain probability distributions. Using the chi-square goodness-of-fit test, the number of arrivals per day of each category of vessels was found to follow the Poisson distribution. The day of week patterns were also analyzed, but no significant differences were found.

Using the mean daily arrival rates and the Poisson distribution, the numbers of movements on each day are generated for ships and tows for both the inbound and outbound traffic for a year. The arrivals on each day were then distributed over the 24 hours, taking into consideration the observed higher number of arrivals during the day than during the night.

Once ships or tows enter the channel system they are advanced at speeds defined by both the vessel type and location in the system. The speeds, in knots (kts), used are:

Tows	4 kts, all locations in harbor
	6 kts from Horn to GIWW
Ships	4 kts in Industrial Canal
	5 kts in turning area to Horn
	6 kts from Horn to Marker 14/15
	8 kts from Marker 14/15 to end of Texas City Channel

These speeds are approximate averages provided by the Pilots. Some vessels will be faster and some slower, but the overall pattern of interactions should be approximately correct. The speeds in the harbor were used in the estimation of arrival times at the entry points of the channel from

the VTS data for determining the probability distributions. They are not needed in the simulation since the existing harbor is outside the area of analysis.

The randomly generated vessel traffic was put into the simulation model to determine the amount of delay, if any, for each vessel movement. For ships with one-way traffic restriction, the use of the channel was assumed to be on a first-come-first-served basis. A 5-minute margin is set for the time between one ship leaving and another entering the channel going the opposite direction. For transit in the same direction, ships are kept at least 10 minutes apart.

Each time the simulation is run, the same pattern of traffic is generated, but each individual movement is unique. Figure 4.2.18-9 is a comparison of traffic using the probability distribution and the actual data for 2000. It can be seen that the traffic that results is similar to the actual, but each time a new set of random numbers is used, it will be slightly different. Because delays and encounters depend on individual movements, it is necessary to repeat the simulation a number of times to get a stable or reproducible answer. Changes in traffic levels can be accommodated by adjusting the number of movements per day using the same time of day distribution.

The first step in modeling the system is to estimate the traffic delays and encounters that currently exist with the year 2000 traffic level. Then, additional runs are made with a 45 percent increase in existing traffic and with the projections from the Port of Texas City.

4.2.18.3 Delays Under Baseline Conditions

Table 4.2.18-1 is a listing of simulation results of the existing system for ten independent years along with the average and range of results. On average, there are 534 ship delays in one year and about 17.3 percent of ship movements are delayed to some extent by the one-way traffic restriction in the Texas City Channel. The average time per delay for the simulations ranges from 23.2 to 26.7 minutes, with a mean of 25.3 minutes. It appears that the variations among the simulations are not significant. The total delay time in a year divided by 365 gives the average delay time per day. There is more variation in this parameter, with a range between 33.1 to 39.4 minutes and a mean of 37.0 minutes.

As seen in Table 4.2.18-1, there is an average of 168 times in a year when a ship overtakes a tow in the Texas City Channel study area. This amounts to about 2 percent of tow movements. Meetings between two tows and between ships and tows are far more frequent. Ship-tow meetings average 1,639/year or more than 4/day, while tow-tow meetings exceed 6/day. About 21 percent of tows meet a ship in the channel while almost 30 percent of tows meet other tows in the channel.

Table 4.2.18-2 presents the delay and encounter results with the projected increases in traffic, along with results of the existing 2000 traffic level. The average delay time per day is increased by 138 percent with the 45 percent traffic increase, and by 271 percent with the Port's projected increases in traffic. Similar percentage increases occur with traffic encounters.

FIGURE 4.2.18-9
COMPARISON OF ACTUAL AND SIMULATED FREQUENCY OF DAILY SHIP ARRIVAL AND DEPARTURE

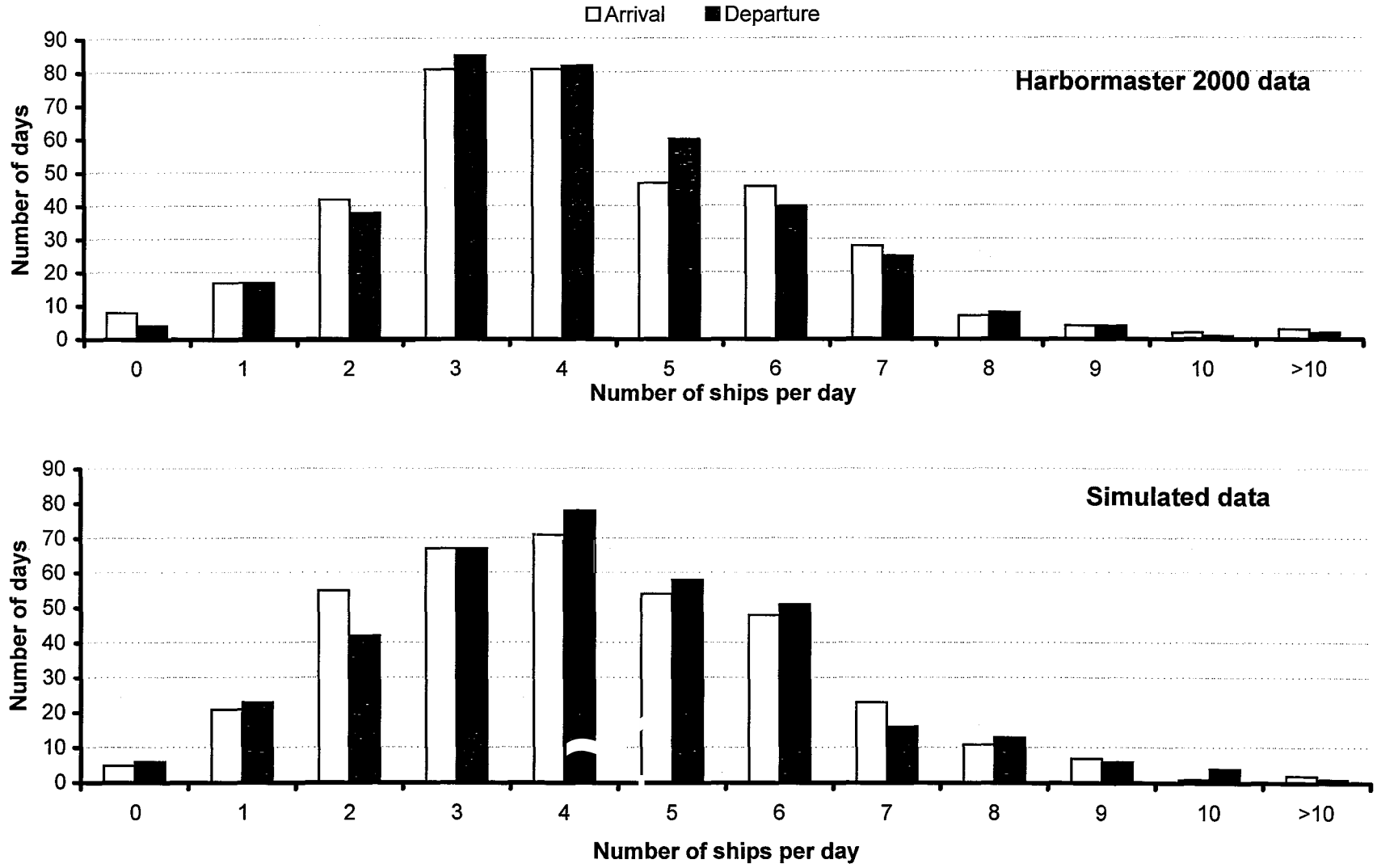


TABLE 4.2.18-1
SIMULATION RESULTS FOR EXISTING TRAFFIC

SIMULATION	NO. OF MOVEMENTS/YR [1]		DELAYS TO NON-CONTAINERSHIPS				ENCOUNTERS					
							Overtakings of tows by non-containerships		Meetings			
									Non-containership-Tow		Tow-Tow	
	Non-con-tainerships	Tows	Number per year	Delay time per delay (min)	Delay time per day (min)	% of movements delayed	Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements
1	3150	7685	571	24.15	37.78	18.13	204	2.65	1609	20.94	2200	28.63
2	3090	7831	534	25.01	36.59	17.28	160	2.04	1646	21.02	2307	29.46
3	3076	7748	501	24.09	33.06	16.29	165	2.13	1642	21.19	2301	29.70
4	3045	7705	509	25.97	36.21	16.72	168	2.18	1551	20.13	2174	28.22
5	3075	7879	526	26.36	37.98	17.11	152	1.93	1628	20.66	2296	29.14
6	3061	7783	539	26.34	38.89	17.61	180	2.31	1609	20.67	2385	30.64
7	3068	7697	533	23.23	33.92	17.37	172	2.23	1651	21.45	2279	29.61
8	3066	7845	550	25.13	37.87	17.94	172	2.19	1589	20.25	2321	29.59
9	3101	7755	526	26.66	38.42	16.96	149	1.92	1732	22.33	2260	29.14
10	3101	7825	555	25.92	39.42	17.90	161	2.06	1731	22.12	2309	29.51
Maximum	3150	7879	571	26.66	39.42	18.13	204	2.65	1732	22.33	2385	30.64
Minimum	3045	7685	501	23.23	33.06	16.29	149	1.92	1551	20.13	2174	28.22
Mean	**3083**	**7775**	**534**	**25.29**	**37.01**	**17.33**	**168**	**2.16**	**1639**	**21.08**	**2283**	**29.36**
St Dev	29.3	68.0	20.9	1.16	2.10	0.58	15.7	0.21	57.2	0.73	60.5	0.65

[1] Variations in the number of movements are due to different series of random numbers generated for the simulations.

TABLE 4.2.18-2
COMPARISON BETWEEN PROJECTED TRAFFIC AND EXISTING TRAFFIC

	MOVEMENTS		DELAYS				ENCOUNTERS					
	No. of movements/year		Delays to non-containerships				Overtakings of tows		Meetings			
							By non-containerships		Non-containership-Tow		Tow-Tow	
	Non-container-ships	Tows	Number per year	Delay time per delay (min)	Delay time per day (min)	% of movements delayed	Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements
Existing traffic												
Mean [1]	3083	7775	534	25.29	37.01	17.33	168	2.16	1639	21.08	2283	29.36
Projected traffic based on historical freight traffic data												
Mean [1]	4457	11228	1123	28.62	88.04	25.19	360	3.21	3438	30.62	4777	42.53
% change [2]	44.5%	44.4%	110.1%	13.2%	137.9%	45.3%	113.8%	48.1%	109.8%	45.3%	109.2%	44.9%
Port of Texas City projected traffic												
Mean [1]	5374	16640	1628	30.78	137.21	30.28	646	3.89	6106	36.70	10464	62.88
% change [2]	74.3%	114.0%	204.6%	21.7%	270.7%	74.7%	284.1%	79.5%	272.6%	74.1%	358.3%	114.1%

[1] Mean results of 10 simulations.
[2] % change referenced to the existing traffic condition.

4.2.18.4 Monetary Effect of Delay Under Baseline Conditions

Vessel operating costs are used to quantify the monetary effect of delays. Cost data are available from the USACE Economic Guidance Memorandum 00-06, Deep Draft Vessel Operating Costs. Data in this publication are presented for different types of vessels, domestic or foreign, and for different tonnages. The total cost includes capital cost, fixed operating cost and fuel cost. Both at sea and in port costs are given. The operating condition of the vessels in the ship channel is somewhat intermediate between maneuvering in port and sailing full speed at sea. Therefore, for the purpose of this study, the average of the at sea and in port costs was used.

The most common ship according to the year 2000 VTS data had a length of 810 feet. Based on interpolation of presented data in the USACE memorandum, the hourly total cost for an 810-foot-long foreign flag tanker with non-double hull is $980. This cost will be used to estimate the cost of delay of the non-containership traffic.

Figure 4.2.18-10 presents the calculated delay costs for the current and increased traffic. The average delay cost per day increases from $604 with existing traffic level to $1,438 with a 45 percent increase in traffic and $2,241 with the higher projection.

4.2.18.5 Tow and Ship Encounters Under Baseline Conditions

Table 4.2.18-2 also shows the number of overtakings and meetings. For each type of encounters (overtaking of tow by ship, ship-tow meeting and tow-tow meeting), the number is more than doubled with the 45 percent increase in non-containership and tow traffic and about quadrupled with the higher projection.

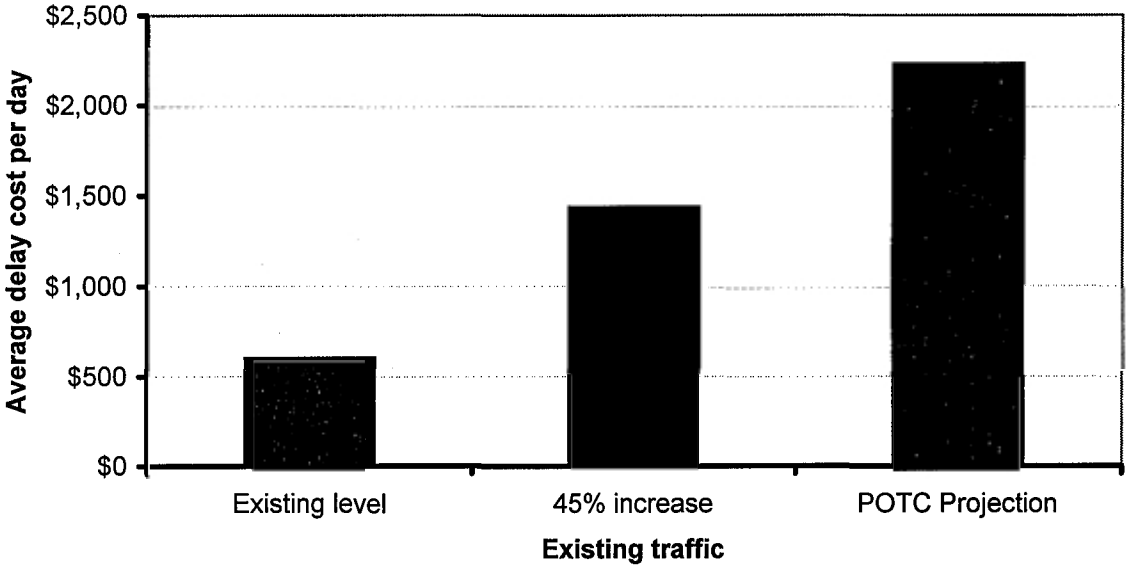
4.2.18.6 Project Effects Approach

The Shoal Point Container Terminal would increase the number of vessel movements in the Texas City Channel and harbor area, and it would change the mix and timing of vessel traffic. These changes can reasonably be expected to affect existing operations to some extent. The purpose of this and following sections is to quantify those effects or impacts.

Several measures of effects are employed. The first is qualitative, simply the percentage increases in new movements over existing movements. The second is a measure of traffic density, quantified as the number of new encounters, both meetings and overtakings, which result from the added vessel movements. These encounters are related to the existing rates of meetings and overtakings in the channel. At some level these encounters represent opportunities for vessel collisions, but the relation between encounters and collisions should not be expected to be linear. The third measure of project effects is traffic delays. Both encounters and delays are determined through simulation of traffic movements and placed into context of the encounters and delays that currently exist.

The primary area of analysis is the Texas City Channel outside of the existing harbor turning area (the Horn), as shown in Figure 4.2.18-1. The movements inside of this point would not be affected by the project, except in terms of possible delays at a dock waiting for the channel to clear.

FIGURE 4.2.18-10
AVERAGE DELAY COST PER DAY FOR EXISTING AND PROJECTED TRAFFIC



To briefly summarize, the project involves three phases. The first phase would average one containership port call per day, with Phase II averaging three per day and Phase III averaging five port calls per day. Each containership port call is assumed to require one bunkering barge trip. Each project phase has a 2,000-foot dock section that is setback 800 feet from the channel. The 800-foot setback of the proposed container terminal would result in restriction of one-way ship traffic for a shorter length of the channel.

4.2.18.7 Containership Traffic

For containership traffic, the average number of arrivals or departures per day is one, three, and five for Phases I, II, and III, respectively. On a particular day, the actual number of arrivals was selected randomly from three numbers – the average, average minus one, or average plus one. For example, in Phase I, the number of arrivals on a particular day could be 0, 1, or 2. The same was done for departure. The time of arrival or departure of a containership was assumed to follow a pattern similar to that at Barbours Cut, which is shown in Figure 4.2.18-11.

Based on input from the Pilots, turning of inbound containerships would be done after outbound vessels have cleared, avoiding delays to outbound traffic that is ready to go to sea. It was assumed that during transit in the channel, an inbound containership must stay at least 20 minutes behind another inbound containership to allow for turning and docking time.

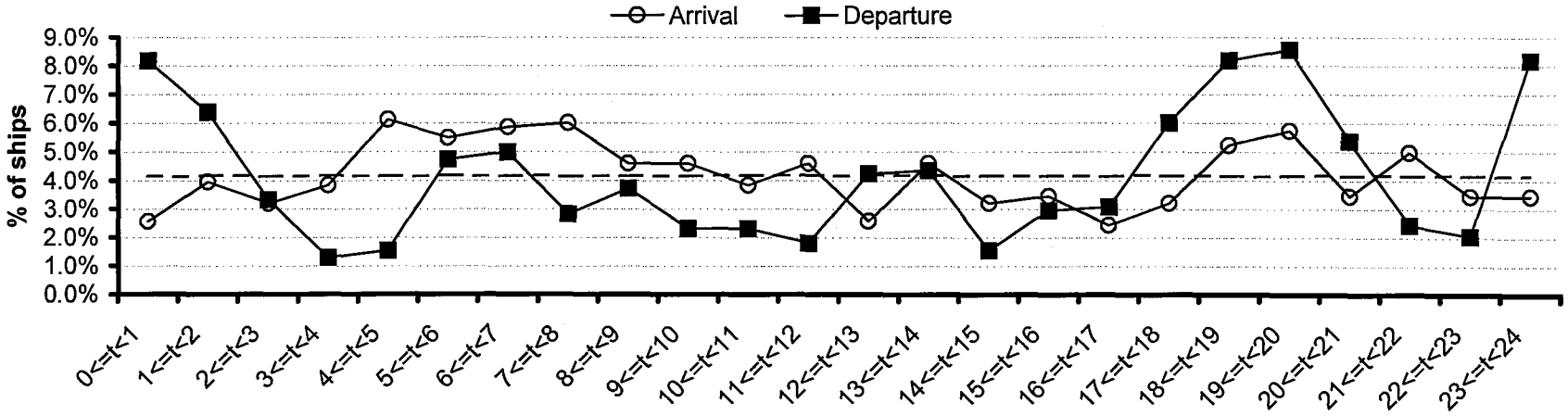
Bunkering barge traffic to service containerships was also simulated. It was assumed that each containership would require one bunkering tow. Half of the bunkering tows were assumed to be from Texas City. The activities of these tows were not modeled since they did not enter into the area of analysis. The other half of the bunkering tows were assumed to come from Houston and contribute to barge traffic in the Texas City Channel. The time that an inbound bunkering tow entered the channel was randomly generated such that the vessel arrived at the dock between 0 and 3 hours after the arrival of the corresponding inbound containership. The bunkering tow was assumed to leave 5 hours after arrival. Whether a particular bunkering tow was from Texas City or Houston was randomly assigned.

The average estimates of 10 simulations for each project phase are shown in Tables 4.2.18-3 to 4.2.18-5, respectively, for the existing traffic level, 45 percent increase in the year 2000 traffic, and the Port's projected increase in traffic. For Phase I and year 2000 traffic, the addition of the containership traffic results in an increase of 24 percent in the ship traffic. The increase would ultimately rise in Phase III to 118 percent (i.e., the total ship traffic would more than double the existing level). If the non-container ship traffic increases by the amount projected by the Port of Texas City, the Phase III containership traffic would result in an increase of only 68 percent.

Figures 4.2.18-12 and 4.2.18-13 present this delay information graphically. As can be seen from the figures, the addition of the containership traffic would increase both the number of delays to the existing ship traffic as well as the average delay time per day. In Phase III, the average delay time per day would increase by 63 percent with the 2000 non-containership traffic, and by 32 percent with the Port of Texas City's projected increase in non-containership traffic.

FIGURE 4.2.18-11

FREQUENCY DISTRIBUTION OF CONTAINERSHIP ARRIVAL AND DEPARTURE TIMES AT BARBOURS CUT



VTS 2000 data

t = time based on the 24-hr clock

TABLE 4.2.18-3
SUMMARY OF TEXAS CITY SHIP CHANNEL DELAY SIMULATIONS WITH YEAR 2000 LEVEL OF NON-CONTAINERSHIP AND TOW TRAFFIC

	MOVEMENTS			DELAYS							
	Number of vessel movements/year			Delays to non-containerships				Delays to containerships			
	Non-container-ships [3]	Tows [4]	Container-ships [5]	Number per year	Delay time per delay (min)	Delay time per day (min)	% of movements delayed	Number per year	Delay time per delay (min)	Delay time per day (min)	% of movements delayed
No project											
Mean [1]	3083	7775		534	25.29	37.01	17.33				
Phase I											
Mean [1]	3090	8103	738	633	24.00	41.64	20.48	151	24.05	10.02	20.48
% change [2]		4.2%	23.9%	18.5%	-5.1%	12.5%	18.2%				
Phase II											
Mean [1]	3063	8846	2186	796	24.24	52.86	25.97	561	23.67	36.42	25.66
% change [2]		13.8%	70.9%	48.9%	-4.1%	42.8%	49.9%				
Phase III											
Mean [1]	3047	9592	3653	937	23.45	60.22	30.76	1161	23.49	74.70	31.78
% change [2]		23.4%	118.5%	75.4%	-7.3%	62.7%	77.5%				

TABLE 4.2.18-4
SUMMARY OF TEXAS CITY SHIP CHANNEL DELAY SIMULATIONS WITH 45% INCREASE IN NON-CONTAINERSHIP AND TOW TRAFFIC (BASED ON HISTORICAL FREIGHT TRAFFIC DATA)

	MOVEMENTS			DELAYS							
	Number of vessel movements/year			Delays to non-containerships				Delays to containerships			
	Non-container-ships [3]	Tows [4]	Container-ships [5]	Number per year	Delay time per delay (min)	Delay time per day (min)	% of movements delayed	Number per year	Delay time per delay (min)	Delay time per day (min)	% of movements delayed
No project											
Mean [1]	4457	11228		1123	28.62	88.04	25.19				
Phase I											
Mean [1]	4449	11567	733	1203	26.00	85.71	27.05	196	26.04	14.01	26.78
% change [2]		3.0%	16.4%	7.2%	-9.2%	-2.7%	7.4%				
Phase II											
Mean [1]	4466	12350	2194	1473	26.33	106.30	32.99	722	26.26	51.92	32.89
% change [2]		10.0%	49.2%	31.2%	-8.0%	20.7%	31.0%				
Phase III											
Mean [1]	4458	12999	3653	1665	26.08	118.92	37.34	1397	26.01	99.54	38.24
% change [2]		15.8%	82.0%	48.3%	-8.9%	35.1%	48.2%				

TABLE 4.2.18-5
SUMMARY OF TEXAS CITY SHIP CHANNEL DELAY SIMULATIONS WITH PORT OF TEXAS CITY PROJECTED INCREASE IN NON-CONTAINERSHIP AND TOW TRAFFIC

	MOVEMENTS			DELAYS							
	Number of vessel movements/year			Delays to non-containerships				Delays to containerships			
	Non-container-ships [3]	Tows [4]	Container-ships [5]	Number per year	Delay time per delay (min)	Delay time per day (min)	% of movements delayed	Number per year	Delay time per delay (min)	Delay time per day (min)	% of movements delayed
No project											
Mean [1]	5374	16640		1628	30.78	137.21	30.28				
Phase I											
Mean [1]	5382	16947	736	1717	28.15	132.45	31.90	237	27.06	17.62	32.25
% change [2]		1.8%	13.7%	5.5%	-8.5%	-3.5%	5.4%				
Phase II											
Mean [1]	5382	17660	2192	2002	28.25	154.92	37.19	821	27.92	62.81	37.46
% change [2]		6.1%	40.8%	23.0%	-8.2%	12.9%	22.8%				
Phase III											
Mean [1]	5414	18466	3639	2296	28.79	181.08	42.41	1566	28.35	121.63	43.03
% change [2]		11.0%	67.7%	41.1%	-6.5%	32.0%	40.0%				

[1] Mean results of 10 simulations.
[2] % change referenced to the no-project condition.
[3] Variations in the number of ship movements are due to different series of random numbers generated for the simulations.
[4] Include bunkering tows associated with containership traffic.
[5] Percentages shown in this column represent the % changes relative to the no-project ship traffic.

FIGURE 4.2.18-12
NUMBER OF DELAYS TO NON-CONTAINERSHIPS PER YEAR FOR EXISTING AND PROJECTED NON-CONTAINERSHIP TRAFFIC

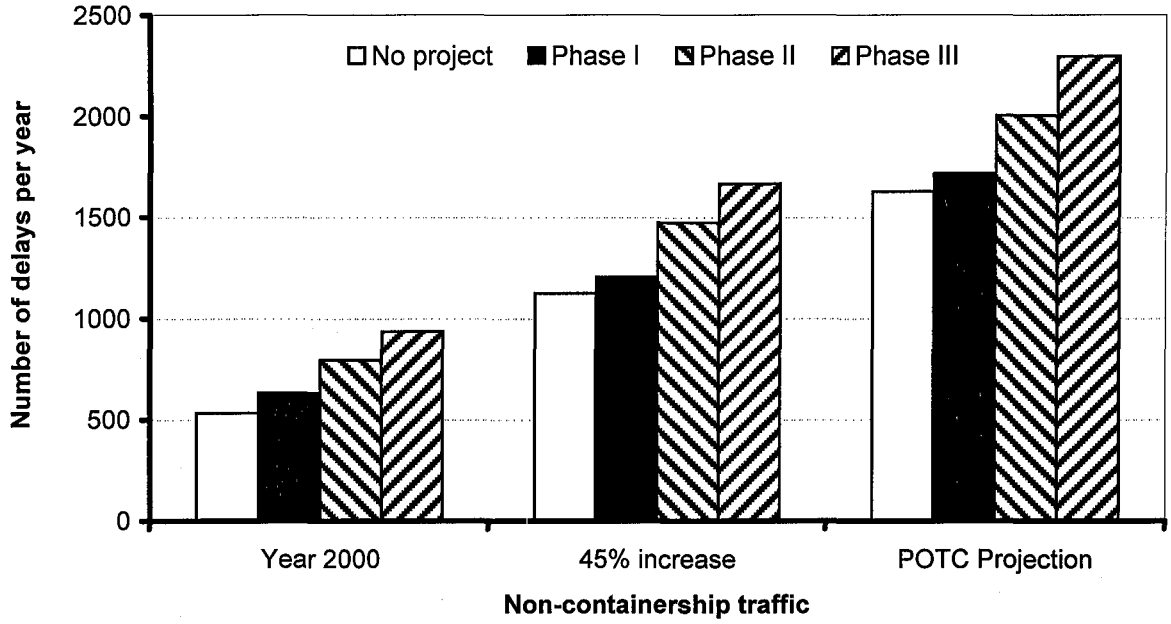
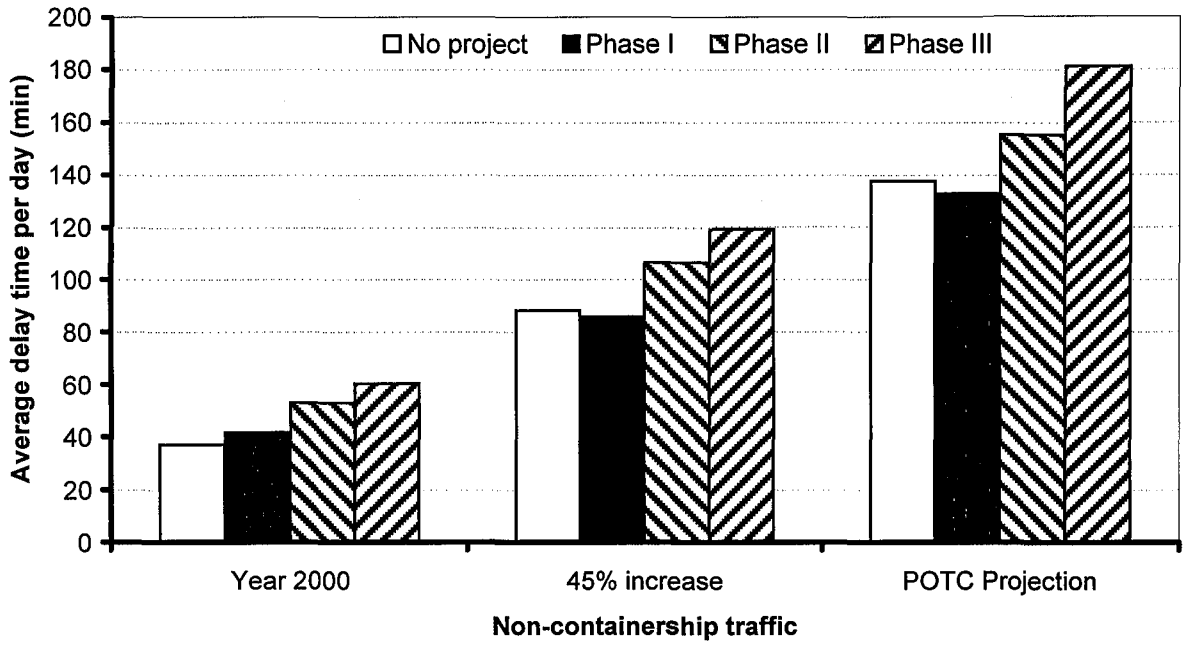


FIGURE 4.2.18-13
AVERAGE DELAY TIME PER DAY FOR NON-CONTAINERSHIPS FOR EXISTING AND PROJECTED NON-CONTAINERSHIP TRAFFIC



The setback and resulting increased length of channel available for two-way ship traffic would help to reduce or mitigate delays to non-containership traffic. For example, without the 800-foot setback, in Phase III the average delay time per day would increase by 187 percent for the current ship traffic level compared with 63 percent with the setback. As shown in Figure 4.2.18-13, with projected increases in non-containership traffic, the average delay time per day in Phase I would be slightly less than without the project. This is because the reduction in delay due to the shorter length of the channel with a one-way restriction is larger than the effect of the increased traffic.

Potential delays to containerships from interactions with other ships are presented in Figures 4.2.18-14 and 4.2.18-15. With existing ship traffic levels, in Phase I, 20.5 percent of the containership movements would be delayed. In Phase III, 31.8 percent of the movements would be delayed. These percentages increase to 32.3 percent and 43.0 percent, respectively, with the Port of Texas City's projected increase in the non-containership traffic. The average delay time per day ranges from about 10 minutes in Phase I with year 2000 non-containership traffic to about 122 minutes in Phase III with the Port's projected increase in non-containership traffic.

4.2.18.8 Monetary Effect of Delay Under Project Conditions

Ship operating costs are presented in Section 4.2.18.4. The operating cost for the most common tank vessel was $980/day. For containership traffic, the following table based on the USACE memorandum shows the hourly total costs for different tonnages of foreign containerships:

TEU	2,200	2,500	2,800	3,000	3,500	4,000	4,800	6,000
DWT	31,000	35,000	39,000	42,000	49,000	55,000	66,000	82,000
Hourly total cost	$943	$1,020	$1,129	$1,174	$1,280	$1,357	$1,477	$1,905

The cost for a 55,000-dead-weight-ton (DWT), 4,000-TEU (20-foot equivalent unit) vessel is used for the containerships. Figures 4.2.18-16 and 4.2.18-17 present the calculated delay costs for the existing ships and containerships, respectively. The average delay cost per day for the non-containership traffic increases from $604 with year 2000 traffic to $1,942 in Phase III with a 45 percent increase in ship traffic. The average delay cost per day for the containership traffic increases from $227 in Phase I with year 2000 ship traffic to $2,751 in Phase III with the Port's projected increase in non-containership traffic.

It is important to recognize that these vessel operating cost values are only a part of the full economic costs associated with congestion and traffic delay. Delay can affect facilities, and if it causes a shutdown in a process unit, the costs could be very large. At the same time, delays from weather (typically 5 to 10 days of fog per year) that affect the entire port are built into normal business practice. The monetary delay costs calculated above should be viewed as crude indicators of total costs, whose primary value lies in the relative changes and not in the absolute values.

FIGURE 4.2.18-14
NUMBER OF DELAYS TO CONTAINERSHIPS PER YEAR FOR EXISTING AND PROJECTED NON-CONTAINERSHIP TRAFFIC

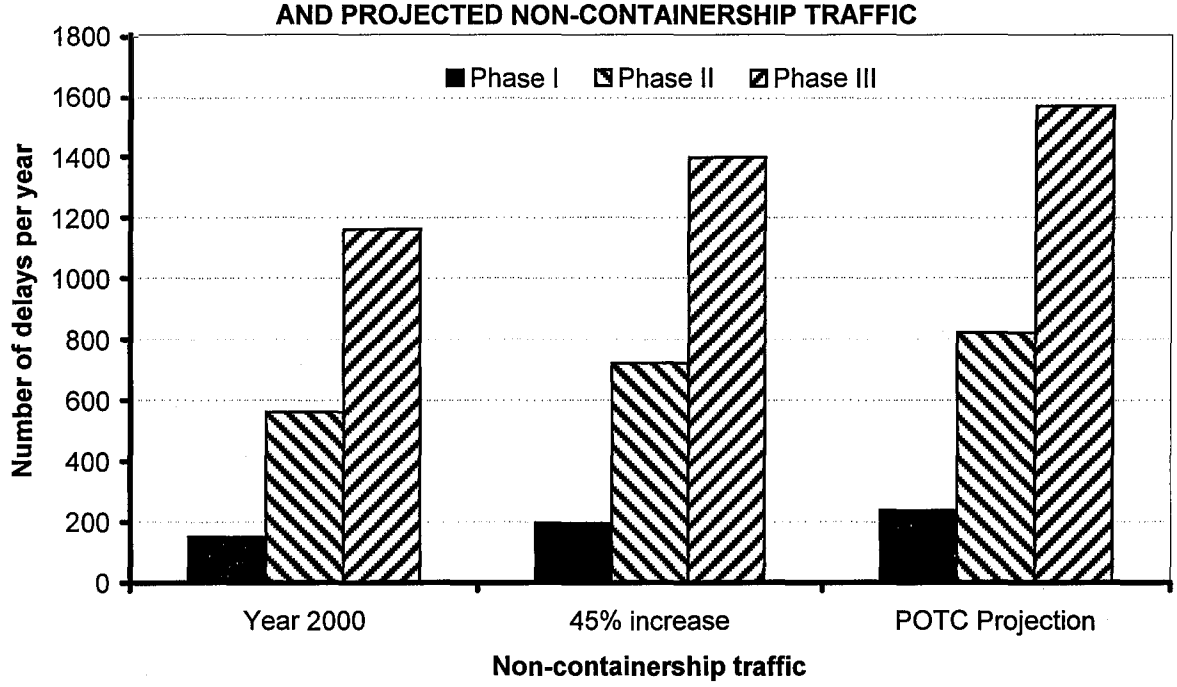


FIGURE 4.2.18-15
AVERAGE DELAY TIME PER DAY FOR CONTAINERSHIPS FOR EXISTING AND PROJECTED NON-CONTAINERSHIP TRAFFIC

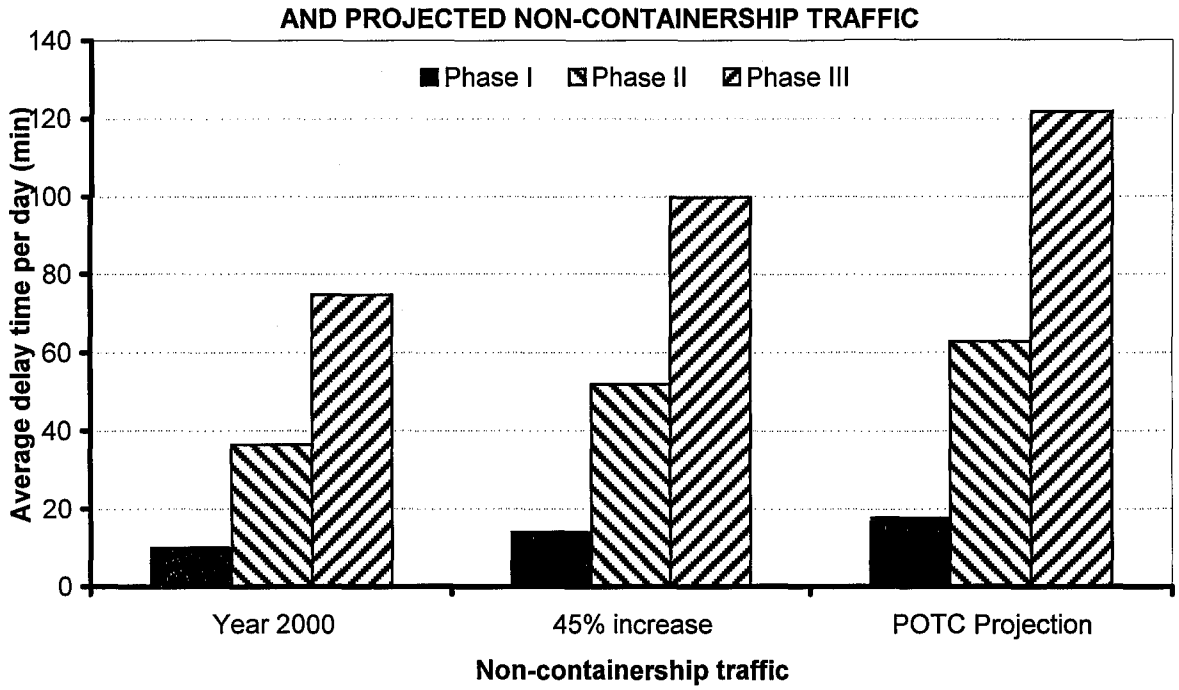


FIGURE 4.2.18-16
AVERAGE DELAY COST PER DAY FOR NON-CONTAINERSHIPS FOR EXISTING AND PROJECTED NON-CONTAINERSHIP TRAFFIC

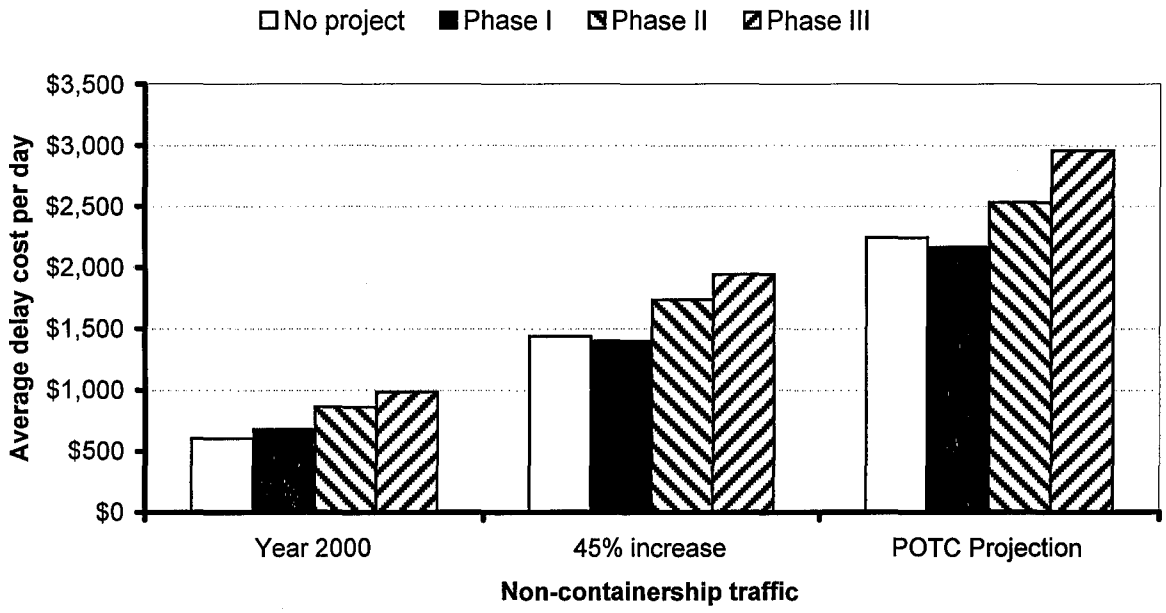
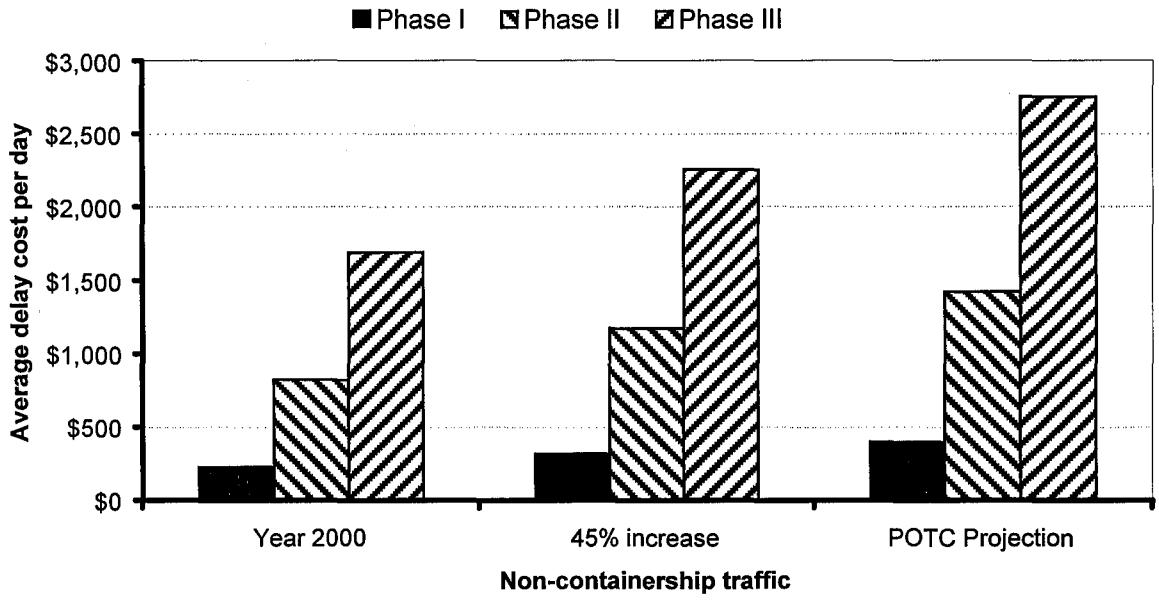


FIGURE 4.2.18-17
AVERAGE DELAY COST PER DAY FOR CONTAINERSHIPS FOR EXISTING AND PROJECTED NON-CONTAINERSHIP TRAFFIC



4.2.18.9 Tow and Ship Encounters under Project Conditions

As noted above, the present traffic pattern is to allow ships and tows to meet and overtake in the Texas City Channel. One of the effects of the container project would be to increase the number of such vessel encounters. This effect has also been quantified with the simulation model.

In principle, the addition of the containership traffic should not have a major effect on the interaction between the non-containership traffic and the existing tow traffic. The time of an encounter may be changed due to delay to ship traffic but the number of encounters should remain about the same. Therefore the increase in the number of overtakings of tows by non-containerships or the increase in the number of meetings between tows and non-containerships results only from the increase in tow traffic due to the addition of the bunkering tows to service the containerships.

The total number of tow and ship encounters (either overtaking or meeting) is increased substantially as a result of the tow and containership encounters. Moreover, the number of meetings between tows is also increased because of the addition of the bunkering tow traffic.

One of the technical decisions to be made in quantifying project effects on encounters is how to consider the wide channel area at the docks created by the 800-foot setback. From the perspective of ship meetings and delays, the wide area is considered a place where ship meetings can take place. Having a wider channel would not alter the fact that a meeting or overtaking occurs, but it would mean there is room for greater separation for meetings and overtakings. Presumably this greater separation would reduce the risk of collision to some degree. Because of this difference and uncertainty over the net effect of channel widening in the dock area on the overall rate of collisions per encounter, the change in encounters is estimated, including and excluding those that occur in the wide areas at the docks. The simulations without setbacks are used to give estimates of encounters including those that occur in the wide areas. The condition is not exactly the same as directly simulating the traffic in the wide area but the differences are believed to be small. The results are tabulated in tables 4.2.18-6 through 4.2.18-8 and also shown in figures 4.2.18-18 through 4.2.18-21.

The number of overtakings of tows by non-containerships is increased somewhat due to the project because of the addition of bunkering tow traffic. The number of overtakings of tows by containerships increases from 49 in Phase I to 276 in Phase III with the year 2000 traffic level, and increases from 63 in Phase I to 378 in Phase III with 45 percent increase in non-containership traffic. Nevertheless, even in Phase III, overtaking of tows by ships is an infrequent occurrence. In all scenarios simulated, less than 7 percent of the tows experience overtaking.

The project produces a substantial increase in meetings in the channel, as can be seen in figures 4.2.18-20 through 4.2.18-21. The biggest percentage increase is for ship-tow meetings, primarily because of the increase in the ship traffic (including containerships). As shown in Figure 4.2.18-22 through 4.2.18-24, with 2000 non-containership and tow traffic, about one-half of the increase in ship-tow meetings takes place in the wide part of the channel at the container docks. With projected increases in non-containership and tow traffic, most of the increase in ship-tow meetings takes place in the wide part.

TABLE 4.2.18-6
SUMMARY OF TEXAS CITY SHIP CHANNEL ENCOUNTER SIMULATIONS WITH YEAR 2000 LEVEL OF NON-CONTAINERSHIP & TOW TRAFFIC

	MOVEMENTS			ENCOUNTERS									
	Number of vessel movements/year			Overtakings of tows				Meetings					
	Non-container-ships [3]	Tows [4]	Container-ships [5]	By non-containerships		By containerships		Non-containership-Tow		Containership-Tow		Tow-Tow	
				Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements
No project													
Mean [1]	3083	7775		168	2.16			1639	21.08			2283	29.36
Phase I													
Mean [1]	3072	8117	723	180	2.21	49	0.61	1700	20.94	463	5.71	2476	30.49
% change [2]		4.4%	23.4%	6.7%	2.2%			3.7%	-0.6%			8.4%	3.8%
Phase II													
Mean [1]	3041	8865	2185	202	2.28	163	1.83	1859	20.97	1502	16.95	2970	33.50
% change [2]		14.0%	70.9%	19.9%	5.2%			13.4%	-0.5%			30.1%	14.1%
Phase III													
Mean [1]	3059	9539	3653	216	2.27	276	2.90	2007	21.04	2698	28.28	3425	35.90
% change [2]		22.7%	118.5%	28.6%	4.8%			22.5%	-0.2%			50.0%	22.3%

TABLE 4.2.18-7
SUMMARY OF TEXAS CITY SHIP CHANNEL ENCOUNTER SIMULATIONS WITH 45% INCREASE IN NON-CONTAINERSHIP AND TOW TRAFFIC (BASED ON HISTORICAL FREIGHT TRAFFIC DATA)

	MOVEMENTS			ENCOUNTERS									
	Number of vessel movements/year			Overtakings of tows				Meetings					
	Non-container-ships [3]	Tows [4]	Container-ships [5]	By non-containerships		By containerships		Non-containership-Tow		Containership-Tow		Tow-Tow	
				Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements
No project													
Mean [1]	4457	11228		360	3.21			3438	30.62			4777	42.53
Phase I													
Mean [1]	4422	11562	731	367	3.18	63	0.55	3472	30.03	649	5.62	5013	43.35
% change [2]		3.0%	16.4%	2.1%	-0.9%			1.0%	-1.9%			4.9%	1.9%
Phase II													
Mean [1]	4407	12351	2199	401	3.24	217	1.76	3709	30.03	2116	17.13	5783	46.82
% change [2]		10.0%	49.3%	11.3%	1.1%			7.9%	-1.9%			21.1%	10.1%
Phase III													
Mean [1]	4453	13051	3645	434	3.32	378	2.90	4008	30.71	3679	28.19	6432	49.28
% change [2]		16.2%	81.8%	20.5%	3.7%			16.6%	0.3%			34.7%	15.9%

TABLE 4.2.18-8
SUMMARY OF TEXAS CITY SHIP CHANNEL ENCOUNTER SIMULATIONS WITH PORT OF TEXAS CITY PROJECTED INCREASE IN NON-CONTAINERSHIP AND TOW TRAFFIC

	MOVEMENTS			ENCOUNTERS									
	Number of vessel movements/year			Overtakings of tows				Meetings					
	Non-container-ships [3]	Tows [4]	Container-ships [5]	By non-containerships		By containerships		Non-containership-Tow		Containership-Tow		Tow-Tow	
				Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements
No project													
Mean [1]	5374	16640		646	3.89			6106	36.70			10464	62.88
Phase I													
Mean [1]	5363	16942	742	658	3.89	100	0.59	6209	36.65	984	5.81	10874	64.18
% change [2]		1.8%	13.8%	1.8%	0.0%			1.7%	-0.1%			3.9%	2.1%
Phase II													
Mean [1]	5365	17691	2183	686	3.88	286	1.62	6477	36.61	2961	16.74	11843	66.95
% change [2]		6.3%	40.6%	6.1%	-0.2%			6.1%	-0.2%			13.2%	6.5%
Phase III													
Mean [1]	5381	18391	3660	712	3.87	518	2.81	6782	36.88	5194	28.24	12787	69.52
% change [2]		10.5%	68.1%	10.1%	-0.4%			11.1%	0.5%			22.2%	10.6%

[1] Mean results of 10 simulations.
[2] % change referenced to the no-project condition.
[3] Variations in the number of ship movements are due to different series of random numbers generated for the simulations.
[4] Include bunkering tows associated with containership traffic.
[5] Percentages shown in this column represent the % changes relative to the no-project ship traffic.

FIGURE 4.2.18-18
NUMBER OF OVERTAKINGS OF TOWS BY NON-CONTAINERSHIPS PER YEAR FOR EXISTING AND PROJECTED NON-CONTAINERSHIP TRAFFIC

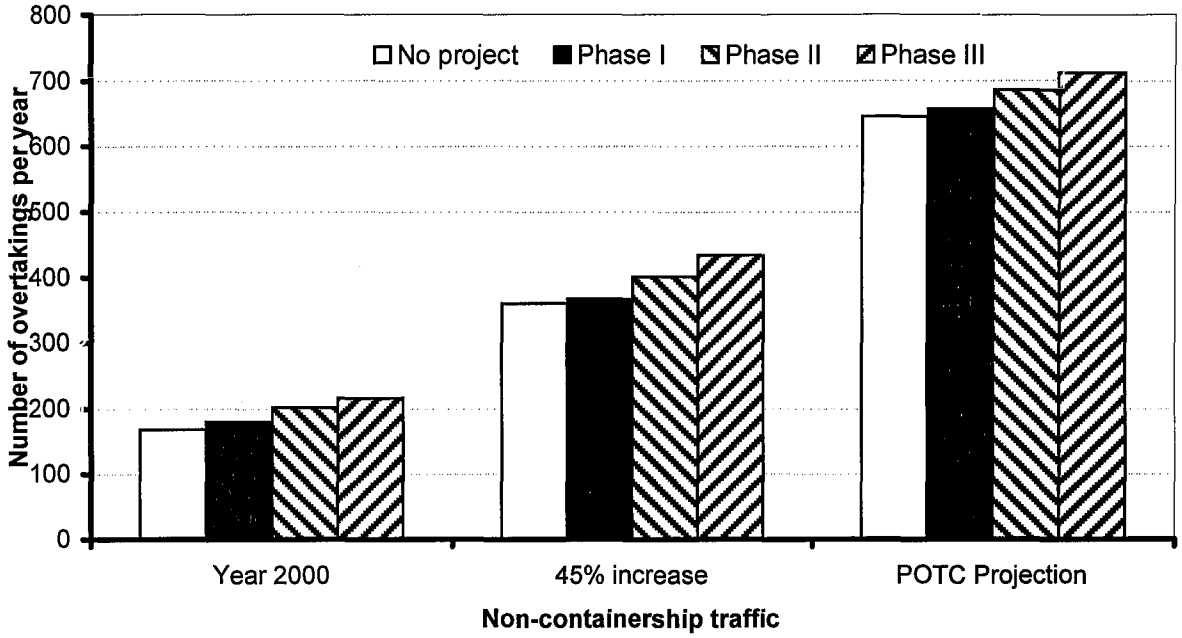


FIGURE 4.2.18-19
NUMBER OF OVERTAKINGS OF TOWS BY CONTAINERSHIPS PER YEAR FOR EXISTING AND PROJECTED NON-CONTAINERSHIP TRAFFIC

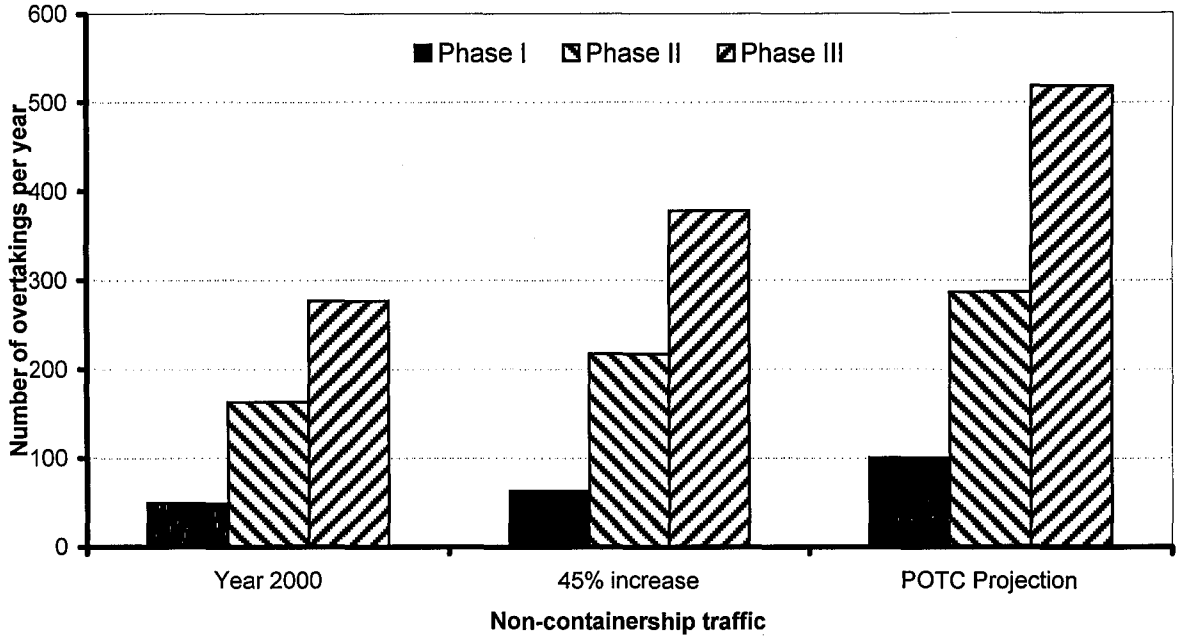


FIGURE 4.2.18-20
NUMBER OF SHIP-TOW MEETINGS PER YEAR FOR EXISTING AND PROJECTED NON-CONTAINERSHIP TRAFFIC

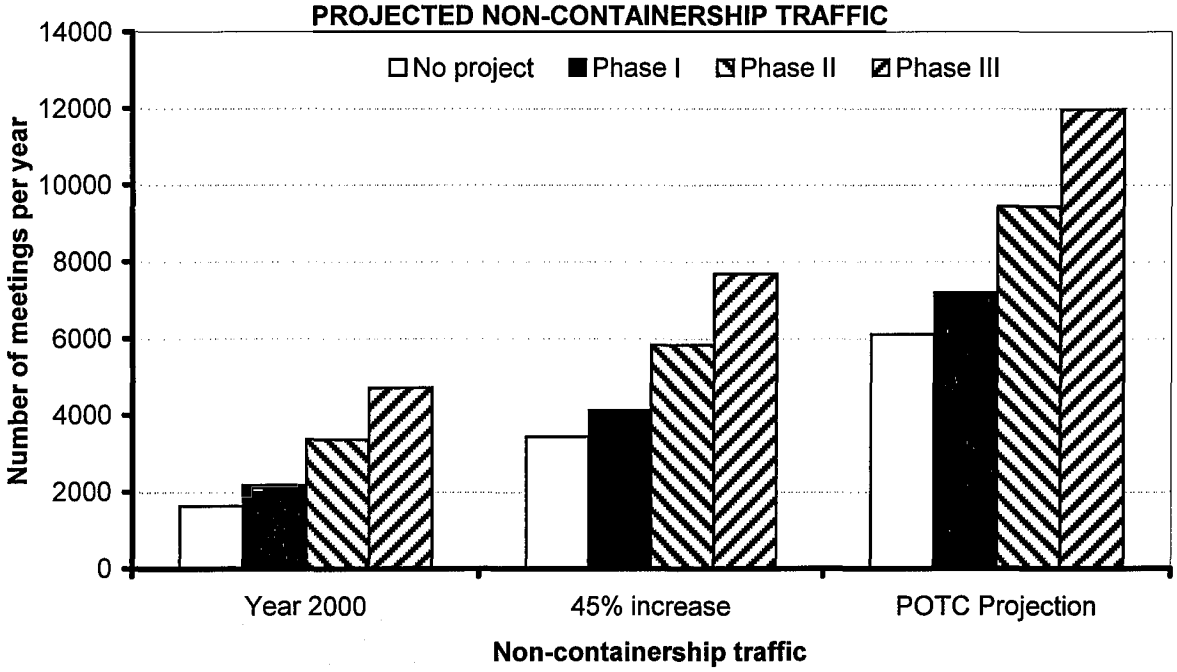


FIGURE 4.2.18-21
NUMBER OF TOW-TOW MEETINGS PER YEAR FOR EXISTING AND PROJECTED NON-CONTAINERSHIP TRAFFIC

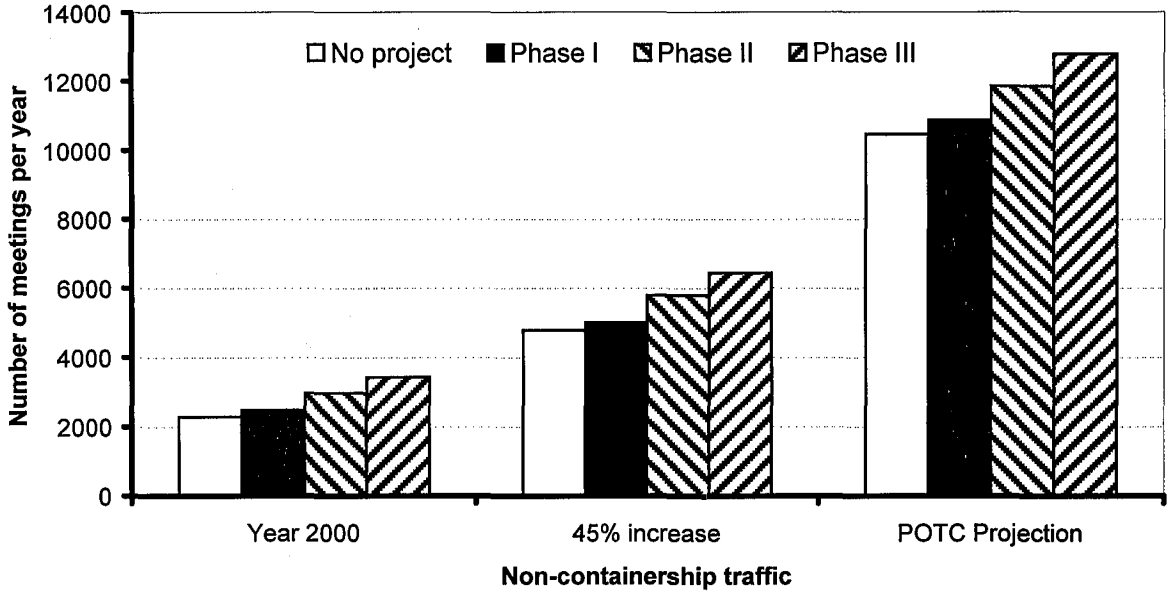
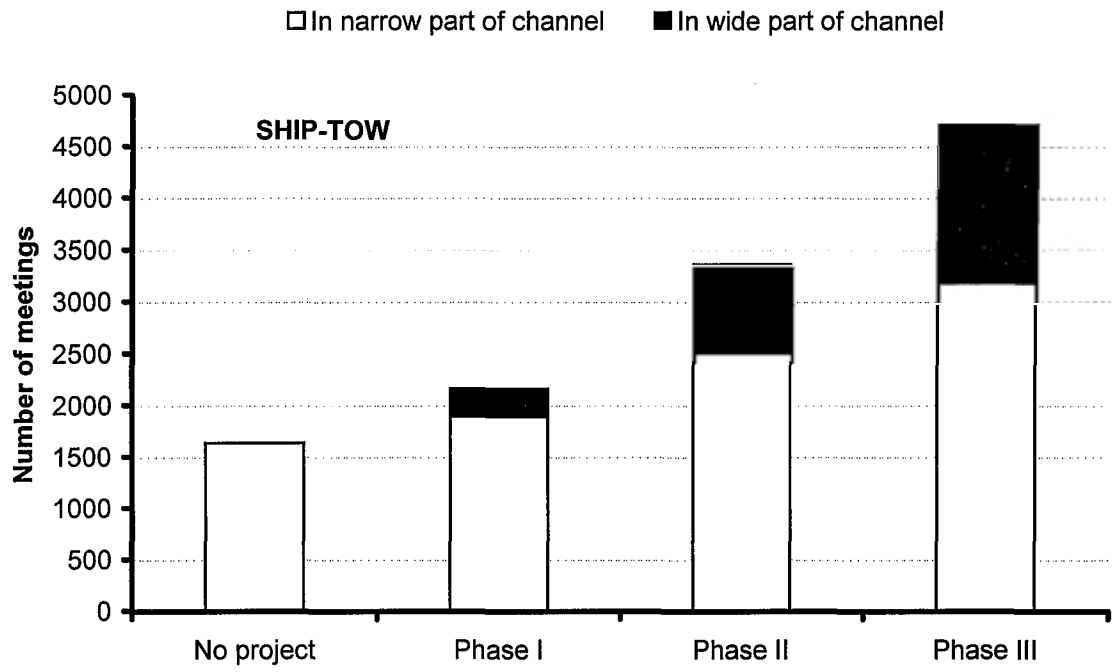


FIGURE 4.2.18-22
NUMBER OF VESSEL MEETINGS AT VARIOUS PROJECT PHASES WITH YEAR 2000 NON-CONTAINERSHIP AND TOW TRAFFIC



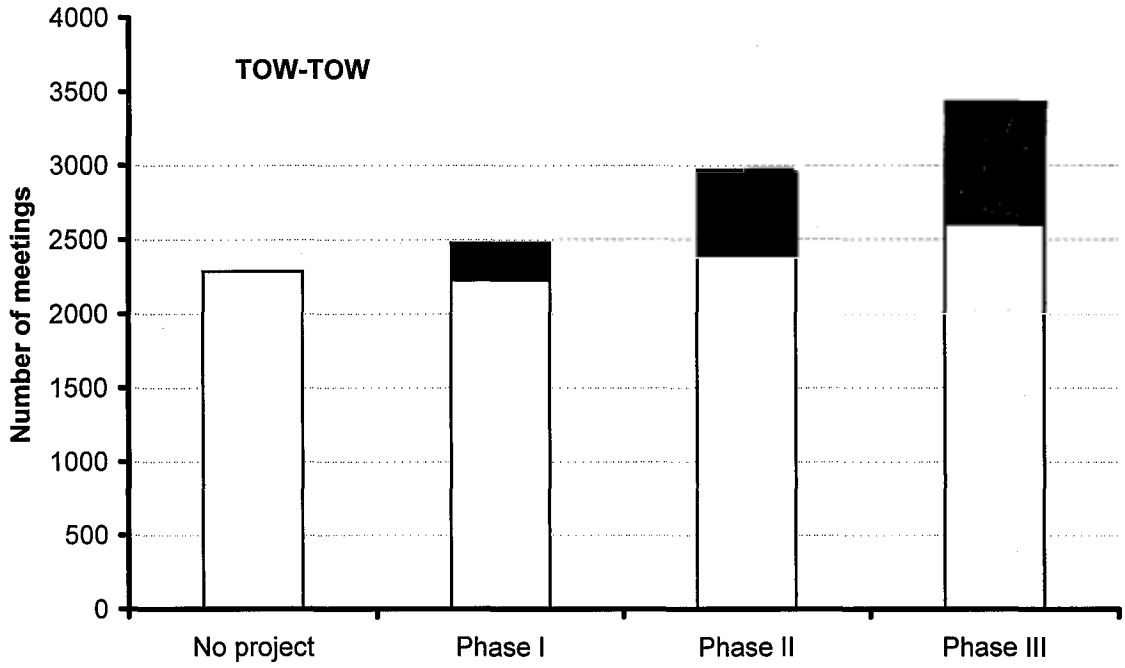


FIGURE 4.2.18-23
NUMBER OF VESSEL MEETINGS AT VARIOUS PROJECT PHASES WITH 45% INCREASE IN NON-CONTAINERSHIP AND TOW TRAFFIC

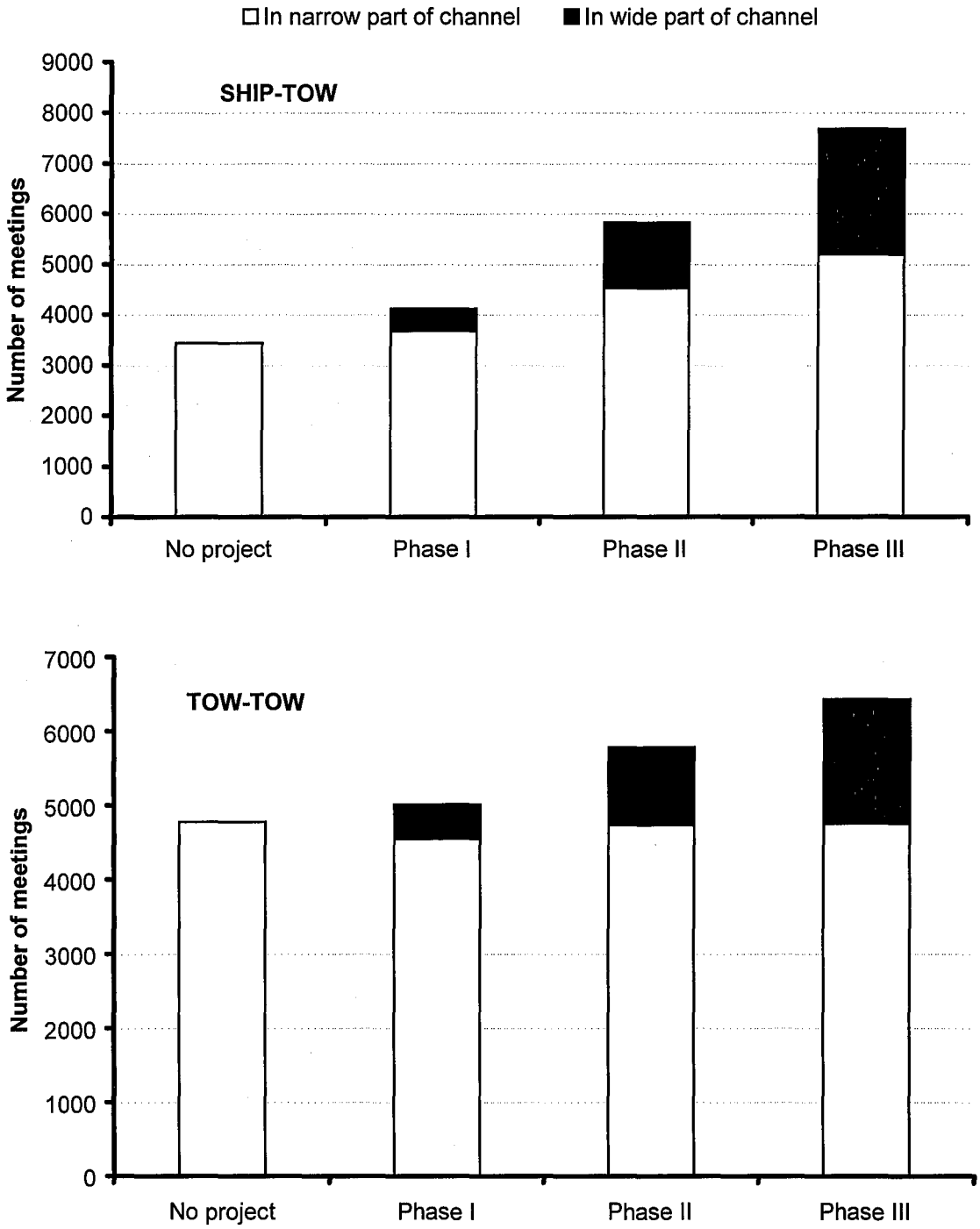
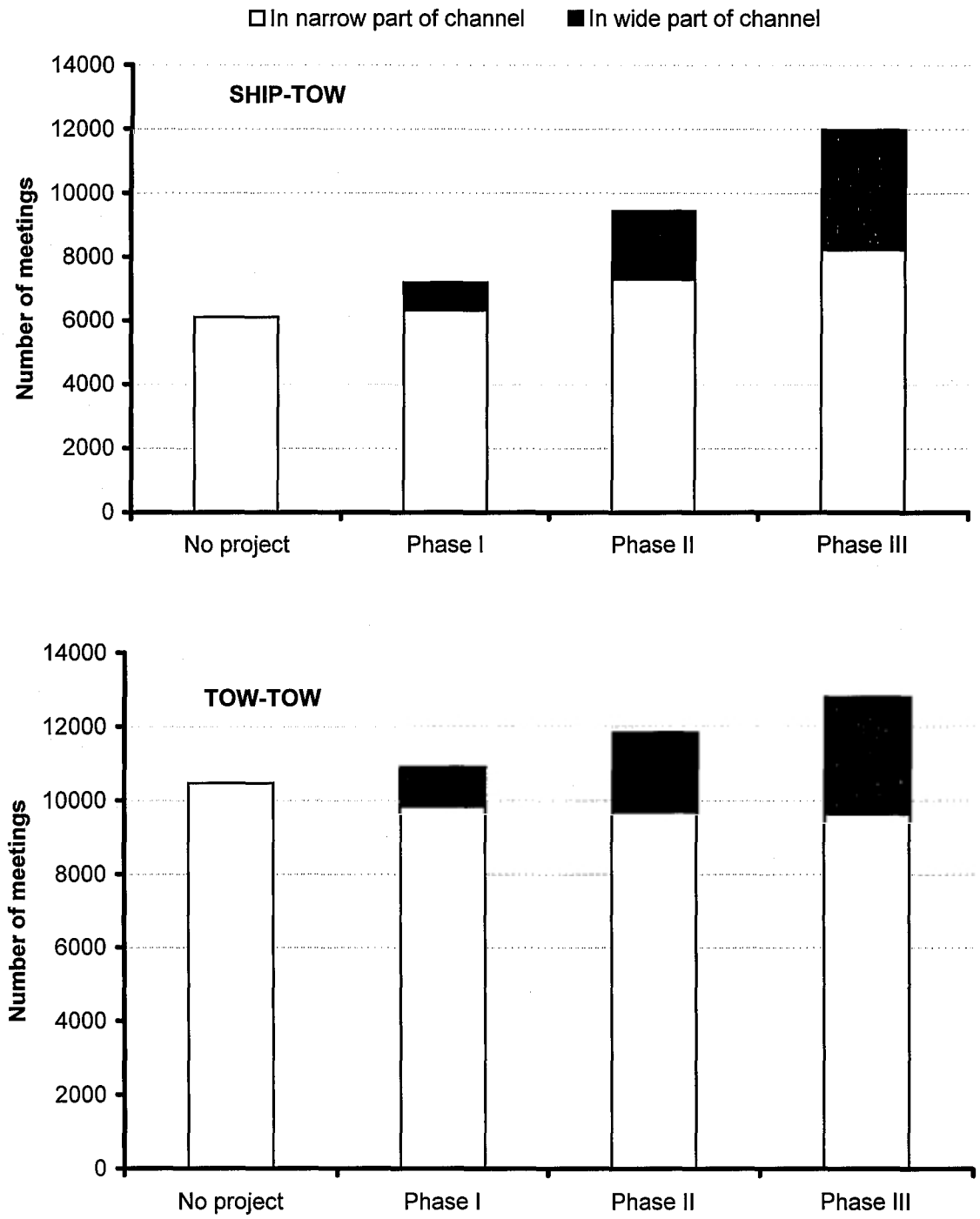


FIGURE 4.2.18-24
NUMBER OF VESSEL MEETINGS AT VARIOUS PROJECT PHASES WITH PORT'S PROJECTED INCREASE IN NON-CONTAINERSHIP AND TOW TRAFFIC



The percentage increase in tow-tow meetings is much smaller and the increase is essentially in the wide portion of the channel.

4.2.18.10 Effect of 800-Foot Setback

To assist in understanding the significance of the 800-foot setback on delays, simulations were performed with and without the setback for each phase of the project. For simulations without setback, the Horn was taken as the end point of the channel for the containership and bunkering tow movements. The details of arriving at and leaving from specific dock locations were not simulated. However, an additional 20-minute period for meeting with tows was allowed for inbound containerships to account for the fact that a containership could meet a tow during turning and docking.

The setback in itself would have the effect of reducing the delay to the existing ship traffic. The average results of 10 simulations with the setback for the 2000 traffic level (but without projected containership traffic) is that the average delay time per day is reduced by 19.2, 30.1 and 36.7 percent due to the Phase I, II, and III setbacks, respectively.

4.2.18.11 Other Topics

The analysis of navigation effects took place over more than a year and involved a number of parties and topics. A number of the topics or issues are important but did not become a part of the quantification effort described above. This section addresses these topics and summarizes their current status. One of the largest and most comprehensive was the Ports And Waterways Safety Assessment (PAWSA).

PAWSA

The USCG convened a PAWSA workshop on August 21, 2000, to address safety issues in the Texas City Harbour with particular regard to the newly proposed container facility. The participants, listed in Appendix F, included twenty representatives of the navigation and environmental support communities. The participants identified factors, risks, risk mitigation strategies, and the lead representatives for addressing the strategies.

Selected topics and additional actions recommended by PAWSA included:

- Ship traffic increases – more tugs and better scheduling are needed
- Tow traffic increases – establish fleeting area, improve scheduling and provide more facilities
- Congestion – trim northwest corner of Shoal Point; separate radio frequencies Vessel Traffic Control-Vessel Traffic Service (VTC-VTS)
- Wind – enhance real-time wind data
- Visibility – explore Automated Information System (AIS), minimize visibility impact around Horn, enhance surveillance
- Channel width – trim Horn, dredge southeast corner of the junction of Texas City and Houston ship channels (i.e., the "Y")
- Hurricane impacts – study impacts and minimize container damage
- Health & Safety – vapor recovery, test alert-evacuation plans

The project considered by the PAWSA group has changed in some respects and the USCG conducted a follow-up review in September 2001 (see Appendix F). Some of the topics addressed by the PAWSA and navigation committee in developing this assessment are summarized below.

Channel Width

Considerable discussion was devoted to the question of the need to widen the Texas City Channel if it were to be deepened to 45 feet as proposed by the applicant. Among the arguments for widening were the need to be consistent with national and international channel design standards. Among the arguments against was that the 400-foot width was adequate for container vessels in one-way traffic and merely providing additional underkeel clearance would not decrease safety for vessels limited by the existing 40-foot channel above the project. At this time the issue is deferred because the deepening to 45 feet would not occur until Phase II of the project and because there is now renewed interest and activity in the Federal project to deepen to 45 feet. The Federal project would involve a thorough analysis of the channel width issue using vessel simulators and would involve all traffic types on the channel.

Turning Area

The initial design for the project involved a dedicated and separate 1,200-foot-diameter turning area on the north side of the channel, somewhat past or to the west of the container facility. This was initially needed because the dock setback considered at the start did not allow vessels to be turned near the docks. As the project evolved to have an 800-foot setback from the 400-foot-wide channel, giving a total width of 1,200 feet, a consensus grew that turning at the dock would be preferable. One of the reasons was that there would be less channel blockage and delay to other traffic from turning at the dock than there would be with a separate basin on the north side of the channel that would require two separate channel crossings for a container vessel to dock. Eventually the project was modified to eliminate the separate turning area, significantly reducing the amount of dredging needed and associated environmental effects. Eventually there will be a need to turn vessels of over 1,000 feet in length, and Phase II of the project incorporates 300 feet of additional width on the north side of the channel opposite berths 2 and 3 to create a turning area for those vessels.

Coordination

There was considerable discussion of the issue of coordination between various entities – the harbor master dealing most directly with tow traffic and the existing private terminals, the pilots dealing exclusively with oceangoing traffic, the harbor tug supplier responding to ship traffic needs, and the USCG VTS providing traffic information. The PAWSA identified the need for some type of Memorandum of Agreement (MOA) to better clarify roles, particularly with a new group (TCIT) that would be independent of the existing port community. There was general agreement among the navigation committee on the utility of such a MOA. However, that is not an action that the applicant can independently control.

Visibility at the Horn

One of the issues addressed in the PAWSA was the visibility around the northwestern corner of Shoal Point (the Horn). In response to this concern, the applicant moved the corner of the facility to the south, away from the existing channel in the design process.

Hurricane Preparation

Another topic addressed was concern over hurricane effects from the container facility. The issue here was the critical nature of the refining and petrochemical facilities at the Port of Texas City to the nation's economy, and the possibility that containers moved into the waterway by a storm might delay return of the port to normal operations. The project representatives indicated that on the approach of a hurricane, their practice would be to move as many of the boxes out as possible and to stack the loaded boxes on top of the empty ones in a manner that would reduce the chance of stack failures.

Barge Lanes

The issue of providing additional width for barge traffic (100-foot lane was discussed) was addressed as a possible mitigation action for the increased vessel traffic from the project. During the discussion, the Pilots representative noted that only approximately 3 miles of the channel would benefit from a barge lane. It was also noted that the Houston and Corpus Christi precedents were somewhat different in that they involved channels used for two-way traffic. Eventually it was determined that a barge lane would not be necessary as it would not appreciably enhance navigation safety under the scenarios considered.

Bunkering

The bunkering of container vessels was addressed because of concern that vessels passing the container facility would cause a surge that would move the bunkering barges relative to the ships they were refueling, possibly causing a hose break and spill. The alternative of providing a single off-channel bunker berth with fuel lines run to each dock was discussed, but not adopted for a number of reasons. Primarily, the channel adjacent to the container dock would be markedly larger than in the 400-foot channel, and the surge effect would be considerably lower.

Barge Fleeting Areas

The need for additional barge fleeting areas in the Texas City Harbour was noted and generally accepted. However, this need was not caused by the proposed container project, except for additional bunkering barges, and no project requirement appeared to be appropriate.

4.2.18.12 Discussion

At full build-out, the proposed Shoal Point Container Terminal would have an impact on the existing Port of Texas City by virtue of approximately doubling the current ship traffic level, and adding substantially to both operational delays and vessel encounters. If major additional growth occurs with the

non-containership vessel traffic (e.g., the doubling of traffic projected by the Port of Texas City), the amount of operational delay in use of the one-way channel for both container and non-container ships could approach 5 hours per day.

Delays and a high frequency of vessel encounters are a logical consequence of using a harbor more intensively. These effects must be managed but are not inherently bad or unacceptable. Other alternative locations for the container facility offer the advantage of not having existing traffic and would thus result in no significant traffic congestion or adverse effects to existing interests. While these are certainly advantages, there are a number of adverse effects that are produced by the development of a greenfield site that are avoided with a Texas City Harbour site. None of these effects are in themselves necessarily determinative. The key point is that congestion and delay effects should be disclosed, understood, and managed.

4.2.19 Land Use/Recreation/Aesthetics

4.2.19.1 Land Use

Site-related Impacts. Shoal Point is currently a DMPA, partially vegetated with shrub/brush rangeland. Location of the project at the Shoal Point site would result in conversion of a DMPA to an industrial use. In the nearby vicinity of the site are additional industrial developments, thus the proposed project would not present an inconsistent land use with adjacent areas.

Transport-related Impacts. Projected traffic volumes with and without the proposed project at the Shoal Point site are presented in Table 4.2.2-4. The major roadways which would receive traffic generated by container terminal activity are IH 45, SH 146, and SH 225.

As discussed in Section 4.2.2-1, IH 45 is expected to receive 42 percent of cargo traffic from the Shoal Point site in 2025. This is equivalent to an additional 4,446 daily trips. A roadway segment analysis is shown in Table 4.2.2-4, indicating the projected traffic volumes with and without the proposed project during various years. Without the project at Shoal Point, traffic on IH 45 would be expected to increase by approximately 19 percent in the vicinity of NASA Road 1 and upwards to 53 percent between FM 518 and FM 646. Traffic from the container terminal is expected to add an additional 2 to 7 percent to the ADT of various segments of IH 45. Thus, the major impacts on IH 45 traffic loads would be caused by regional growth, with some additional impact, primarily in the form of truck traffic, from the proposed project. IH 45 is designed to carry large volumes of interstate traffic. Although the various land uses adjacent to IH 45 would experience greater noise and related impacts from higher traffic loads on the freeway, the addition of traffic from the proposed project would not introduce a land use incompatibility from the project, since IH 45 is already expected to carry large volumes of traffic in the region.

To the extent that trucks utilize FM 519 between Loop 197 and IH 45, truck traffic through this local commercial and residential area could adversely affect the enjoyment of residential and small commercial uses due to additional noise and traffic congestion.

SH 146 is projected to receive 28 percent of traffic from the proposed Shoal Point site, or an average daily traffic volume of 2,964 by 2025. As shown in Table 4.2.2-4, traffic volumes along SH 146

are expected to increase by approximately 58 percent by 2025 without the proposed project. The additional project traffic would add an extra 5 to 7 percent along the northern portions of SH 146 and an additional 10 to 25 percent in the southern segments. SH 146 passes through largely commercial and industrial areas in various communities between Texas City and the intersection of SH 146 and SH 225. The introduction of an additional 2,964 truck trips a day along this roadway does not present an incompatible use, although as noted in Section 4.2.2, improvements would be needed to SH 146 to accommodate projected traffic volumes (with or without the project) to maintain an acceptable level of service.

SH 146 intersects with SH 225, which would receive approximately 2,000 additional truck trips per day from the proposed Shoal Point site. SH 225 passes through highly industrialized areas and the addition of project truck traffic would not introduce an incompatible land use along this highway.

Loop 197 is the proposed tie-in to the access road to the site and is expected to receive approximately an additional 10,000 ADT from the project. Loop 197 passes through a highly industrialized area of Texas City and additional truck traffic along that roadway would not pose any significant incompatibility with existing adjacent land uses.

Labor Force-Related Impacts. Housing, commercial and public land uses would be required to serve the projected 890 inmigrant population of operations workers and their families. Assuming the same land use per 100 persons shown in Table 4.1.19-1, the demands generated by the inmigrant population would include approximately 37 acres of residential land uses, 3.5 acres of commercial uses, 39.5 acres of public, semipublic and park uses, and 36.5 acres of streets.

Secondary Impacts. Construction and operation of the proposed container terminal at this site would contribute to the conversion of currently undeveloped land to industrial use. The addition of the facility to the area may lead to the potential development of secondary, or ancillary growth effects in the general vicinity. This development would likely include facilities associated with the development of private sector commercial support industries, such as transportation centers, convenience stores, or distribution warehouses. These secondary land use changes that may occur as a result of the proposed container facility are consistent with nearby industrial land uses and would not introduce a new element in the area. Additionally, the potential addition of these secondary facilities would represent a small portion of the overall land use changes likely to occur in the area over the next several years with or without the project.

4.2.19.2 Recreation

Shoal Point is directly south of the Texas City Dike which is used for recreational fishing on its southern shore and also for swimming and other water-based recreation on the northern shore.

The location of the container terminal facilities on Shoal Point is not expected to interfere with recreational fishing (see Section 4.2.15.4) or other activities along the dike. Although preliminary proposals included placement of dredged material for beneficial uses in the area between Dollar Point and the Texas City Dike, use of this area as a Beneficial Use site was eliminated from project plans as a result of public comments regarding potential impacts on recreational fishing in this area.

Recreational fishing activities exist in the area. The Beneficial Use sites will convert bay waters into tidal wetlands. This conversion would provide nursery habitat for commercially important species, but would also restrict recreational fishing in these areas.

Additional ships in the channel would provide greater opportunities for ship watching, presently a recreational activity along the Texas City Dike.

Bird nesting and loafing habitats occur in the vicinity of the Shoal Point site, and a rookery is associated with Swan Lake just south of the proposed access road. Bird watching activities could be adversely affected if bird nesting or roosting is disturbed at the project site or in the nearby environs of the project site (see Section 4.2.14 for additional information).

4.2.19.3 Aesthetics

As discussed in Section 3.18.4, the most aesthetically valuable views within the vicinity of the Shoal Point site are from city parks: along Texas City Dike, from First Ladies Pavilion, from the entrance to Skyline Road at the western terminus of the dike, and from the higher points in Bay Street Park, such as the Thomas S. Mackey Nature Center.

From the dike, Shoal Point can be seen in low relief in the midground viewscape, with the large industrial areas of Texas City in the background. The view is a largely urban waterscape, especially at the eastern end of the dike. Introduction of the proposed terminal facility in this location would bring the industrial composition closer to the dike into the midground viewscape, and additional ships would be seen in the channel, adding a more dynamic element to the landscape. Currently, Shoal Point lies very low in the water and is barely visible and the landscape has little form or variety. Addition of the terminal facilities to the landscape, although industrial in nature, would add an element of interest. The electric transmission line would lie along the Galveston County Discharge Canal and the west edge of Shoal Point, with the main terminal located between the dike and transmission line. Thus, the introduction of the electric transmission line into the dike viewscape would constitute a background industrial element in an already industrial landscape. Nevertheless, the landscape would become less natural and more industrial.

Shoal Point and the terminal would also be visible from First Ladies Pavilion at the head of the dike. The comments regarding the dike view also apply to the view from the Pavilion, except that the portion of the transmission line along the west edge of Shoal Point would be more visible from the Pavilion than from the eastern end of the dike and would bring this industrial element into the midground viewscape. Nevertheless, the view from the Pavilion is already industrial in nature and the change would be quantitative rather than qualitative.

From Skyline Road, the terminal would lie further in the background. The view from that point is already cluttered with road signs, electric lines, signs, a bait shop, restaurant, and the aforementioned industrial structures in the distance. A terminal facility and electric transmission line would not significantly change the quality of the view from that location.

From Thomas S. Mackey Nature Center, the terminal would be barely visible on the low horizon, and Bay Street Park in the foreground would dominate the view. Although the electric

transmission line would be visible from the park, it would occur in the distance, with other industrial type structures in the foreground.

4.2.20 Socioeconomics

4.2.20.1 Population

For each alternative, direct employment was projected by the project's engineer for the construction phase and by the project's manager for operations. The employment expected to be created by the project was compared with the labor force that is expected to be available during the life of the project. This is discussed in Section 4.2.20.6 below.

For all alternatives, including the Shoal Point site, the available construction labor force is expected to offer adequate labor to complete construction work without the importation of workers from outside the subregion most proximate to the site.

For operations-phase employment, an adequate local labor force would not likely be available to fill all employment positions. Table 4.2.20-1 shows the number of operations workers which may relocate to the Shoal Point region. Inmigration of workers is expected to begin in 2005, with 25 workers, and escalate to 318 when Phase III is operational. Also shown in Table 4.2.20-1 are the additional family members which could be expected to accompany the project operations workers. Total population increase resulting from direct employment during the operations phase of the project is expected to amount to 890 at full operation.

4.2.20.2 Environmental Justice

EJ Index Methodology

The DVMAV data for Shoal Point (Appendix G-1) show that within the 50-square-mile area surrounding this alternative, 36.1 percent of the population is of minority status, as compared with 39.4 percent statewide. The overall minority status is ranked 1.

The DVECO data for Shoal Point show that within the 50-square-mile area surrounding this alternative, 30.0 percent of the population is economically stressed, as compared with 27.6 percent statewide. The overall economically stressed status is ranked 2.

According to the EJ Index, the overall EJ potential for the 50-square-mile area at Shoal Point is ranked 4.

Census Tract Analysis

The average percentage of African Americans (or Blacks) within the Shoal Point alternative study area is 12.8 percent, which is slightly under the percentage of African Americans in Galveston County (17.2 percent) and almost equal to the state (11.7 percent). Census blocks that exceed the threshold of 10 percent over the county's percentage of African Americans are tract 1229.12, block 2 and tract 1230, block 5. The average percentage of Hispanics is 4.2 percent, which is much less than that

Table 4.2.20-1
Population and Housing Effects
Shoal Point Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
SHOAL POINT ALTERNATIVE														
Direct Construction Jobs Created	23	36	20	9	28	34	0	0	0	0	6	13	29	55
Available Construction Workforce (RAZ 180, 184, 186, 187)	108	109	110	111	111	112	112	113	114	114	114	115	115	115
Inmigration of Construction Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Operations Jobs Created	0	0	94	153	177	201	225	253	277	301	325	352	376	400
Available Operations Workforce (RAZ 180. 184, 186, 187)	125	126	128	129	129	130	131	131	132	132	133	133	134	134
Inmigration of Operations Workers	0	0	0	25	48	71	94	122	145	168	192	219	243	266
Secondary Family Growth	0	0	0	45	86	128	170	219	261	304	346	396	438	480
Total Potential Inmigration	0	0	0	69	134	200	265	341	406	472	538	615	681	746
Housing Units Needed for Inmigration	0	0	0	25	48	71	94	122	145	168	192	219	243	266

Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
SHOAL POINT ALTERNATIVE										
Direct Construction Jobs Created	0	0	0	0	0	0	0	0	0	0
Available Construction Workforce (RAZ 180, 184, 186, 187)	116	116	116	117	117	118	118	119	119	119
Inmigration of Construction Workers	0	0	0	0	0	0	0	0	0	0
Direct Operations Jobs Created	452	452	452	452	452	452	452	452	452	452
Available Operations Workforce (RAZ 180. 184, 186, 187)	134	135	135	136	136	137	137	138	138	139
Inmigration of Operations Workers	318	317	317	316	316	315	315	314	314	313
Secondary Family Growth	573	572	571	570	570	569	568	567	566	565
Total Potential Inmigration	890	889	888	887	886	884	883	881	880	879
Housing Units Needed for Inmigration	318	317	317	316	316	315	315	314	314	313

of the county (13.9 percent) and state averages (25.2 percent). There are no census blocks that exceed the threshold of 10 percent over the county's percentage of Hispanics. The average percentage of "other races" is 2.2 percent, which is about equal to the county (2.0 percent) and the state (2.3 percent). The only census block that exceeds the threshold of 10 percent over the county's percentage of "other races" is 1229.12, block 2. The average percentage of persons living below the poverty line within the census blocks is 14.2 percent, which is less than Galveston County (15.3 percent) and the state (17.6 percent). The only census block that exceeds the threshold of 10 percent over the county's percentage of residents living below the poverty line is tract 1229.12, block 2.

The proposed project would be situated approximately 4,500 feet from the nearest residence. The land use would be consistent with current land uses in the area. If any minority or low-income groups are dependent on the natural resources in the vicinity of the Shoal Point site (e.g., for subsistence fishing), they are not likely to be adversely affected by the proposed project since project activities are not expected to result in long-term adverse impacts on resources of this type (e.g., fishing) (see Section 4.2.15.4). Potential effects of locating the project at this site include increased traffic, noise and air pollution (see sections 4.2.1, 4.2.2 and 4.2.3); however, these effects would also occur at any of the alternative sites. Some of the advantages the community would reap as a result of the creation of this project are: increased number of jobs for many levels of experience and the infusion of indirect economic contributions to the community (see Section 4.2.19). These beneficial effects would also occur at any of the alternative sites.

4.2.20.3 Community Values

The City of Texas City is the applicant for the proposed project. One of the goals of that community is to develop an intramodal shipping center and "MegaPort" in Texas City. Thus, construction of the proposed project at Shoal Point is an integral element in achieving this goal of the community. The proposed project would also support other community goals related to: an economy that attracts residents and results in higher incomes; a waterfront development supportive of the marine industry; and full employment. It may also support the development of tourism assets, insofar as ship watching opportunities are increased. The development of additional wetlands (see Section 4.2.10.7) would support the community goals of ecological management of sensitive areas.

4.2.20.4 Housing

Table 4.2.20-1 shows the housing needs of the families of inmigrant operations workers. At full operation, there is expected to be a demand of 318 housing units for workers' families.

4.2.20.5 Leading Economic Sectors

Total Demand. Table 4.2.20-2 shows the direct and indirect effect of the construction and operation of the Shoal Point alternative on the Texas economy, as well as direct non-Texas effects of the project.

Table 4.2.20-2
Total Economic Effect of Project *
Shoal Point Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION ACTIVITIES													
Construction Costs	$23,283,387	$39,337,768	$40,778,845	$9,115,464	$28,417,841	$37,266,694	$0	$0	$0	$0	$6,229,429	$13,737,593	$29,765,389
Direct Effects:													
Effect Outside of Texas	$4,422,891	$7,472,567	$7,746,313	$1,731,565	$5,398,228	$7,079,148	$0	$0	$0	$0	$1,183,337	$2,609,581	$5,654,206
Texas Direct Effect	$18,860,496	$31,865,201	$33,032,532	$7,383,899	$23,019,614	$30,187,547	$0	$0	$0	$0	$5,046,092	$11,128,013	$24,111,182
Total Texas Effect (a)	$83,661,867	$140,464,922	$146,454,521	$32,753,686	$102,110,988	$133,214,346	$0	$0	$0	$0	$22,383,584	$49,361,921	$106,952,995
OPERATIONS ACTIVITIES													
Construction Costs	$250,000	$33,583,333	$11,902,655	$19,502,212	$55,875,369	$25,581,858	$28,621,681	$32,168,142	$35,207,965	$38,247,788	$41,287,611	$44,834,071	$81,207,227
Direct Effects:													
Effect Outside of Texas	$32,191	$4,324,368	$1,532,649	$2,511,208	$7,194,809	$3,294,056	$3,685,479	$4,142,140	$4,533,564	$4,924,988	$5,316,412	$5,773,073	$10,456,673
Texas Direct Effect	$217,809	$29,258,965	$10,370,006	$16,991,004	$48,680,560	$22,287,803	$24,936,202	$28,026,001	$30,674,400	$33,322,800	$35,971,199	$39,060,998	$70,750,554
Total Texas Effect (a)	$812,350	$109,125,683	$38,676,487	$63,370,489	$181,561,423	$83,125,691	$93,003,292	$104,527,159	$114,404,760	$124,282,361	$134,159,962	$145,683,830	$263,874,764
TOTAL EFFECT													
Total Costs	$23,533,387	$72,921,101	$52,681,500	$28,617,677	$84,293,210	$62,848,553	$28,621,681	$32,168,142	$35,207,965	$38,247,788	$47,517,039	$58,571,664	$110,972,616
Direct Effects:													
Effect Outside of Texas	$4,455,083	$11,796,935	$9,278,962	$4,242,774	$12,593,036	$10,373,203	$3,685,479	$4,142,140	$4,533,564	$4,924,988	$6,499,748	$8,382,653	$16,110,879
Texas Direct Effect	$19,078,305	$61,124,166	$43,402,538	$24,374,903	$71,700,174	$52,475,349	$24,936,202	$28,026,001	$30,674,400	$33,322,800	$41,017,291	$50,189,011	$94,861,736
Total Texas Effect (a)	$84,474,217	$249,590,606	$185,131,008	$96,124,175	$283,672,411	$216,340,037	$93,003,292	$104,527,159	$114,404,760	$124,282,361	$156,543,546	$195,045,750	$370,827,759

* In year-2000 dollars.

Table 4.2.20-2 (concluded)

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION ACTIVITIES												
Construction Costs	$59,056,851	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$286,989,262
Direct Effects:												
Effect Outside of Texas	$11,218,386	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$54,516,222
Texas Direct Effect	$47,838,465	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$232,473,040
Total Texas Effect (a)	$211,164,566	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,028,523,395
OPERATIONS ACTIVITIES												
Construction Costs	$50,913,717	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$1,074,183,628
Direct Effects:												
Effect Outside of Texas	$6,555,920	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$138,317,577
Texas Direct Effect	$44,357,797	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$935,866,051
Total Texas Effect (a)	$165,439,031	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$3,490,452,282
TOTAL EFFECT												
Total Costs	$109,970,568	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$1,361,172,890
Direct Effects:												
Effect Outside of Texas	$17,774,306	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$192,833,799
Texas Direct Effect	$92,196,261	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$1,168,339,091
Total Texas Effect (a)	$376,603,598	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$4,518,975,677

Source: Texas Comptroller of Public Accounts, 1989.

Direct effects, as derived from the Texas Input-Output Model (Texas Comptroller of Public Accounts, 1989), are disaggregated into direct Texas effects and imports (effects on the economy outside the state of Texas). Economic effects are shown for both construction and operations activities.

For both the construction and operations phases, the total final demand effect of each phase on the Texas economy is also shown. This is obtained from the final demand multipliers for various construction activities (heavy, light and roadway construction) and water-related transport activities for operations. The final demand multipliers were applied to total construction or operations cost to obtain the total demand, which includes indirect effects as goods and services are provided to the sectors that provide the goods and services directly to the construction or operation of the project. Also included are effects on households in the form of personal income.

For the Shoal Point alternative, total construction costs from 2002 to 2015 are anticipated to amount to $287.0 million. Direct Texas effects are expected to amount to $232.5 million, with an export effect of $54.5 million. Total Texas effect from construction activities is expected to amount to $1.029 billion over the 2002 to 2015 period.

Operations-related effects are expected to be similar for all alternatives. Operations expenditures will begin prior to construction and start of operations with the purchase of land and major equipment. Operations are expected to begin in 2004 and gradually grow until the project is completely operational for all three phases. At the point of full operation, the project operations cost is expected to amount to $57.5 million annually. The direct Texas effect is anticipated to be $50.1 million each year, with $7.4 million exported. Total Texas effect, including both direct and indirect effects, is projected to be approximately $186.8 million annually.

Effects to Major Economic Sectors. Table 4.2.20-3 shows the relative economic effect on various major economic sectors from the construction and operation of the proposed project at the Shoal Point site.

For construction-related activities, $313.8 million (41%) of the overall project effect is expected to accrue to the construction sector. Other major sectors affected would be manufacturing, with $104.4 million (14%); services, with $96.6 million (13%); and finance, insurance and real estate (FIRE), with $94.76 million (13%).

For operations-related activities at full build-out, 51 percent of annual effects ($70.3 million) are predicted to pertain to the transportation, communication and utilities sector, with other major affected sectors being FIRE, with $22.1 million (16%); trade, with $15.0 million (11%); and services, with $14.1 million (10%). These effects would be the same for all alternatives.

The year of greatest effect from construction activities alone would be 2015, which would also be the year of greatest overall effect.

Effects on Retail and Wholesale Trade. Table 4.2.20-4 provides more specific data on the effects of construction and operations on retail and wholesale trade.

Table 4.2.20-3
Total Texas Effect of Project, by Major Economic Sector *
Shoal Point Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Agriculture	$653,753	$1,099,140	$1,163,938	$255,945	$797,919	$1,042,155	$0	$0	$0	$0	$174,911	$385,726	$835,756
Mining	$1,234,912	$2,076,229	$2,198,628	$483,469	$1,507,235	$1,968,586	$0	$0	$0	$0	$330,399	$728,619	$1,578,707
Construction	$25,452,996	$42,793,534	$45,316,324	$9,964,868	$31,065,892	$40,574,881	$0	$0	$0	$0	$6,809,904	$15,017,699	$32,539,008
Manufacturing	$8,469,750	$14,239,995	$15,079,480	$3,315,914	$10,337,500	$13,501,715	$0	$0	$0	$0	$2,266,067	$4,997,296	$10,827,694
Transp., Comm., Util.	$3,827,228	$6,434,630	$6,813,969	$1,498,363	$4,671,209	$6,101,024	$0	$0	$0	$0	$1,023,968	$2,258,130	$4,892,713
Trade	$6,454,030	$10,851,012	$11,490,707	$2,526,758	$7,877,273	$10,288,435	$0	$0	$0	$0	$1,726,764	$3,807,987	$8,250,806
FIRE **	$7,679,859	$12,911,969	$13,673,163	$3,006,671	$9,373,422	$12,242,541	$0	$0	$0	$0	$2,054,733	$4,531,247	$9,817,901
Services	$7,835,315	$13,173,334	$13,949,936	$3,067,532	$9,563,159	$12,490,355	$0	$0	$0	$0	$2,096,324	$4,622,969	$10,016,635
Totals	$61,607,842	$103,579,843	$109,686,145	$24,119,519	$75,193,608	$98,209,693	$0	$0	$0	$0	$16,483,069	$36,349,672	$78,759,219
OPERATIONS-RELATED EFFECTS													
Agriculture	$4,460	$599,169	$212,358	$347,944	$996,886	$456,412	$510,647	$573,920	$628,154	$682,388	$736,623	$799,896	$1,448,838
Mining	$9,316	$1,251,514	$443,563	$726,768	$2,082,247	$953,331	$1,066,613	$1,198,775	$1,312,057	$1,425,339	$1,538,621	$1,670,783	$3,026,262
Construction	$8,088	$1,086,438	$385,057	$630,907	$1,807,597	$827,586	$925,926	$1,040,656	$1,138,996	$1,237,336	$1,335,675	$1,450,405	$2,627,095
Manufacturing	$50,136	$6,734,895	$2,386,992	$3,911,028	$11,205,402	$5,130,257	$5,739,872	$6,451,089	$7,060,703	$7,670,318	$8,279,933	$8,991,150	$16,285,524
Transp., Comm., Util.	$305,639	$41,057,510	$14,551,664	$23,842,549	$68,310,774	$31,275,258	$34,991,612	$39,327,359	$43,043,713	$46,760,067	$50,476,421	$54,812,168	$99,280,393
Trade	$65,086	$8,743,194	$3,098,776	$5,077,269	$14,546,775	$6,660,064	$7,451,461	$8,374,758	$9,166,156	$9,957,553	$10,748,950	$11,672,247	$21,141,753
FIRE **	$96,025	$12,899,391	$4,571,821	$7,490,819	$21,461,783	$9,826,017	$10,993,616	$12,355,814	$13,523,413	$14,691,012	$15,858,611	$17,220,810	$31,191,775
Services	$61,200	$8,221,173	$2,913,760	$4,774,126	$13,678,245	$6,262,418	$7,006,565	$7,874,735	$8,618,881	$9,363,028	$10,107,174	$10,975,344	$19,879,464
Totals	$599,950	$80,593,283	$28,563,991	$46,801,409	$134,089,710	$61,391,344	$68,686,311	$77,197,106	$84,492,073	$91,787,041	$99,082,008	$107,592,803	$194,881,104
TOTAL EFFECTS													
Agriculture	$658,214	$1,698,309	$1,376,296	$603,889	$1,794,805	$1,498,567	$510,647	$573,920	$628,154	$682,388	$911,533	$1,185,621	$2,284,594
Mining	$1,244,229	$3,327,743	$2,642,192	$1,210,237	$3,589,482	$2,921,917	$1,066,613	$1,198,775	$1,312,057	$1,425,339	$1,869,019	$2,399,402	$4,604,968
Construction	$25,461,083	$43,879,972	$45,701,381	$10,595,774	$32,873,489	$41,402,468	$925,926	$1,040,656	$1,138,996	$1,237,336	$8,145,579	$16,468,104	$35,166,103
Manufacturing	$8,519,886	$20,974,890	$17,466,472	$7,226,942	$21,542,902	$18,631,973	$5,739,872	$6,451,089	$7,060,703	$7,670,318	$10,545,999	$13,988,446	$27,113,218
Transp., Comm., Util.	$4,132,867	$47,492,140	$21,365,632	$25,340,912	$72,981,983	$37,376,281	$34,991,612	$39,327,359	$43,043,713	$46,760,067	$51,500,389	$57,070,297	$104,173,106
Trade	$6,519,116	$19,594,205	$14,589,483	$7,604,027	$22,424,048	$16,948,499	$7,451,461	$8,374,758	$9,166,156	$9,957,553	$12,475,715	$15,480,234	$29,392,559
FIRE **	$7,775,884	$25,811,360	$18,244,985	$10,497,489	$30,835,205	$22,068,558	$10,993,616	$12,355,814	$13,523,413	$14,691,012	$17,913,344	$21,752,057	$41,009,675
Services	$7,896,514	$21,394,506	$16,863,696	$7,841,658	$23,241,404	$18,752,774	$7,006,565	$7,874,735	$8,618,881	$9,363,028	$12,203,498	$15,598,313	$29,896,099
Totals	$62,207,792	$184,173,126	$138,250,136	$70,920,928	$209,283,318	$159,601,037	$68,686,311	$77,197,106	$84,492,073	$91,787,041	$115,565,077	$143,942,475	$273,640,322

* In year-2000 dollars.
** Finance, insurance and real estate.

Table 4.2.20-3 (concluded)

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Agriculture	$1,651,869	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$8,061,111
Mining	$3,120,311	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,227,095
Construction	$64,313,291	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$313,848,397
Manufacturing	$21,400,919	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$104,436,330
Transp., Comm., Util.	$9,670,439	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$47,191,671
Trade	$16,307,704	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$79,581,476
FIRE **	$19,405,063	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$94,696,568
Services	$19,797,861	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$96,613,419
Totals	$155,667,457	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$759,656,067
OPERATIONS-RELATED EFFECTS												
Agriculture	$908,364	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$19,164,778
Mining	$1,897,346	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$40,030,435
Construction	$1,647,085	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$34,750,391
Manufacturing	$10,210,379	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$215,419,780
Transp., Comm., Util.	$62,244,876	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$1,313,249,777
Trade	$13,255,042	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$279,656,448
FIRE **	$19,556,008	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$412,594,976
Services	$12,463,637	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$262,959,286
Totals	$122,182,738	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$2,577,825,871
TOTAL EFFECTS												
Agriculture	$2,560,234	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$27,225,889
Mining	$5,017,657	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$55,257,530
Construction	$65,960,376	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$348,598,788
Manufacturing	$31,611,298	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$319,856,110
Transp., Comm., Util.	$71,915,315	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$1,360,441,448
Trade	$29,562,746	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$359,237,923
FIRE **	$38,961,071	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$507,291,545
Services	$32,261,498	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$359,572,705
Totals	$277,850,195	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$3,337,481,938

Source: Texas Comptroller of Public Accounts, 1989.

** Finance, insurance and real estate.

Table 4.2.20-4
Retail and Wholesale Sales Effect of Project *
Shoal Point Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Retail Trade	$3,054,017	$5,134,647	$5,437,348	$1,195,650	$3,727,488	$4,868,439	$0	$0	$0	$0	$817,097	$1,801,922	$3,904,242
Wholesale Trade	$2,898,799	$4,873,684	$5,161,001	$1,134,882	$3,538,043	$4,621,006	$0	$0	$0	$0	$775,569	$1,710,341	$3,705,813
Totals	$5,952,816	$10,008,332	$10,598,349	$2,330,532	$7,265,531	$9,489,445	$0	$0	$0	$0	$1,592,665	$3,512,262	$7,610,056
OPERATIONS-RELATED EFFECTS													
Retail Trade	$30,318	$4,072,734	$1,443,464	$2,365,081	$6,776,144	$3,102,375	$3,471,022	$3,901,110	$4,269,757	$4,638,404	$5,007,051	$5,437,139	$9,848,201
Wholesale Trade	$29,589	$3,974,853	$1,408,773	$2,308,241	$6,613,292	$3,027,815	$3,387,603	$3,807,354	$4,167,141	$4,526,928	$4,886,716	$5,306,467	$9,611,518
Totals	$59,908	$8,047,587	$2,852,238	$4,673,323	$13,389,436	$6,130,191	$6,858,625	$7,708,464	$8,436,898	$9,165,332	$9,893,766	$10,743,606	$19,459,719
TOTAL EFFECTS													
Retail Trade	$3,084,335	$9,207,381	$6,880,813	$3,560,731	$10,503,633	$7,970,814	$3,471,022	$3,901,110	$4,269,757	$4,638,404	$5,824,147	$7,239,060	$13,752,444
Wholesale Trade	$2,928,389	$8,848,538	$6,569,774	$3,443,123	$10,151,335	$7,648,821	$3,387,603	$3,807,354	$4,167,141	$4,526,928	$5,662,284	$7,016,808	$13,317,332
Totals	$6,012,723	$18,055,919	$13,450,587	$7,003,855	$20,654,968	$15,619,635	$6,858,625	$7,708,464	$8,436,898	$9,165,332	$11,486,431	$14,255,868	$27,069,775

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Retail Trade	$7,716,728	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$37,657,579
Wholesale Trade	$7,324,534	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$35,743,672
Totals	$15,041,262	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$73,401,251
OPERATIONS-RELATED EFFECTS												
Retail Trade	$6,174,432	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$130,268,903
Wholesale Trade	$6,026,041	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$127,138,137
Totals	$12,200,474	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$257,407,040
TOTAL EFFECTS												
Retail Trade	$13,891,161	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$167,926,482
Wholesale Trade	$13,350,575	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$162,881,809
Totals	$27,241,736	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$330,808,291

Source: Texas Comptroller of Public Accounts, 1989.
* In year-2000 dollars.

Total construction-related effects on wholesale and retail trade are anticipated to be approximately $73.4 million over the full construction period, with roughly 51 percent of those effects on the retail sector and 49 percent on the wholesale sector. At full build-out, operation of the project is expected to have an almost $7 million effect on retail trade annually, and a $6.8 million effect on wholesale trade each year. This is the same prospective effect as for all alternatives.

4.2.20.6 Employment

Table 4.2.20-5 shows the number of jobs expected to be generated by the construction and operation of the project at the Shoal Point site, both directly in the construction sector (construction phase) and transportation sector (operations phase), and indirectly in all other sectors. A job is defined as full-time equivalent employment for one person for one year. Direct employment figures were obtained from the project engineer for the proposed project. The number of jobs expected to be created was established in a ratio to construction cost, and the resulting employment ratio was applied to all alternatives.

Indirect construction-related employment figures were derived from the Texas Input-Output Model, using factors for the number of jobs per $1,000,000 of construction and operations costs adjusted from the 1986 cost figures used in the Input-Output Model to 2000 costs by applying *Engineering News-Record* (*ENR*) Construction Cost Indices (*ENR*, 2001). Construction-generated indirect employment was calculated independently for heavy, light and roadway construction activities.

For the operations phase, projected employment figures were obtained from the project manager and were used for all alternatives. Operations-related multipliers from the Texas Input-Output Model were used to project the number of indirect jobs expected to be created during operations. Operations-related factors per $1,000,000 of operations costs were adjusted from the consumer price index for the Houston-Galveston-Brazoria PMSA published by the Texas Comptroller of Public Accounts.

The construction phase of the project is expected to create 253 direct jobs over the 2002 to 2015 construction period, with the creation of an additional 5,124 jobs indirectly. The direct employment would be created in the general region of the project; indirect employment would be created throughout the region and the state as goods and services are provided to the project. The highest year of employment creation would occur in 2003 during Phase I construction, when 53 direct jobs would be created.

When the project is fully operational, it is expected to create approximately 450 direct jobs and almost 800 in indirect employment, the same as all alternatives (see Table 4.2.20-5).

Given the size of the Houston metropolitan area, it is likely that the construction workforce could be drawn from the general region without causing significant population relocations for construction. Assuming that half of the projected unemployed construction workforce from RAZ 180, 184, 186 and 187 (Galveston and Texas City region) is qualified for the work presented by the project, there is projected to be a larger construction workforce than is needed for the project. This is shown in Table 4.2.20-1.

Table 4.2.20-5
Employment Effect of Project
Shoal Point Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED JOBS													
Direct Jobs	23	36	20	9	28	34	0	0	0	0	6	13	29
Indirect Jobs	419	700	719	164	511	664	0	0	0	0	112	247	535
Total Jobs	442	736	739	173	539	698	0	0	0	0	118	260	564
OPERATIONS-RELATED JOBS													
Direct Jobs	0	0	94	153	177	201	225	253	277	301	325	352	376
Indirect Jobs	3	465	165	270	774	354	396	446	488	530	572	621	1,125
Total Jobs	3	465	258	423	951	555	621	698	764	830	896	973	1,501
TOTAL JOBS													
Direct Jobs	23	36	114	162	205	235	225	253	277	301	331	365	405
Indirect Jobs	422	1,165	884	434	1,285	1,019	396	446	488	530	684	868	1,660
Total Jobs	445	1,201	997	596	1,490	1,254	621	698	764	830	1,014	1,233	2,065

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED JOBS												
Direct Jobs	55	0	0	0	0	0	0	0	0	0	0	253
Indirect Jobs	1,053	0	0	0	0	0	0	0	0	0	0	5,124
Total Jobs	1,108	0	0	0	0	0	0	0	0	0	0	5,377
OPERATIONS-RELATED JOBS												
Direct Jobs	400	452	452	452	452	452	452	452	452	452	452	7,654
Indirect Jobs	705	796	796	796	796	796	796	796	796	796	796	14,878
Total Jobs	1,105	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	22,532
TOTAL JOBS												
Direct Jobs	455	452	452	452	452	452	452	452	452	452	452	7,907
Indirect Jobs	1,759	796	796	796	796	796	796	796	796	796	796	20,002
Total Jobs	2,214	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	27,909

Source: Texas Comptroller of Public Accounts, 1989.

Using the same assumption of one-half of the unemployed labor force having the necessary qualifications for employment on the project, the operations-related available workforce is projected to amount to 125-139 during the 2002-2025 time frame, compared with the projected employment of approximately 450. Thus, it is possible that as many as 318 workers may be drawn from outside the immediate region of the project site at Shoal Point.

4.2.20.7 Household Income Effects

Table 4.2.20-6 shows the effects on household incomes from the construction and operations phases of the project. The construction phase of the project is expected to have a direct effect of $109.2 million on household incomes, and an indirect effect of $160.0 million. At full operation, the project is anticipated to have an annual operations-related direct effect on household income of $23.7 million and an indirect effect of $25.2 yearly, similar to all alternative sites.

4.2.20.8 Residential Property Values

According to Delucchi and Hsu (1998), residential property values may decrease from 0.2–1.5 percent for every dBA above 55 dBA. Those impacts may be temporary in nature (during construction activities) or they may be long-term effects associated with noise from operations at the container terminal site or from increased traffic.

Construction

As discussed in Section 4.2.3, dredging activities at the Shoal Point site would result in noise levels of 26 dBA to 46 dBA at the nearest residential receptor, located approximately 4,500 feet to the northwest of the site. Other construction would result in noise levels of 35 dBA and 62 dBA at the nearest residential receptors. As discussed in Section 3.3.2.1, ambient noise levels in the nearest residential neighborhoods were recorded at 63.8 dBA L_{dn} and 64.9 dBA L_{dn}. Thus, construction activities at the Shoal Point alternative site would not generate noise levels that are likely to result in lower residential property values since ambient noise levels are higher than those that are expected to be experienced at the nearest receptors as a result of construction activities.

Operations

A projected L_{dn} of 59.0 dBA recorded approximately 2,000 feet from the berths indicates that noise from operations at the terminal would be unlikely to adversely affect property values at the nearest residences, which lie at least 4,500 feet from the proposed site and currently have higher ambient noise levels.

Traffic

Table 4.2.3-1 also shows that virtually all of the residential receptors along major roadways that would be affected by increased terminal traffic currently have noise levels above 55 dBA, ranging from 63–74 dBA. According to the results of the Delucchi and Hsu research, those properties currently at the 63 dBA level likely have current property values 1.6–12.0 percent lower than similar

Table 4.2.20-6
Household Income Effect of Project *
Shoal Point Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Direct Effects	$9,019,984	$15,134,729	$14,102,957	$3,531,331	$11,009,072	$14,355,057	$0	$0	$0	$0	$2,413,281	$5,321,944	$11,531,112
Indirect Effects	$13,034,040	$21,750,351	$22,665,419	$5,102,837	$15,908,308	$20,649,595	$0	$0	$0	$0	$3,487,234	$7,690,305	$16,662,665
Total Effects	$22,054,024	$36,885,079	$36,768,376	$8,634,168	$26,917,379	$35,004,653	$0	$0	$0	$0	$5,900,515	$13,012,248	$28,193,776
OPERATIONS-RELATED EFFECTS													
Direct Effects	$102,875	$13,819,542	$4,897,942	$8,025,160	$22,992,714	$10,526,935	$11,777,822	$13,237,190	$14,488,077	$15,738,965	$16,989,852	$18,449,220	$33,416,774
Indirect Effects	$109,525	$14,712,858	$5,214,553	$8,543,919	$24,478,999	$11,207,412	$12,539,159	$14,092,863	$15,424,609	$16,756,356	$18,088,102	$19,641,806	$35,576,886
Total Effects	$212,400	$28,532,400	$10,112,496	$16,569,080	$47,471,713	$21,734,347	$24,316,981	$27,330,053	$29,912,687	$32,495,320	$35,077,954	$38,091,027	$68,993,660
TOTAL EFFECTS													
Direct Effects	$9,122,859	$28,954,270	$19,000,900	$11,556,491	$34,001,786	$24,881,992	$11,777,822	$13,237,190	$14,488,077	$15,738,965	$19,403,133	$23,771,164	$44,947,886
Indirect Effects	$13,143,565	$36,463,209	$27,879,972	$13,646,756	$40,387,307	$31,857,008	$12,539,159	$14,092,863	$15,424,609	$16,756,356	$21,575,336	$27,332,111	$52,239,551
Total Effects	$22,266,424	$65,417,479	$46,880,872	$25,203,247	$74,389,093	$56,739,000	$24,316,981	$27,330,053	$29,912,687	$32,495,320	$40,978,469	$51,103,275	$97,187,436

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Direct Effects	$22,755,534	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$109,175,000
Indirect Effects	$32,741,575	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$159,692,329
Total Effects	$55,497,109	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$268,867,329
OPERATIONS-RELATED EFFECTS												
Direct Effects	$20,950,994	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$442,026,563
Indirect Effects	$22,305,299	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$470,599,848
Total Effects	$43,256,294	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	
TOTAL EFFECTS												
Direct Effects	$43,706,528	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$551,201,563
Indirect Effects	$55,046,874	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$630,292,176
Total Effects	$98,753,403	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$1,181,493,739

Source: Texas Comptroller of Public Accounts, 1989.
* In year-2000 dollars.

properties with noise levels below 55 dBA. On the upper end of the range, those receptors with current noise levels of 74 dBA likely have property values 3.8–28.5 percent lower than comparable properties with noise levels less than 55 dBA. Thus, much of the potential loss of property value due to traffic noise is already represented in current market values.

Table 4.2.3-1 indicates that noise levels are expected to increase by 1–3 dBA over existing conditions, for all residential receptors, by 2025, without the project. Thus, without the project, there may be property values which are 0.2–4.5 percent lower than those of comparable homes at different, quieter locations, in addition to the current estimated lesser property values of 3.8–28.5 percent.

With the project at Shoal Point, some residential receptors may experience an increase in noise of approximately 1 dBA beyond the no-build noise levels projected for 2025. Thus, some properties might be expected to experience an additional 0.2–1.5 percent decrease in relative property values.

Omega Bay

The residents of Omega Bay, near the intersection of IH 45 and SH 6, have submitted numerous comments regarding their concerns about the potential effects of the traffic generated by the proposed project on property values in their neighborhood.

A noise study on a sample of homes in Omega Bay was performed, as discussed in Section 3.3. The study found that virtually all of the homes surveyed currently have noise levels above 55 dBA, likely due, in part, to the proximity of the Omega Bay development to IH 45 and SH 6. Surveyed properties had existing noise levels ranging from 60 dBA to 77 dBA. According to the results of the Delucchi and Hsu research, those properties currently at the 60 dBA level would likely have current property values 1.0–7.5 percent lower than similar properties with noise levels below 55 dBA. On the upper end of the range, those properties closest to the roadways with current noise levels of 77 dBA likely have property values 4.4–33.0 percent lower than comparable properties with noise levels less than 55 dBA. Thus, much of the potential loss of property value due to traffic noise is already represented in current market values.

The noise study found that noise levels are expected to increase by 1–2 dBA over existing conditions, for all surveyed properties, by 2025, without the project. Thus, without the project, there may be property values which are 0.2–3.0 percent lower than those of comparable homes at a different, quieter location, in addition to the current estimated lesser property values of 1.0–33.0 percent.

With the project, a few isolated homes in Omega Bay may experience an increase in noise of approximately 1 dBA beyond the no-build noise levels projected for 2025. Thus a few properties might be expected to experience an additional 0.2–1.5 percent decrease in relative property values.

Uniform Standards of Professional Appraisal Practice (The Appraisal Foundation Appraisal Standards Board, 2002) states in Standards Rule 1-2(e)(i) "In developing a real property appraisal, an appraiser must . . . identify the characteristics of the property that are relevant to the purpose and intended use of the appraisal, including . . . its location and physical, legal, and economic

attributes . . . " Further, Standards Rule 1-4(f) states "An appraiser must analyze the effect on value, if any, of anticipated public or private improvements, located on or off the site, to the extent that market actions reflect such anticipated improvements as of the effective appraisal date." In response to the need to address anticipated improvements on property values, Mitch McCullough, Deputy Director of the Galveston Central Appraisal District, was interviewed (McCullough, 2002). Mr. McCullough stated that waterfront properties, including Omega Bay and other similar developments, are highly desirable in the market at this time. Moreover, he said that historical experience in the area suggests that additional traffic and noise in the Omega Bay area, which would be considered in property appraisals, would likely have no additional market or property value effect beyond that which already exists due to the location of Omega Bay residences proximate to two major highways. He described the market for Omega Bay and similar developments as "supercharged" and stated his opinion that other market forces, such as the general desirability of such properties and general economic conditions, would have much greater effect on property values than increased traffic and noise.

4.2.21 Community Infrastructure and Municipal Services

The sections below discuss community infrastructure requirements of the project, to the extent that they are known. The Greater Houston metropolitan area is a very large, growing and economically viable region. Operations inmigrants to the area may locate in any of a large number of communities or in suburban areas. Inmigrants will likely either locate in communities which are able to provide community services or they will commute to locations where services are located. Inmigrants will contribute to local government revenues through ad valorem taxes, sales taxes, mixed beverage taxes, and other local taxes and fees. Typically, residential properties do not contribute enough in tax revenues to support the general fund needs of the residents. On the other hand, property tax revenues from industrial developments, particularly those with high property values such as the proposed project, are generally much greater than the costs on general fund municipal services imposed by such developments. Unlike the other alternatives, location of the project at Shoal Point would not result in an increase in the property value or property tax revenues of the land on which the project would be constructed because the land would be leased from Texas City. However, the project would nevertheless generate property tax revenues for local government from the improvements made on the site. From a regional perspective, the proposed project and its operations inmigrants are expected to contribute more to local governmental revenues than they cost in service provision; however, the locational choices of the inmigrants will determine the specific impacts on individual communities.

4.2.21.1 Utilities

For the projected inmigrant population of 890 persons, it is anticipated that there would be an additional 0.144 MGD in additional municipal water demand.

The proposed container terminal would require access to utilities needed for operation and maintenance, typical of similar facilities. For example, telephone and fiber optic service, water supply, and electricity would be needed at the site (Berger/Abam, 2001). Detailed studies regarding the ability of current systems to provide the needed utilities would be performed during the design phase of the project. In addition to providing new access to utilities, the removal or realignment of existing utility structures

within the project site would be required. Currently available information regarding existing utilities and preliminary plans for utility service requirements and relocations is summarized in Section 2.4.2.6. Utility service providers in the area are discussed in Section 3.20.

The project site is located within a very large, growing and economically viable metropolitan area. Because of the overall growth or demand on services that is typical in a metropolitan area of this size, the addition of the proposed facility and approximately 318 families to the area is not expected to result in major short- or long-term impacts on service levels. Any of several communities within the region could receive the growth anticipated as a result of the project, with the majority of the growth most likely going to communities that are able to provide the desired services.

4.2.21.2 Stormwater and Drainage

Stormwater would be treated at the project site with oil-water separators before discharge into Galveston Bay (Berger/Abam, 2001).

4.2.21.3 Solid Waste and Wastewater Collection

An additional 0.089 MGD of municipal wastewater flow is expected to occur from the projected inmigrant population of 890 persons.

Solid waste and wastewater collection services or systems would be needed at the proposed terminal site. Service providers in the area are discussed in Section 3.20.

As discussed above for other utilities, the addition of the proposed facility and inmigrant population to the metropolitan area is not expected to result in major short- or long-term impacts on service levels of local communities. Detailed studies regarding the adequacy of current systems would be performed during the design phase of the project.

4.2.21.4 Fire, Police, Emergency Medical Service, and Port Security

For the projected inmigrant population of 890 persons, the demand for police and fire/EMS personnel and emergency vehicles is projected as follows:

1 Firefighter at 1.17 firefighters per 1,000 persons
3 Police officers at 348 persons per officer
0 Additional emergency vehicles (at 6,961 residents per vehicle)
2 EMS personnel at 533 residents per EMS personnel

The Shoal Point Container Terminal would have its own security force that would cooperate with Texas City's Emergency Management Coordinator and local industry to provide security at the port. As required by the USCG under their "Waterfront Security Guidelines," SSA, as the operator of the proposed Shoal Point Container Terminal, would develop and implement a Security Plan for the proposed facility. This plan would be designed to comply with security requirements of various agencies and initiatives, including those described in Section 3.20.4.4 of this EIS. In addition, the operator for the

proposed facility would partner with state, regional, and local governmental agencies and with customers to ensure effective communication and coordination regarding security operations at the terminal. The Security Plan would incorporate best available technologies to satisfy security requirements, including technologies to identify container movements, associate truck operators with specific shipments, electronically seal containers, and inspect and/or validate container contents using sensors. Additional security measures for the proposed facility would include evaluation of vulnerability and threats, risk management planning, crisis management planning, security management training, development of a security education and awareness program, and security audit and reevaluation programs.

An assessment of security risks related to container cargo is based on the difference between the number of containers that would enter the Houston area with the proposed project compared with the number of containers that would enter the Houston area with the No-Build alternative. The assessment also considers the increased efforts of all of the Federal, state, and local agencies and private parties (especially including the Port Operator's responsibilities) to assess, prevent, and respond to port security threats, including terrorist events.

Containers, by design, provide for efficient transfer of large quantities of goods from ships to truck and rail for distribution through the transportation grid of the U.S. to virtually every city in the country. Demand for container cargo nationally and in the Houston area is expected to increase in response to market demands. It is anticipated that without the proposed project, container cargo destined for the Houston area would arrive at a more distant port and be transported to the Houston market via truck or rail. The risk of an accidental or intentional event with the Build alternative would increase proportionally to the increased number of containers that enter the Houston area as compared with the No-Build alternative. However, with the increased security measures in place and planned at all U.S. ports, the City of Texas City's Emergency Management Plan, and the coordination of port security among all port users, the potential increased risk of a threat due to the presence of a new marine terminal would be offset.

4.2.21.5 Hospitals/Medical Services

For the projected inmigrant population of 890 persons, the demand for hospital beds and medical personnel needed is projected as follows:

4	Hospital beds at 221 residents per hospital bed
2	Direct care physicians at 560 residents per physician
6	Registered nurses at 140 residents per nurse
0	Dentists at 1,982 residents per dentist

4.2.21.6 Schools

For the projected inmigrant population of 890 persons, it is anticipated that the demand for Texas City ISD staff would be 12 teachers and 23 public school staff.

4.2.21.7 Libraries

For the projected inmigrant population of 890 persons, the demand for facilities is projected to be:

1,228 Books at 1.38 books per capita
3,377 Total resources at 3.79 per capita
271 Additional square feet of library space

It is not anticipated that local libraries would need to hire additional staff.

4.2.21.8 Parks and Recreation Facilities

The additional projected inmigrant population of 890 persons is likely to create a demand for an additional 7 acres of various types of parks or recreation facilities, at 0.79 acre per 100 persons.

4.2.21.9 Streets and Public Transportation

A new access corridor would be built to provide access from the terminal location to Loop 197. The access corridor may consist of four 12-foot lanes and two 6-foot shoulders resulting in a 60-foot roadway prism. The access corridor would originate south of the existing Loop 197 bridge crossing the Galveston County Discharge Canal. To ensure that the roadway prism fits within the Galveston County ROW, the roadway would have a structural wall along the north face bordering the canal. The wall would minimize the disturbance to the existing canal. In the vicinity of Swan Lake, the roadway would consist of a typical embankment section, which would result in the toe of the roadway slope projecting into Swan Lake.

Initially, rail traffic is expected to be distributed evenly between the UPRR, BNSF, and Barbours Cut intermodal yards. A new intermodal yard, not part of this project, is expected to be constructed at a later date. This occurrence would be driven by the growth of the terminal. The proposed intermodal yard would be located within approximately 5 miles of the project site. No rail access would be provided at the proposed project site.

4.2.21.10 Impacts on Local Tax Revenues

Table 4.2.21-1 shows the potential effect of the proposed project at the Shoal Point site on government revenues. Total government effect of the construction phase of the project is expected to be approximately $9.3 million, of which roughly 10 percent is anticipated to affect local governments. State government is expected to receive approximately 29 percent ($2.7 million) and the Federal government 61 percent ($5.7 million).

At full operation of the project, annual government effects are expected to amount to $1.8 million annually, with a $0.2 million effect on local government, $0.5 million effect on State government and a $1.1 million effect on the Federal government. Operations-related effects are expected to be generally the same for all alternatives.

Table 4.2.21-1
Government Revenues *
Shoal Point Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION ACTIVITIES													
Federal Government	$431,697	$804,409	$886,856	$169,010	$526,895	$749,768	$0	$0	$0	$0	$115,500	$254,709	$551,880
State Government	$221,490	$366,133	$373,843	$86,714	$270,333	$348,180	$0	$0	$0	$0	$59,259	$130,683	$283,152
Local Government	$72,069	$133,019	$145,839	$28,215	$87,962	$124,172	$0	$0	$0	$0	$19,282	$42,522	$92,133
Total Government	$725,257	$1,303,561	$1,406,538	$283,939	$885,190	$1,222,121	$0	$0	$0	$0	$194,041	$427,914	$927,165
OPERATIONS ACTIVITIES													
Federal Government	$4,635	$622,669	$220,687	$361,591	$1,035,985	$474,313	$530,675	$596,430	$652,791	$709,152	$765,514	$831,269	$1,505,663
State Government	$2,378	$319,472	$113,228	$185,521	$531,531	$243,355	$272,272	$306,009	$334,926	$363,844	$392,761	$426,498	$772,508
Local Government	$774	$103,950	$36,842	$60,365	$172,951	$79,184	$88,593	$99,570	$108,979	$118,388	$127,798	$138,775	$251,361
Total Government	$7,787	$1,046,091	$370,757	$607,476	$1,740,467	$796,852	$891,540	$1,002,009	$1,096,696	$1,191,384	$1,286,072	$1,396,541	$2,529,532
TOTAL EFFECT													
Federal Government	$436,333	$1,427,078	$1,107,544	$530,600	$1,562,880	$1,224,082	$530,675	$596,430	$652,791	$709,152	$881,013	$1,085,977	$2,057,543
State Government	$223,868	$685,605	$487,070	$272,234	$801,864	$591,535	$272,272	$306,009	$334,926	$363,844	$452,020	$557,181	$1,055,660
Local Government	$72,843	$236,970	$182,681	$88,580	$260,913	$203,356	$88,593	$99,570	$108,979	$118,388	$147,079	$181,297	$343,494
Total Government	$733,044	$2,349,652	$1,777,295	$891,415	$2,625,658	$2,018,973	$891,540	$1,002,009	$1,096,696	$1,191,384	$1,480,113	$1,824,455	$3,456,697

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION ACTIVITIES												
Federal Government	$1,183,183	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$5,673,908
State Government	$552,300	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,692,087
Local Government	$196,030	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$941,243
Total Government	$1,931,513	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,307,238
OPERATIONS ACTIVITIES												
Federal Government	$943,991	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$19,916,439
State Government	$484,332	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$10,218,494
Local Government	$157,593	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$3,324,921
Total Government	$1,585,916	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$33,459,853
TOTAL EFFECT												
Federal Government	$2,127,174	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$25,590,347
State Government	$1,036,632	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$12,910,581
Local Government	$353,623	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$4,266,164
Total Government	$3,517,429	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$42,767,092

Source: Texas Comptroller of Public Accounts, 1989.
* In year-2000 dollars.

4.3 PELICAN ISLAND ALTERNATIVE

4.3.1 Air Quality

For this alternative, direct and indirect air quality impacts associated with the construction and operation of the proposed project on Pelican Island were evaluated.

Pelican Island is located in Galveston County, Texas, which is included in the HGA. As previously noted, the EPA has determined that Galveston County is in severe nonattainment for the 1-hour ozone air quality standard. Sources in this area are subject to the TNRCC SIP requirements for the control of ozone precursors, NO_x and VOC emissions.

Air monitoring data in the area of this alternative are limited. Air quality monitoring stations closest to the project site are located in Galveston at the Airport (Scholes Field) on 8715 Cessna Street. Existing air quality for this area based on the monitoring data for monitoring year 2000 may be summarized as follows:

As shown in Table 4.3.1-1, monitoring of ozone concentrations in the Galveston area indicate ozone levels above the NAAQS. All other pollutants were monitored below the NAAQS.

TABLE 4.3.1-1
SUMMARY OF AIR QUALITY MONITORING VALUES FOR GALVESTON
MONITORING YEAR 2000

Air Contaminant	Averaging Period	Highest Monitored Value	NAAQS	% of NAAQS
Ozone	1-hr (ppm)	0.041	0.12	118
Ozone	8-hr (ppm)	0.093	0.08	116
NO_2	Annual (ppm)	0.005	0.053	9.4
SO_2	24-hr (ppm)	--	0.14	--
SO_2	Annual (ppm)	--	0.03	--
PM_{10}	24-hr ($\mu g/m^3$)	45	150	30.0
PM_{10}	Annual ($\mu g/m^3$)	19.9	50	39.8
$PM_{2.5}$*	24-hr ($\mu g/m^3$)	46.8	65	72.0
$PM_{2.5}$*	Annual ($\mu g/m^3$)	14.6	15	97.3
CO	1-hr (ppm)	--	35	--
CO	8-hr (ppm)	--	9	--

Source: EPA, 2001d; TNRCC, 2001a.

-- Not available.

* Available $PM_{2.5}$ monitoring data for 2001 used.

4.3.1.1 Impacts

An estimate of air emissions from this alternative (JDC, 2002) was based on the same methodologies and emission factors developed from the Shoal Point alternative detailed emission calculations (see Section 4.2.1.1). It was assumed that the basic footprint and operation of the site would be similar for either alternative. The calculations were site specific, using the following as a basis:

- Site-specific values for access road length, volume of dredged material, and volume of other fill material.
- Ship emissions were based on the route to the site.
- Truck emissions were based on the route to the site.
- Distribution to the railroad yards was adjusted, as appropriate.

Pollutant emissions from construction activities may result in short-term impacts on air quality in the immediate vicinity of the project site, including increased levels of particulate matter and vehicular exhaust emissions. As shown in Table 4.3.1-2, construction of the proposed project would result in an increase in emissions above those resulting from existing sources in this county. During Phase I, when emissions from construction activities would be at a peak, emissions of NO_x, VOC, CO, and SO_2 are expected to result in a less than 1 percent increase relative to existing emissions. Emissions of particulate matter from construction activities may result in increased localized concentrations in the ambient air surrounding the facility. Because of the schedule for construction, construction emissions during Phase II and Phase III would be below these peak levels.

TABLE 4.3.1-2
PEAK ANNUAL CONSTRUCTION EMISSIONS SUMMARY,
COMPARISON WITH GALVESTON COUNTY EMISSIONS
PELICAN ISLAND ALTERNATIVE

Air Contaminant	Maximum Annual Construction Emissions (tpy)	Peak Year	Existing (1999) Galveston County Emissions (tpy)	Site Emissions % of Existing Galveston County Emissions
NO_x	87.3	2003	128,634	0.07
VOC	8.4	2003	30,857	0.03
CO	37.5	2003	91,978	0.04
SO_2	25.5	2003	17,289	0.15
PM_{10}	358.8	2002	16,695	2.15
$PM_{2.5}$	45.9	2002	5,048	0.91

The peak annual operating emissions for this alternative were compared with Galveston County emissions as shown in Table 4.3.1-3. As shown in the table, emissions of $PM_{2.5}$ within Galveston County may increase by less than 1 percent due to onsite operating emissions. These emissions would be primarily attributable to the combustion of diesel fuel in terminal mobile equipment and on-site maintenance activities. It is estimated that NO_x, VOC, CO, SO_2, and PM_{10} emissions would also result in a small percent increase (less than 1 percent) over the existing Galveston County emissions. To minimize emissions, terminal sponsors would comply with the requirements of the SIP including low emission diesel and idling restrictions, as well as reductions based on diesel fuel sulfur control requirements. Total operating emissions would be expected to contribute less than 1 percent to total emissions for this county.

TABLE 4.3.1-3
COMPARISON OF PEAK ANNUAL ONSITE OPERATING EMISSIONS WITH GALVESTON COUNTY EMISSIONS
PELICAN ISLAND ALTERNATIVE

Air Contaminant	Maximum Annual Operating Emissions (tpy)	Peak Year	Existing (1999) Galveston County Emissions (tpy)	% of Existing Galveston County Emissions
NO_x	48.8	2006	128,634	0.04
VOC	137.4	2026	30,857	0.45
CO	43.6	2026	91,978	0.05
SO_2	56.1	2026	17,289	0.32
PM_{10}	50.3	2026	16,695	0.30
$PM_{2.5}$*	48.9	2026	5,048	0.97
TOTAL	336		285,453	0.12

* $PM_{2.5}$ emissions are a subset of PM_{10} emissions and are not included in emissions total.

Under this alternative, motor vehicle traffic emissions would be greater, compared with other alternatives, because this alternative is located the farthest distance from the Houston area where the bulk of the containers are expected to go. The train trip distances would also increase because of the additional distance needed to distribute cargo from this site. Because Pelican Island is closer to the entrance of the Gulf of Mexico, the average ship travel distance would be reduced. As these types of mobile emissions are more regional in nature, they may be compared with emissions from the HGA, as shown on Table 4.3.1-4.

TABLE 4.3.1-4
TRANSPORTATION EMISSIONS SUMMARY
PELICAN ISLAND ALTERNATIVE COMPARED WITH HGA TRANSPORTATION EMISSIONS

Air Contaminant	Peak Transportation Emissions* During Operation - 2026 (tpy)	HGA Transportation Emissions (tpy)	Transportation Emissions % of HGA Transportation Emissions
NO_x	2,021	295,613	0.7
VOC	333	84,130	0.4
CO	904	593,057	0.2
SO_2	1272	26,720	4.8
PM_{10}	132	7,697	1.7
$PM_{2.5}$	115	6,363	1.8

* Transportation emissions will peak after full build-out in 2026.

Because these are non-stationary sources, and because the background concentrations (except for ozone) in the project area are well below the NAAQS, it is expected that ambient air contaminant concentrations for PM_{10}, CO, and SO_2 would not be large enough to cause or contribute to an exceedance of an ambient air quality standard in this region, although localized SO_2 and PM_{10} concentrations may increase. VOC and NO_x emissions from the operation of container terminals, ocean-going vessels, mobile emissions, and associated activities are also included in the inventory for the SIP. These pollutants are not expected to impede attainment of the ozone standard in the HGA. In addition, because of the distance and prevailing southeast winds, emissions from this alternative would not be expected to have a major impact on the nearest Class I air quality areas (see Section 3.1.3).

4.3.1.2 State Implementation Plan (SIP) Conformity Review

For comparison with the thresholds defined in the General Conformity Rule as discussed in Section 3.1.1, the emissions from the portion of the construction activities subject to USACE responsibility for this alternative location are summarized on Table 4.3.1-5 below for each phase of the project:

TABLE 4.3.1-5
SUMMARY OF MAXIMUM ANNUAL CONSTRUCTION
EMISSIONS SUBJECT TO USACE RESPONSIBILITY
PELICAN ISLAND ALTERNATIVE

Air Contaminant	Phase I (tpy)	Phase II (tpy)	Phase III (tpy)
NO_x	85.4	8.6	5.9
VOC	8.2	1.2	1.0
CO	36.3	7.7	6.9
SO_2	24.9	4.9	5.0
PM_{10}	22.3	13.7	14.0
$PM_{2.5}$	7.1	2.6	2.6

For this alternative, the NO_x emissions for Phase I of the project construction emissions would exceed the emission rate (25 tpy) established by the Clean Air Act for determining whether a General Conformity Determination would be required. Under this alternative, emissions of NO_x from Phase I would account for approximately 0.97 percent of the construction budget in the SIP (8,827.5 tpy) based on the Post-1999 Rate of Progress and Attainment Demonstration SIP approved by the EPA in October 2001. Based on previous discussions with the TNRCC and EPA, it is likely they would determine that the project construction emissions at this site would be included in the recently approved Attainment SIP.

For Phase II and Phase III, the VOC and NO_x emissions for project construction emissions would not exceed the emission rate for requiring a General Conformity Determination. As the emissions from each phase of the project would be less than an increase of 10 percent of the VOC and NO_x emissions SIP inventories for the entire nonattainment area, the project would not be regionally significant for purposes of General Conformity.

Because 1) the project construction emissions during Phase II and III would be exempt from the General Conformity Rule, 2) emissions during Phase I are probably accounted for in the SIP, and 3) the project is not regionally significant, the emissions from the project construction should not:

- cause or contribute to any new violation of any of the NAAQS in the project area;
- increase the frequency or severity of any existing violation of any NAAQS in the project area; or
- delay timely attainment of the NAAQS or any required interim emission reduction in the project area.

Therefore, the TNRCC would more than likely confirm that emissions from this alternative would comply with the requirements of the General Conformity Rule and would be in conformity with the Texas SIP.

4.3.2 Roadway Traffic Impact Analysis

This section presents analyses for the unsignalized intersections, signalized intersections, and major corridors that would potentially be affected by construction of the proposed project at the Pelican Island alternative site. Pelican Island is located on Galveston Bay in Galveston County, Texas. Currently, a two-lane causeway bridge allows access to Pelican Island. The construction of the container terminal at Pelican Island would require a new four-lane bridge to accommodate the terminal traffic. The traffic impact analysis was conducted for the years 2001, 2005, 2015, and 2025. Existing conditions are represented by the 2001 traffic information. The following sections describe the potential impacts of the project in terms of the differences in traffic LOS between the No-Build and Build conditions for the Pelican Island alternative.

4.3.2.1 Container Distribution

Anticipated container distribution for the Pelican Island alternative is presented in Table 4.3.2-1, based on the results of H-GAC's modeling effort. The same intermodal split described for the Shoal Point alternative in Section 4.2.2.1 (i.e., 80 percent by highway/20 percent by rail) was assumed for all alternative sites.

As indicated in Table 4.3.2-1, IH 45 would be the primary corridor, carrying 63, 65, and 70 percent of the container terminal traffic for years 2005, 2015, and 2025, respectively.

Projected daily truck volumes described for the Shoal Point alternative (see Table 4.2.2-2) would be the same for all alternative sites.

TABLE 4.3.2-1
CONTAINER DISTRIBUTION

	Distribution (% of Container Traffic)		
Corridor	2005	2015	2025
IH 45	63	65	70
SH 146	31	29	5
New Intermodal Railway Facility	0	0	20
Other routes	6	6	5

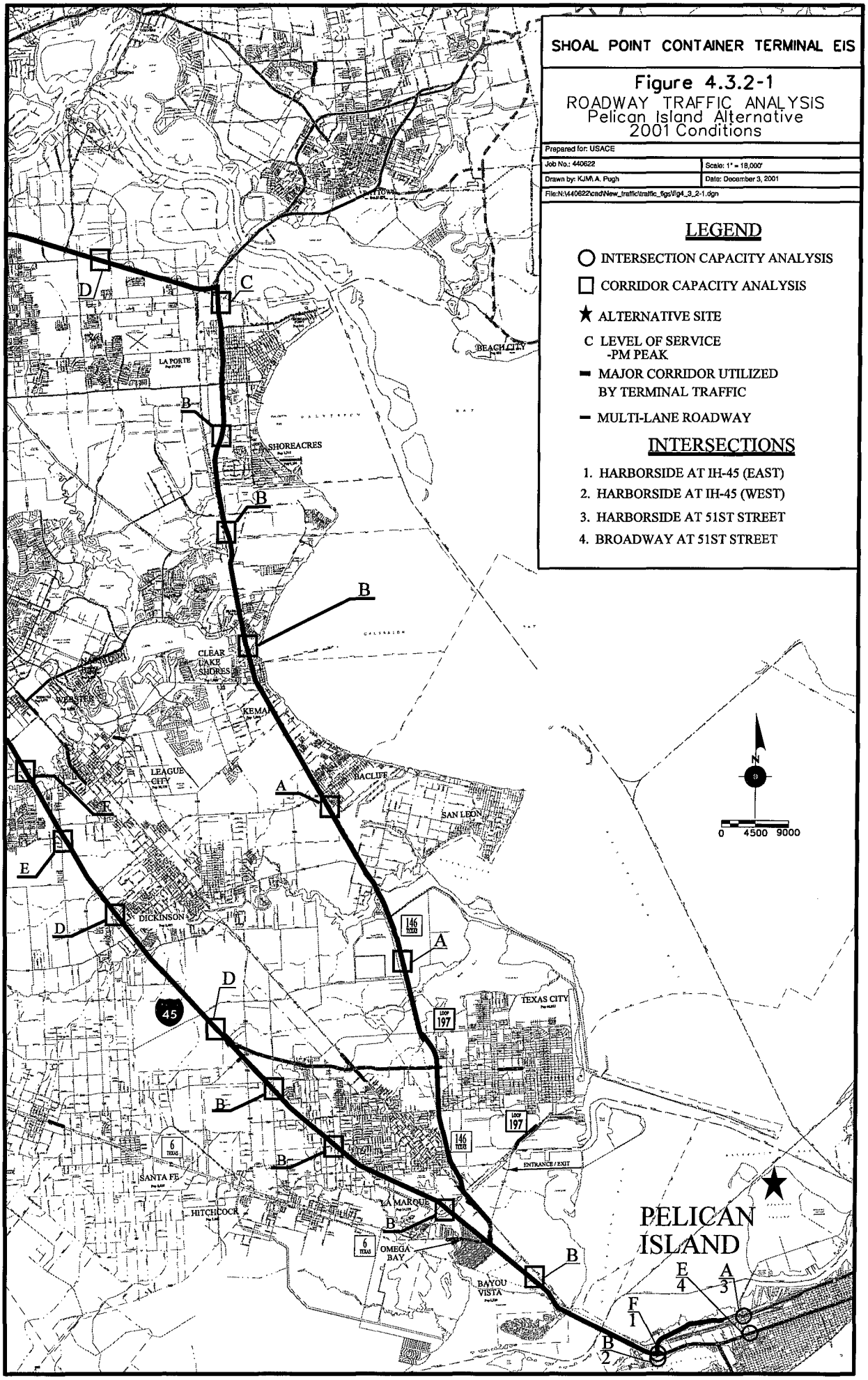
4.3.2.2 Intersection Analysis – Unsignalized Intersections

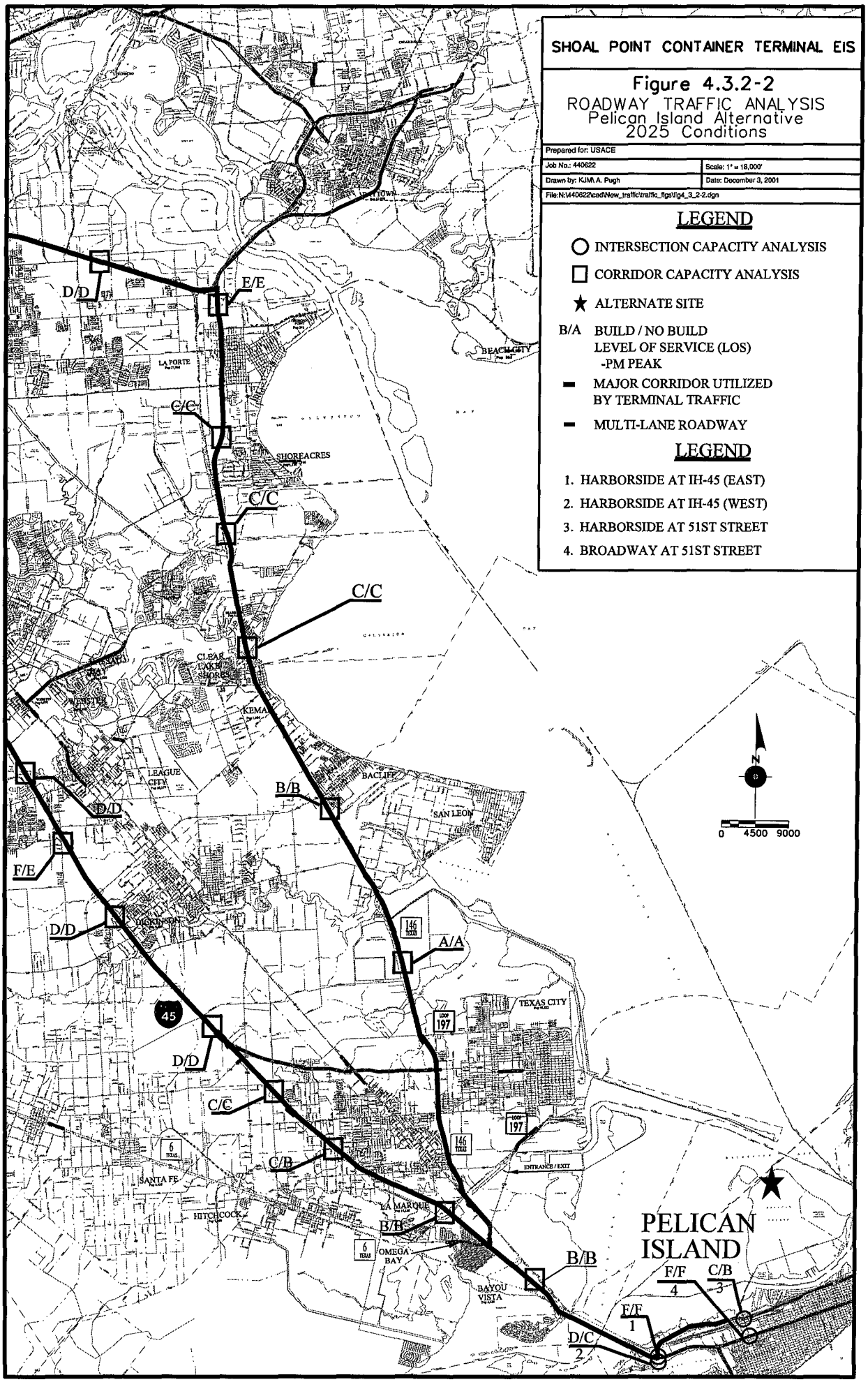
The Harborside at IH 45 interchange consists of two unsignalized intersections. The east intersection is congested during the PM peak hour and the west intersection is congested during the AM peak hour. Since the analysis was conducted for the PM peak hour, the east intersection becomes the critical intersection. The east intersection is currently at LOS F (Table 4.3.2-2 and Figure 4.3.2-1) and would remain at LOS F through 2025 for both the No-Build and Build conditions (see Table 4.3.2-2 and Figure 4.3.2-2). The west intersection would not experience an LOS change due to the project, except for the year 2025, where the LOS would change from C to D (see Table 4.3.2-2 and Figure 4.3.2-2).

TABLE 4.3.2-2

PELICAN ISLAND INTERSECTION TRAFFIC ANALYSIS

Limits	Year 2001		Year 2005 Build		Year 2005 No Build		Year 2015 Build		Year 2015 No Build		Year 2025 Build		Year 2025 No Build	
	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)
Broadway at 51st St.	E	70	F	139	F	127	F	182	F	176	F	200	F	198
Harborside at IH-45 (East Side)	F	300	F	540	F	430	F	736	F	630	F	900	F	800
Harborside at IH-45 (West Side)	B	12	B	15	B	13	C	19	C	17	D	26	C	24
Harborside at 51st St.	A	8	A	10	A	9	B	15	B	13	C	20	B	18


SHOAL POINT CONTAINER TERMINAL EIS
Figure 4.3.2-1
ROADWAY TRAFFIC ANALYSIS
Pelican Island Alternative
2001 Conditions
Prepared for: USACE
Job No.: 440622
Scale: 1" = 18,000'
Drawn by: KJM\ A. Pugh
Date: December 3, 2001
File:N:\440622\cad\New_traffic\traffic_figs\fig4_3_2-1.dgn
LEGEND
INTERSECTION CAPACITY ANALYSIS
CORRIDOR CAPACITY ANALYSIS
ALTERNATIVE SITE
C LEVEL OF SERVICE -PM PEAK
MAJOR CORRIDOR UTILIZED BY TERMINAL TRAFFIC
MULTI-LANE ROADWAY
INTERSECTIONS
1. HARBORSIDE AT IH-45 (EAST)
2. HARBORSIDE AT IH-45 (WEST)
3. HARBORSIDE AT 51ST STREET
4. BROADWAY AT 51ST STREET
LA PORTE
BEACH CITY
SHOREACRES
CLEAR LAKE SHORES
WEBSTER
KEMAH
LEAGUE CITY
BACLIFF
SAN LEON
DICKINSON
TEXAS CITY
SANTA FE
HITCHCOCK
LA MARQUE
OMEGA BAY
BAYOU VISTA
ENTRANCE / EXIT
PELICAN ISLAND
0 4500 9000
N


SHOAL POINT CONTAINER TERMINAL EIS
Figure 4.3.2-2
ROADWAY TRAFFIC ANALYSIS
Pelican Island Alternative
2025 Conditions
Prepared for: USACE
Job No.: 440622
Scale: 1" = 18,000'
Drawn by: KJM/ A. Pugh
Date: December 3, 2001
File:N:\440622\cad\New_traffic\traffic_figs\fig4_3_2-2.dgn
LEGEND
INTERSECTION CAPACITY ANALYSIS
CORRIDOR CAPACITY ANALYSIS
ALTERNATE SITE
B/A BUILD / NO BUILD LEVEL OF SERVICE (LOS) -PM PEAK
MAJOR CORRIDOR UTILIZED BY TERMINAL TRAFFIC
MULTI-LANE ROADWAY
LEGEND
1. HARBORSIDE AT IH-45 (EAST)
2. HARBORSIDE AT IH-45 (WEST)
3. HARBORSIDE AT 51ST STREET
4. BROADWAY AT 51ST STREET
D/D
E/E
C/C
C/C
C/C
D/D
F/E
D/D
B/B
A/A
D/D
C/C
C/B
B/B
B/B
F/F
4
C/B
3
F/F
1
D/C
2
PELICAN ISLAND
LA PORTE
SHORE ACRES
CLEAR LAKE SHORES
WEBSTER
KEMAH
LEAGUE CITY
BACLIFF
SAN LEON
DICKINSON
TEXAS CITY
SANTA FE
HITCHCOCK
LA MARQUE
OMEGA BAY
BAYOU VISTA
ENTRANCE / EXIT
45
146
197
6
0 4500 9000

4.3.2.3 Intersection Analysis – Signalized Intersections

Two signalized intersections were evaluated for this alternative: Broadway at 51st Street and Harborside at 51st Street. The Broadway at 51st intersection is currently at LOS E (Table 4.3.2-2; Figure 4.3.2-1). The analysis indicates that it would reach LOS F during the year 2005 and remain at this level through 2025 as a result of normal growth in the area (i.e., the No-Build alternative) (Table 4.3.2-2; Figure 4.3.2-2). The Build alternative would not change the LOS relative to the No-Build conditions. The Harborside at 51st Street intersection would not experience a change in LOS due to the project except in the year 2025, when the LOS would change from B to C as a result of project-related traffic (i.e., the Build alternative) (see Table 4.3.2-2 and Figure 4.3.2-2).

4.3.2.4 Main Corridor Analysis

Three main corridors were analyzed for this alternative: IH 45, SH 225, and SH 146. SH 146 and SH 225 were included in the analysis because there would be intermodal traffic to and from the Barbours Cut railroad yard that would utilize those two roadways. The IH 45 corridor included in the analysis extends from Galveston to Beltway 8 in ten segments. Existing (2001) conditions are included in Table 4.3.2-3 and displayed on Figure 4.3.2-1. The analysis indicates a change in LOS for two segments between No-Build and Build conditions. The FM 517 to FM 1764 segment would change from LOS C to D due to the project in the year 2015. The FM 1765 to FM 519 segment would change from LOS B to C due to the project in the year 2025. The analysis indicates that there would be no change in LOS between No-Build and Build conditions along SH 225 or SH 146 (see Table 4.3.2-3 and Figure 4.3.2-2). Roadway improvements included in the model for this analysis (see Table 4.2.2-5) would improve the LOS on segments of IH 45 and SH 225 by 2015 and by 2005, respectively; however, by 2025, normal growth would cause some segments of these corridors to return to a poor LOS (see Table 4.3.2-2).

4.3.2.5 Railroad Crossing Impacts

The major railroad intersections that would be affected by the container terminal at the Pelican Island site are SH 3 at NASA Road 1, SH 3 at FM 518, SH 3 at FM 517, SH 3 at FM 1765, and along Harborside Drive. The Pelican Island alternative would potentially affect a high number of railroad intersections relative to the other alternatives. The difference between the Build and No-Build conditions would be four trains per day during ultimate design build-out (2025). Estimated increases in future average delays (i.e., seconds per vehicle of delay while a train is crossing the intersection) for each railroad crossing due to the additional train activity related to the project are presented in Table 4.3.2-4.

4.3.2.6 Hurricane Evacuation

In the event of a hurricane, with ample warning from the National Weather Service, the terminal would coordinate efforts of the Port Operations Manager, Terminal Managers, and Shop Foreman to activate its Hurricane Preparedness Plan (HPP) (see Section 4.2.2.7 for a description of the process used to implement the HPP). The HPP would be coordinated with and would be on file with the emergency management systems of the local county or municipality and the USCG's Commander of the Port prior to a hurricane event. Within the HPP, a point of contact would be established with whom the

TABLE 4.3.2-3

PELICAN ISLAND FREEWAY LEVEL OF SERVICE (LOS) ANALYSIS

	Alternative	Roadway	Limits	Year 2001			Year 2005			Year 2015			Year 2025		
				ADT	Density	LOS	ADT	Density	LOS	ADT	Density	LOS	ADT	Density	LOS
No Build	Pelican Island	IH-45	Beltway 8 to FM 2351	203,913	*	*F*	214,146	*	*F*	232,834	38.5	*E*	262,171	56.8	*F*
			FM 2351 to Nasa Rd. 1	157,680	*	*F*	160,321	*	*F*	175,134	25.2	D	187,142	27.2	D
			Nasa Rd. 1 to FM 518	155,520	*	*F*	159,542	*	*F*	173,112	24.8	D	183,115	26.5	D
			FM 518 to FM 646	104,760	32.7	*E*	122,154	45.3	*F*	142,362	33.2	*E*	160,145	42.4	*F*
			FM 646 to FM 517	83,428	24.7	D	97,664	29.6	D	116,158	25.4	D	122,164	27	D
			FM 517 to FM 1764	82,080	24.2	D	93,121	27.9	D	107,764	23.4	C	118,631	26.1	D
			FM 1764 to FM 1765	55,080	16	B	60,821	17.7	C	70,124	14.9	B	77,096	16.4	C
			FM 1765 to FM 519	52,920	15.4	B	59,245	17.2	C	66,172	14.1	B	73,504	15.6	B
			FM 519 to SH6/SH3 interchange	46,440	13.5	B	51,771	15	B	57,273	11.1	B	65,728	14	B
			SH6/SH3 Interchange to Harborside	45,580	13.2	B	50,138	14.8	B	56,124	10.7	B	64,725	13.8	B
		SH-225	Beltway 8 to Center Rd.	111,080	36.1	*E*	122,191	27.0	D	131,524	29.5	D	142,823	33.4	*E*
			Center Rd. to SH-146	90,700	27.0	D	95,062	20.5	C	105,019	22.8	C	112,986	24.7	D
		SH-146	SH-225 to Shoreacres	73,880	21.7	C	84,108	24.9	D	96,612	29.2	D	112,354	36.9	*E*
			Shoreacres to Port Road	44,112	12.8	B	48,523	14.1	B	58,227	17.1	C	69,873	20.4	C
			Port Road to Red Bluff	39,252	11.4	B	43,177	12.6	B	51,740	15.1	B	66,489	19.5	C
			Red Bluff to FM 518	34,980	10.1	B	38,478	11.2	B	46,173	13.4	B	55,408	16.1	C
			FM 518 to FM 517	23,100	6.7	A	25,410	7.4	A	30,492	8.9	A	36,590	10.7	B
			FM 517 to Loop 197	17,490	5.1	A	19,239	5.6	A	23,011	6.7	A	27,704	8.1	A
			Loop 197 to FM 519	15,264	4.4	A	16,790	4.9	A	20,148	5.9	A	24,178	7.1	A
Build	Pelican Island	IH-45	Beltway 8 to FM 2351	Not Applicable			215,106	*	*F*	235,494	39.5	*E*	269,171	65.6	F
			FM 2351 to Nasa Rd. 1				162,281	*	*F*	177,794	25.6	D	194,142	28.5	D
			Nasa Rd. 1 to FM 518				161,502	*	*F*	175,772	25.3	D	190,115	27.8	D
			FM 518 to FM 646				124,114	47.7	*F*	145,022	34.2	*E*	167,145	48.3	F
			FM 646 to FM 517				99,624	30.4	D	118,818	26.1	D	129,164	28.8	D
			FM 517 to FM 1764				95,081	28.6	D	110,424	24.1	D	125,631	27.9	D
			FM 1764 to FM 1765				62,781	18.2	C	72,784	15.5	B	84,096	17.9	C
			FM 1765 to FM 519				61,205	17.8	C	68,832	14.6	B	80,504	17.1	C
			FM 519 to SH6/SH3 interchange				53,731	15.6	B	59,933	12.7	B	72,728	15.5	B
			SH6/SH3 Interchange to Harborside				52,098	15.1	B	58,784	12.5	B	71,725	15.3	B
		SH-225	Beltway 8 to Center Rd.				123,091	27.2	D	132,724	29.9	D	145,823	34.7	*E*
			Center Rd. to SH-146				95,962	20.7	C	106,219	23.0	C	115,986	25.4	D
		SH-146	SH-225 to Shoreacres				85,008	25.2	D	97,812	29.6	D	115,354	39.1	*E*
			Shoreacres to Port Road				49,423	14.3	B	59,367	17.2	C	72,873	21.4	C
			Port Road to Red Bluff				44,077	12.8	B	52,880	15.3	B	69,489	20.2	C
			Red Bluff to FM 518				39,378	11.4	B	47,373	13.7	B	58,408	17.0	C
			FM 518 to FM 517				26,310	7.6	A	31,692	9.2	A	39,590	11.5	B
			FM 517 to Loop 197				20,139	5.8	A	24,211	7.1	A	30,704	8.9	A
			Loop 197 to FM 519				17,690	5.1	A	21,348	6.2	A	27,178	7.9	A

Year 2001: Analysis based on TxDOT Provided ADT and Existing Geometry
Year 2005: Analysis based on H-GAC Model Traffic and Geometry
Year 2015: Analysis based on H-GAC Model Traffic and Geometry
Year 2025: Analysis based on H-GAC Model Traffic and Geometry
No-Build: Existing Traffic Generators
Build: Existing Traffic Generators and Terminal Operation

Peak Hour Factor: 0.90
K factor: 10
Directional Distribution: 50-50
Percent Truck Traffic: 10%

ADT: Average Daily Traffic (Bi-directional Daily Traffic Volume)
Density: Passenger Cars per Mile per Lane
LOS: Level of Service (Qualitative Measure of Effectiveness)
Change in Level of Service
ITALICS - Poor Level of Service
* - Density out of range

local agencies and USCG would share information prior to, during, and after the hurricane. The goal of the HPP is to allow the terminal to have all equipment and facilities secured and evacuated by the time the USCG's Commander of the Port closes the HSC to vessel traffic.

TABLE 4.3.2-4
ESTIMATED RAILROAD DELAY, PELICAN ISLAND ALTERNATIVE

Intersection	Year 2025-Build	
	Future Average Delay (sec/veh)	Additional Train Activity (trains per day)
SH 3 at NASA ROAD 1	0.89	4
SH 3 at FM 518	0.66	4
SH 3 at FM 517	0.30	4
SH 3 at FM 1765	0.35	4
Harborside	0.32	4

4.3.2.7 Construction

Most of the construction traffic to build the proposed container terminal would occur on site and most of the raw materials would be barged to the terminal site. The primary source of offsite traffic during construction of the terminal would be from the daily workers. Therefore, minimal construction traffic impact to the transportation network would be anticipated.

4.3.3 Noise

Noise associated with the Pelican Island alternative would be generated during the construction phase and during the operation of the facility. Major noise sources associated with the proposed project would include the construction equipment, the loading equipment used during operations, and truck traffic. In the following sections, potential impacts at the nearest noise sensitive receptors are quantified.

4.3.3.1 Construction

Noise associated with construction activities is primarily generated by the engines of the construction equipment. Analyses by the USDOT and the EPA have found that the typical noise levels of construction equipment can vary from 74 dBA to 101 dBA at a distance of 50 feet from the source (USDOT, 1995). Typical construction noise decreases by approximately 6 dB as the distance from the source is doubled. For example, if noise generated from a bulldozer is 85 dB at 50 feet, the noise level would decrease to approximately 79 dB at 100 feet and decrease to approximately 73 dB at 200 feet. Typical noise levels generated by construction equipment are listed in Table 4.2.3-1. Construction activities associated with the proposed project include the excavation and dredging of the channel, the moving and grading of placement fill, and the construction of the loading docks and berths.

Dredging within the Pelican Island project area would occur along the northeastern shoreline of the project site. Dredging activities during the construction phase of the project could occur as much as 24 hours a day, 7 days a week. Electric dredging equipment would be used where feasible within the project area in order to reduce air emissions. Depending on engine components and configuration, noise levels associated with electric dredges range from 65 dBA to 85 dBA at a distance of 50 feet (USACE, 2001a). Calculations indicate that noise levels associated with dredging activities at the nearest sensitive receptors, located approximately 8,000 feet to the southwest of the dredge area, would range from approximately 21 dBA to 41 dBA. These levels are lower than ambient noise measurements for these receptors; therefore, dredging activities are not expected to cause a noise impact.

Construction of the facilities at the Pelican Island site would also include the use of typical construction equipment, some of which is included in Table 4.2.3-1. Calculations indicate that propagated noise levels associated with construction of the project would range between 30 dBA and 57 dBA at the nearest sensitive receptors. These levels do not exceed the existing noise environment and would therefore not result in a noise impact.

4.3.3.2 Operations

The nearest sensitive receptors are located approximately 8,000 feet southwest of the main gate for this alternative. Results from the noise monitoring program conducted at the Barbours Cut Terminal (USACE, 2001a) indicate that these receptors would be most influenced by diesel truck engines idling at the entrance of the facility. However, the combined sound level of all operations and activities occurring within the facility would contribute.

A L_{dn} of 56.7 dBA recorded at a distance of approximately 1,500 feet from the main gate (USACE, 2001a) indicates that noise levels associated with operations would not present an impact to the sensitive receptors located approximately 8,000 feet from the Pelican Island alternative.

4.3.3.3 Traffic

As discussed in Section 3.3, a noise analysis was conducted for representative residential structures (Category B receivers) located adjacent to the main roadways that could potentially be affected by operation of the proposed container terminal at the Pelican Island site. The results of this analysis are presented in Table 4.3.3-1. As indicated in the table, existing noise levels along most of the roadways included in the analysis for the Pelican Island site are currently exceeding the NAC levels for Category B receivers, and are, therefore, already impacted under the absolute criterion (defined in Section 3.3). Based on the analysis, noise levels at three of the analyzed roadway segments are currently under the NAC level for residential structures (67 dBA). These segments are on SH 146, from FM 518 to FM 517, from FM 517 to Loop 197, and from Loop 197 to FM 519.

The noise analysis indicates that all of the roadway segments are expected to experience further noise level increases in 2025 as a result of traffic associated with normal growth in the area (i.e., the No-Build scenario). In this scenario, only the segment of SH 146 from Loop 197 to FM 519 would exhibit noise levels below the NAC level.

TABLE 4.3.3-1

EXISTING AND PREDICTED TRAFFIC NOISE LEVELS FOR PELICAN ISLAND ALTERNATIVE

Study Area	NAC Category	NAC Level (dBA)	Existing 2001 (dBA)	Noise Impact at Present (2001)	Predicted 2025/No Build (dBA)	Change (+/-) (dBA)	Noise Impact with "No-Build" Option	Predicted 2025/Build (dBA)	Increase in dBA over "No-Build" Condition
IH 45 From Beltway 8 to FM 2351	B	67	74	Yes	75	+1	Yes	76	+1
IH 45 From FM 2351 to NASA Rd 1	B	67	73	Yes	75	+2	Yes	75	+0
IH 45 From NASA Road 1 to FM 518	B	67	73	Yes	74	+1	Yes	74	+0
IH 45 From FM 518 to FM 646	B	67	71	Yes	74	+3	Yes	74	+0
IH 45 From FM 646 to FM 517	B	67	70	Yes	72	+2	Yes	72	+0
IH 45 From FM 517 to FM 1764	B	67	71	Yes	73	+2	Yes	73	+0
IH 45 From FM 1764 to FM 1765	B	67	69	Yes	71	+2	Yes	71	+0
IH 45 From FM 1765 to FM 519	B	67	68	Yes	70	+2	Yes	71	+1
IH 45 From FM 519 to SH 6/SH 3 Interchange	B	67	68	Yes	69	+1	Yes	70	+1
IH 45 From SH 6/SH 3 Interchange to Harborside	B	67	68	Yes	69	+1	Yes	70	+1
SH 225 From Beltway 8 to Center Rd.	B	67	72	Yes	73	+1	Yes	74	+1
SH 225 From Center Road to SH 146	B	67	71	Yes	72	+1	Yes	73	+1
SH 146 From SH 225 to Shoreacres	B	67	71	Yes	72	+1	Yes	73	+1
SH 146 From Shoreacres to Port Rd.	B	67	68	Yes	70	+2	Yes	70	+0
SH 146 From Port Rd. To Red Bluff	B	67	67	Yes	69	+2	Yes	70	+1
SH 146 From Red Bluff to FM 518	B	67	67	Yes	69	+2	Yes	69	+0
SH 146 From FM 518 to FM 517	B	67	65	No	67	+2	Yes	67	+0
SH 146 From FM 517 to Loop 197	B	67	64	No	66	+2	Yes	67	+1
SH 146 From Loop 197 to FM 519	B	67	63	No	65	+2	No	66	+1*

* Noise level increase at this receptor meets the absolute criterion for impact. Therefore, this receptor which was not impacted under existing, or no-build conditions, would be impacted under the build scenario.

In the Build scenario, noise levels on most of the segments analyzed for this alternative are expected to increase by 1 dBA over the levels predicted for the No-Build scenario in 2025. This indicates that if the project were built, the noise levels would increase over the levels predicted for these road segments due to normal growth. The analysis indicates that noise levels on the remaining segments are not expected to increase as a result of the project. In the Build scenario, the SH 146 segment from Loop 197 to FM 519 is expected to experience a 1 dBA increase over the No-Build conditions, which constitutes an impact under the absolute criterion because the predicted noise level (66 dBA) would approach (i.e., would be within 1 dBA of) the NAC level of 67 dBA for Category B receivers.

4.3.4 Physiography, Topography, and Bathymetry

Construction of the proposed project at the Pelican Island site would include dredging and grading activities. The most significant effects on bathymetry would be related to permanent alterations resulting from dredging to create an entrance channel and new berthing areas for cargo ships. An estimated 13 mcy would be dredged during construction. The material would be used as fill for the terminal and to construct beneficial use areas. Surface topography changes would primarily be associated with site preparation activities for the container yard and associated access road and dredged material placement. While local changes in bathymetry and topography would occur during construction of the container terminal, these alterations would be expected to have minimal impacts on regional physiography, topography, and bathymetry of the submerged and subaerial portions of the project area.

4.3.5 Geology

The impacts on the local geology during dredging and construction activities associated with the proposed project would include redistribution of existing sediment, local increases in turbidity, and potential increases of local scouring and shoaling rates. Net impacts on local geology would be minimal from these operations.

4.3.6 Energy and Mineral Resources

Constructing the proposed project at the Pelican Island site would have no impacts on the energy resources within the project area. There are petroleum resources in the region but no active wells occur on the Pelican Island site (see Section 3.6.2). Relocation of some existing petroleum pipelines in the area may be required depending on the exact location of the terminal but would not impact oil and gas resources. Remediation of impacted soil and/or groundwater related to pipeline spills or leaks may be required during relocation activities. Consumptive use of construction products such as sand, gravel, and cement would constitute an irretrievable commitment of these mineral resources.

4.3.7 Surface Soils

Pelican Island is an active DMPA and the majority of the site consists of poorly consolidated clayey dredged material. Due to the disturbed nature of the site, impacts to native surface soils within the site would be minimal. During construction of the terminal, the site would require a soil consolidation program to minimize the amount of settlement that could occur after the terminal is in operation. The consolidation program would likely consist of the installation of wick drains, along with soil

surcharge. Possible impacts to surface soils exist from the potential release of petroleum products during construction and hazardous material spills from hazardous cargo during facility operations and potential accidents during local highway transport. However, the proposed container terminal is expected to handle a minimal amount of containerized hazardous cargo and the use of BMPs for potential hazardous material spills that could occur at the terminal site would greatly minimize the potential for this type of impact.

Transportation of hazardous cargo is regulated by the U.S. Department of Transportation. Shippers of hazardous materials are required to properly packaging the cargo to reduce the potential of a release during transport and handling. In the event of a release during highway transport, City and local hazardous response teams are trained in spill containment and cleanup. Section 4.3.9 assesses in more detail the potential impact from a release of hazardous cargo due to increase traffic on highways near the site.

4.3.8 Groundwater Quality and Hydrology

Construction and operation activities associated with the proposed project at the Pelican Island site are not expected to result in impacts to groundwater hydrology, quantity and quality. The recharge of shallow groundwater underlying the site by precipitation would be reduced in areas at the terminal site occupied by impervious cover. However, shallow groundwater would continue to be recharged by the surrounding bay waters. In addition, the majority of surface soil at the site consists of clay and clayey loam of low permeability. These soils would tend to decrease infiltration of precipitation, and a relatively large amount of rainfall is likely lost to evaporation and surface runoff currently at the site. The decrease in recharge from precipitation would have little affect on local or regional groundwater levels. The primary drinking water aquifers (Chicot and Evangeline aquifers) typically produce fresh water from depth of 300-700 feet and 800-1,500 feet, respectively, in the vicinity of the proposed and alternate sites. Groundwater recharge to these aquifers by precipitation occurs inland in outcrop areas. Groundwater quality in these aquifers becomes poorer near the coast where saltwater encroachment limits the amount of available fresh water. The regional affects of this relatively small decrease in recharge on the primary aquifers in the region would be negligible.

Other possible impacts to shallow groundwater exist from the potential release of petroleum products during construction and hazardous material spills from hazardous cargo during facility operations and potential accidents during local highway transport. The proposed container terminal is expected to handle some hazardous cargo; however, the use of BMPs for potential hazardous material spills that could occur at the terminal site would greatly minimize the potential for this type of impact to groundwater quality. BMPs which meet local, State, and Federal requirements will be developed and implemented as part of the Spill Response Plan for the project to address potential spills. In addition, packages for hazardous material must conform to standards set by Research and Special Programs Administration (RSPA) of the Department of Transportation and the International Maritime Organization (IMO). A carrier accepting hazardous cargo from a shipper or intermediary is obliged to exercise reasonable care to be sure that the shipment has been properly prepared. This obligation exists each time the cargo is handed off during the transportation process. Specific requirements apply to highway, rail, air and ocean transport. These procedures will greatly reduce the risk of impact to the underlying groundwater at the site. Section 4.3.9 assesses in more detail the potential impact from a release of hazardous cargo due to increase traffic on highways near the site.

4.3.9 Hazardous Materials Site Assessment

No known existing hazardous material sites occur within the Pelican Island alternative site boundary (see Section 3.9.2). However, according to the regulatory agency database search and site reconnaissance, several hazardous material sites occur adjacent to the site boundary. These facilities are located along the proposed access corridor and in the vicinity of the industrialized Galveston Channel. The environmental impacts that have resulted from these facilities vary greatly; however, these sites do not appear to provide a significant environmental concern to the project.

The greatest potential for encountering contaminated media is during roadway widening and bridge construction activities along the access corridor. If contaminated media are encountered, the media should be isolated and segregated for characterization and proper disposal.

4.3.9.1 Hazardous Material Impacts to the Existing Environment from Project Construction Activities

The impacts from hazardous material use and handling during construction activities associated with the proposed project pose a minimal risk of impacts to the environment. Temporary aboveground storage tanks and equipment, vehicles, and machinery that contain oil and use diesel fuel are typically utilized during major construction projects. Impacts from the storage and handling of fuels and lubricants can be eliminated or minimized with the use of mitigation methods. Mitigation will involve the implementation of a Spill Prevention Control and Countermeasure Plan (SPCC). The SPCC plan should effectively minimize impacts of spills that occur during the construction of the facility by requiring all potential contaminants to be stored, handled, and disposed of so that the risk of accidental releases to the environment is minimized. The SPCC plan utilizes effective best management practices (BMPs), containment and control methods, and cleanup operations. Appropriate BMPs may include secondary containment for storage tanks, and drip pans for refueling, maintenance and storage of vehicles and equipment. In the event of a spill, containment and cleanup may include sorbents such as pillows, mats and booms. The plan will include training personnel for spill prevention, operation of spill response equipment, material handling, equipment inspection and maintenance, refueling procedures, spill control and containment, and spill cleanup.

4.3.9.2 Hazardous Material Impacts to the Project from Operation Activities

Fueling of land-based and water-based equipment and vessels would take place on site. The operational component of the proposed container terminal would be expected to handle some hazardous cargo. The accidental spill of fuel, lubricants, or other potentially toxic material is inevitable; however, with proper precautions in place, the impacts to human health and the environment can be greatly reduced. Precautions include a SPCC plan that would be implemented for emergency response to hazardous material spills on the terminal site. The SPCC plan requires training personnel for proper spill prevention, notification, emergency response and containment. Extensive impervious cover and proper spill response should effectively minimize or eliminate significant impacts to soils and groundwater. The risk of impacts to surface water is greatest and may require additional safeguards. Additional information regarding accidental spills is included in Section 4.3.10.

4.3.9.3 Hazardous Materials Transport

The transport of hazardous material cargo presents the potential for impacts related to accidental spills. However, multimodal transportation is extensively regulated. In the U.S., the authority is the RSPA of the USDOT. International shipments are covered by the IMO of the UN and adhere to the IMDG. Packages for hazardous material must comply with standards set by the RSPA and the UN. A carrier accepting a hazardous cargo from a shipper or intermediary is obliged to exercise reasonable care to be sure that the shipment has been properly prepared. This obligation exists with each change of custody throughout the transportation process. Specific requirements apply to sea, air, rail and highway.

The packaging requirements for hazardous material cargo have reduced environmental impacts during shipping; however, concerns remain regarding public safety issues while the cargo is in transport on local highways. To address these concerns, the increased probability of traffic accidents was assessed along the nearest major arterial highway providing access to the proposed and alternative sites. For the Pelican Island alternative, the assessment used traffic data provided by TxDOT for a segment of IH 45 between SH 6 and Harborside (see Table 4.3.2-3). The results of the assessment, as shown on Table 4.3.9-1, indicate that under the No-Build scenario, the average daily traffic (ADT) of 45,580 vehicles (as recorded in 2001) would increase approximately 42 percent to 64,725 vehicles in the year 2025. If the proposed cargo facility is constructed, the 2001 ADT is projected to increase an additional 15 percent over baseline conditions to 71,725 vehicles by the year 2025. This increase in traffic would be incremental and would occur as each of the three phases of the cargo facility become operational.

TABLE 4.3.9-1
PELICAN ISLAND ALTERNATIVE AVERAGE DAILY TRAFFIC PROJECTIONS

			Year 2001	Year 2005		Year 2015		Year 2025	
Option	Roadway	Limits	ADT	ADT	% Truck Traffic Increase	ADT	% Truck Traffic Increase	ADT	% Truck Traffic Increase
No-Build	IH 45	SH 6 to Harborside	45,580	50,139	10%	56,124	23%	64,725	42%
Build	IH 45	SH 6 to Harborside		52,098	14%	58,784	29%	71,725	57%

For this analysis, it is assumed that an increase in traffic would result in an equivalent increase in traffic accidents. TxDOT reported an average of 4 truck accidents per year from 1997 through 1999 along the segment of IH 45 between SH 6 and FM 519. No accident data are available from TxDOT for the SH 6 to Harborside segment; therefore, data for the adjoining segment were used. Under the No-Build scenario, with a 42 percent increase in traffic, the number of truck accidents in the year 2025 is projected to be 5.7 accidents. If the proposed cargo facility is constructed and traffic increases an additional 15 percent, the number of truck accidents in the year 2025 is projected to be 6.6 accidents. The increase in traffic accidents would also be incremental as each phase becomes operational. It is estimated that less than 5 percent of the truck traffic exiting the Barbours Cut facility is hauling hazardous material (USACE, 2001a). Therefore, while traffic accidents are projected to increase consistent with increased traffic, less than 5 percent of those accidents associated with project-related truck traffic would be expected to involve trucks hauling hazardous material cargo.

According to Federal Motor Carrier Safety Administration (March 2002), 16 percent of the traffic accidents involving trucks transporting hazardous material result in the release of the hazardous material to the environment. The level of impact to human health and the environment that could result from the release is directly proportional to several factors. These factors include the state of the spilled material (i.e., gas, liquid, or solid), the distance to the nearest occupied structures, the distance to the nearest surface water body, the response time of the hazardous material response team, and the amount of time the hazardous material was exposed to the environment. The spilled material is initially classified and is isolated to minimize widespread impacts. Isolation is used to prevent discharge to surface waters or recharge to groundwater. The cleanup of a hazardous material spill typically involves the physical removal of the spilled material. This process is performed by trained hazardous material response teams and is performed by either vacuum extraction or other methods to physically containerize the spilled material. Depending on the nature of the spilled material, an evacuation of the public within a specified radius may be performed. Once the recoverable material has been removed, any impacted soil is excavated and containerized for disposal. The excavated site is backfilled with clean fill.

4.3.10 Surface Water Quality and Hydrology

The Pelican Island site is on the northeastern shore of the island. There are no perennial surface waters on the island that would be affected by this alternative.

The main effects of this project alternative on surface water hydrology and quality would include turbidity during construction dredging and earthwork on the project site, long-term changes in runoff characteristics, modifications in water circulation, and the introduction of a new potential for accidental spills from both containers and containerships.

Project construction would involve dredging of the berthing area and channel deepening (see Table 2-3). During the dredging process, higher turbidity and suspended solids concentration would be produced both in the area being dredged and in the area where the dredged material is placed. This would lead to a short-term reduction in water quality and the water's ability to support its designated aquatic life use.

Channels in the vicinity of Pelican Island are naturally deep, and no maintenance dredging is performed. Therefore, no elutriate and water test results for maintenance dredging activities are available. New work sediments that might be dredged during construction would be less likely to exhibit contamination (relative to maintenance material) because they have not been exposed to anthropogenic influences. See Appendix D for testing data on virgin sediment.

After construction is complete, changes to surface water quality would result from the addition of impervious cover (pavement and pier surface) and associated drainage structures where none currently exist. Impervious cover prevents rain from soaking into the ground where it can be used by plants during dry periods. Instead, most of the rain that falls would be forced to run off of the site. In addition to reducing groundwater recharge, increased impervious cover can have adverse effects on receiving water bodies, causing erosion of the streambed (if the receiving water is a stream) and damaging aquatic habitat. While higher runoff and reduced recharge conditions would result from the

project, the consequences should not be severe at this site. Since little groundwater recharge occurs at this site and drainage is directly to Bolivar Roads, rather than to streams, effects would be negligible. The facility would be required to abide by the TPDES construction and operation stormwater permits. Details of the stormwater system would be defined during final design of the project facilities.

Placing the berths and turning area in tidal flats along the Pelican Island shore would be expected to alter water circulation patterns to some degree, but would have no significant effect on salinity. The most likely consequence would be the generation of a sediment trap that would require additional maintenance dredging to maintain depths. Essentially, the channel could be viewed as a small-scale version of the original Texas City Channel, created about 100 years ago, that eventually required a dike to control cross-channel flow and sediment trapping.

Container vessels, like most oceangoing cargo ships, at times need to compensate for changes in cargo and fuel loads by taking on or discharging ballast water. Such water taken aboard in a foreign port could potentially transport and result in the introduction of non-native species to U.S. waters. To minimize this risk, U.S. regulations currently encourage exchange of ballast waters in the open ocean prior to entry and require reporting of any ballast water discharge. Currently there are no special provisions for receiving and treating ballast waters in Texas ports, and none are planned for this project. However, if future regulations require such facilities, they would be provided.

The proposed project would introduce a higher potential for accidental spills. The terminal would handle a large number of containers, some (less than 5 percent [USACE, 2001a]) carrying packaged products that are toxic or hazardous in some measure. Ruptures of products in these containers could result in harmful materials being released. To control such events, the facility would be designed with spill response systems to trap and remove spills and oil-water separators built into the site drainage system. A facility emergency response plan that includes appropriate procedures for each type and location of event would be completed prior to facility operation.

Another type of spill event could be associated with the fueling operations of containerships. Since this type of activity does not currently exist at the site, the addition of any fueling activity at the site would generate a new risk of water pollution from accidental spills. While such risk would increase relative to the present condition, fuel spills are rare and, typically, such spills are quite small (see Section 3.9.1).

4.3.11 Texas Coastal Management Program (TCMP) Consistency Determination

If this alternative is selected and a permit application is submitted to the USACE, it would automatically trigger a review by the GLO for consistency with TCMP. As part of the permit application to the USACE, the permittee would submit a TCMP consistency statement. Any concerns expressed by the GLO would need to be addressed before the permit was granted.

4.3.12 Vegetation

The majority of the proposed footprint of the port facility (excluding the land access corridor) would be located on the northeastern side of Pelican Island within two leveed cells of an active

USACE DMPA. The leveed cells cover 288 acres within the proposed footprint. Construction of the proposed port facility also covers and would displace a shoreline, nontidal, lagoonal area which is primarily open water (52 acres) and intermediate-to-high salt marsh dominated by saltwort, glasswort, bushy sea ox-eye, and saltgrass (88 acres). No submerged aquatic vegetation was observed within the lagoon or along the bay shoreline during site visits. It would also impact unvegetated areas (8 acres) in the lower elevations within this protected lagoon. These areas are not strictly flats because there is no regular tidal influence. The shoreline is a higher ridge with no tidal inlet, so tidal inundation could only happen during extremely high seasonal or storm tides. This site has probably experienced periods of extremely high salinity due to the lack of regular flushing that tidally influenced marshes experience, which would explain the general lack of low salt marsh (smooth cordgrass) in this lagoon. The beach is a mixture of sand, mud, and shell materials. Upland shrubland/grassland (12 acres) would be impacted on the shoreline ridge and on the raised areas adjacent to the roads and levees. Species dominating these areas include bermudagrass, Indian blanket (*Gaillardia pulchella*), prickly pear cactus, eastern baccharis, camphor daisy, and marshhay cordgrass.

The land access corridor, which would connect Pelican Island to Galveston Island at the existing 51st Street bridge, would cross part of the DMPA and would displace upland shrub/scrub and grassland communities (17 acres) and, according to National Wetlands Inventory (NWI) mapping (1995), freshwater wetlands (7 acres).

In summary, approximately 29 acres of upland shrubland/grassland, 96 acres of saline wetlands, and 7 acres of freshwater wetlands would be lost.

4.3.13 Section 404/Section 10 Jurisdictional Areas (Wetlands and Open Water)

The jurisdictional wetland communities correspond to those described above. Note that the salt marshes and tidal flats are not tidally influenced except in extreme weather conditions. This lowers the habitat value, but the wetlands are still jurisdictional because they qualify as adjacent wetlands according to the guidelines by the USACE-Galveston District (2001b). The jurisdictional areas (Section 10/404) include 96 acres of wetlands (88 acres vegetated and 8 acres unvegetated) and 183 acres of open waters (52 acres of adjacent but nontidal lagoon; 131 acres of open bay), for a total jurisdictional area of 279 acres.

4.3.14 Terrestrial Wildlife

The primary direct adverse impact of the proposed construction activities on wildlife at the Pelican Island site would result from the vegetation clearing and the subsequent loss of wildlife habitat. Construction activities might also result in the direct destruction of those organisms not mobile enough to avoid construction equipment. These would potentially include individuals of several species of reptiles, mammals and, if construction occurs during the breeding season, the young of some avian species, including nestling and fledgling birds. Fossorial animals (i.e., those that live underground), such as mice and shrews, may similarly be negatively impacted as a result of soil compaction caused by heavy machinery. For the most part, mobile wildlife species, particularly adult birds and larger mammals, would likely avoid the initial construction activity and move into available habitat outside the project area. Each

species, however, is dependent upon available resources such as food, shelter, water, territory, and nesting sites in any given area of habitat (Dempster, 1975). It is assumed, for the purpose of impact analysis, that habitats are at their carrying capacity for the species that live there. Therefore, displaced wildlife populations would be forced into competition with resident populations in adjoining habitats, creating an inevitable decreased birthrate and/or increased mortality rate until populations are reduced to numbers that the habitat can support. Thus, construction activity would ultimately result in a reduction in the local wildlife populations proportional to the amount of habitat preempted.

The noise of equipment and increased human activity during construction may disturb some local wildlife. In addition, fugitive dust associated with construction activities may have minor impacts on the vegetation, thus decreasing its value as wildlife habitat. Such impacts, however, should be temporary and without significant long-term implications.

Construction of the port facility and access corridor at the Pelican Island site would remove portions of several habitat types, including intermediate-to-high salt marsh; upland shrubland/grassland; beach, consisting of a mix of sand, mud, and shell materials; and open water.

Pelican Island has been documented as the site of several rookeries (GLO, 1996b; FWS, 2001c; TXBCD, 2001) and many avian species were observed during PBS&J's June 19, 2001, site visit (Section 3.13.1.3). Marshes, lagoons, and beaches in the area provide nesting, foraging, and loafing habitat for a variety of birds. These areas would be permanently lost if the Pelican Island alternative were selected. If construction were to take place during the nesting season, loss of eggs and young would result. Individuals using any portions of the nesting/foraging/loafing areas not directly lost to construction would likely be disturbed during construction, especially during the nesting season.

Pelican Spit is a small island that occurs approximately 2,000 feet from the project site. This island contains one of the largest rookeries in the Galveston Bay System and numerous bird species were observed on the island during site visits. While this rookery would remain intact, many of the individuals in this rookery likely currently utilize the areas within the construction footprint and, therefore, would be impacted through loss of foraging and loafing habitat, as well as from noise and human movement during construction, especially during the nesting season. The Pelican Spit rookery, being farther from the construction, would be less likely to be impacted by noise, especially since individuals nesting on the southern edge of the rookery would have become acclimatized to boat traffic in the adjacent GIWW. Dredging activities in the area may indirectly impact this rookery if they take place during the nesting season by potentially reducing the availability of the food supply due to increased turbidity and loss of visual cues during feeding.

Once the facility is in operation, wildlife remaining in the area could be impacted by noise, lights, and human activity. Furthermore, an increase in vehicular traffic would increase the potential for collision mortality for some wildlife species. The increased possibility of chemical or oil spills poses a threat to the nekton community and, thus, the food source of many coastal birds in the area.

4.3.15 Aquatic Ecology

4.3.15.1 Freshwater Habitats and Fauna

The Pelican Island alternative site supports no freshwater habitats. The Houston Ship Channel, Bolivar Roads, and the GIWW lie adjacent to Pelican Island. Bolivar Roads is the main pass to the Gulf in this area and most of the nekton community utilize this pass during some portion of their life cycle. Since numerous fish and shellfish species spawn in this area and their offspring remain in the area during the larval and juvenile phases of their life cycles, they could potentially be affected during and after construction of the container terminal.

4.3.15.2 Open Bay/Open-Bay Bottom

Turbidity in estuarine waters is generally credited with having a complex set of impacts on a wide array of organisms (Hirsch et al., 1978; Stern and Stickle, 1978; EH&A, 1978). Suspended material can play both beneficial and detrimental roles in aquatic environments. Increased turbidity in the area can interfere with light penetration and thus reduce photosynthetic activity by phytoplankton. Such reductions in primary productivity would be localized around the immediate area of the dredging operations. Conversely, the decrease in primary productivity has been found to be offset by increased nutrient content (Morton, 1977).

Potential effects of elevated turbidities on the adult stages of various filter-feeding organisms such as oysters and copepods include reduction of pumping and filter rates and clogging of filtering mechanisms (Stern and Stickle, 1978). These effects are pronounced with high TSS levels, but are apparently reversible once turbidities return to ambient levels.

Water column turbidity would increase in open-bay habitats near the project site during dredging activities but the effects are expected to be temporary and local. Some studies of turbidity from TSS associated with dredging operations have concluded that dredging had no substantial effects on nekton (Ritchie, 1970; Stickney, 1972; Wright, 1978); however, other studies have shown that elevated TSS levels and prolonged exposure can suffocate and reduce growth rates in adult and juvenile nekton and reduce viability of eggs (Moore, 1977; Stern and Stickle, 1978). Elevated turbidities during construction and maintenance dredging may affect some aquatic organisms near the dredging activity; however, turbidities in the open-bay habitats can be expected to return to near ambient conditions after dredging ceases.

For any Beneficial Use sites that would be created, similar impacts from FLUMF and benefits to the aquatic community as described in the Shoal Point alternative (Section 4.2.15) apply.

In the event an accidental spill should occur, benthic fauna may be killed and phytoplankton may be adversely affected. It is unlikely, however, that a spill in Galveston Bay would result in long-term adverse impacts to phytoplankton, zooplankton, or benthic communities. These communities have the ability to recover rapidly from a spill due primarily to the rapid rate of reproduction of the organisms and to the widespread distribution of the dominant species. Adult crustaceans (shrimp and crabs) and adult finfish are probably mobile enough to avoid most areas of high concentrations of toxins.

Larval and juvenile finfish and shellfish tend to be more susceptible to toxins than adults. Juveniles could be affected extensively by a spill during their period of active immigration. The potential for impacts from spills would be minimized by use of BMPs and spill control and prevention measures. Therefore, the impacts of dredging and placement of dredged material are both localized and temporary and are not expected to have long-term adverse impacts on the aquatic environment.

The construction of a new berthing area and entrance channel would slightly increase habitat for nekton species common in deeper offshore waters, which periodically enter the bay through the deep channel corridor (Breuer, 1962). This would also result in a slight increase in the availability of feeding and nursery area for demersal fish (Breuer, 1972). Adverse impacts to benthos affected by construction would likely be short term due to their ability to recolonize the affected area relatively quickly.

The impacts of contaminated dredged material depend on the nature of the biogeochemical environment and the contaminants. Common contaminants of sediment include heavy metals, chemical byproducts, petroleum, and organohalides. Contaminants bind to sediments which are in direct contact with benthic organisms and may be ingested (Montagna et al., 1998). Few studies have examined sediment contaminants in many areas of Galveston Bay, with the exception of the upper Houston Ship Channel, a well documented source of toxicity (GBNEP, 1994b). Based on GBNEP (1994b), elevated levels of contaminants do not occur near this alternative; therefore, impacts to benthic organisms and nekton from contaminated sediments are not expected. Stormwater runoff can carry toxic contaminants into surface waters, depositing them on sediments and potentially affecting the aquatic community. The potential for toxic runoff would increase with the building of the Pelican Island alternative; however, runoff from industrial point sources contributes less than 7 percent of the total loading of any pollutant, including heavy metals and biological oxygen demand, in Galveston Bay (GBNEP, 1994b). In addition, pollutant loading is expected to be minimal due to the type of facility (containerized cargo) and to the controls that would be implemented to control runoff and spills. Therefore, impacts from contamination are expected to be minimal.

4.3.15.3 Oyster Reefs

No live oyster reefs occur at or near the Pelican Island alternative; therefore, no live oyster reefs are expected to be impacted as a result of construction or dredging operations.

4.3.15.4 Recreational and Commercial Fisheries

The recreational and commercial fishery may be temporarily affected in the vicinity of dredging operations as a result of decreased water quality and increased turbidity during dredging, and the loss of attractiveness to fish in the area due to loss of benthic organisms. This is not a permanent condition; the quality of fishing in the project area should steadily improve after dredging is completed. Recreational fishing impacts would be temporary, potentially resulting in local disturbances to both boat and wade-bank fishing. However, recreational fishing at these locations, while locally important, constitutes a relatively small portion of the overall recreational fishing activity in the project vicinity. Construction and dredging activities in this portion of the bay are not expected to have long-term adverse impacts on fishing in the project area.

If an accidental spill were to occur, adult finfish are mobile enough to avoid the area; however, larval and juvenile finfish and shellfish could be affected extensively. Serious impacts to shrimp could also affect the commercial shrimping industry in the area if the spill is severe and widespread. The potential for impacts from spills would be minimized by the use of BMPs and spill control and prevention measures. Impacts from stormwater runoff are expected to be minimal.

4.3.15.5 Essential Fish Habitat

EFH for adult and juvenile brown and white shrimp, red drum, and Spanish mackerel occurs in the vicinity of the Pelican Island alternative and may include estuarine emergent wetlands, estuarine mud, sand, sand and shell substrates, SAV, and estuarine water column. Approximately 183 acres of open-bay bottom would be affected by dredging of new berthing areas and entrance channel.

Dredging activities in open-bay bottom habitat would impact benthic communities in those areas. Although recovery of some benthic organisms would likely occur relatively quickly, assemblage in the sediments at the bottom of the new berthing areas and entrance channel may differ from the assemblage that existed prior to construction.

While dredged material generated by dredging at this site would be available for beneficial uses, a detailed DMMP has not been produced for this alternative. If this alternative was selected for construction of the proposed project, detailed plans for dredged material placement and beneficial uses would be required. Beneficial Use sites created for this alternative would have similar positive effects on EFH and managed species as those discussed in Section 4.2.15.5 for Shoal Point, although the location and size of the Beneficial Use sites would vary.

Increased water column turbidity during construction would be localized and temporary and the amount of open-bay bottom that would be disturbed is a small percentage of the total bay bottom. Accidental spills have the potential to impact EFH, and larval and juvenile finfish could be affected extensively should a spill occur. The potential for adverse impacts from spills would be minimized, however, through the use of BMPs and spill control and prevention measures.

Adult and juvenile brown and white shrimp, and red drum would be temporarily and locally impacted by the loss of open-bay bottom habitat. However, as with the Shoal Point alternative, these species would experience an overall benefit by the creation of Beneficial Use sites. There would be no direct benefits to Spanish mackerel, as they are not marsh dependent; however, it is assumed that marsh habitat would be created as Beneficial Use sites which would increase prey for Spanish mackerel, potentially resulting in an indirect benefit.

4.3.16 Endangered and Threatened Species

4.3.16.1 Plants

No plants Federally listed as endangered, threatened, or SOC are known to occur within or near (less than 2 miles) the Pelican Island alternative. Much of the proposed footprint is on an unvegetated, active, leveed DMPA; however, this site has habitats that may be able to support some of

the species discussed in Section 3.16. Most of the area for these habitats would occur on the proposed land access corridor rather than the terminal facility itself, which would be located primarily on the DMPA and a nontidal lagoon. Habitats for the Pelican Island alternative site that could potentially support any endangered, threatened, or SOC plants include upland shrubland and grassland (mostly disturbed). Texas prairie dawn, Houston machaeranthera, and Texas windmillgrass grow in upland grasslands. However, prairie dawn is not known to occur in Galveston County. Also, Houston machaeranthera prefers sandy loam soils of the Clodine, Gessner and Wockley series, none of which occur on this site. Texas windmillgrass could occur in the upland grassland and roadside areas, but none were observed during field visits (not all of the proposed site was accessible).

4.3.16.2 Fish and Wildlife

Brown pelicans nest at the Little Pelican Island/Pelican Spit rookery. A total of 350 pairs of nesting brown pelicans was recorded in 1998 at this rookery; 1,023 surviving fledglings were also recorded (TXBCD, 2001). In 1999, 127 pairs were recorded at the rookery, while 100 pairs were recorded in 2000 (FWS, 2001c). While no brown pelican nests were observed on Pelican Island during PBS&J's June 2001 field visit, eight brown pelicans (four adults and four juveniles) were observed loafing on the beach area. These birds probably inhabit the rookery on Pelican Spit. This loafing area would be lost if the Pelican Island site is selected, although some loafing habitat would still be available, albeit less attractive because of noise and light during terminal construction and operation. While the Pelican Spit rookery would not be destroyed during construction, dredging activities in the area may indirectly impact the rookery if they take place during the nesting season by potentially reducing the availability of the food supply. The increased possibility of chemical or oil spills poses a threat to the nekton community and, thus, the food source of the brown pelican.

The white-faced ibis, a Federal SOC and State-threatened species, nests on Little Pelican Island/Pelican Spit. In 2000, 37 nesting pairs were recorded there (FWS, 2001c). This rookery would not be destroyed during construction; however, construction noise may have an impact on the rookery. The increased possibility of chemical or oil spills also poses a threat to the food source of the white-faced ibis.

While no other Federally or State-listed species are known to occur within 2 miles of the project site, two species of sea turtle, Kemp's ridley and the loggerhead, have been recorded from the Bolivar Roads area. If present in the area, dredging activities could have an impact on these species through an increase in sedimentation, turbidity, and resuspension of any toxic sediments. The sedimentation may impact food sources for the turtles, and the turbidity could affect primary productivity. This would be short-term, however. While adult sea turtles may be mobile enough to avoid areas of high oil or chemical concentrations, hatchling, post-hatchling and juvenile turtles in the area would be more susceptible. An increase in marine traffic may result in a higher incidence of collision with sea turtles. Sea turtles are not expected to nest at the site due to lack of suitable habitat.

4.3.17 Cultural Resources

There is a very low probability of impacting unrecorded terrestrial archaeological sites. However, there have been numerous potential shipwrecks documented in the waters surrounding Pelican Island, some of which may be historically significant.

The Pelican Island Alternative is located on the Galveston quadrangle map. Files at the Texas Archeological Research Laboratory (TARL) did not identify any previously recorded cultural resource sites within the 400-acre plot for this alternative site. No known sites were identified along the proposed access corridor. The nearest recorded cultural resource site, 41GV102 is a NRHP-listed shipwreck (the *S.S. Selma*) located approximately 1,500 feet east in Galveston Bay. There are no listed or determined eligible for listing NRHP or SAL designated sites within the boundaries of the 400-acre site.

The *S.S. Selma* (41GV102) was a ferro-cement vessel built by the Emergency Fleet Corporation as part of a feasibility study for the United States Shipping Board's experiment in steel-saving shipbuilding techniques during World War I. It was completed as a troop transport in 1919 and launched at Mobile, Alabama. Due to the war's end at the time of its launch, the *Selma* was used as an oil tanker in the Gulf until it wrecked in Tampico, Mexico, in 1920. Tugboats towed the *S.S. Selma* to dry dock at Galveston for repairs. After several moves, the United States Shipping Board deemed the vessel unreparable and it was partially buried near Pelican Island in 1922, where it would not be a hazard to navigation. Because the *S.S. Selma* provided valuable data in the development of other ferro-cement vessels, it was considered eligible for the NRHP under criteria C and D and was formerly listed by the National Park Service on January 5, 1994 (National Register Nomination Form, THC). The *Selma* is also a registered SAL.

Numerous potential shipwreck sites are documented in the waters surrounding Pelican Island (Hoyt et al., 1999). These wrecks are, in part, a subsequent result of expanded waterway access and navigational improvements in lower portions of the Galveston Bay Channel, which ultimately contributed to increased shipping. Some of these vessels could provide an historic association with early commercial port development, Federal and/or Confederate military activities in the 1860s, or immigration and emigration operations at the Pelican Spit Quarantine Station of the Galveston Island Station in the 1890s.

Based on the results of the file review, no adverse impacts are anticipated to known terrestrial cultural resource sites, and a low probability exists of impacting previously unrecorded terrestrial cultural resource sites on the portion of the island that is under consideration for this project. A cultural resource remote-sensing survey completed for all submerged portions of the Shoal Point Alternative included an area on the west side of Pelican Island at the location of a proposed Beneficial Use site. One anomaly, PI1, was recorded at the proposed location of the western levee of the Pelican Island Beneficial Use site. The significance of this anomaly has not been determined. Dredging for the Pelican Island alternative would not impact this anomaly. Historically significant properties may be present in the surrounding waters and there is a high probability that these properties could be adversely impacted by construction of the project at this location.

The Galveston area historic districts and NRHP-listed or determined eligible properties would not suffer direct impacts if the project was constructed on Pelican Island. Indirect impacts would also not be anticipated. The NRHP-listed site nearest to the proposed transportation route is the Galveston Causeway. The Galveston Causeway parallels IH 45, which would be expected to handle the increase in traffic if the project was constructed on the Pelican Island site.

4.3.18 Commercial and Recreational Navigation

The Pelican Island alternative is located on the northeastern side of the island immediately adjacent to Bolivar Roads and the GIWW. Ship traffic to this location will not impede or delay traffic to other channels or port users. Accordingly, no detailed analysis of navigation effects is considered. Similarly, little conflict is expected between deep-draft traffic and commercial fishing or pleasure boat activities.

4.3.19 Land Use/Recreation/Aesthetics

4.3.19.1 Land Use

Site-related Impacts. If the project were to be built at the Pelican Island site, currently undeveloped non-forested wetlands, part of a lake, and portions of an active DMPA would be converted to industrial uses. There are no developed land uses adjacent to the site currently which would be affected by the location of the project at Pelican Island.

Transport-related Impacts. Land access to the site would be via Seawolf Parkway and then across Pelican Island Causeway and through Galveston. A new four-lane bridge would be constructed to replace the existing two-lane bridge. There are only sparsely developed lands on the island currently, mostly port facilities at a distance from the road, and a branch of Texas A&M University next to the bridge, but these are likely to experience some level of roadway congestion due to the single access point to the island. Inside Galveston, trucks would pass commercial areas for a distance before entering IH 45 and would introduce a greater element of congestion for commercial areas.

The major roadways which would receive traffic generated by container terminal activity from the Pelican Island alternative site are IH 45, SH 146 and SH 225.

According to engineering analysis of the No-Build scenario, traffic volumes on IH 45 are expected to increase by 20,000 to 60,000 average daily traffic (ADT) by 2025, or an increase of 20 to 50 percent in various segments of the highway. If the container terminal were built on Pelican Island, an additional 7,000 daily trips would be expected on IH 45 by 2025, representing another 3 percent growth in the northern segments and an additional 7 to 15 percent in the southern segments. Thus, the major impacts on IH 45 traffic loads would be caused by regional growth, with some additional impact primarily in the form of truck traffic from the proposed project. IH 45 is designed to carry large volumes of interstate traffic. Although the various land uses adjacent to IH 45 would experience greater noise and related impacts from higher traffic loads on the freeway, the addition of traffic from the proposed project would not introduce a land use incompatibility from the project, since IH 45 is already expected to carry large volumes of traffic in the region.

SH 146 is projected to receive an additional 3,000 ADT by 2025 from the proposed project if it were located at Pelican Island. Traffic volumes along SH 146 are expected to increase approximately 58 percent by 2025 without the proposed project. The additional project traffic would add an extra 1 percent along the northern portions of SH 146 and an additional 10 to 20 percent in the southern segments. SH 146 passes through largely commercial and industrial areas in various communities between Texas City and the intersection of SH 146 and SH 225. The introduction of an additional 3,000 project-related truck trips a day along this roadway does not present an incompatible use, although as noted in Section 4.2.2, improvements would be needed to SH 146 to accommodate projected traffic volumes (with or without the project) to maintain an acceptable level of service.

SH 146 intersects with SH 225, which would receive approximately 3,000 additional truck trips per day from the proposed Pelican Island alternative site. SH 225 passes through highly industrialized areas, and the addition of project truck traffic would not introduce an incompatible land use along this highway.

Labor Force-Related Impacts. Housing, commercial and public land uses would be required to serve the projected 890 inmigrant population of operations workers and their families. Assuming the same land uses per 100 persons that were shown in Table 4.1.19-1, the demands generated by the inmigrant population would include approximately 37 acres of residential land uses, 3.5 acres of commercial uses, 39.5 acres of public, semi-public and park uses, and 36.5 acres of streets.

Secondary Impacts. Construction and operation of the proposed container terminal at this site would contribute to the conversion of currently undeveloped land to industrial use. The addition of the facility to the area may lead to the potential development of secondary, or ancillary growth effects in the general vicinity. This development would likely include facilities associated with the development of private sector commercial support industries, such as transportation centers, convenience stores, or distribution warehouses. These secondary land use changes that may occur as a result of the proposed container facility would introduce a new land use element in the area and increase the amount of undeveloped land being converted to industrial or commercial uses. However, the potential addition of these secondary facilities would represent a small portion of the overall land use changes likely to occur in the general vicinity over the next several years with or without the project.

4.3.19.2 Recreation

Seawolf Park lies to the south of the proposed Pelican Island site. The park is devoted to military and maritime history, and facilities are provided for ship watching. The proposed project would have limited visibility from the park; however, there would be additional ship traffic in the vicinity of the park which would provide additional opportunities for ship watching.

No significant impacts are expected for recreational fishing in the vicinity of the Pelican Island site (see Section 4.2.15). Several rookeries exist on and near Pelican Island. Bird watching activities could be adversely affected if bird nesting or roosting is disturbed at the project site or in the nearby environs of the project site (see Section 4.2.14 for additional information).

4.3.19.3 Aesthetics

As discussed in Section 3.18.4, the area of greatest aesthetic value in the vicinity of the Pelican Island site is the eastern terminus of the Texas City Dike. The view from the dike is not a pristine natural view, as industrial development lies in the distant background in Galveston. There are currently boat docks, ship traffic and other human developments in the area. The construction of the container terminal project at the Pelican Island site would change the nature of the aesthetic environment by adding an industrial element to the landscape in the place of the current low relief, generally natural setting. The change would be quantitative rather than qualitative, since the project would shift the emphasis of the landscape from being largely natural with somewhat remote industrial uses to one with more proximate industrial use and less natural landscape.

4.3.20 Socioeconomics

4.3.20.1 Population

For all alternatives, the available construction labor force in each subregion is expected to offer adequate labor to complete construction work without the importation of workers from outside the subregion most proximate to each site.

On the other hand, for all operations-phase employment, an adequate local labor force would not likely be available to fill all employment positions. It is therefore expected that the operations phase of the project would encourage relocation of workers to the general environs of each project site alternative. Given the metropolitan nature of the greater Houston area, there would be a wide variety of opportunities for relocation. However, since regional median travel time to work is approximately 20 to 30 minutes, it seems likely that each project site would attract permanent operations workers to the nearby environs of the project.

Table 4.3.20-1 shows the number of operations workers which may relocate to the Pelican Island region. Inmigration of workers is expected to begin in 2005, with 25 workers, and escalate to 318 when the project is fully operational. Also shown in Table 4.3.20-1 are the additional family members which could be expected to accompany the project operations workers. Total population increase resulting from direct employment during the operations phase of the project is expected to amount to 890 at full operation.

4.3.20.2 Environmental Justice

EJ Index Methodology

The DVMAV data for Pelican Island (Appendix G-2) show that the area has a higher proportion of ethnic minorities than the overall state minority percentage. Within the 50-square-mile area surrounding this alternative, 64.8 percent of the population is of minority status, as compared with 39.4 percent statewide. The overall minority status is ranked 3.

Table 4.3.20-1
Population and Housing Effects
Pelican Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
PELICAN ISLAND ALTERNATIVE														
Direct Construction Jobs Created	12	55	70	2	16	38	0	0	0	0	6	10	21	60
Available Construction Workforce (RAZ 180, 184, 186, 187)	108	109	110	111	111	112	112	113	114	114	114	115	115	115
Inmigration of Construction Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Operations Jobs Created	0	0	94	153	177	201	225	253	277	301	325	352	376	400
Available Operations Workforce (RAZ 180. 184, 186, 187)	125	126	128	129	129	130	131	131	132	132	133	133	134	134
Inmigration of Operations Workers	0	0	0	25	48	71	94	122	145	168	192	219	243	266
Secondary Family Growth	0	0	0	45	86	128	170	219	261	304	346	396	438	480
Total Potential Inmigration	0	0	0	69	134	200	265	341	406	472	538	615	681	746
Housing Units Needed for Inmigration	0	0	0	25	48	71	94	122	145	168	192	219	243	266

Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
PELICAN ISLAND ALTERNATIVE										
Direct Construction Jobs Created	0	0	0	0	0	0	0	0	0	0
Available Construction Workforce (RAZ 180, 184, 186, 187)	116	116	116	117	117	118	118	119	119	119
Inmigration of Construction Workers	0	0	0	0	0	0	0	0	0	0
Direct Operations Jobs Created	452	452	452	452	452	452	452	452	452	452
Available Operations Workforce (RAZ 180. 184, 186, 187)	134	135	135	136	136	137	137	138	138	139
Inmigration of Operations Workers	318	317	317	316	316	315	315	314	314	313
Secondary Family Growth	573	572	571	570	570	569	568	567	566	565
Total Potential Inmigration	890	889	888	887	886	884	883	881	880	879
Housing Units Needed for Inmigration	318	317	317	316	316	315	315	314	314	313

The DVECO data for Pelican Island show that the area also has a higher proportion of economically stressed residents than the overall state percentage. Within the 50-square-mile area surrounding this alternative, 47.6 percent of the population is economically stressed, as compared with 27.6 percent statewide. The overall economically stressed status is ranked 4.

According to the EJ Index, the overall EJ potential for the 50-square-mile area at Pelican Island is ranked 24.

Census Tract Analysis

The percentage of African Americans in the Pelican Island alternative study area is 38.2 percent, which is more than twice as much as Galveston County (17.2 percent) and more than three times as much as the state (11.7 percent). The only census tract that exceeds the threshold of 10 percent over the county's percentage of African Americans is tract 1240. The average percentage of Hispanics is 18.8 percent, which is about 30 percent greater than the county (13.9 percent) but less than the state (25.2 percent). Census tracts that exceed the threshold of 10 percent over the county's percentage of Hispanics are tracts 1232 and 1234.99. The average percentage of "other races" is 4.0 percent, which is about twice as high as both the county (2.0 percent) and state (2.3 percent). Census tracts that exceed the threshold of 10 percent over the county's percentage of "other races" are tracts 1232 and 1234.99. The average percentage of persons living below the poverty line within the census tracts is 34.9 percent, which is about twice as high as in Galveston County (15.3 percent) and the state (17.6 percent). The only census tract that exceeds the threshold of 10 percent over the county's percentage of residents living below the poverty line is tract 1240.

The Pelican Island alternative would be situated greater than 8,500 feet from the nearest residence. The land use would be consistent with current land uses in the area. If any minority or low-income groups are dependent on the natural resources in the vicinity of the Pelican Island site (e.g., for subsistence fishing), they would not likely be adversely affected by the project since project activities are not expected to result in long-term adverse impacts on resources of this type (e.g., fishing) (see Section 4.3.15.4). Potential effects of locating the project at this location include increased traffic, noise and air pollution (see Sections 4.3.1, 4.3.2 and 4.3.3); however, these effects would also occur at any of the alternative sites. Some of the advantages the community would reap as a result of the creation of this project are: increased number of jobs for many levels of experience and the infusion of indirect economic contributions to the community (see Section 4.3.19). These beneficial effects would also occur at any of the alternative sites.

4.3.20.3 Community Values

Galveston's Comprehensive Plan (City of Galveston, 2001) directly supports port and industrial development on Pelican Island and plans for infrastructure improvements to accommodate such development. The plan more specifically supports the cruise ship industry as well as oil and gas port businesses. A container port on Pelican Island would appear to have similar benefits for the City of Galveston and be consistent with the general support for the increase in maritime industries on Pelican Island.

4.3.20.4 Housing

Table 4.3.20-1 shows the housing needs of the inmigrant operations families. At full operation, there is expected to be a demand of 318 housing units for worker families.

4.3.20.5 Leading Economic Sectors

Total Demand. Table 4.3.20-2 shows the direct and indirect effect of the construction and operation of the Pelican Island alternative on the Texas economy, as well as direct non-Texas effects of the project.

For the Pelican Island alternative, total construction costs from 2002 through 2015 are anticipated to amount to $295.9 million. Direct Texas effects are expected to amount to $239.7 million, with an export (i.e., outside of Texas) effect of $56.2 million. Total Texas effect from construction activities are expected to amount to $1.061 billion over the 2002 to 2015 period.

Operations-related effects are expected to be similar for all alternatives, as discussed above in Section 4.2.20.5. At the point of full operation, the project operations cost is expected to amount to $57.5 million annually. Based on the water transport demand multiplier from the Texas Input-Output Model, the direct Texas effect will amount to $50.1 million each year, with $7.4 million exported. Total Texas effect, including both direct and indirect effects, will be approximately $186.8 million annually.

Effects on Major Economic Sectors. Table 4.3.20-3 shows the relative economic effect on various major economic sectors from the construction and operation of the project at the Pelican Island alternative. These are the relative portions of the total Texas effect figures (total demand) from Table 4.3.20-2. (The remaining demand effect, household sector effects, are discussed below and shown in Table 4.3.20-6.)

For construction-related activities, 41 percent ($323.9 million) of the overall project effect would accrue to the construction sector. Other major sectors affected would be manufacturing, with $107.8 million (14%); services, with $99.7 million (13%); and finance, insurance and real estate (FIRE), with $97.7 million (13%).

For operations-related activities at full build-out, 51 percent of the effects ($70.3 million) would pertain to the transportation, communication and utilities sector, with other major affected sectors being FIRE, with $22.1 million annually (16%); trade, with $15.0 million annually (11%); and services, with $14.1 annually (10%). These effects would be the same for all alternatives.

The year of greatest effect from construction activities alone would be 2004, while the year of greatest overall effect would be 2015, during which major construction activities for Phase III would occur contiguously with almost full employment and operation.

Effects on Retail and Wholesale Trade. Table 4.3.20-4 provides more specific data on the effects of construction and operations on retail and wholesale trade. Retail and wholesale trade are some of the components of "Trade" from Table 4.3.20-3.

Table 4.3.20-2
Total Economic Effect of Project *
Pelican Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION ACTIVITIES													
Construction Costs	$12,178,372	$56,111,093	$71,410,535	$2,196,844	$16,097,415	$38,905,741	$0	$0	$0	$0	$6,422,649	$10,018,234	$21,322,764
Direct Effects:													
Effect Outside of Texas	$2,313,393	$10,658,813	$13,565,081	$417,310	$3,057,851	$7,390,500	$0	$0	$0	$0	$1,220,041	$1,903,055	$4,050,453
Texas Direct Effect	$9,864,980	$45,452,280	$57,845,454	$1,779,533	$13,039,565	$31,515,241	$0	$0	$0	$0	$5,202,608	$8,115,179	$17,272,311
Total Texas Effect	$43,759,327	$202,314,876	$255,359,586	$7,893,698	$57,841,233	$139,103,769	$0	$0	$0	$0	$23,077,861	$35,997,519	$76,616,957
OPERATIONS ACTIVITIES													
Operations Costs	$250,000	$33,583,333	$11,902,655	$19,502,212	$55,875,369	$25,581,858	$28,621,681	$32,168,142	$35,207,965	$38,247,788	$41,287,611	$44,834,071	$81,207,227
Direct Effects:													
Effect Outside of Texas	$32,191	$4,324,368	$1,532,649	$2,511,208	$7,194,809	$3,294,056	$3,685,479	$4,142,140	$4,533,564	$4,924,988	$5,316,412	$5,773,073	$10,456,673
Texas Direct Effect	$217,809	$29,258,965	$10,370,006	$16,991,004	$48,680,560	$22,287,803	$24,936,202	$28,026,001	$30,674,400	$33,322,800	$35,971,199	$39,060,998	$70,750,554
Total Texas Effect	$812,350	$109,125,683	$38,676,487	$63,370,489	$181,561,423	$83,125,691	$93,003,292	$104,527,159	$114,404,760	$124,282,361	$134,159,962	$145,683,830	$263,874,764
TOTAL EFFECT													
Total Costs	$12,428,372	$89,694,426	$83,313,190	$21,699,056	$71,972,784	$64,487,599	$28,621,681	$32,168,142	$35,207,965	$38,247,788	$47,710,259	$54,852,305	$102,529,992
Direct Effects:													
Effect Outside of Texas	$2,345,584	$14,983,181	$15,097,730	$2,928,519	$10,252,659	$10,684,555	$3,685,479	$4,142,140	$4,533,564	$4,924,988	$6,536,452	$7,676,127	$14,507,126
Texas Direct Effect	$10,082,788	$74,711,245	$68,215,460	$18,770,537	$61,720,125	$53,803,044	$24,936,202	$28,026,001	$30,674,400	$33,322,800	$41,173,807	$47,176,178	$88,022,865
Total Texas Effect	$44,571,677	$311,440,560	$294,036,073	$71,264,187	$239,402,656	$222,229,459	$93,003,292	$104,527,159	$114,404,760	$124,282,361	$157,237,823	$181,681,349	$340,491,721

* In year 2000 dollars.

Table 4.3.20-2 (concluded)

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION ACTIVITIES												
Construction Costs	$61,236,353	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$295,900,000
Direct Effects:												
Effect Outside of Texas	$11,632,402	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$56,208,898
Texas Direct Effect	$49,603,950	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$239,691,102
Total Texas Effect	$218,995,953	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,060,960,780
OPERATIONS ACTIVITIES												
Operations Costs	$50,913,717	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$1,074,183,628
Direct Effects:												
Effect Outside of Texas	$6,555,920	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$138,317,577
Texas Direct Effect	$44,357,797	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$935,866,051
Total Texas Effect	$165,439,031	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$3,490,452,282
TOTAL EFFECT												
Total Costs	$112,150,070	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$1,370,083,628
Direct Effects:												
Effect Outside of Texas	$18,188,322	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$194,526,475
Texas Direct Effect	$93,961,747	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$1,175,557,153
Total Texas Effect	$384,434,984	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$4,551,413,062

Source: Texas Comptroller of Public Accounts, 1989.

Table 4.3.20-3
Total Texas Effect of Project, by Major Economic Sector *
Pelican Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Agriculture	$341,946	$1,588,941	$2,013,276	$61,683	$451,985	$1,088,176	$0	$0	$0	$0	$180,336	$281,293	$598,703
Mining	$645,921	$3,001,441	$3,802,992	$116,517	$853,780	$2,055,518	$0	$0	$0	$0	$340,647	$531,350	$1,130,924
Construction	$13,313,186	$61,863,250	$78,384,163	$2,401,551	$17,597,416	$42,366,659	$0	$0	$0	$0	$7,021,128	$10,951,760	$23,309,677
Manufacturing	$4,430,101	$20,585,642	$26,083,148	$799,141	$5,855,724	$14,097,948	$0	$0	$0	$0	$2,336,354	$3,644,312	$7,756,538
Transp., Comm., Util.	$2,001,831	$9,302,039	$11,786,199	$361,108	$2,646,027	$6,370,443	$0	$0	$0	$0	$1,055,729	$1,646,756	$3,504,949
Trade	$3,375,779	$15,686,455	$19,875,607	$608,953	$4,462,117	$10,742,770	$0	$0	$0	$0	$1,780,324	$2,777,001	$5,910,556
FIRE	$4,016,949	$18,665,819	$23,650,627	$724,613	$5,309,617	$12,783,169	$0	$0	$0	$0	$2,118,465	$3,304,443	$7,033,161
Services	$4,098,260	$19,043,653	$24,129,363	$739,281	$5,417,095	$13,041,927	$0	$0	$0	$0	$2,161,347	$3,371,332	$7,175,527
Total	$32,223,973	$149,737,241	$189,725,376	$5,812,848	$42,593,761	$102,546,611	$0	$0	$0	$0	$16,994,329	$26,508,248	$56,420,035
OPERATIONS-RELATED EFFECTS													
Agriculture	$4,460	$599,169	$212,358	$347,944	$996,886	$456,412	$510,647	$573,920	$628,154	$682,388	$736,623	$799,896	$1,448,838
Mining	$9,316	$1,251,514	$443,563	$726,768	$2,082,247	$953,331	$1,066,613	$1,198,775	$1,312,057	$1,425,339	$1,538,621	$1,670,783	$3,026,262
Construction	$8,088	$1,086,438	$385,057	$630,907	$1,807,597	$827,586	$925,926	$1,040,656	$1,138,996	$1,237,336	$1,335,675	$1,450,405	$2,627,095
Manufacturing	$50,136	$6,734,895	$2,386,992	$3,911,028	$11,205,402	$5,130,257	$5,739,872	$6,451,089	$7,060,703	$7,670,318	$8,279,933	$8,991,150	$16,285,524
Transp., Comm., Util.	$305,639	$41,057,510	$14,551,664	$23,842,549	$68,310,774	$31,275,258	$34,991,612	$39,327,359	$43,043,713	$46,760,067	$50,476,421	$54,812,168	$99,280,393
Trade	$65,086	$8,743,194	$3,098,776	$5,077,269	$14,546,775	$6,660,064	$7,451,461	$8,374,758	$9,166,156	$9,957,553	$10,748,950	$11,672,247	$21,141,753
FIRE	$96,025	$12,899,391	$4,571,821	$7,490,819	$21,461,783	$9,826,017	$10,993,616	$12,355,814	$13,523,413	$14,691,012	$15,858,611	$17,220,810	$31,191,775
Services	$61,200	$8,221,173	$2,913,760	$4,774,126	$13,678,245	$6,262,418	$7,006,565	$7,874,735	$8,618,881	$9,363,028	$10,107,174	$10,975,344	$19,879,464
Total	$599,950	$80,593,283	$28,563,991	$46,801,409	$134,089,710	$61,391,344	$68,686,311	$77,197,106	$84,492,073	$91,787,041	$99,082,008	$107,592,803	$194,881,104
TOTAL EFFECTS													
Agriculture	$346,406	$2,188,109	$2,225,634	$409,627	$1,448,871	$1,544,588	$510,647	$573,920	$628,154	$682,388	$916,958	$1,081,189	$2,047,541
Mining	$655,237	$4,252,955	$4,246,556	$843,285	$2,936,027	$3,008,850	$1,066,613	$1,198,775	$1,312,057	$1,425,339	$1,879,267	$2,202,133	$4,157,185
Construction	$13,321,273	$62,949,688	$78,769,220	$3,032,458	$19,405,013	$43,194,245	$925,926	$1,040,656	$1,138,996	$1,237,336	$8,356,804	$12,402,165	$25,936,772
Manufacturing	$4,480,237	$27,320,537	$28,470,140	$4,710,169	$17,061,126	$19,228,205	$5,739,872	$6,451,089	$7,060,703	$7,670,318	$10,616,286	$12,635,462	$24,042,062
Transp., Comm., Util.	$2,307,470	$50,359,549	$26,337,863	$24,203,657	$70,956,802	$37,645,701	$34,991,612	$39,327,359	$43,043,713	$46,760,067	$51,532,150	$56,458,924	$102,785,342
Trade	$3,440,865	$24,429,649	$22,974,383	$5,686,222	$19,008,892	$17,402,834	$7,451,461	$8,374,758	$9,166,156	$9,957,553	$12,529,274	$14,449,248	$27,052,309
FIRE	$4,112,974	$31,565,210	$28,222,448	$8,215,432	$26,771,401	$22,609,186	$10,993,616	$12,355,814	$13,523,413	$14,691,012	$17,977,076	$20,525,253	$38,224,936
Services	$4,159,460	$27,264,826	$27,043,124	$5,513,407	$19,095,340	$19,304,345	$7,006,565	$7,874,735	$8,618,881	$9,363,028	$12,268,521	$14,346,676	$27,054,990
Total	$32,823,923	$230,330,525	$218,289,367	$52,614,257	$176,683,471	$163,937,955	$68,686,311	$77,197,106	$84,492,073	$91,787,041	$116,076,337	$134,101,051	$251,301,138

* In year-2000 dollars.

Table 4.3.20-3 (concluded)

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Agriculture	$1,713,066	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$8,319,404
Mining	$3,235,908	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,714,999
Construction	$66,695,885	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$323,904,675
Manufacturing	$22,193,752	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$107,782,662
Transp., Comm., Util.	$10,028,696	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$48,703,779
Trade	$16,911,850	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$82,131,412
FIRE	$20,123,956	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$97,730,820
Services	$20,531,306	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$99,709,090
Total	$161,434,419	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$783,996,840
OPERATIONS-RELATED EFFECTS												
Agriculture	$908,364	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$19,164,778
Mining	$1,897,346	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$40,030,435
Construction	$1,647,085	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$34,750,391
Manufacturing	$10,210,379	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$215,419,780
Transp., Comm., Util.	$62,244,876	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$1,313,249,777
Trade	$13,255,042	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$279,656,448
FIRE	$19,556,008	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$412,594,976
Services	$12,463,637	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$262,959,286
Total	$122,182,738	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$2,577,825,871
TOTAL EFFECTS												
Agriculture	$2,621,430	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$27,484,181
Mining	$5,133,254	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$55,745,434
Construction	$68,342,970	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$358,655,066
Manufacturing	$32,404,131	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$323,202,442
Transp., Comm., Util.	$72,273,573	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$1,361,953,556
Trade	$30,166,892	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$361,787,860
FIRE	$39,679,964	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$510,325,796
Services	$32,994,943	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$362,668,376
Total	$283,617,157	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$3,361,822,711

Source: Texas Comptroller of Public Accounts, 1989.

Table 4.3.20-4
Retail and Wholesale Sales Effect of Project *
Pelican Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Retail Trade	$1,597,403	$7,422,756	$9,405,043	$288,154	$2,111,453	$5,083,428	$0	$0	$0	$0	$842,441	$1,314,064	$2,796,847
Wholesale Trade	$1,516,217	$7,045,503	$8,927,042	$273,509	$2,004,140	$4,825,068	$0	$0	$0	$0	$799,625	$1,247,278	$2,654,700
Total	$3,113,619	$14,468,259	$18,332,085	$561,663	$4,115,593	$9,908,497	$0	$0	$0	$0	$1,642,065	$2,561,341	$5,451,547
OPERATIONS-RELATED EFFECTS													
Retail Trade	$30,318	$4,072,734	$1,443,464	$2,365,081	$6,776,144	$3,102,375	$3,471,022	$3,901,110	$4,269,757	$4,638,404	$5,007,051	$5,437,139	$9,848,201
Wholesale Trade	$29,589	$3,974,853	$1,408,773	$2,308,241	$6,613,292	$3,027,815	$3,387,603	$3,807,354	$4,167,141	$4,526,928	$4,886,716	$5,306,467	$9,611,518
Total	$59,908	$8,047,587	$2,852,238	$4,673,323	$13,389,436	$6,130,191	$6,858,625	$7,708,464	$8,436,898	$9,165,332	$9,893,766	$10,743,606	$19,459,719
TOTAL EFFECTS													
Retail Trade	$1,627,721	$11,495,490	$10,848,508	$2,653,235	$8,887,597	$8,185,803	$3,471,022	$3,901,110	$4,269,757	$4,638,404	$5,849,491	$6,751,202	$12,645,048
Wholesale Trade	$1,545,806	$11,020,356	$10,335,815	$2,581,750	$8,617,433	$7,852,884	$3,387,603	$3,807,354	$4,167,141	$4,526,928	$5,686,340	$6,553,745	$12,266,219
Total	$3,173,527	$22,515,846	$21,184,323	$5,234,985	$17,505,030	$16,038,687	$6,858,625	$7,708,464	$8,436,898	$9,165,332	$11,535,832	$13,304,947	$24,911,267

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Retail Trade	$8,002,608	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$38,864,197
Wholesale Trade	$7,595,883	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$36,888,965
Total	$15,598,491	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$75,753,161
OPERATIONS-RELATED EFFECTS												
Retail Trade	$6,174,432	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$130,268,903
Wholesale Trade	$6,026,041	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$127,138,137
Total	$12,200,474	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$257,407,040
TOTAL EFFECTS												
Retail Trade	$14,177,040	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$169,133,100
Wholesale Trade	$13,621,925	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$164,027,102
Total	$27,798,965	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$333,160,202

Source: Texas Comptroller of Public Accounts, 1989.
* In year-2000 dollars.

Total construction-related effects on wholesale and retail trade are anticipated to be approximately $75.8 million over the full construction period, with roughly 51 percent ($38.9 million) of those effects on the retail sector and 49 percent ($36.9 million) on the wholesale sector. At full build-out, operation of the project is expected to have an almost $7 million effect on retail trade annually and a $6.8 million effect on wholesale trade each year. This is the same prospective effect as for all alternatives.

4.3.20.6 Employment

Table 4.3.20-5 shows the number of jobs expected to be generated by the construction and operation of the project at the Pelican Island alternative site. A job is defined as full-time equivalent employment for one person for one year.

Table 4.3.20-5 shows that the construction phase of the project is expected to create 290 direct jobs over the 2002-2016 construction period, with the creation of an additional 5,284 jobs indirectly. The highest year of employment creation would occur in 2004, when 70 direct construction jobs are created.

When the project is fully operational, it would be expected to create approximately 450 direct operations jobs and almost 800 in indirect employment.

Assuming that half of the projected unemployed construction workforce from RAZ 180, 184, 186, and 187 (Galveston and Texas City region) is qualified for the work presented by the project, a larger construction workforce is projected to be available than is needed for the project. This is shown in Table 4.3.20-1.

Using the same assumption of one-half of the unemployed labor force having the necessary qualifications for operations employment on the project, the operations-related available workforce is projected to amount to 125 to 139 during the 2002 to 2025 time frame, compared with the projected employment of approximately 450 individuals. Thus, it is possible that as many as 318 workers may be drawn from outside the immediate region of the Pelican Island alternative site.

4.3.20.7 Household Income Effects

Table 4.3.20-6 shows the effects on households from the construction and operations phases of the project. The construction phase of the project is expected to have a direct effect of $112.2 million on household incomes, with an indirect effect of $164.8 million. At full operation, the project is expected to have an annual operations-related direct effect on household income of $23.7 million and an indirect effect of $25.2 million yearly.

4.3.20.8 Residential Property Values

According to Delucchi and Hsu (1998), residential property values may decrease from 0.2–1.5 percent for every dBA above 55 dBA. Those impacts may be temporary in nature (during

Table 4.3.20-5
Employment Effect of Project
Pelican Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED JOBS													
Direct Jobs	12	55	70	2	16	38	0	0	0	0	6	10	21
Indirect Jobs	219	1,008	1,263	39	289	694	0	0	0	0	115	180	383
Total Jobs	231	1,063	1,333	41	305	732	0	0	0	0	121	190	404
OPERATIONS-RELATED JOBS													
Direct Jobs	0	0	94	153	177	201	225	253	277	301	325	352	376
Indirect Jobs	3	465	165	270	774	354	396	446	488	530	572	621	1,125
Total Jobs	3	465	258	423	951	555	621	698	764	830	896	973	1,501
TOTAL JOBS													
Direct Jobs	12	55	164	155	193	239	225	253	277	301	331	362	397
Indirect Jobs	222	1,473	1,428	310	1,063	1,048	396	446	488	530	687	801	1,508
Total Jobs	234	1,528	1,592	465	1,256	1,287	621	698	764	830	1,018	1,163	1,905

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED JOBS												
Direct Jobs	60	0	0	0	0	0	0	0	0	0	0	290
Indirect Jobs	1,093	0	0	0	0	0	0	0	0	0	0	5,284
Total Jobs	1,153	0	0	0	0	0	0	0	0	0	0	5,574
OPERATIONS-RELATED JOBS												
Direct Jobs	400	452	452	452	452	452	452	452	452	452	452	7,654
Indirect Jobs	705	796	796	796	796	796	796	796	796	796	796	14,878
Total Jobs	1,105	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	22,532
TOTAL JOBS												
Direct Jobs	460	452	452	452	452	452	452	452	452	452	452	7,944
Indirect Jobs	1,798	796	796	796	796	796	796	796	796	796	796	20,162
Total Jobs	2,258	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	28,106

Source: Texas Comptroller of Public Accounts, 1989.

Table 4.3.20-6
Household Income Effect of Project *
Pelican Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Direct Effects	$4,717,901	$21,019,745	$26,150,563	$851,057	$6,236,139	$14,990,024	$0	$0	$0	$0	$2,488,134	$3,881,064	$8,260,439
Indirect Effects	$6,817,453	$31,557,890	$39,483,647	$1,229,793	$9,011,333	$21,567,134	$0	$0	$0	$0	$3,595,399	$5,608,207	$11,936,483
Total Effects	$11,535,354	$52,577,635	$65,634,211	$2,080,850	$15,247,472	$36,557,158	$0	$0	$0	$0	$6,083,533	$9,489,271	$20,196,922
OPERATIONS-RELATED EFFECTS													
Direct Effects	$102,875	$13,819,542	$4,897,942	$8,025,160	$22,992,714	$10,526,935	$11,777,822	$13,237,190	$14,488,077	$15,738,965	$16,989,852	$18,449,220	$33,416,774
Indirect Effects	$109,525	$14,712,858	$5,214,553	$8,543,919	$24,478,999	$11,207,412	$12,539,159	$14,092,863	$15,424,609	$16,756,356	$18,088,102	$19,641,806	$35,576,886
Total Effects	$212,400	$28,532,400	$10,112,496	$16,569,080	$47,471,713	$21,734,347	$24,316,981	$27,330,053	$29,912,687	$32,495,320	$35,077,954	$38,091,027	$68,993,660
TOTAL EFFECTS													
Direct Effects	$4,820,776	$34,839,287	$31,048,506	$8,876,218	$29,228,853	$25,516,959	$11,777,822	$13,237,190	$14,488,077	$15,738,965	$19,477,986	$22,330,284	$41,677,213
Indirect Effects	$6,926,978	$46,270,748	$44,698,200	$9,773,712	$33,490,332	$32,774,546	$12,539,159	$14,092,863	$15,424,609	$16,756,356	$21,683,501	$25,250,014	$47,513,370
Total Effects	$11,747,754	$81,110,035	$75,746,706	$18,649,930	$62,719,185	$58,291,505	$24,316,981	$27,330,053	$29,912,687	$32,495,320	$41,161,487	$47,580,298	$89,190,583

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Direct Effects	$23,599,873	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$112,194,940
Indirect Effects	$33,961,660	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$164,769,000
Total Effects	$57,561,533	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$276,963,940
OPERATIONS-RELATED EFFECTS												
Direct Effects	$20,950,994	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$442,026,563
Indirect Effects	$22,305,299	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$470,599,848
Total Effects	$43,256,294	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$912,626,411
TOTAL EFFECTS												
Direct Effects	$44,550,868	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$554,221,503
Indirect Effects	$56,266,960	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$635,368,848
Total Effects	$100,817,827	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$1,189,590,351

Source: Texas Comptroller of Public Accounts. December 1989. The Texas Input-Output Model, 1986 Update. 164-Sector Multiplier Tables. Austin, Texas.
* In year-2000 dollars.

construction activities) or they may be long-term effects associated with noise from operations at the container terminal site or from increased traffic.

Construction

As discussed in Section 4.3.3, dredging activities at the Pelican Island site would result in noise levels of 21 dBA to 41 dBA at the nearest sensitive receptor (Texas A&M University-Galveston Campus), located approximately 8,000 feet to the southwest of the site. Other construction would result in noise levels of 30 dBA to 57 dBA at the nearest receptor. Since ambient noise levels at the campus range from 58.3 dBA L_{dn} to 65.8 dBA L_{dn} (Section 3.3.2.2), construction activities at the Pelican Island alternative site would not generate noise levels higher than ambient levels at the University site, nor for residential areas further away. Thus, no residential property value impacts are expected from construction at the Pelican Island alternative site.

Operations

A projected L_{dn} of 56.7 dBA recorded approximately 1,500 feet from the main gate, which is lower than ambient noise levels, indicates that noise from operations at the terminal would be unlikely to adversely affect property values at the nearest residences, which are located greater than 8,000 feet from the Pelican Island alternative site.

Traffic

Table 4.3.3-1 also shows that virtually all of the residential receptors along major roadways that would be affected by increased terminal traffic currently have noise levels above 55 dBA, ranging from 63–74 dBA. According to the results of the Delucchi and Hsu research, those properties currently at the 63 dBA level likely have current property values 1.6–12.0 percent lower than similar properties with noise levels below 55 dBA. On the upper end of the range, those receptors with current noise levels of 74 dBA likely have property values 3.8–28.5 percent lower than comparable properties with noise levels less than 55 dBA. Thus, much of the potential loss of property value due to traffic noise is already represented in current market values.

Table 4.3.3-1 indicates that noise levels are expected to increase by 1–3 dBA over existing conditions, for all residential receptors, by 2025, without the project. Thus, without the project, there may be property values which are 0.2–4.5 percent lower than those of comparable homes at different, quieter locations, in addition to the current estimated lesser property values of 3.8–28.5 percent.

With the project at Pelican Island, some residential receptors may experience an increase in noise of approximately 1 dBA beyond the no-build noise levels projected for 2025. Thus, some properties might be expected to experience an additional 0.2–1.5 percent decrease in relative property values.

4.3.21 Community Infrastructure and Municipal Services

The sections below discuss community infrastructure requirements of the project, to the extent that they are known. The Greater Houston metropolitan area is a very large, growing and economically viable region. Operations inmigrants to the area may locate in any of a large number of communities or in suburban areas. Inmigrants will likely either locate in communities which are able to provide community services or they will commute to locations where services are located. Inmigrants will contribute to local government revenues through ad valorem taxes, sales taxes, mixed beverage taxes, and other local taxes and fees. Typically, residential properties do not contribute enough in tax revenues to support the general fund needs of the residents. On the other hand, property tax revenues from industrial developments, particularly those with high property values such as the proposed project, are generally much greater than the costs on general fund municipal services imposed by such developments. From a regional perspective, the proposed project and its operations inmigrants are expected to contribute more to local governmental revenues than they cost in service provision; however, the locational choices of the inmigrants will determine the specific impacts on individual communities.

4.3.21.1 Utilities

For the projected inmigrant population of 890 persons, it is anticipated that there would be an additional 0.144 MGD in additional municipal water demand.

The proposed container terminal would require access to utilities needed for operation and maintenance, typical of similar facilities. For example, telephone and fiber optic service, water supply, and electricity would be needed at the site (Berger/Abam, 2001). Detailed studies regarding the ability of current systems to provide the needed utilities would be performed during the design phase of the project. In addition to providing new access to utilities, the removal or realignment of existing utility structures within the project site would be required. Currently available information regarding existing utilities and preliminary plans for utility service requirements and relocations is summarized in Section 2.4.3.6. Utility service providers in the area are discussed in Section 3.20.

The project site is located near a very large, growing and economically viable metropolitan area. Because of the overall growth or demand on services that is typical in a metropolitan area of this size, the addition of the proposed facility and approximately 318 families to the area is not expected to result in major short- or long-term impacts on service levels. Any of several communities within the region could receive the growth anticipated as a result of the project, with the majority of the growth most likely going to communities that are able to provide the desired services.

4.3.21.2 Stormwater and Drainage

Stormwater would be treated at the project site with oil-water separators before discharge into Galveston Bay (Berger/Abam, 2001).

4.3.21.3 Solid Waste and Wastewater Collection

An additional 0.089 MGD of municipal wastewater flow is expected to occur from the projected inmigrant population of 890 persons.

Solid waste and wastewater collection services or systems would be needed at the proposed terminal site. Service providers in the area are discussed in Section 3.20.

As discussed above for other utilities, the addition of the proposed facility and inmigrant population to the metropolitan area is not expected to result in major short- or long-term impacts on service levels of local communities. Detailed studies regarding the adequacy of current systems would be performed during the design phase of the project.

4.3.21.4 Fire, Police, Emergency Medical Service, and Port Security

For the projected inmigrant population of 890 persons, the demand for police and fire/EMS personnel and emergency vehicles is projected to be:

1 Firefighter at 1.17 firefighters per 1,000 persons
3 Police officers at 348 persons per officer
0 Additional emergency vehicles (at 6,961 residents per vehicle)
2 EMS personnel at 533 residents per EMS personnel

The container facility would have its own security force that would cooperate with the appropriate Emergency Management Coordinator and local industry to provide security at the port. A Security Plan and other security measures similar to those described in Section 4.2.21.4 for the Shoal Point site would be developed and implemented.

An assessment of security risks related to container cargo is based on the difference between the number of containers that would enter the Houston area with the proposed project compared with the number of containers that would enter the Houston area with the No-Build alternative. The assessment also considers the increased efforts of all of the Federal, state, and local agencies and private parties (especially including the Port Operator's responsibilities) to assess, prevent, and respond to port security threats, including terrorist events.

Containers, by design, provide for efficient transfer of large quantities of goods from ships to truck and rail for distribution through the transportation grid of the U.S. to virtually every city in the country. Demand for container cargo nationally and in the Houston area is expected to increase in response to market demands. It is anticipated that without the proposed project, container cargo destined for the Houston area would arrive at a more distant port and be transported to the Houston market via truck or rail. The risk of an accidental or intentional event with the Build alternative would increase proportionally to the increased number of containers that enter the Houston area as compared with the No-Build alternative. However, with the increased security measures in place and planned at all U.S. ports, the local Emergency Management Plan, and the coordination of port security among all port users, the potential increased risk of a threat due to the presence of a new marine terminal would be offset.

4.3.21.5 Hospitals/Medical Services

For the projected inmigrant population of 890 persons, the demand for hospital beds and medical personnel needed is projected to be:

4	Hospital beds at 221 residents per hospital bed
2	Direct care physicians at 560 residents per physician
6	Registered nurses at 140 residents per nurse
0	Dentists at 1,982 residents per dentist

4.3.21.6 Schools

For the projected inmigrant population of 890 persons, it is anticipated that the demand for Galveston staff would be 12 teachers and 23 public school staff.

4.3.21.7 Libraries

For the projected inmigrant population of 890 persons, the library demand is projected to be:

1,228	Books at 1.38 books per capita
3,377	Total resources at 3.79 per capita
271	Additional square feet of library space

It is not anticipated that local libraries would need to hire additional staff.

4.3.21.8 Parks and Recreation Facilities

The additional projected inmigrant population of 890 persons is likely to create demand for 7 acres of various types of parkland uses, at 0.79 acre per 100 persons.

4.3.21.9 Streets and Public Transportation

This alternative would likely require the development and construction of a new four-lane bascule bridge as well as the widening of the existing two-lane roadway to accommodate a four-lane facility.

Initially, rail traffic is expected to be distributed evenly between the UPRR, BNSF, and Barbours Cut intermodal yards. A new intermodal yard, not part of this project, is expected to be constructed at a later date. This improvement would be driven by the growth of the terminal.

The proposed intermodal yard would be located on Galveston Island approximately 10 miles from the project site at an existing rail siding. No rail access would be provided at the Pelican Island alternative site.

4.3.21.10 Effects on Local Tax Revenues

Table 4.3.21-1 shows the potential effect of the proposed project at the Pelican Island site on government revenues, based on the Texas Input-Output Model. Effects would be experienced at all levels of government, including Federal, State and various local governments. Total government effect of the construction phase of the project is expected to be approximately $9.6 million, of which roughly 10 percent is anticipated to accrue to local governments. State government is expected to receive approximately 29 percent ($2.8 million) and the Federal government, 61 percent ($5.8 million).

At full operation of the project, annual government effects are expected to amount to $1.8 million annually, with a $0.2 million effect on local government, $0.5 million effect on State government and a $1.1 million effect on the Federal government.

4.4 BAYPORT ALTERNATIVE

4.4.1 Air Quality

For this alternative, direct and indirect air quality impacts associated with the construction and operation of the proposed project at the Bayport site were evaluated.

An estimate of air emissions from this alternative (JDC, 2002) was based on the same methodologies and emission factors developed from the Shoal Point alternative detailed emission calculations (see Section 4.2.1.1). It was assumed that the basic footprint and operation of the site would be similar for either alternative. The calculations were site specific, using the following as a basis:

- Site-specific values for access road length, volume of dredged material, and volume of other fill material.
- Ship emissions were based on the route to the site.
- Truck emissions were based on the route to the site.
- Distribution to the railroad yards was adjusted, as appropriate.

Bayport is located in Harris County, Texas. For consistency, the same methodologies used to evaluate the air quality impacts of the other alternative site locations were applied to this alternative. Under this alternative, the length of the oceangoing transit would be longer when compared with the Pelican Island and Shoal Point alternatives and slightly shorter when compared with the Alexander Island, Spillman's Island or Cedar Point alternatives. The motor vehicle (e.g., truck) trips would be shorter than Pelican Island or Shoal Point trips. The combined terminal equipment fleets would be the same for this alternative and the other alternatives.

Table 4.3.21-1
Government Revenues *
Pelican Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION ACTIVITIES													
Federal Government	$225,799	$1,040,356	$1,529,846	$40,732	$298,462	$780,158	$0	$0	$0	$0	$119,082	$185,748	$395,345
State Government	$115,850	$533,774	$657,157	$20,898	$153,131	$363,772	$0	$0	$0	$0	$61,097	$95,301	$202,839
Local Government	$37,696	$173,681	$251,910	$6,800	$49,826	$129,246	$0	$0	$0	$0	$19,880	$31,009	$66,000
Total Government	$379,345	$1,747,810	$2,438,913	$68,430	$501,420	$1,273,176	$0	$0	$0	$0	$200,060	$312,059	$664,185
OPERATIONS ACTIVITIES													
Federal Government	$4,635	$622,669	$220,687	$361,591	$1,035,985	$474,313	$530,675	$596,430	$652,791	$709,152	$765,514	$831,269	$1,505,663
State Government	$2,378	$319,472	$113,228	$185,521	$531,531	$243,355	$272,272	$306,009	$334,926	$363,844	$392,761	$426,498	$772,508
Local Government	$774	$103,950	$36,842	$60,365	$172,951	$79,184	$88,593	$99,570	$108,979	$118,388	$127,798	$138,775	$251,361
Total Government	$7,787	$1,046,091	$370,757	$607,476	$1,740,467	$796,852	$891,540	$1,002,009	$1,096,696	$1,191,384	$1,286,072	$1,396,541	$2,529,532
TOTAL EFFECT													
Federal Government	$230,434	$1,663,024	$1,750,533	$402,322	$1,334,447	$1,254,471	$530,675	$596,430	$652,791	$709,152	$884,596	$1,017,017	$1,901,009
State Government	$118,229	$853,245	$770,384	$206,419	$684,663	$607,127	$272,272	$306,009	$334,926	$363,844	$453,858	$521,799	$975,347
Local Government	$38,470	$277,631	$288,752	$67,165	$222,777	$208,429	$88,593	$99,570	$108,979	$118,388	$147,678	$169,784	$317,361
Total Government	$387,133	$2,793,901	$2,809,670	$675,906	$2,241,887	$2,070,028	$891,540	$1,002,009	$1,096,696	$1,191,384	$1,486,132	$1,708,600	$3,193,717

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION ACTIVITIES												
Federal Government	$1,223,593	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$5,839,122
State Government	$573,033	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,776,853
Local Government	$202,776	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$968,825
Total Government	$1,999,403	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,584,800
OPERATIONS ACTIVITIES												
Federal Government	$943,991	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$19,916,439
State Government	$484,332	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$10,218,494
Local Government	$157,593	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$3,324,921
Total Government	$1,585,916	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$33,459,853
TOTAL EFFECT												
Federal Government	$2,167,584	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$25,755,561
State Government	$1,057,365	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$12,995,347
Local Government	$360,369	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$4,293,745
Total Government	$3,585,319	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$43,044,653

Source: Texas Comptroller of Public Accounts, 1989.
* In year-2000 dollars.

Based on the most recent available air emissions inventory information provided by the EPA, the following Table 4.4.1-1 is a summary of emissions for Harris County. The emissions for each pollutant are broken out by area source, non-road mobile, on-road mobile, and point source emissions based on emissions inventory information for 1999. In assimilating data for $PM_{2.5}$ emissions, the EPA database was accessed. As this database appears to provide more current and comprehensive emissions information, the database was used as a basis for emissions information in the Final EIS. Although this emissions inventory is not current, it is the most recent data available, and it provides a relative basis from which to compare the proposed project emissions.

Localized air monitoring data in the area of this alternative are limited. Air quality monitoring stations closest to the project site are located at Shore Acres, 3903½ Old Highway 146, La Porte and on Fairmont Parkway, Houston, to the west of the site. As shown in Table 3.1.3-2, monitoring of ozone concentrations in the HGA indicate ozone levels above the NAAQS. All other pollutants were monitored below the NAAQS.

TABLE 4.4.1-1
SUMMARY OF AIR EMISSIONS FOR HARRIS COUNTY (1999)
BY SOURCE CATEGORY

Air Contaminant	Area tpy	Non-Road Mobile tpy	On-Road Mobile tpy	Point Source tpy	Total tpy
NO_x	5,621	108,188	83,356	90,635	287,800
VOC	46,493	27,615	53,162	54,852	182,122
CO	52,206	387,726	374,666	41,689	856,287
SO_2	104	19,078	4,030	38,116	61,328
PM_{10}	138,635	4,918	3,822	5,857	152,432
$PM_{2.5}$	31,176	4,476	2,305	4,344	42,301

Source: EPA, 2000f; TNRCC, 2001c and 2001d.

4.4.1.1 Impacts

Pollutant emissions from construction activities may result in short-term impacts on air quality in the immediate vicinity of the project site, including increase levels of particulate matter and vehicular exhaust emissions. As shown on Table 4.4.1-2, construction of the proposed project would result in a relative increase in emissions above those resulting from existing sources in this county. Emissions of NO_x, VOC, CO, and SO_2 (highest during Phase I) are expected to result in a less than one percent increase over existing emissions. Emissions of particulate matter from construction activities may result in increased localized concentrations in the ambient air surrounding the facility. The highest emission rates for particulate matter for this alternative would occur during Phase III of construction. Construction emissions during other phases of construction would be below these peak levels.

TABLE 4.4.1-2
PEAK ANNUAL CONSTRUCTION EMISSIONS SUMMARY
COMPARISON WITH HARRIS COUNTY EMISSIONS
BAYPORT ALTERNATIVE

Air Contaminant	Maximum Annual Construction Emissions (tpy)	Peak Year	Harris County Emissions (tpy)	Site Emissions % of Harris County Emissions
NO_x	81.9	2002	287,800	0.03
VOC	8.1	2002	182,122	0.004
CO	35.1	2002	856,287	0.004
SO_2	24.7	2002	61,328	0.04
PM_{10}	177.5	2015	152,432	0.12
$PM_{2.5}$	24.3	2,015	42,301	0.06

The peak annual operating emissions for this alternative were compared with Harris County emissions as shown on Table 4.4.1-3.

TABLE 4.4.1-3
COMPARISON OF PEAK ANNUAL ONSITE OPERATING
EMISSIONS WITH HARRIS COUNTY EMISSIONS
BAYPORT ALTERNATIVE

Air Contaminant	Maximum Annual Operating Emissions (tpy)	Peak Year	Harris County Emissions (tpy)	% of Harris County Emissions
NO_x	48.8	2006	287,800	0.02
VOC	137.4	2026	182,122	0.08
CO	43.6	2026	856,287	0.005
SO_2	56.1	2026	61,328	0.09
PM_{10}	50.3	2026	152,432	0.03
$PM_{2.5}$*	48.9	2026	42,301	0.12
TOTAL	336		1,539,969	0.02

* $PM_{2.5}$ emissions are a subset of PM_{10} emissions and are not included in emissions total.

As shown on this table, the estimated emissions would result in a small percent increase (less than 1%) over the existing Harris County emissions. To minimize emissions, terminal sponsors would comply with the requirements of the SIP, including low emission diesel and idling restrictions as well as reductions based on diesel fuel sulfur control requirements. Total operating emissions would be expected to contribute less than 1 percent to total emissions for this county.

Under this alternative, motor vehicle traffic emissions would be less than the Pelican Island or Shoal Point alternatives because this alternative is located closer to the Houston area where the bulk of the containers are expected to go. The train trip distances would also be shorter. Because Bayport is farther from the entrance of the Gulf of Mexico, the average ship travel distance would increase. As these transportation-related emissions are more regional in nature, they may be compared with emissions from the HGA, as shown on Table 4.4.1-4.

TABLE 4.4.1-4
TRANSPORTATION EMISSIONS SUMMARY OF
BAYPORT ALTERNATIVE COMPARED WITH HGA TRANSPORTATION EMISSIONS

Air Contaminant	Peak Transportation Emissions* During Operation - 2026 (tpy)	HGA Transportation Emissions (tpy)	Transportation Emissions % of HGA Transportation Emissions
NO_x	2,364	295,613	0.80
VOC	248	84,130	0.29
CO	928	593,057	0.16
SO_2	1,765	26,720	6.6
PM_{10}	114	7,697	1.5
$PM_{2.5}$	102	6,363	1.6

* Transportation emissions would peak after full build-out in 2026.

Because these are non-stationary sources, and because the background concentrations (except for ozone) in the project area are well below the NAAQS, it is expected that ambient air contaminant concentrations for PM_{10}, CO, and SO_2 would not be large enough to cause or contribute to an exceedance of an ambient air quality standard in this region, although localized SO_2 and PM_{10} concentrations may increase. VOC and NO_x emissions from the operation of container terminals, ocean-going vessels, mobile emissions, and associated activities are also included in the inventory for the SIP. These pollutants are not expected to impede attainment of the ozone standard in the HGA. In addition, because of the distance and prevailing southeast winds, emissions from this alternative would not be expected to have a major impact on the nearest Class I air quality areas.

4.4.1.2 State Implementation Plan (SIP) Conformity Review

For this alternative location, the emissions from the portion of the construction activities subject to USACE responsibility are summarized on Table 4.4.1-5 for each phase of the project:

TABLE 4.4.1-5
SUMMARY OF MAXIMUM ANNUAL CONSTRUCTION EMISSIONS
SUBJECT TO USACE RESPONSIBILITY, BAYPORT ALTERNATIVE

Air Contaminant	Phase I (tpy)	Phase II (tpy)	Phase III (tpy)
NO_x	62.8	8.9	5.1
VOC	5.9	1.3	0.9
CO	26.5	7.1	6.3
SO_2	18.6	5.1	5.0
PM_{10}	13.6	13.9	13.6
$PM_{2.5}$	4.7	2.7	2.6

For this alternative, the NO_x emissions for Phase I of the project construction emissions would exceed the 25 tpy emission rate for requiring a General Conformity Determination. Under this alternative, emissions of NO_x from Phase I would account for approximately 0.7 percent of the construction budget in the SIP (8,827.5 tpy) based on the Post-1999 Rate of Progress and Attainment

Demonstration SIP approved by the EPA in October 2001. Based on previous discussions with the TNRCC and EPA, it is likely that they would determine that the project construction emissions at this site would be included in the previously approved SIP and the recent Attainment SIP.

For Phase II and III, the VOC and NO_x emissions for project construction emissions would not exceed the emission rate for General Conformity Determination. As the emissions from each phase of the project would be less than a 10 percent increase of the VOC and NO_x emissions inventories for the entire nonattainment area, the project would not be regionally significant for purposes of General Conformity.

Because 1) the project construction emissions during Phase II and III would be exempt from the General Conformity Rule, 2) emissions during Phase I are expected to be accounted for in the SIP, and 3) the project is not regionally significant, the emissions from the project construction should not:

- Cause or contribute to any new violation of any of the NAAQS in the project area;
- Increase the frequency or severity of any existing violation of any NAAQS in the project area; or
- Delay timely attainment of the NAAQS or any required interim emission reduction in the project area.

Therefore, the TNRCC would more than likely confirm that emissions from this alternative would comply with the requirements of the General Conformity Rule and would be in conformity with the Texas SIP.

4.4.2 Roadway Traffic Impact Analysis

This section presents analyses for the unsignalized intersections, signalized intersections, and major corridors that would potentially be affected by construction of the proposed project at the Bayport alternative site. Bayport is located along the west shoreline of Galveston Bay, north of Seabrook, Texas. The traffic impact analysis was conducted for the years 2001, 2005, 2015, and 2025. Existing conditions are represented by the 2001 traffic information. The following sections describe the potential impacts of the project in terms of the differences in traffic LOS between the No-Build and Build conditions for the Bayport alternative.

4.4.2.1 Container Distribution

Anticipated container distribution for the Bayport alternative is presented in Table 4.4.2-1, based on the results of H-GAC's modeling effort. The same intermodal split described for the Shoal Point alternative in Section 4.2.2.1 (i.e., 80 percent by highway/20 percent by rail) was assumed for all alternative sites.

As indicated by Table 4.4.2-1, SH 146 to SH 225 is projected to be the primary corridor, carrying 75 percent of the container terminal traffic.

Projected daily truck volumes described for the Shoal Point alternative (see Table 4.2.2-2) would be the same for all alternative sites.

TABLE 4.4.2-1
CONTAINER DISTRIBUTION

Corridor	Distribution (% of Container Traffic) 2005	2015	2025
SH 146 to SH 225	84	84	65
SH 146 to IH 10	10	10	10
New Intermodal Railway Facility	0	0	20
Other routes	6	6	5

4.4.2.2 Intersection Analysis – Unsignalized Intersections

The SH 146 at Port Road interchange consists of two unsignalized intersections. Although both intersections have a current (2001) LOS of A (see Table 4.4.2-2 and Figure 4.4.2-1), the west intersection is congested during the PM peak hour and the east intersection is congested during the AM peak hour. Since the analysis was conducted for the PM peak hour, the west intersection becomes the critical intersection. The west intersection is projected to experience a change in LOS from A under existing conditions to C under 2025 No-Build conditions (Table 4.4.2-2 and Figure 4.4.2-2); however, it would not experience a change in LOS due to the project (i.e., relative to the No-Build conditions). In 2015 the east intersection would experience a change in LOS from A to B as a result of the project (see Table 4.4.2-2).

4.4.2.3 Intersection Analysis – Signalized Intersections

No signalized intersections were evaluated for this alternative.

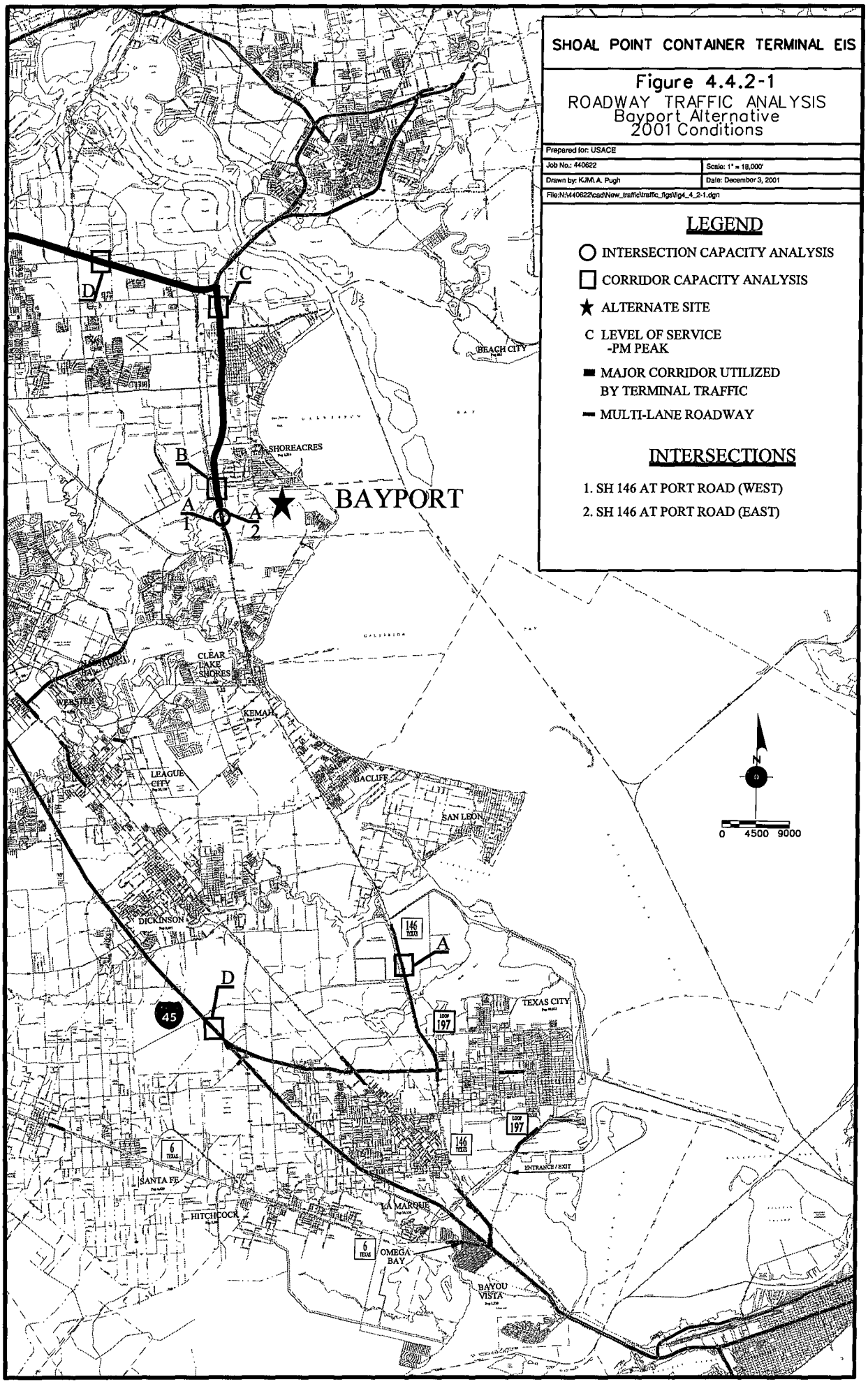
4.4.2.4 Main Corridor Analysis

Two main corridors were analyzed for this alternative: SH 225 and SH 146 (Table 4.4.2-3 and Figure 4.4.2-2). The SH 225 corridor included in the analysis for this alternative extends from SH 146 to Beltway 8. The SH 146 corridor analyzed extends from Port Road to SH 225. The Beltway 8 to Center Road segment of SH 225 is currently experiencing a poor LOS (E) (see Table 4.4.2-3 and Figure 4.4.2-1). Roadway improvements included in the model for this analysis (see Table 4.2.2-5) would improve the LOS in this segment to D in 2005 and 2015; however, by 2025, normal growth would cause the segment to return to LOS E. No change in LOS is expected on this segment as a result of the proposed project, relative to the No-Build scenario. The Center Road to SH 146 segment of SH 225 would experience similar improvements in 2005 and 2015 when roadway projects would result in a change in the 2001 LOS from D to C. By 2025, the LOS would return to D as a result of normal growth, and project-related traffic would not cause a change in LOS for this segment. The SH 146 segment from SH 225 to Shoreacres would experience a gradual change in LOS from C in 2001 to E in 2025 as a result of normal growth in the area. Project-related traffic would not result in any change in LOS on this segment relative to the No-Build scenario. The SH 146 segment from Shoreacres to Port Road would maintain a good LOS during the analysis years, ranging from B in 2001 to C in 2025 under the Build and No-Build scenarios.

TABLE 4.4.2-2

BAYPORT INTERSECTION TRAFFIC ANALYSIS

Limits	Year 2001		Year 2005 Build		Year 2005 No Build		Year 2015 Build		Year 2015 No Build		Year 2025 Build		Year 2025 No Build	
	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)
SH-146 at Port Rd. (East Side)	A	9	A	10	A	9	B	11	A	10	B	12	B	11
SH-146 at Port Rd. (West Side)	A	10	B	11	B	10	B	14	B	12	C	25	C	23


SHOAL POINT CONTAINER TERMINAL EIS
Figure 4.4.2-1
ROADWAY TRAFFIC ANALYSIS
Bayport Alternative
2001 Conditions
Prepared for: USACE
Job No.: 440622
Scale: 1" = 18,000'
Drawn by: KJM\A. Pugh
Date: December 3, 2001
File:N:\440622\cad\New_traffic\traffic_figs\fig4_4_2-1.dgn
LEGEND
INTERSECTION CAPACITY ANALYSIS
CORRIDOR CAPACITY ANALYSIS
ALTERNATE SITE
C LEVEL OF SERVICE -PM PEAK
MAJOR CORRIDOR UTILIZED BY TERMINAL TRAFFIC
MULTI-LANE ROADWAY
INTERSECTIONS
1. SH 146 AT PORT ROAD (WEST)
2. SH 146 AT PORT ROAD (EAST)
BAYPORT
BEACH CITY
SHOREACRES
CLEAR LAKE SHORES
WEBSTER
KEMAH
LEAGUE CITY
BACLIFF
SAN LEON
DICKINSON
TEXAS CITY
SANTA FE
HITCHCOCK
LA MARQUE
OMEGA BAY
BAYOU VISTA
ENTRANCE/EXIT
0 4500 9000

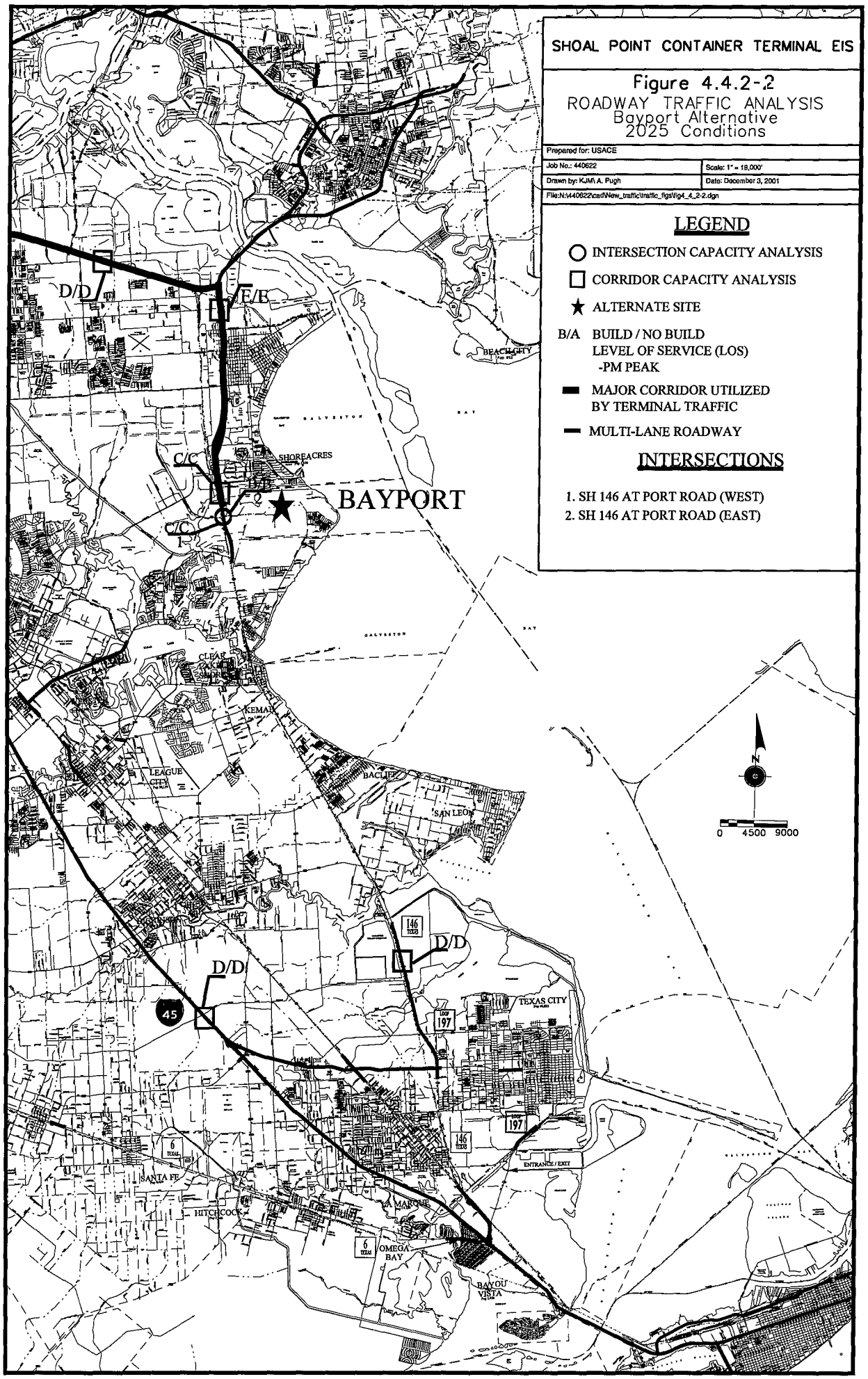

SHOAL POINT CONTAINER TERMINAL EIS
Figure 4.4.2-2
ROADWAY TRAFFIC ANALYSIS
Bayport Alternative
2025 Conditions
Prepared for: USACE
Job No.: 440622
Scale: 1" = 18,000'
Drawn by: KJM\ A. Pugh
Date: December 3, 2001
File:N:\440622\cad\New_traffic\traffic_figs\fig4_4_2-2.dgn
LEGEND
INTERSECTION CAPACITY ANALYSIS
CORRIDOR CAPACITY ANALYSIS
ALTERNATE SITE
B/A BUILD / NO BUILD LEVEL OF SERVICE (LOS) -PM PEAK
MAJOR CORRIDOR UTILIZED BY TERMINAL TRAFFIC
MULTI-LANE ROADWAY
INTERSECTIONS
1. SH 146 AT PORT ROAD (WEST)
2. SH 146 AT PORT ROAD (EAST)
D/D
E/B
C/C
BAYPORT
SHOREACRES
BEACH CITY
GALVESTON BAY
KEMAH
LEAGUE CITY
BACLIFF
SAN LEON
TEXAS CITY
SANTA FE
HITCHCOCK
LA MARQUE
OMEGA BAY
BAYOU VISTA
ENTRANCE / EXIT
45
146
197
6
0 4500 9000

TABLE 4.4.2-3

BAYPORT FREEWAY LEVEL OF SERVICE (LOS) ANALYSIS

	Alternative	Roadway	Limits	Year 2001			Year 2005			Year 2015			Year 2025		
				ADT	Density	LOS	ADT	Density	LOS	ADT	Density	LOS	ADT	Density	LOS
No Build	Bayport	SH-225	Beltway 8 to Center Rd.	111,080	36.1	***E***	122,191	27.0	D	131,524	29.5	D	142,823	33.4	***E***
			Center Rd. to SH-146	90,700	27.0	D	95,062	20.5	C	105,019	22.8	C	112,986	24.7	D
		SH-146	SH-225 to Shoreacres	73,880	21.7	C	84,108	24.9	D	96,612	29.2	D	112,354	36.9	***E***
			Shoreacres to Port Road	44,112	12.8	B	48,523	14.1	B	58,227	17.1	C	69,873	20.4	C
Build	Bayport	SH-225	Beltway 8 to Center Rd.	Not Applicable			124,800	27.7	D	135,200	30.7	D	152,900	37.9	***E***
			Center Rd. to SH-146				97,811	21.1	C	108,802	23.7	C	122,102	26.9	D
		SH-146	SH-225 to Shoreacres				86,700	25.7	D	100,100	30.6	D	121,856	44.8	***E***
			Shoreacres to Port Road				51,323	15.0	B	62,027	18.1	C	79,873	23.6	C

Year 2001: Analysis based on TxDOT Provided ADT and Existing Geometry
Year 2005: Analysis based on H-GAC Model Traffic and Geometry
Year 2015: Analysis based on H-GAC Model Traffic and Geometry
Year 2025: Analysis based on H-GAC Model Traffic and Geometry
No-Build: Existing Traffic Generators
Build: Existing Traffic Generators and Terminal Operation

Peak Hour Factor: 0.90
K factor: 10
Directional Distribution: 50-50
Percent Truck Traffic: 10%

ADT: Average Daily Traffic (Bi-directional Daily Traffic Volum
Density: Passenger Cars per Mile per Lane
LOS: Level of Service (Qualitative Measure of Effectiveness)
- Change in Level of Servic
ITALICS - Poor Level of Service
* - Density out of range

4.4.2.5 Railroad Crossing Impact

The major railroad intersections that would be affected by the container terminal at the Bayport site are Choate Road at SH 146, Fairmont Parkway at SH 146, W. Main at SH 146, and Center Road at SH 225. The Bayport alternative would affect railroad intersections with relatively low traffic volumes. The difference between the Build and No-Build scenarios would be four trains per day during ultimate design build-out (2025). Estimated increases in future average delays (i.e., seconds per vehicle of delay while a train is crossing the intersection) for each railroad crossing due to the additional train activity related to the project are presented in Table 4.4.2-4.

TABLE 4.4.2-4
ESTIMATED RAILROAD DELAY, BAYPORT ALTERNATIVE

Intersection	Year 2025-Build	
	Future Average Delay (sec/veh)	Additional Train Activity (trains per day)
SH 146 at Choate	0.08	4
SH 146 at Fairmont Pkwy	0.42	4
SH 146 at W. Main	0.24	4
SH 225 at Center Road	0.34	4

4.4.2.6 Hurricane Evacuation

In the event of a hurricane, with ample warning from the National Weather Service, the terminal would coordinate efforts of the Port Operations Manager, Terminal Managers, and Shop Foreman to activate its Hurricane Preparedness Plan (HPP) (see Section 4.2.2.7 for a description of the process used to implement the HPP). The HPP would be coordinated with and would be on file with the emergency management systems of the local county or municipality and the USCG's Commander of the Port prior to a hurricane event. Within the HPP, a point of contact would be established with whom the local agencies and USCG would share information prior to, during, and after the hurricane. The goal of the HPP is to allow the terminal to have all equipment and facilities secured and evacuated by the time the USCG's Commander of the Port closes the HSC to vessel traffic.

4.4.2.7 Construction

Most of the construction traffic to build the proposed container terminal would occur on site and most of the raw materials would be barged to the terminal site. The primary source of offsite traffic during construction of the terminal would be from the daily workers. Therefore, minimal construction traffic impact to the transportation network would be anticipated.

4.4.3 Noise

Noise associated with the Bayport alternative would be generated during the construction phase and during the operation of the facility. Major noise sources associated with the proposed project would include the construction equipment, the loading equipment used during operations, and truck traffic. In the following sections, potential impacts at the nearest noise sensitive receptors are quantified.

4.4.3.1 Construction

Noise associated with construction activities is primarily generated by the engines of the construction equipment. Analyses by the USDOT and the EPA have found that the typical noise levels of construction equipment can vary from 74 dBA to 101 dBA at a distance of 50 feet from the source (USDOT, 1995). Typical construction noise decreases by approximately 6 dB as the distance from the source is doubled. For example, if noise generated from a bulldozer is 85 dB at 50 feet, the noise level would decrease to approximately 79 dB at 100 feet and decrease to approximately 73 dB at 200 feet. Typical noise levels generated by construction equipment are listed in Table 4.2.3-1. Construction activities associated with the proposed project include the excavation and dredging of the channel, the moving and grading of placement fill, and the construction of the loading docks and berths.

Dredging within the Bayport project area would occur south of the existing Bayport Ship Channel, along the northern shoreline of the project site. Dredging activities during the construction phase of the project could occur as much as 24 hours a day, 7 days a week. Electric dredging equipment would be used where feasible within the project area in order to reduce air emissions. Depending on engine components and configuration, noise levels associated with electric dredges range from 65 dBA to 85 dBA at a distance of 50 feet (USACE, 2001a). Calculations indicate that noise levels associated with dredging activities at the nearest residential receptors will result in noise impacts. The residential subdivisions of Shady Oaks and Bay Colony, located approximately 600 feet to the north, would be exposed to noise levels ranging from approximately 50 dBA to 70 dBA, exceeding the current ambient noise environment of 51.3 to 57.6 dBA.

Construction of the facilities at the Bayport site would also include the use of typical construction equipment, some of which is included in Table 4.2.3-1. Calculations indicate that propagated noise levels associated with construction of the project would result in substantial impacts at the nearest residential receptors. Shady Oaks and Bay Colony would be exposed to noise levels that range between 59 dBA and 86 dBA.

4.4.3.2 Operations

The nearest residential receptors are located approximately 600 feet north of the container berths for this alternative. Results from the noise monitoring program conducted at the Barbours Cut Terminal (USACE, 2001a) indicate that these receptors would be most influenced by activities occurring dockside along the container berths. However, the combined sound level of all operations and activities occurring within the facility would contribute.

Calculations indicate that the nearest residential receptors located in the Shady Oaks and Bay Colony subdivisions would be exposed to noise levels of approximately 73 dBA during operations. These levels would exceed the ambient environment by approximately 15 dBA to 22 dBA, resulting in an impact.

4.4.3.3 Traffic

As discussed in Section 3.3, a noise analysis was conducted for representative residential structures (Category B receivers) located adjacent to the main roadways that could potentially be affected by construction of the proposed container terminal at the Bayport site. The results of this analysis are presented in Table 4.4.3-1. As indicated in the table, existing noise levels along all of the roadways included in the analysis for the Bayport site currently meet or exceed the NAC levels for Category B receivers and are, therefore, already impacted under the absolute criterion (defined in Section 3.3).

The noise analysis indicates that all of the roadway segments are expected to experience further noise level increases in 2025 as a result of traffic associated with normal growth in the area (i.e., the No-Build scenario).

In the Build scenario, noise levels on three out of four of the segments analyzed are expected to increase by 1 dBA over the levels predicted for the No-Build scenario in 2025. This indicates that if the project were built, the noise levels would be increased by 1 dBA over the levels predicted for these road segments due to normal growth. The analysis indicates that noise levels on the remaining segment (SH 146 from Shoreacres to Port Road) would not experience an increase over the No-Build levels.

4.4.4 Physiography, Topography, and Bathymetry

Construction of the project at the Bayport site would include dredging and grading activities. The most significant effects on bathymetry would be related to permanent alterations resulting from dredging to deepen the existing Bayport Ship Channel and to create a new berthing area and turning basin for cargo ships. An estimated 6.7 mcy of material would be dredged to construct the facility. The dredged material would be used as fill for the terminal and placed into existing upland DMPAs or used to create beneficial use areas. Surface topography changes would primarily be associated with site preparation activities for the container yard and associated access road and dredged material placement. While local changes in bathymetry and topography would occur during construction of the container terminal, these alterations would be expected to have negligible impacts on regional physiography, topography, and bathymetry of the submerged and subaerial portions of the project area.

4.4.5 Geology

The impacts on the local geology during dredging and construction activities associated with the proposed project would include redistribution of existing sediment, local increases in turbidity, and potential increases of local scouring and shoaling rates. Net impacts on local geology would be minimal from these operations.

TABLE 4.4.3-1

EXISTING AND PREDICTED TRAFFIC NOISE LEVELS FOR BAYPORT ALTERNATIVE

Study Area	NAC Category	NAC Level (dBA)	Existing 2001 (dBA)	Noise Impact at Present (2001)	Predicted 2025/No Build (dBA)	Change (+/-) (dBA)	Noise Impact with "No-Build" Option	Predicted 2025/Build (dBA)	Increase in dBA over "No-Build" Conditions
SH 225 From Beltway 8 to Center Rd.	B	67	72	Yes	73	+1	Yes	74	+1
SH 225 From Center Road to SH 146	B	67	71	Yes	72	+1	Yes	73	+1
SH 146 From SH 225 to Shoreacres	B	67	71	Yes	72	+1	Yes	73	+1
SH 146 From Shoreacres to Port Rd.	B	67	67	Yes	69	+2	Yes	69	+0

4.4.6 Energy and Mineral Resources

The proposed project would have no impacts on the energy resources within the project area. There are petroleum resources in the region but no active wells occur within the area that would be directly impacted by the project at this alternative site (see Section 3.6.3). Relocation of some existing petroleum pipelines in the area may be required depending on the exact location of the terminal but would not impact oil and gas resources. Remediation of impacted soil and/or groundwater related to pipeline spills or leaks may be required during relocation activities. Consumptive use of construction products such as sand, gravel, and cement would constitute an irretrievable commitment of these mineral resources.

4.4.7 Surface Soils

The proposed terminal location is situated on undeveloped land. Other than disruption of surface soils during construction in the immediate area of the terminal, no impacts to the surface soils within the project area would be associated with this alternative. No undesirable geotechnical phenomena would be expected at the site. Minimal surcharge conditions, if any, would be expected during the development of the site. Possible impacts to surface soils exist from the potential release of petroleum products during construction and hazardous material spills from hazardous cargo during facility operations and potential accidents during local highway transport. However, the proposed container terminal is expected to handle a minimal amount of containerized hazardous cargo and the use of BMPs for potential hazardous material spills that could occur at the terminal site would greatly minimize the potential for this type of impact.

Transportation of hazardous cargo is regulated by the U.S. Department of Transportation. Shippers of hazardous materials are required to properly package the cargo to reduce the potential of a release during transport and handling. In the event of a release during highway transport, City and local hazardous response teams are trained in spill containment and cleanup. Section 4.4.9 assesses in more detail the potential impact from a release of hazardous cargo due to increase traffic on highways near the site.

4.4.8 Groundwater Quality and Hydrology

Construction and operation activities associated with this alternative are not expected to result in impacts to groundwater hydrology, quantity and quality. The recharge of shallow groundwater underlying the site by precipitation would be reduced in areas at the terminal site occupied by impervious cover. A large portion of the surface soil at the site consists of low permeability clay and clayey loam that would tend to decrease infiltration of precipitation, and currently causes much of the rainfall to be lost to evaporation and surface runoff. The decrease in recharge from precipitation would have little affect on local or regional groundwater levels. The primary drinking water aquifers (Chicot and Evangeline aquifers) typically produce fresh water from depth of 300-700 feet and 800-1,500 feet, respectively, in the vicinity of the proposed and alternate sites. Groundwater recharge to these aquifers by precipitation occurs inland in outcrop areas. Groundwater quality in these aquifers becomes poorer near the coast where saltwater

encroachment limits the amount of available fresh water. The regional affects of this relatively small decrease in recharge on the primary aquifers in the region would be negligible.

Other possible impacts to shallow groundwater exist from the potential release of petroleum products during construction and hazardous material spills from hazardous cargo during facility operations and potential accidents during local highway transport. The proposed container terminal is expected to handle some hazardous cargo; however, the use of BMPs for potential hazardous material spills that could occur at the terminal site would greatly minimize the potential for this type of impact to groundwater quality. BMPs which meet local, State, and Federal requirements will be developed and implemented as part of the Spill Response Plan for the project to address potential spills. In addition, packages for hazardous material must conform to standards set by Research and Special Programs Administration (RSPA) of the Department of Transportation and the International Maritime Organization (IMO). A carrier accepting hazardous cargo from a shipper or intermediary is obliged to exercise reasonable care to be sure that the shipment has been properly prepared. This obligation exists each time the cargo is handed off during the transportation process. Specific requirements apply to highway, rail, air and ocean transport. These procedures will greatly reduce the risk of impact to the underlying groundwater at the site. Section 4.4.9 assesses in more detail the potential impact from a release of hazardous cargo due to increase traffic on highways near the site.

4.4.9 Hazardous Materials Site Assessment

No known existing hazardous material sites occur within the Bayport alternative site boundary (see Section 3.9.3). However, according to the regulatory agency database search and site reconnaissance, several hazardous material sites occur adjacent to the project boundary. These facilities are located along the proposed access corridor and adjacent to petrochemical industrial facilities along the Bayport Ship Channel and Turning Basin. The environmental impacts that have resulted from these facilities vary greatly; however, these sites do not appear to provide a significant environmental concern to the project.

The greatest potential for encountering contaminated media is during construction and/or widening activities of the access corridor. If contaminated media are encountered, the media should be isolated and segregated for characterization and proper disposal.

4.4.9.1 Hazardous Material Impacts to the Existing Environment from Project Construction Activities

The impacts from hazardous material use and handling during construction activities associated with the proposed project pose a minimal risk of impacts to the environment. Temporary aboveground storage tanks and equipment, vehicles, and machinery that contain oil and use diesel fuel are typically utilized during major construction projects. Impacts from the storage and handling of fuels and lubricants can be eliminated or minimized with the use of mitigation methods. Mitigation will involve the implementation of a Spill Prevention Control and Countermeasure Plan (SPCC). The SPCC plan should effectively minimize impacts of spills that occur during the construction of the facility by requiring all potential contaminants to be stored, handled, and disposed of so that the risk of accidental releases to the

environment is minimized. The SPCC plan utilizes effective best management practices (BMPs), containment and control methods, and cleanup operations. Appropriate BMPs may include secondary containment for storage tanks, and drip pans for refueling, maintenance and storage of vehicles and equipment. In the event of a spill, containment and cleanup may include sorbents such as pillows, mats and booms. The plan will include training personnel for spill prevention, operation of spill response equipment, material handling, equipment inspection and maintenance, refueling procedures, spill control and containment, and spill cleanup.

4.4.9.2 Hazardous Material Impacts to the Project from Operation Activities

Fueling of land-based and water-based equipment and vessels would take place on site. The operational component of the proposed container terminal would be expected to handle some hazardous cargo. The accidental spill of fuel, lubricants, or other potentially toxic material is inevitable; however, with proper precautions in place, the impacts to human health and the environment can be greatly reduced. Precautions include a SPCC plan that would be implemented for emergency response to hazardous material spills on the terminal site. The SPCC plan requires training personnel for proper spill prevention, notification, emergency response and containment. Extensive impervious cover and proper spill response should effectively minimize or eliminate significant impacts to soils and groundwater. The risk of impacts to surface water is greatest and may require additional safeguards. Additional information regarding accidental spills is included in Section 4.4.10.

4.4.9.3 Hazardous Materials Transport

The transport of hazardous material cargo presents the potential for impacts related to accidental spills. However, multimodal transportation is extensively regulated. In the U.S., the authority is the RSPA of the USDOT. International shipments are covered by the IMO of the UN and adhere to the IMDG. Packages for hazardous material must comply with standards set by the RSPA and the UN. A carrier accepting a hazardous cargo from a shipper or intermediary is obliged to exercise reasonable care to be sure that the shipment has been properly prepared. This obligation exists with each change of custody throughout the transportation process. Specific requirements apply to sea, air, rail and highway.

The packaging requirements for hazardous material cargo have reduced environmental impacts during shipping; however, concerns remain regarding public safety issues while the cargo is in transport on local highways. To address these concerns, the increased probability of traffic accidents was assessed along the nearest major arterial highway providing access to the proposed and alternative sites. For the Bayport Alternative, the assessment used traffic and accident data provided by TxDOT for a segment of SH 146 between Shoreacres and Port Road (see Table 4.4.2-3). The results of the assessment, as shown on Table 4.4.9-1, indicate that under the No-Build scenario, the average daily traffic (ADT) of 44,112 vehicles (as recorded in 2001) would increase approximately 58 percent to 69,873 vehicles in the year 2025. If the proposed cargo facility is constructed, the 2001 ADT is projected to increase an additional 23 percent over baseline conditions to 79,873 vehicles by the year 2025. This increase in traffic would be incremental and would occur as each of the three phases of the cargo facility become operational.

TABLE 4.4.9-1
BAYPORT ALTERNATIVE AVERAGE DAILY TRAFFIC PROJECTIONS

			Year 2001	Year 2005		Year 2015		Year 2025	
Option	Roadway	Limits	ADT	ADT	% Truck Traffic Increase	ADT	% Truck Traffic Increase	ADT	% Truck Traffic Increase
No-Build	SH 146	Shoreacres to Port Road	44,112	48,523	10%	58,227	32%	69,873	58%
Build	SH 146	Shoreacres to Port Road		51,323	16%	62,027	41%	79,873	81%

For this analysis, it is assumed that an increase in traffic would result in an equivalent increase in traffic accidents. TxDOT reported an average of five truck accidents per year from 1997 through 1999 along the segment of SH 146 between Shoreacres and Port Road. Under the No-Build scenario, with a 58 percent increase in traffic, the number of truck accidents in the year 2025 is projected to be 7.9 accidents. If the proposed cargo facility is constructed and traffic increases an additional 23 percent, the number of truck accidents in the year 2025 is projected to be 9.7 accidents. The increase in traffic accidents would also be incremental as each phase becomes operational. It is estimated that less than 5 percent of the truck traffic exiting the Barbours Cut facility is hauling hazardous material (USACE, 2001a). Therefore, while traffic accidents are projected to increase consistent with increased traffic, less than 5 percent of those accidents associated with project-related truck traffic would be expected to involve trucks hauling hazardous material cargo.

According to Federal Motor Carrier Safety Administration (March 2002), 16 percent of the traffic accidents involving trucks transporting hazardous material result in the release of the hazardous material to the environment. The level of impact to human health and the environment that could result from the release is directly proportional to several factors. These factors include the state of the spilled material (i.e., gas, liquid, or solid), the distance to the nearest occupied structures, the distance to the nearest surface water body, the response time of the hazardous material response team, and the amount of time the hazardous material was exposed to the environment. The spilled material is initially classified and is isolated to minimize widespread impacts. Isolation is used to prevent discharge to surface waters or recharge to groundwater. The cleanup of a hazardous material spill typically involves the physical removal of the spilled material. This process is performed by trained hazardous material response teams and is performed by either vacuum extraction or other methods to physically containerize the spilled material. Depending on the nature of the spilled material, an evacuation of the public within a specified radius may be performed. Once the recoverable material has been removed, any impacted soil is excavated and containerized for disposal. The excavated site is backfilled with clean fill.

4.4.10 Surface Water Quality and Hydrology

The Bayport site is on the southern shore of the inland portion of the Bayport Channel. There are no perennial surface waters that cross the site and would be affected by the alternative. Waters on the shore adjacent to the site are part of the Bayport Channel.

The main effects of this project alternative on surface water hydrology and quality would include turbidity during construction dredging and earthwork on the project site, long-term changes in runoff characteristics, and the introduction of new potential for accidental spills from containers and containerships.

Project construction would involve dredging berthing and turning areas (see Table 2-3). The dredging volume would total 6.7 million cubic yards (USACE, 2001a). During the dredging process, higher turbidity and suspended solids concentration would be produced both in the area being dredged and in the area where the dredged material is placed. This would result in short-term reduction in water quality and the water's ability to support its designated aquatic life use.

Table D-2 in Appendix D lists the elutriate and water test results for maintenance dredging on the Bayport and Barbours Cut channel projects since 1992 along with the current (TNRCC, 2000) water quality criteria. Based on a comparison of the criteria and observed levels, there has been no indication of water concentration data exceeding acceptable standards in the sediments to be dredged from the Bayport Channel or Barbours Cut areas. One exception is an isolated case in 1992 in which the elutriate copper concentration exceeded the criterion by a small amount. New work sediments that might be dredged during construction would be less likely to exhibit contamination because they have not been exposed to anthropogenic influences. Appendix D contains data confirming this point.

After construction is complete, changes to surface water quality would result from the addition of impervious cover (pavement and pier surface) and associated drainage structures where none currently exist, and from slightly increased salinity from the deepening of the channel to –45 feet MLT. Impervious cover prevents rain from soaking into the ground where it can be used by plants during dry periods. Instead, most of the rain that falls would be forced to run off of the site. In addition to reducing groundwater recharge, increased impervious cover can have adverse effects on receiving water bodies, causing erosion of the streambed (if the receiving water is a stream) and damaging aquatic habitat. While higher runoff and reduced recharge conditions would result from the project, the consequences should not be severe at this site. Since little groundwater recharge occurs at this site and drainage is directly to the Bayport Channel, rather than to streams, effects would be negligible. The facility would be required to abide by the TPDES construction and operation stormwater permits. Details of the stormwater system would be defined during final design of the project facilities. The deeper channel would allow a slight increase in salinity in the Bayport Channel.

Container vessels, like most oceangoing cargo ships, at times need to compensate for changes in cargo and fuel loads by taking on or discharging ballast water. Such water taken aboard in a foreign port could potentially transport and result in the introduction of non-native species to U.S. waters. To minimize this risk, U.S. regulations currently encourage exchange of ballast waters in the open ocean prior to entry and require reporting of any ballast water discharge. Currently there are no special provisions for receiving and treating ballast waters in Texas ports, and none is planned for this project. However, if future regulations require such facilities, they would be provided.

The proposed project would introduce a higher potential for accidental spills. The terminal would handle a large number of containers, some (less than 5 percent [USACE, 2001a]) carrying

packaged liquid products that are toxic or hazardous in some measure. Ruptures of products in these containers could result in harmful materials being released. To control such events, the facility would be designed with spill response systems to trap and remove spills and oil-water separators built into the site drainage system. A facility emergency response plan that includes appropriate procedures for each type and location of event would be completed prior to facility operation.

Another type of spill event could be associated with the fueling operations of containerships. Since this type of activity does not currently exist at the site, the addition of any fueling activity at the site would generate a new risk of water pollution from accidental spills. While such risk would increase relative to the present condition, fuel spills are rare and, typically, such spills are quite small (Section 3.9.1).

4.4.11 Texas Coastal Management Program (TCMP) Consistency Determination

If this alternative is selected and a permit application is submitted to the USACE, it would automatically trigger a review by the GLO for consistency with TCMP. As part of the permit application to the USACE, the permittee would submit a TCMP consistency statement. Any concerns expressed by the GLO would need to be addressed before the permit was granted.

4.4.12 Vegetation

According to the BEI survey (2001), Berg-Oliver Associates map (1998), and the updated jurisdictional wetlands map (USACE, 2002) of the Waters of the U.S. on the Bayport site, the footprint of the facility proposed by Texas City, including a land access corridor, would displace approximately 320 acres of uplands and a total of 41 acres of wetland communities (15.5 acres jurisdictional and 25.5 acres nonjurisdictional). The majority of wetlands within the project footprint are primarily nontidal freshwater wetlands that include sugarcane plumegrass (*Erianthus giganteus*) marshes; low areas within upland woodlands with species such as Gulf muhly (*Muhlenbergia filipes*), spikerush (*Eleocharis* spp.), mermaid weed (*Proserpinaca palustris*), flatsedge (*Cyperus* spp.), bushy bluestem, eastern gamagrass (*Tripsacum dactyloides*), switchgrass, willow oak (*Quercus phellos*) and Chinese tallow tree; and low areas within shrub-grass uplands with dominant species such as flatsedge, spikerush, dewberry and tamarix. The dominant species in these shrub-grass uplands include Chinese tallow tree saplings, eastern baccharis shrubs, Gulf muhly and bermudagrass. The upland woodland species include Chinese tallow tree stands and mixed woodlands with Chinese tallow as well as sugarberry and southern red oak. Shrub and herb level species associated with these woodlands include yaupon, eastern baccharis, wax myrtle, Macartney rose (*Rosa bracteata*), Japanese honeysuckle (*Lonicera japonica*), Alabama supple jack (*Berchemia scandens*) and dewberry.

There are also two woodland communities with tidal inlets on the Bayport Ship Channel that would be lost; one of which lines a small stream channel. Species include bulrush, rattlebox (*Ludwigia alternifolia*), and flatsedge. The larger of the two wetlands includes a broader depressional area that is a mosaic of wetlands within upland woodland. Species include Chinese tallow, black willow, sugarberry, cocklebur, (*Xanthium strumerium*), wax myrtle, bulrush, eastern baccharis, yaupon, goosefoot

(*Chenopodium album*), and smartweed (*Polygonum hydropiperoides*). These two wooded (or forested) wetlands cover approximately 3 acres.

No SAV is known to occur at the Bayport site and none was observed during field visits. However, widgeongrass may be present in the vicinity, especially north of the Bayport Ship Channel entrance. No impacts are expected to occur to SAV, including widgeongrass, as a result of this project.

4.4.13 Section 404/Section 10 Jurisdictional Areas (Wetlands and Open Water)

Of the wetland vegetation communities described above, construction of the proposed project at this site would result in the loss of approximately 15.5 acres that have been determined to be jurisdictional wetlands (described in Section 4.4.12) due to their tidal connection to the Bayport Ship Channel. The remaining 25.5 acres of wetland communities that would be displaced by project facilities are considered nonjurisdictional because a steep slope on the northern shoreline along the existing Bayport Channel, in effect, isolates these wetlands from the bay. The USACE-Galveston Regulatory Branch, following the District's guidelines for adjacency (USACE, 2001b), has jurisdiction over the 15.5 acres of wetlands described above. Dredging activities for channel and berthing areas would also impact 245 acres of open water.

4.4.14 Terrestrial Wildlife

The primary direct, adverse impact of the proposed construction activities on wildlife at the Bayport site would result from vegetation clearing and the subsequent loss of wildlife habitat. Construction activities might also result in the direct destruction of those organisms not mobile enough to avoid construction equipment. These would potentially include individuals of several species of reptiles, mammals and, if construction occurs during the breeding season, the young of some species, including nestling and fledgling birds. Fossorial animals (i.e., those that live underground), such as mice and shrews, may similarly be negatively impacted as a result of soil compaction caused by heavy machinery. For the most part, mobile wildlife species, particularly adult birds and larger mammals, would likely avoid the initial construction activity and move into available habitat outside the project area. Each species, however, is dependent upon available resources such as food, shelter, water, territory, and nesting sites in any given area of habitat (Dempster, 1975). It is assumed, for the purpose of impact analysis, that habitats are at their carrying capacity for the species that live there. Therefore, displaced wildlife populations are forced into competition with resident populations in adjoining habitats, creating an inevitable decreased birthrate and/or increased mortality rate until populations are reduced to numbers that the habitat can support. Thus, construction activity would ultimately result in a reduction in the local wildlife populations proportional to the amount of habitat preempted.

The noise of equipment and increased human activity during construction may disturb some local wildlife. In addition, fugitive dust associated with construction activities may have minor impacts on the vegetation, thus decreasing its value as wildlife habitat. Dredging activities may indirectly impact sea birds in the area by potentially reducing the availability of the food supply. Such impacts, however, should be temporary and without significant long-term implications.

Construction of the proposed Bayport facility would impact several wildlife habitat types, including upland woodlands, shrub-grass uplands, and wetland habitat. Several isolated freshwater wetlands occur at the Bayport site. Most of these wetlands would be filled during construction. Southern leopard frogs were heard during the June 2001 site visit.

While no known nesting rookeries occur at the Bayport site, sea birds do frequent the area.

Once the facility is in operation, wildlife remaining in the area could be impacted by noise, lights, and human activity. Furthermore, an increase in vehicular traffic would increase the potential for collision mortality for some wildlife species. The increased possibility of chemical or oil spills poses a threat to the nekton community and, thus, the food source of many sea birds.

4.4.15 Aquatic Ecology

4.4.15.1 Freshwater Habitats and Fauna

The Bayport site supports 38 acres of freshwater wetlands that would be lost during construction. These areas are ephemeral and contain little to no open water. They provide only limited aquatic habitat.

4.4.15.2 Open Bay/Open-Bay Bottom

Turbidity in estuarine waters is generally credited with having a complex set of impacts on a wide array of organisms (Hirsch et al., 1978; Stern and Stickle, 1978; EH&A, 1978). Suspended material can play both beneficial and detrimental roles in aquatic environments. Increased turbidity in the area can interfere with light penetration and thus reduce photosynthetic activity by phytoplankton. Such reductions in primary productivity would be localized around the immediate area of the dredging operations. Conversely, the decrease in primary productivity has been found to be offset by increased nutrient content (Morton, 1977).

Potential effects of elevated turbidities on the adult stages of various filter-feeding organisms such as oysters and copepods include reduction of pumping and filter rates and clogging of filtering mechanisms (Stern and Stickle, 1978). These effects are pronounced with high TSS levels, but are apparently reversible once turbidities return to ambient levels.

Water column turbidity would increase in open-bay habitats near the project site during dredging activities but the effects are expected to be temporary and local. Some studies of turbidity from TSS associated with dredging operations have concluded that dredging had no substantial effects on nekton (Ritchie, 1970; Stickney, 1972; Wright, 1978); however, other studies have shown that elevated TSS levels and prolonged exposure can suffocate and reduce growth rates in adult and juvenile nekton and reduce viability of eggs (Moore, 1977; Stern and Stickle, 1978). Elevated turbidities during construction and maintenance dredging may affect some aquatic organisms near the dredging activity; however, turbidities in the open-bay habitats can be expected to return to near ambient conditions after dredging ceases.

For any Beneficial Use sites that would be created, similar impacts from FLUMF and benefits to the aquatic community as described in the Shoal Point alternative (Section 4.2.15) apply.

In the event an accidental spill should occur, benthic fauna may be killed and phytoplankton may be adversely affected. It is unlikely, however, that a spill in Galveston Bay would result in long-term adverse impacts to phytoplankton, zooplankton, or benthic communities. These communities have the ability to recover rapidly from a spill due primarily to the rapid rate of reproduction of the organisms and to the widespread distribution of the dominant species. Adult crustaceans (shrimp and crabs) and adult finfish are probably mobile enough to avoid most areas of high concentrations of toxins. Larval and juvenile finfish and shellfish tend to be more susceptible to toxins than adults. Juveniles could be affected extensively by a spill during their period of active immigration. The potential for impacts from spills would be minimized by use of BMPs and spill control and prevention measures. Therefore, the impacts of dredging and placement of dredged material are both localized and temporary and are not expected to have long-term adverse impacts on the aquatic environment.

The deepening of the Bayport Ship Channel would slightly increase habitat for nekton species common in deeper offshore waters, which periodically enter the bay through the deep channel corridor (Breuer, 1962). Channel deepening would also result in a slight increase in the availability of feeding and nursery area for demersal fish (Breuer, 1972). Adverse impacts to benthos affected by channel deepening would likely be short term due to their ability to recolonize the affected area relatively quickly. Even without the proposed channel deepening, the benthos populations in the channel are subject to disturbance due to regular channel maintenance activities.

The impacts of contaminated dredged material depend on the nature of the biogeochemical environment and the contaminants. Common contaminants of sediment include heavy metals, chemical byproducts, petroleum, and organohalides. Contaminants bind to sediments which are in direct contact with benthic organisms and may be ingested (Montagna et al., 1998). Few studies have examined sediment contaminants in many areas of Galveston Bay, with the exception of the upper Houston Ship Channel, a well documented source of toxicity (GBNEP, 1994b). Based on GBNEP (1994b), elevated levels of contaminants do not occur near this alternative; therefore, impacts to benthic organisms and nekton from contaminated sediments are not expected. Stormwater runoff can carry toxic contaminants into surface waters, depositing them on sediments and potentially affecting the aquatic community. The potential for toxic runoff would increase with the building of the Bayport alternative; however, runoff from industrial point sources contributes less than 7 percent of the total loading of any pollutant, including heavy metals and biological oxygen demand, in Galveston Bay (GBNEP, 1994b). In addition, pollutant loading is expected to be minimal due to the type of facility (containerized cargo) and to the controls that would be implemented to control runoff and spills. Therefore, impacts from contamination are expected to be minimal.

4.4.15.3 Oyster Reefs

Live oyster reefs occur near the Bayport alternative (GLO, 1996b) and may be affected by project construction. Increased sedimentation due to dredging activities has the potential to cover existing oyster reefs, clogging their filter feeding ability; however, oysters can survive minimal coverage. Dredging

activities associated with construction of the Bayport alternative should not pose a long-term threat to oyster populations.

4.4.15.4 Recreational and Commercial Fisheries

The recreational and commercial fishery may be temporarily affected in the vicinity of dredging operations as a result of decreased water quality and increased turbidity during dredging, and the loss of attractiveness to fish in the area due to loss of benthic organisms. This is not a permanent condition; the quality of fishing in the project area should steadily improve after dredging is completed. Recreational fishing impacts would be temporary, potentially resulting in local disturbances to both boat and wade-bank fishing. However, recreational fishing at these locations, while locally important, constitutes a relatively small portion of the overall recreational fishing activity in the project vicinity. Construction and dredging activities in this portion of the bay are not expected to have long-term adverse impacts on fishing in the project area.

If an accidental spill were to occur, adult finfish are mobile enough to avoid the area; however, larval and juvenile finfish and shellfish could be affected extensively. Serious impacts to shrimp could also affect the commercial shrimping industry in the area if the spill is severe and widespread. The potential for impacts from spills would be minimized by the use of BMPs and spill control and prevention measures. Impacts from stormwater runoff are expected to be minimal.

4.4.15.5 Essential Fish Habitat

EFH for adult and juvenile brown and white shrimp, red drum, and Spanish mackerel occurs in the vicinity of the Bayport alternative and may include estuarine emergent wetlands, estuarine mud, sand, sand and shell substrates, SAV, and estuarine water column. Approximately 245 acres of open-bay bottom would be affected by construction of new berthing areas and deepening of the Bayport Ship Channel.

Dredging activities in open-bay bottom habitat would impact benthic communities in those areas. Although recovery of some benthic organisms would likely occur relatively quickly, the assemblage in the sediments at the bottom of the new berthing areas and Bayport Ship Channel may differ from the assemblage that existed prior to construction.

While dredged material generated by dredging at this site would be available for beneficial uses, a detailed DMMP has not been produced for this alternative. If this alternative was selected for construction of the proposed project, detailed plans for dredged material placement and beneficial uses would be required. Beneficial Use sites created for this alternative would have similar positive effects on EFH and managed species as those discussed in Section 4.2.15.5 for Shoal Point, although the location and size of the Beneficial Use sites would vary.

Increased water column turbidity during construction would be localized and temporary and the amount of open-bay bottom that would be disturbed is a small percentage of the total bay bottom. Accidental spills have the potential to impact EFH, and larval and juvenile finfish could be affected

extensively should a spill occur. The potential for adverse impacts from spills would be minimized, however, through the use of BMPs and spill control and prevention measures.

Adult and juvenile brown and white shrimp, and red drum would be temporarily and locally impacted by the loss of open-bay bottom habitat. However, as with the Shoal Point alternative, these species would experience an overall benefit by the creation of Beneficial Use sites. There would be no direct benefits to Spanish mackerel, as they are not marsh dependent; however, it is assumed that marsh habitat would be created as Beneficial Use sites which would increase prey for Spanish mackerel, potentially resulting in an indirect benefit.

4.4.16 Endangered and Threatened Species

4.4.16.1 Plants

No Federally listed endangered, threatened, or SOC plant species are known to occur within or near (less than 2 miles) the Bayport alternative. This site's upland grasslands may be able to support species including Texas prairie dawn, Houston machaeranthera, and Texas windmillgrass. However, prairie dawn is generally found in western (not eastern) Harris County and Houston machaeranthera prefers sandy loam soils of the Clodine, Gessner and Wockley series, none of which occur on this site. Texas windmillgrass could occur in the upland grassland and roadside areas, but none was observed during field visits.

4.4.16.2 Fish and Wildlife

While no Federally or State-listed species are known to occur within 2 miles of the Bayport project site, sea turtles such as Kemp's ridley and the loggerhead have been recorded from Galveston Bay and, thus, may be present in the Bayport area. If so, they could be impacted by the dredging of the Bayport Ship Channel. Dredging activities could have an impact on sea turtles through an increase in sedimentation, turbidity, and resuspension of any toxic sediments. The sedimentation may impact food sources for the turtles, and the turbidity could affect primary productivity. This would be short-term, however. The increased possibility of chemical or oil spills poses a threat to turtles both directly and indirectly through their food source. While adult sea turtles may be mobile enough to avoid areas of high oil or chemical concentrations, hatchling, post-hatchling, and juvenile turtles in the area would be more susceptible. An increase in marine traffic may result in a higher incidence of collision with sea turtles. Sea turtles are not expected to nest at the site due to lack of suitable habitat.

4.4.17 Cultural Resources

There is a high probability for unrecorded terrestrial archaeological sites to be present on this site. There is, however, little or no possibility for historic shipwrecks in the waters surrounding this site because the Bayport Channel has been in use less than 50 years.

The Bayport Alternative site is located on the Bacliff and League City, Texas, quadrangle maps. Two previously recorded sites are located within the 400-acre site of the Bayport Alternative, 41HR833 and 41HR832. Site 41HR833, identified during a survey for the Port of Houston Authority, is

located in the northeast quadrant of the alternative site. Site 41HR833, which was identified on the presence of three concrete slabs, is a historic farmstead located on a flat upland approximately 0.6 mile west of Galveston Bay. Deed research and aerial photography indicate that the farmstead was probably occupied ca. 1916 to 1956 (TARL Site Form). One artifact was recovered during subsurface testing at this site. The artifact was a clear fragment of bottle glass that was recovered between 0 and 15 inches below ground surface. Other cultural material on the surface included glass beer bottles and large metal objects that appeared to be the remains of household appliances. The investigating archaeologists were not able to ascertain if these appliances were associated with the occupation at 41HE833, or if they were the result of a recent dumping episode. Site 41HR833 does not appear to contain high research value due to its limited age and lack of associated artifacts. The recording archaeologist did not recommend any further cultural resources investigations at this site (TARL Site Form). It is not known if the THC concurred with this recommendation.

The Site Form at TARL identifies site 41HR832 as a single component historic occupation located on a bluff overlooking Galveston Bay. The site consists of 20 structure groups that encompassed 24 house foundations, 1 possible workshop foundation, 1 water tower foundation, 10 outbuildings, 3 fence lines, 9 cisterns, and 6 drilled wells. Many types of artifacts such as soda, whiskey and beer bottles; jars, aluminum and paint cans; whiteware ceramic plates, electrical wires, light bulbs, a boot, and a nut grinder were observed on the surface of the site area. However, it is not clear if this material was associated with the occupation of the site or if it was the result of a more recent dumping episode (TARL Site Form). Site 41HR832 appears to encompass a portion of the Rustic Red Bluff subdivision, an early to mid-twentieth century subdivision in Harris County. Due to its presumed recent age, the recording archaeologist did not recommend further cultural resources investigations (TARL Site Form). It is not known if the THC concurred with this assessment.

No listed or determined eligible for listing NRHP properties or SAL designated sites were identified on the 400-acre site. However, because two archaeological sites have been previously recorded and because portions of this alternative site have not been surveyed, this site has a high probability of containing unrecorded cultural resources sites. No recorded shipwrecks were identified during the file review in the waters surrounding this alternative site, and since the Bayport Ship Channel is less than 50 years old, there is no possibility that historic shipwrecks are present in the channel.

4.4.18 Commercial and Recreational Navigation

This section presents a characterization of the existing commercial vessel traffic in the Bayport Ship Channel, and analyzes the effects that a container terminal alternative placed at Bayport would have on the existing commercial navigation interests. The delays and encounters at the existing traffic level as well as projected increases in the traffic are quantified by means of simulation. These results serve as baseline conditions to be compared with corresponding calculations of the various project phases. The primary area of analysis is the Bayport Ship Channel outside of the existing harbor turning basin to the confluence with the Houston Ship Channel. This is the area that may be affected by the additional vessel traffic from the proposed container facility.

In addition to effects to deep draft commercial navigation that is the primary element of the project, this as well as other alternatives would have some effect on commercial bay fishing and recreational boating. As noted in the baseline Section 3.17, Galveston Bay is actively used by both types of small craft--bay commercial fishing vessels and recreational boaters. The northern part of the bay has a major concentration of recreational boating activity. For a variety of navigation and safety reasons, deep draft traffic must have right-of-way over small craft in the restricted deep draft channels. Increases in deep draft commerce will increase the amount of time that small craft traffic will experience some restrictions or the need to yield right-of-way in the deep channels. That would appear to be an unavoidable consequence. However, with very few exceptions, these small craft are not restricted to the dredged channels, so the limitation is small and avoidable. In addition, the amount of time that deep draft channels are actually occupied by deep draft vessels tends to be a very small portion of the day. Overall, there is a measure of use conflict between small craft and deep draft vessels, and increases in deep draft commerce will increase that conflict. However, the conflict is relatively small and will not significantly impact small craft uses.

4.4.18.1 Existing Traffic and Future Non-Container Traffic

The existing traffic in the Bayport Ship Channel and harbor comes from three facilities:

- Baytank (Houston) Inc. is a public bulk liquid storage facility, with two ship docks and four barge docks,
- PetroUnited Terminals, Inc., is a bulk liquid storage facility with one ship and two barge docks,
- Hoechst Celanese Chemical Co. has a private marine terminal.

Records of the USCG VTS for the calendar year 2000 were obtained to characterize this traffic. The frequency of vessel movements can be derived from the VTS data, as it provides times of arrival and departure at each point. Figure 4.4.18-1 presents data on ship movements per day. Figure 4.4.18-2 presents plots of vessel and tow movements at Bayport docks taken from VTS data.

The current traffic in the system consists of one-way traffic for oceangoing vessels, but two-way traffic for tows. Based on the VTS data, the arrival rates (inbound or outbound) of ships and tows at the Bayport Ship Channel are estimated to be 2.03 and 5.09 per day, respectively.

Over the approximately 20 years that would be required for the alternative to develop all three phases, it can be expected that there would be increases in vessel traffic from the existing facilities. For consistency in the analysis it is assumed that the same increase in tonnage and traffic as projected for Texas City is applicable to Bayport. This is a 45 percent increase in tonnage by the year 2020. As with the Shoal Point analysis, to be conservative it is assumed that an increase in tonnage is reflected in a proportionate increase in vessel traffic.

FIGURE 4.4.18-1
FREQUENCY OF DAILY SHIP ARRIVAL AND DEPARTURE
(VTS DATA)

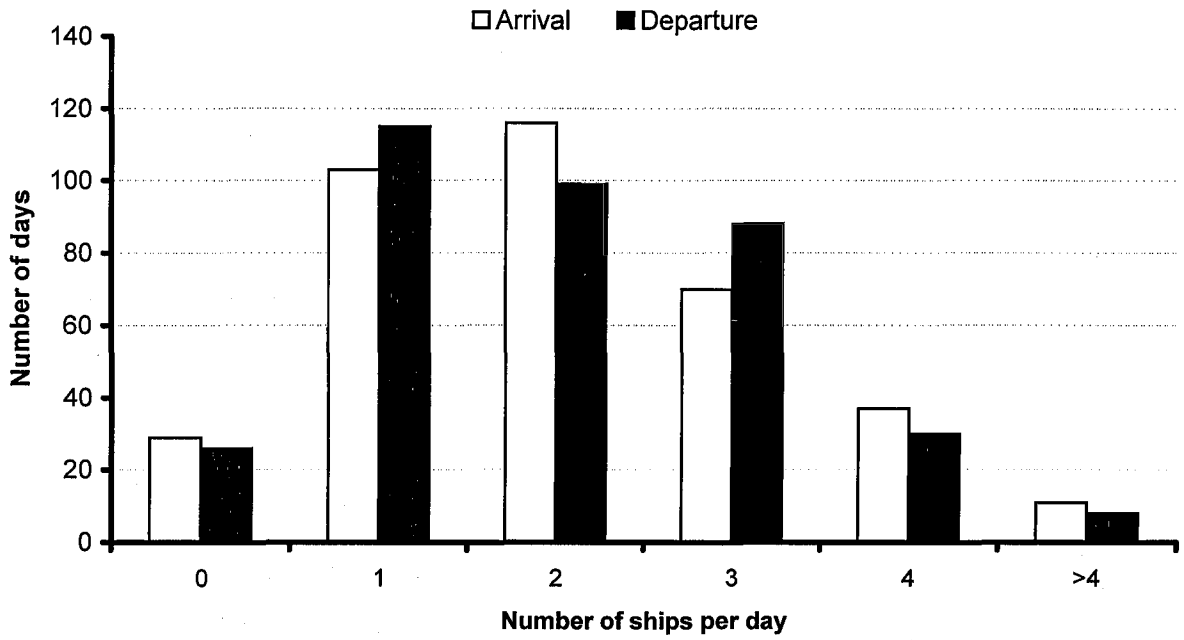
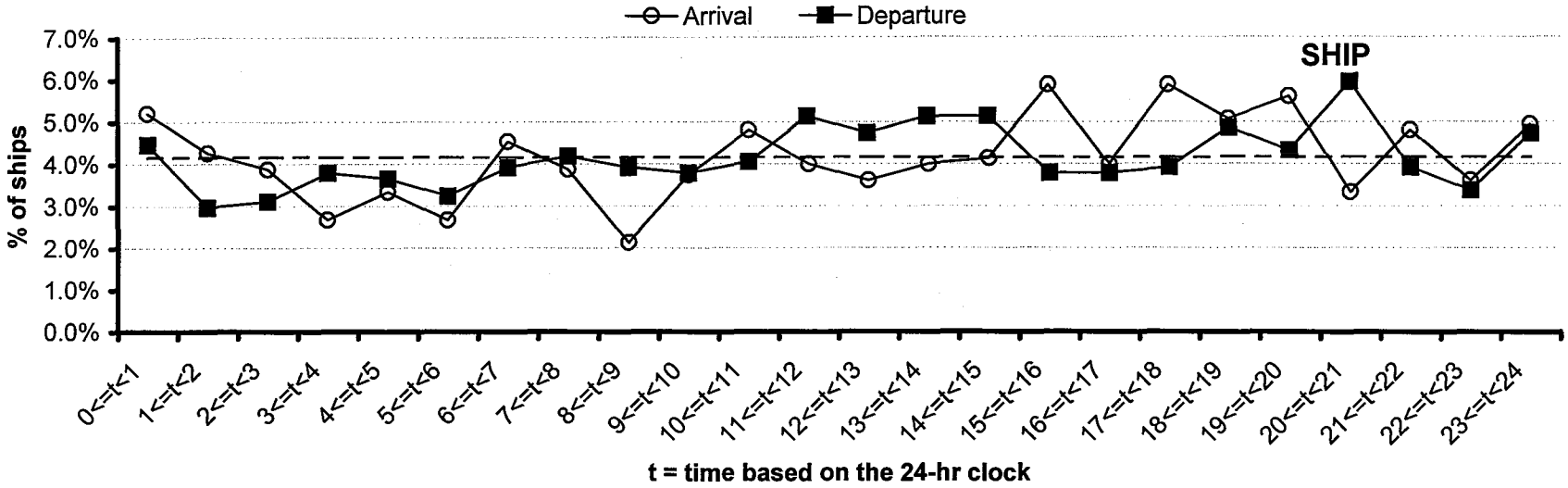
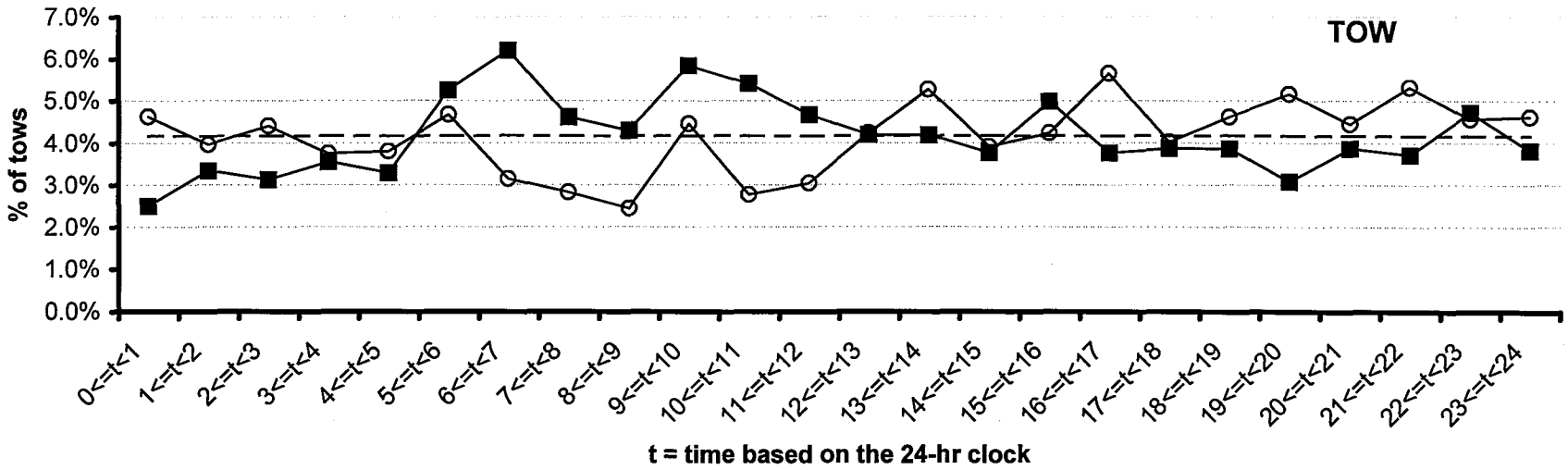


FIGURE 4.4.18-2
FREQUENCY DISTRIBUTION OF ARRIVAL AND DEPARTURE TIMES (VTS DATA)





4.4.18.2 Quantification of Navigation Effects

The basic method for quantifying the number of delays and encounters for the existing and No-Action future is to employ a numerical model to simulate the system. The model tabulates delays and encounters for each scenario being evaluated.

Vessel departures from the landward end of the ship channel, and arrivals entering the system at the Houston Ship Channel confluence, are generated in the model using a random number generator along with a probability distribution that represents the existing traffic patterns.

Using the VTS data, the arrival times of inbound vessels at the Houston Ship Channel confluence were estimated based on their approximate speeds in the channel. For outbound vessels, the times recorded in the VTS data were taken as the arrival times of outbound vessels at the landward end of the ship channel. The small travel time between dock and the channel was ignored.

The arrival times are random variables with certain probability distributions. Using the chi-square goodness-of-fit test, the numbers of arrivals per day of inbound and outbound tows were found to follow the Poisson distribution. The test was also applied to the inbound and outbound ship traffic data but these were found to vary from the Poisson distribution. Figure 4.4.18-3 shows the arrival and departure frequencies assuming a Poisson distribution with the observed average rates. Although a rigorous statistical test indicated that the observed distribution was not Poisson, for practical purposes, the frequency distribution generated using a Poisson distribution agreed reasonably well with the observed pattern. To avoid undue complication in the analysis, the Poisson distribution was also used for generating data for the ship traffic. The day-of-week patterns were also analyzed, but no significant differences were found.

Using the mean daily arrival rates and the Poisson distribution, the numbers of arrivals on each day are generated for ships and tows for both the inbound and outbound traffic for a year. The arrivals on each day were then distributed over 24 hours, taking into consideration the observed distributions.

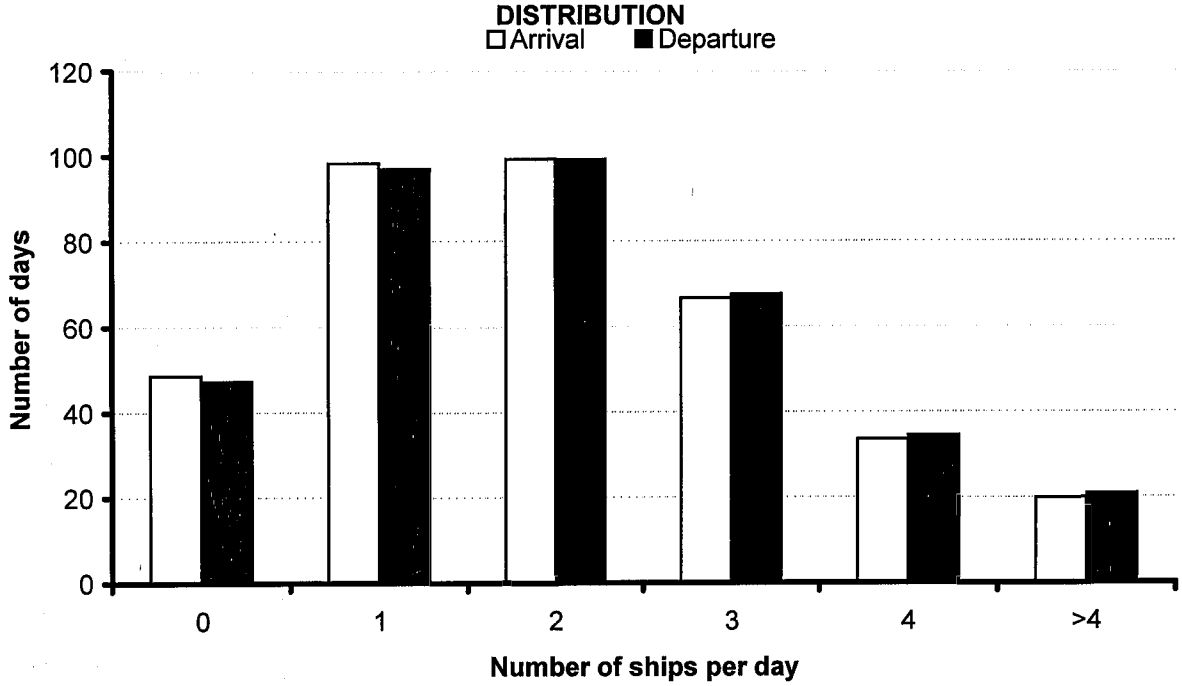
Once ships or tows enter the channel system, they are advanced at speeds defined by both the vessel type and location in the system. The speeds used are:

Tows	6 kts
Ships	6 kts in inland section of channel 8 kts in open-bay section of channel

These speeds are approximate averages. Some vessels would be faster and some slower, but the overall pattern of interactions should be approximately correct.

The randomly generated vessel traffic was put into the simulation model to determine the amount of delay, if any, for each vessel movement. For ships with one-way traffic restriction, the use of the channel was assumed to be on a first-come, first-served basis. A 5-minute margin is set for the time

FIGURE 4.4.18-3
FREQUENCY OF DAILY SHIP ARRIVAL AND DEPARTURE WITH POISSON DISTRIBUTION



between one ship leaving and another entering the channel going the opposite direction. For transit in the same direction, ships are kept at least 10 minutes apart.

Each time the simulation is run, the same pattern of traffic is generated, but each individual movement is unique. Because delays and encounters depend on individual movements, it is necessary to repeat the simulation a number of times to get a stable or reproducible answer. Changes in traffic levels can be accommodated by adjusting the number of movements per day using the same time of day distribution.

The first step in modeling the system is to estimate the traffic delays and encounters that currently exist at the year 2000 traffic level. Then, additional runs are made with an increase in non-containership traffic that might be expected in the year 2020. This increase is assumed to be the same that would exist at Texas City based on the total tonnage movement for the last 30 years because both ports predominantly handle bulk liquids.

4.4.18.3 Delays Under Baseline Conditions

Table 4.4.18-1 is a listing of simulation results of the existing system for ten independent years along with the average and range of results. On average, there are 92 ship delays in 1 year and about 6.2 percent of ship movements are delayed to some extent by the one-way traffic restriction in the Bayport Ship Channel. The average time per delay for the simulations ranges from 11.3 to 16.4 minutes, with a mean of 13.8 minutes. It appears that the variations among the simulations are not significant. The total delay time in a year divided by 365 gives the average delay time per day. There is more variation in this parameter, with a range between 2.5 to 4.8 minutes and a mean of 3.5 minutes.

Also as seen in Table 4.4.18-1, there is an average of 26 times in a year when a ship overtakes a tow in the Bayport Ship Channel study area. This amounts to about 0.7 percent of tow movements. Meetings between two tows and between ships and tows are more frequent. Ship-tow meetings average 301/year while tow-tow meetings exceed 1/day. About 8 percent of tows meet a ship in the channel, while about 11 percent of tows meet other tows in the channel.

Table 4.4.18-2 presents the results of the scenarios with a 45 percent increase in the non-containership traffic, along with results of the existing traffic level. The average delay time per day is increased by 114 percent with a 45 percent increase in traffic.

4.4.18.4 Monetary Effect of Delay Under Baseline Conditions

Vessel operating costs are used to quantify the monetary effect of delays. Cost data are available from the USACE Economic Guidance Memorandum 00-06, Deep Draft Vessel Operating Costs. Data in this publication are presented for different types of vessels, domestic or foreign, and for different tonnages. The total cost includes capital cost, fixed operating cost, and fuel cost. Both at sea and in port costs are given. The operating condition of the vessels in the ship channel is somewhat intermediate between maneuvering in port and sailing full speed at sea. Therefore, for the purpose of this study, the average of the at-sea and in-port costs was used.

TABLE 4.4.18-1
SIMULATION RESULTS FOR EXISTING BAYPORT TRAFFIC

SIMULATION	NO. OF MOVEMENTS/YR [1]		DELAYS TO NON-CONTAINERSHIPS				ENCOUNTERS					
							Overtakings of tows by non-containerships		Meetings			
									Non-containership-Tow		Tow-Tow	
	Non-con-tainerships	Tows	Number per year	Delay time per delay (min)	Delay time per day (min)	% of movements delayed	Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements
1	1547	3683	108	13.75	4.07	6.98	28	0.76	323	8.77	367	9.96
2	1485	3700	106	16.42	4.77	7.14	29	0.78	325	8.78	362	9.78
3	1511	3713	91	13.64	3.40	6.02	18	0.48	274	7.38	389	10.48
4	1458	3741	95	14.27	3.71	6.52	24	0.64	287	7.67	413	11.04
5	1438	3757	81	11.31	2.51	5.63	25	0.67	316	8.41	435	11.58
6	1506	3705	89	12.85	3.13	5.91	19	0.51	294	7.94	383	10.34
7	1459	3651	79	13.46	2.91	5.41	25	0.68	288	7.89	400	10.96
8	1465	3669	97	14.34	3.81	6.62	26	0.71	298	8.12	365	9.95
9	1477	3707	98	13.75	3.69	6.64	27	0.73	341	9.20	412	11.11
10	1470	3708	76	14.02	2.92	5.17	35	0.94	262	7.07	417	11.25
Maximum	1547	3757	108	16.42	4.77	7.14	35	0.94	341	9.20	435	11.58
Minimum	1438	3651	76	11.31	2.51	5.17	18	0.48	262	7.07	362	9.78
Mean	**1482**	**3703**	**92**	**13.78**	**3.49**	**6.20**	**26**	**0.69**	**301**	**8.12**	**394**	**10.65**
St Dev	31.9	31.2	10.9	1.28	0.66	0.67	4.9	0.13	24.8	0.67	25.1	0.63

[1] Variations in the number of movements are due to different series of random numbers generated for the simulations.

TABLE 4.4.18-2
COMPARISON BETWEEN 45% INCREASE IN NON-CONTAINERSHIP TRAFFIC WITH EXISTING BAYPORT TRAFFIC

	MOVEMENTS		DELAYS				ENCOUNTERS					
	No. of movements/year		Delays to non-containerships				Overtakings of tows		Meetings			
							By non-containerships		Non-containership-Tow		Tow-Tow	
	Non-container-ships	Tows	Number per year	Delay time per delay (min)	Delay time per day (min)	% of movements delayed	Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements
Existing traffic												
Mean [1]	1482	3703	92	13.78	3.49	6.20	26	0.69	301	8.12	394	10.65
45% increase in non-containership traffic												
Mean [1]	2161	5389	189	14.38	7.46	8.74	54	1.00	637	11.82	855	15.86
% change [2]	45.8%	45.5%	105.4%	4.4%	113.7%	40.9%	109.8%	44.6%	111.7%	45.5%	116.8%	49.0%

[1] Mean results of 10 simulations.
[2] % change referenced to the existing traffic condition.

The most common ship according to the year 2000 VTS data had a length of 580 feet. Based on interpolation of presented data in the USACE memorandum, the hourly total cost for a 580-foot-long foreign flag tanker with non-double hull is $673. This cost was used to estimate the cost of delay of the non-containership traffic.

Figure 4.4.18-4 presents the calculated delay costs to the current and projected traffic. The average delay cost per day increases from $39 with existing traffic level to $84 with a 45 percent increase in traffic. Such costs are an accepted part of commercial operations. In practice, such delays are rarely directly noted or viewed as significant. However, there are times when a delay can incur some additional costs, and the cumulative effect of small delays can become significant in some cases.

4.4.18.5 Tow and Ship Encounters Under Baseline Conditions

Table 4.4.18-1 also shows the number of overtakings and meetings. For each type of encounter (overtaking of tow by ship, ship-tow meeting and tow-tow meeting), the apparent percentage increase in encounters is more than double the percentage increase in traffic.

4.4.18.6 Navigation Effects Approach

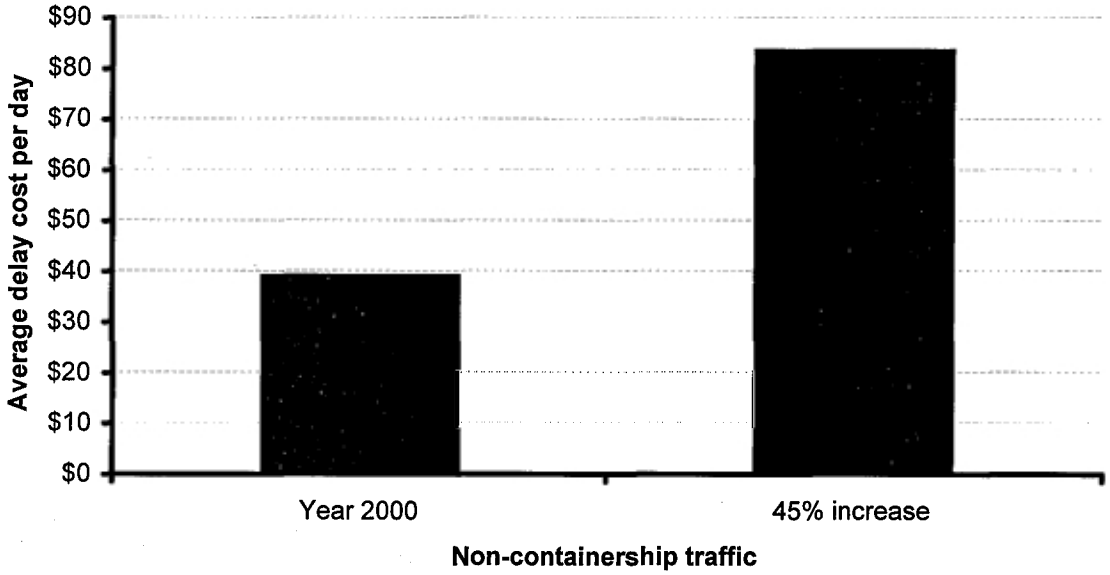
A container facility at Bayport would increase the number of vessel movements in the Bayport Ship Channel, and it would change the mix and timing of vessel traffic. These changes can reasonably be expected to affect existing operations to some extent. The purpose of this section is to quantify those effects or impacts.

Several measures of effects are employed. The first is qualitative, simply the percentage increases in new movements over existing movements. The second is a measure of traffic density, quantified as the number of new encounters, both meetings and overtakings, which result from the added vessel movements. These encounters are related to the existing rates of meetings and overtakings in the channel. At some level these encounters represent opportunities for vessel collisions, but the relation between encounters and collisions cannot be expected to be linear. The third measure of project effects is traffic delays. Both encounters and delays are determined through simulation of traffic movements and placed into context of the encounters and delays that currently exist.

To briefly summarize, the project involves three phases. The first phase will average one containership port call per day, with Phase II averaging three per day and Phase III averaging five port calls per day. Each containership port call is assumed to require one bunkering barge trip. Each project phase has a 2,000-foot dock section.

For containership traffic, the average number of arrivals or departures per day is one, three, and five for Phases I, II, and III, respectively. On a particular day, the actual number of arrivals was selected randomly from three numbers – the average, average minus one, or average plus one. For example, in Phase I, the number of arrival on a particular day could be zero, one, or two. The same was done for departures. The time of arrival or departure of a containership was assumed to follow a pattern similar to that at Barbours Cut, which is shown in the Shoal Point analysis in Section 4.2.18.

FIGURE 4.4.18-4
AVERAGE DELAY COST PER DAY FOR EXISTING AND PROJECTED NON-CONTAINERSHIP TRAFFIC



Bunkering tow traffic to service containerships was also simulated. It was assumed that each containership would require one bunkering tow that would originate from the Houston Ship Channel, either from Houston or Texas City. The time that an inbound bunkering tow entered the channel was randomly generated such that the vessel arrived at the dock between 0 and 3 hours after the arrival of the corresponding inbound containership. The bunkering tow was assumed to leave 5 hours after arrival.

The landward end of the ship channel was assumed to be the starting point of all outbound containerships and bunkering tows in the simulations. The same location was assumed to be the end point of inbound bunkering tows. Turning of inbound containerships was assumed to occur in the existing turning basin. The turning operation was assumed to require 20 minutes and to cause additional delay to outbound ship traffic. However, details of movement after turning were not simulated. It was further assumed that during transit in the channel, an inbound containership must stay at least 20 minutes behind another inbound containership to allow for turning and docking time.

The average estimates of ten simulations for each project phase are shown in Table 4.4.18-3 for the existing non-containership traffic and Table 4.3.18-4 for a 45 percent increase in non-containership traffic. For Phase I and existing ship traffic, the addition of the containership traffic results in an increase of 50 percent in the ship traffic. The increase would ultimately rise to 246 percent, i.e., the total ship traffic would more than triple the existing level. If the non-containership traffic increases by 45 percent, the Phase III containership traffic would result in an increase in ship traffic of 169 percent.

Figure 4.4.18-5 presents the non-containership delay information from the two tables graphically. As can be seen from the figure, the addition of the containership traffic would result in a very large increase in both the number of delays to the non-containership traffic as well as the average delay time per day. In Phase III, the average delay time per day would increase by about 563 percent, with the existing traffic level as a base, to 394 percent if the base traffic level is 45 percent higher.

The delays to the containerships are presented in Figure 4.4.18-6. The delay could be caused by either the non-containership traffic or another containership. With the existing ship traffic level, in Phase I, 9.3 percent of the containership movements would be delayed but in Phase III, 25.0 percent of the movements will be delayed. These percentages increase slightly to 12.3 percent and 27.5 percent with 45 percent increase in the non-containership traffic. The average delay time per day ranges from about 3 minutes in Phase I with existing ship traffic to about 63 minutes in Phase III with 45 percent increase in non-containership traffic.

4.4.18.7 Monetary Effect of Delay Under Project Conditions

Ship operating costs have been presented in Section 4.3.18. For containership traffic, the following table based on the USACE memorandum shows the hourly total costs for different sizes of foreign containerships:

TEU	2,200	2,500	2,800	3,000	3,500	4,000	4,800	6,000
DWT	31,000	35,000	39,000	42,000	49,000	55,000	66,000	82,000
Hourly total cost	$943	$1,020	$1,129	$1,174	$1,280	$1,357	$1,477	$1,905

TABLE 4.4.18-3
SUMMARY OF BAYPORT SHIP CHANNEL TRAFFIC SIMULATIONS WITH YEAR 2000 LEVEL OF NON-CONTAINERSHIP AND TOW TRAFFIC

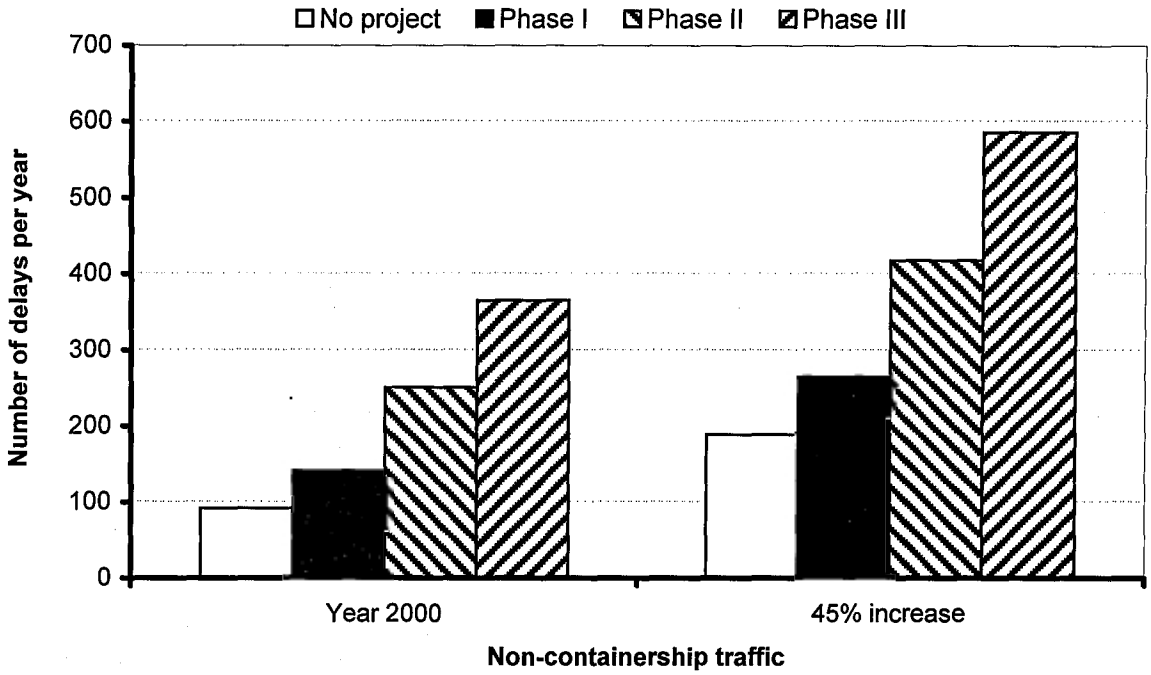
	MOVEMENTS			DELAYS								ENCOUNTERS									
	Number of vessel movements/year			Delays to non-containerships				Delays to containerships				Overtakings of tows				Meetings					
												By non-containerships		By containerships		Non-containership-Tow		Containership-Tow		Tow-Tow	
	Non-container-ships [3]	Tows [4]	Container-ships [5]	Number per year	Delay time per delay (min)	Delay time per day (min)	% of movements delayed	Number per year	Delay time per delay (min)	Delay time per day (min)	% of movements delayed	Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements
No project																					
Mean [1]	1482	3703		92	13.78	3.49	6.20					26	0.69			301	8.12			394	10.65
Phase I																					
Mean [1]	1472	4442	735	140	16.73	6.41	9.50	68	17.15	3.20	9.25	33	0.74	14	0.32	366	8.24	180	4.06	579	13.03
% change [2]		19.9%	49.6%	52.1%	21.4%	83.6%	53.1%					28.5%	7.4%			21.6%	1.4%			46.8%	22.4%
Phase II																					
Mean [1]	1488	5903	2192	251	19.52	13.43	16.86	374	19.76	20.23	17.05	38	0.64	57	0.96	493	8.35	710	12.03	1013	17.16
% change [2]		59.4%	147.9%	172.8%	41.6%	284.5%	171.8%					46.9%	-7.7%			63.9%	2.8%			157.0%	61.2%
Phase III																					
Mean [1]	1470	7388	3644	365	23.15	23.16	24.87	912	22.39	55.95	25.03	54	0.72	124	1.68	605	8.19	1482	20.06	1583	21.42
% change [2]		99.5%	245.9%	297.1%	68.0%	563.3%	300.9%					109.0%	4.8%			101.3%	0.9%			301.5%	101.3%

TABLE 4.4.18-4
SUMMARY OF BAYPORT SHIP CHANNEL TRAFFIC SIMULATIONS WITH 45% INCREASE IN NON-CONTAINERSHIP AND TOW TRAFFIC

	MOVEMENTS			DELAYS								ENCOUNTERS									
	Number of vessel movements/year			Delays to non-containerships				Delays to containerships				Overtakings of tows				Meetings					
												By non-containerships		By containerships		Non-containership-Tow		Containership-Tow		Tow-Tow	
	Non-container-ships [3]	Tows [4]	Container-ships [5]	Number per year	Delay time per delay (min)	Delay time per day (min)	% of movements delayed	Number per year	Delay time per delay (min)	Delay time per day (min)	% of movements delayed	Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements	Number per year	% of tow movements
No project																					
Mean [1]	2161	5389		189	14.38	7.46	8.74					54	1.00			637	11.82			855	15.86
Phase I																					
Mean [1]	2140	6161	735	262	17.51	12.58	12.26	91	16.69	4.15	12.33	64	1.03	21	0.34	735	11.93	257	4.17	1104	17.92
% change [2]		14.3%	34.0%	38.8%	21.8%	68.6%	40.3%					18.2%	3.4%			15.4%	0.9%			29.1%	13.0%
Phase II																					
Mean [1]	2130	7531	2186	418	20.01	22.94	19.64	439	20.31	24.47	20.10	69	0.91	74	0.98	890	11.83	899	11.94	1641	21.79
% change [2]		39.7%	101.2%	121.4%	39.1%	207.5%	124.7%					27.9%	-8.6%			39.8%	0.1%			92.0%	37.4%
Phase III																					
Mean [1]	2158	9060	3647	586	22.93	36.83	27.17	1003	22.77	62.58	27.50	95	1.05	154	1.70	1103	12.17	1802	19.89	2399	26.48
% change [2]		68.1%	168.8%	210.3%	59.4%	393.6%	210.8%					76.7%	4.9%			73.2%	3.0%			180.7%	66.9%

[1] Mean results of 10 simulations.
[2] % change referenced to the no-project condition.
[3] Variations in the number of ship movements are due to different series of random numbers generated for the simulations.
[4] Include bunkering tows associated with containership traffic.
[5] Percentages shown in this column represent the % changes relative to the no-project ship traffic.

FIGURE 4.4.18-5
NUMBER OF DELAYS TO NON-CONTAINERSHIPS AND DELAY TIME PER DAY FOR TWO LEVELS OF NON-CONTAINERSHIP TRAFFIC



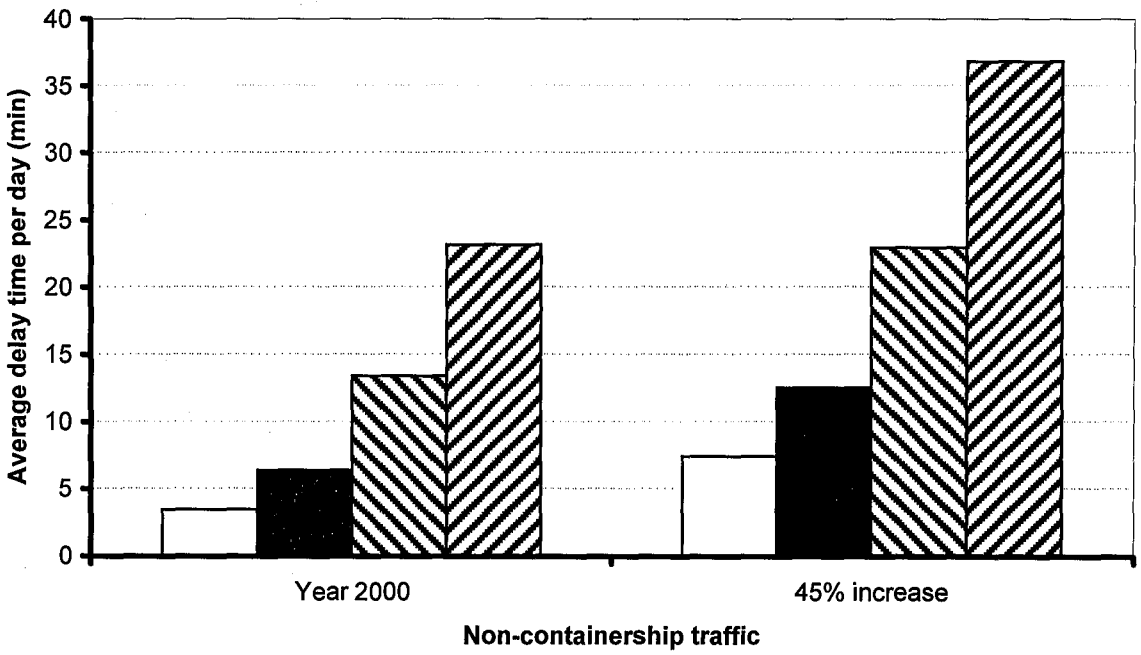
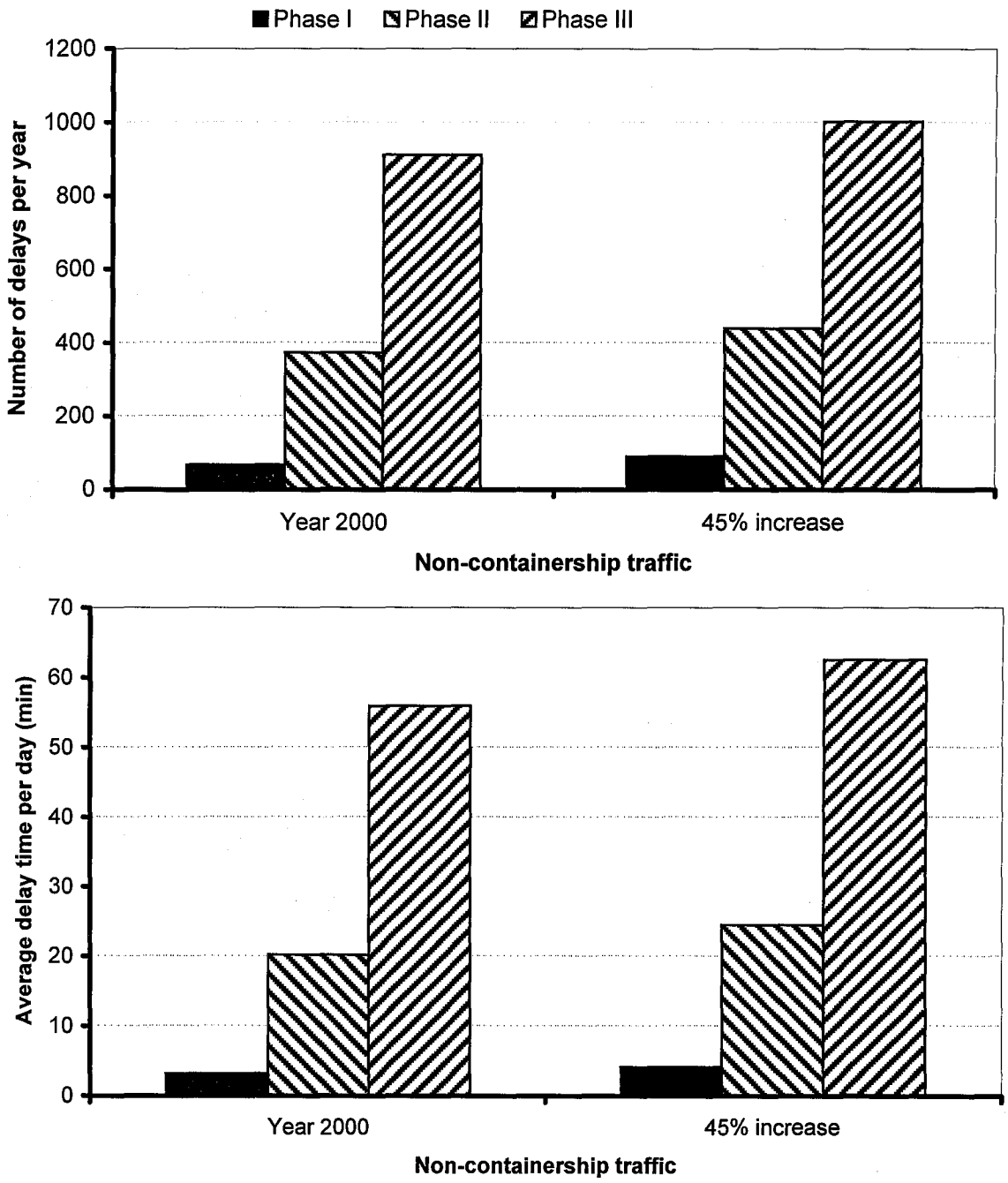


FIGURE 4.4.18-6
NUMBER OF DELAYS TO CONTAINERSHIPS AND DELAY TIME PER DAY FOR TWO LEVELS OF NON-CONTAINERSHIP TRAFFIC



The cost for 55,000-DWT, 4,000-TEU vessels is used for containerships. Figure 4.4.18-7 presents the calculated delay costs for the non-containerships and containerships respectively. The average delay cost per day for the non-containership traffic increases from $39 with existing traffic to $413 in Phase III with 45 percent increase in non-containership traffic. The average delay cost per day for the containership traffic increases from $72 in Phase I with existing non-containership traffic to $1,415 in Phase III with 45 percent increase in non-containership traffic.

These estimates of delay cost based on vessel operating costs are a crude approximation of the real cost of congestion on port operations. Some delays are an accepted part of operations, but some can result in significant costs. The main utility in this analysis is as a measure of change, and from that perspective the increased traffic in a one-way channel can be expected to produce a marked percentage increase in congestion costs in the future. In some cases this congestion can be expected to cause significant costs to landside facility operations.

4.4.18.8 Tow and Ship Encounters Under Project Conditions

As noted earlier, the present traffic pattern is to allow ships and tows to meet and overtake in the Bayport Ship Channel. One of the effects of the container project would be to increase the number of such vessel encounters. This effect has also been quantified with the simulation model.

In principle, the addition of the containership traffic should not have any significant effect on the interaction between the non-containership traffic and the tow traffic. The time of an encounter may be changed due to delay of ship traffic but the number of encounters should remain about the same. Therefore the increase in the number of overtaking of tows by non-containerships or the increase in the number of meetings between tows and non-containerships actually results from the increase in tow traffic due to the addition of the bunkering tows.

The total number of tow and ship encounters (either overtaking or meeting) would be increased substantially as a result of the tow and containership encounters. Moreover, the number of meetings between tows would also be increased significantly because of the addition of the bunkering tow traffic. The results are shown in Figure 4.4.18-8.

In Phase III, the number of overtakings of tows by non-containerships would approximately double due to the project. The number of overtakings of tows by containerships increases from 14 in Phase I to 124 in Phase III with existing traffic level, and increases from 21 in Phase I to 154 in Phase III with a 45 percent increase in non-containership traffic. Nevertheless, even in Phase III, overtaking of tows by ships is an infrequent occurrence. In all scenarios simulated, less than 3 percent of the tows experience overtaking.

The project produces a substantial increase in meetings in the channel. The biggest percentage increase is for ship-tow meetings, primarily because of the increase in the ship traffic (including containerships). The percentage increase in tow-tow meetings is comparatively smaller.

FIGURE 4.4.18-7
AVERAGE DELAY COST PER DAY FOR NON-CONTAINERSHIPS AND CONTAINERSHIPS FOR TWO LEVELS OF NON-CONTAINERSHIP TRAFFIC

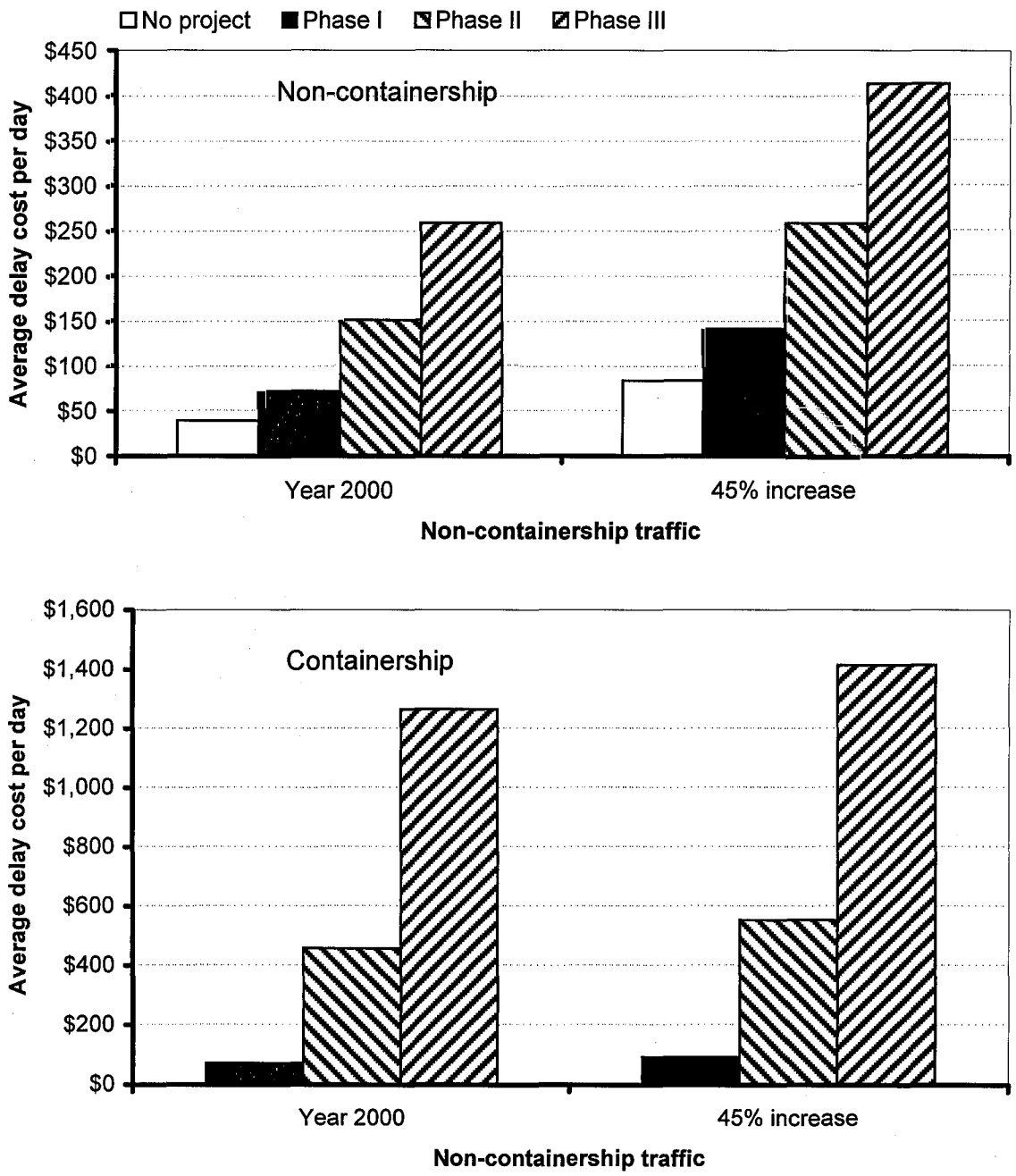
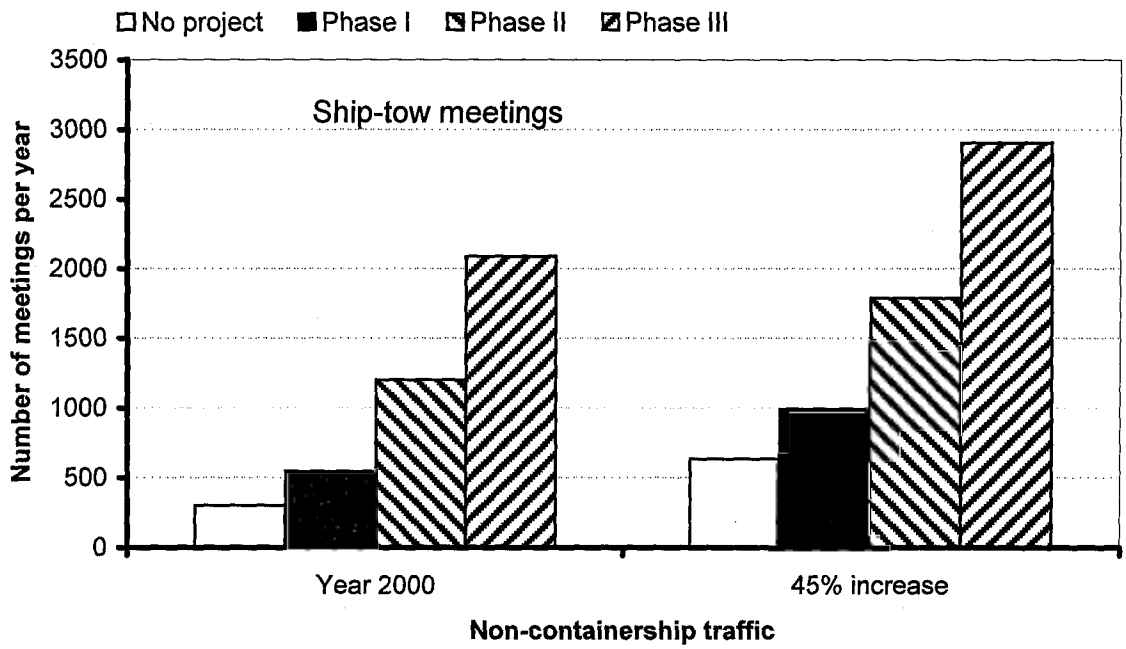
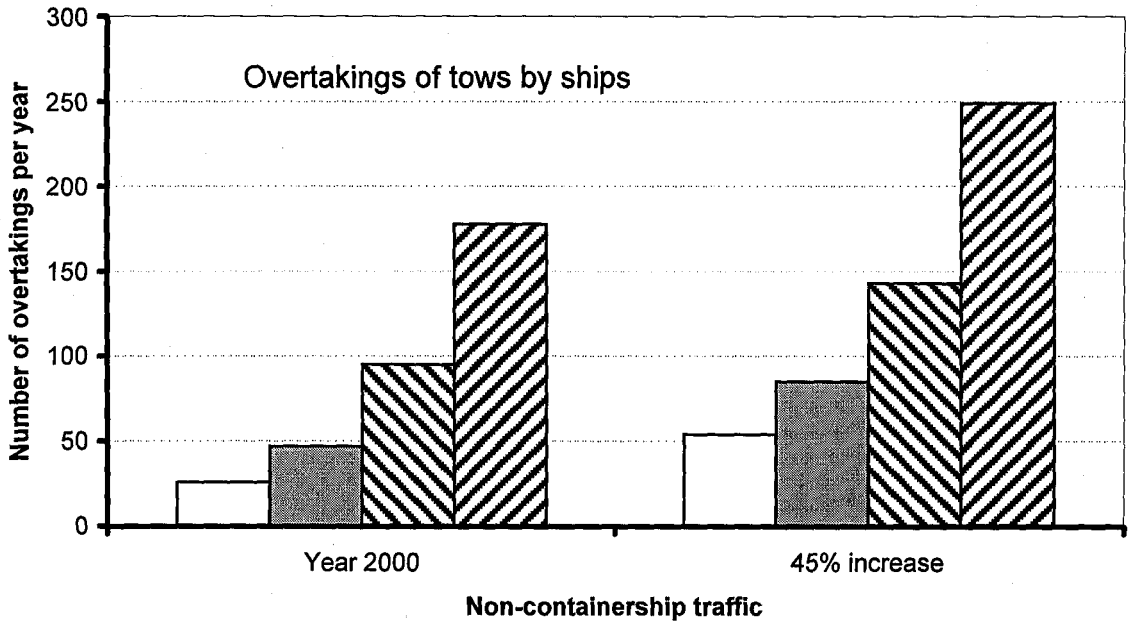


FIGURE 4.4.18-8
NUMBER OF MEETINGS AND OVERTAKINGS OF TOWS FOR TWO LEVELS OF NON-CONTAINERSHIP TRAFFIC





4.4.19 Land Use/Recreation/Aesthetics

4.4.19.1 Land Use

Site-related Impacts. The Bayport site is an area of shrub/brush rangeland with a small portion of managed pastureland, situated on the south shore of the Bayport Ship Channel adjacent to existing industrial sites. To the north lies the residential community of Shoreacres, and three other incorporated communities lie within 1 mile of the site (see Section 3.18.2.3). Industrial uses are generally incompatible with residential land uses. However, Shoreacres lies adjacent to the Bayport Ship Channel and is already influenced by industrial activity across the channel from Shoreacres. Thus, the adjacent land use change would be quantitative rather than qualitative. Nevertheless, location of the project at the Bayport location would introduce a greater level of industrial uses adjacent to residential neighborhoods.

Transport-related Impacts. The major roadways which would receive traffic generated by container terminal activity from the Bayport site are SH 146 and SH 225.

SH 146 is projected to receive virtually all of the truck traffic from the Bayport alternative, or approximately 10,000 truck trips daily by 2025. Traffic volumes along SH 146 are expected to increase by approximately 58 percent by 2025 without the proposed project. The additional project traffic would add an extra 13 to 23 percent. SH 146 passes through largely commercial and industrial areas in various communities. The introduction of an additional 10,000 truck trips a day along this roadway does not present an incompatible use, although as noted in Section 4.2.2, improvements will be needed to SH 146 to accommodate projected traffic volumes (with or without the project) to maintain an acceptable level of service.

SH 146 intersects with SH 225, which would also receive approximately 10,000 additional truck trips per day from the proposed Bayport alternative site. SH 225 passes through highly industrialized areas and the addition of project truck traffic would not introduce an incompatible land use along this highway.

In addition to traffic on major freeways, Port Road, which is the proposed access road for the Bayport site, would receive an additional 10,000 ADT in truck traffic. This may present congestion problems for residents in El Jardin del Mar subdivision, who currently must use Port Road or Todville Road for access to and from their residences.

Labor Force-Related Impacts. Additional housing, commercial and public land uses would be required to serve the projected 981 inmigrant population of operations workers and their families. Assuming the same land uses per 100 individuals shown in Table 4.1.19-1, the demands generated by the inmigrant population would include approximately 40.8 acres of residential land uses, 3.8 acres of commercial uses, 43.5 acres of public, semipublic and park uses, and 40.2 acres of streets.

Secondary Impacts. Construction and operation of the proposed container terminal at this site would contribute to the conversion of currently undeveloped land to industrial use. The addition of the facility to the area may lead to the potential development of secondary, or ancillary growth effects in

the general vicinity. This development would likely include facilities associated with the development of private sector commercial support industries, such as transportation centers, convenience stores, or distribution warehouses. These secondary land use changes that may occur as a result of the proposed container facility are consistent with nearby industrial land uses and would not introduce a new element in the area. However, they would increase the amount of industrial or commercial land uses in close proximity to residential developments. Residential and industrial/commercial developments are generally considered incompatible land uses. Regardless, the potential addition of these secondary facilities would represent a small portion of the overall land use changes likely to occur in the area over the next several years with or without the project.

4.4.19.2 Recreation

The nearest recreational site for the Bayport alternative is the Houston Yacht Club, which lies north of the channel on the bay. It is not anticipated that the proposed project at the Bayport site would significantly affect recreational activities at the Yacht Club site, at other local parks, or at the Girl Scout camp near Pine Gully, except to the extent that additional shipping traffic may somewhat diminish the recreational enjoyment of boating in the area. However, additional opportunities for recreational ship watching may be created in the area.

Location of the port facilities at the Bayport alternative site are not expected to significantly interfere with recreational fishing activities (see Section 4.4.15). No known bird rookeries occur at the Bayport site, but sea birds do frequent the area. Bird watching activities could be adversely affected if bird nesting or roosting is disturbed at the project site or in the nearby environs of the project site (see Section 4.4.14 for additional information).

4.4.19.3 Aesthetics

As discussed in Section 3.18.4, most of the access to views of the ship channel from the Shoreacres side of the channel are from private residences. Generally, there are privacy fences, vegetation, and berms which somewhat obstruct the view from Shoreacres. Moreover, the view toward the channel currently includes ships and industrial development in the foreground view. Nevertheless, a development of the size of the proposed project would introduce a dramatic change in the view from one with some industrial elements to one dominated by industrial activity and structures.

4.4.20 Socioeconomics

4.4.20.1 Population

For all alternatives, including the Bayport site, the available construction labor force is expected to offer adequate labor to complete construction work without the importation of workers from outside the subregion most proximate to the site.

For operations-phase employment, an adequate local labor force would not likely be available to fill all employment positions. Table 4.4.20-1 shows the number of operations workers which may relocate to the Bayport region. Inmigration of workers is expected to begin in 2003, with 65 workers,

Table 4.4.20-1
Population and Housing Effects
Bayport Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
BAYPORT ALTERNATIVE														
Direct Construction Jobs Created	43	0	0	0	0	0	0	0	0	0	0	0	0	0
Available Construction Workforce (RAZ 88,89,91,92)	75	76	77	78	80	81	82	83	84	85	85	86	87	88
Inmigration of Construction Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Operations Jobs Created	0	0	153	177	201	225	253	277	301	325	352	376	400	452
Available Operations Workforce (RAZ 88, 89, 91. 92)	87	88	90	91	92	94	95	96	97	98	99	100	101	102
Inmigration of Operations Workers	0	0	64	86	109	131	158	181	204	226	253	276	299	350
Secondary Family Growth	0	0	115	155	196	237	285	326	367	408	457	498	539	631
Total Potential Inmigration	0	0	178	241	305	369	443	507	571	635	710	774	839	981
Housing Units Needed for Inmigration	0	0	64	86	109	131	158	181	204	226	253	276	299	350

Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
BAYPORT ALTERNATIVE										
Direct Construction Jobs Created	0	0	0	0	0	0	0	0	0	0
Available Construction Workforce (RAZ 88,89,91,92)	89	90	90	91	92	93	94	95	96	96
Inmigration of Construction Workers	0	0	0	0	0	0	0	0	0	0
Direct Operations Jobs Created	452	452	452	452	452	452	452	452	452	452
Available Operations Workforce (RAZ 88, 89, 91. 92)	103	104	105	106	107	108	109	110	111	112
Inmigration of Operations Workers	349	348	347	346	345	344	343	342	341	340
Secondary Family Growth	629	627	626	624	622	620	619	617	615	613
Total Potential Inmigration	978	975	973	970	967	964	962	959	956	953
Housing Units Needed for Inmigration	349	348	347	346	345	344	343	342	341	340

and escalate to 350 when the project becomes fully operational. Also shown in Table 4.4.20-1 are the additional family members which could be expected to accompany the project operations workers. Total population increase resulting from direct employment during the operations phase of the project is expected to amount to 981 at full operation.

4.4.20.2 Environmental Justice

EJ Index Methodology

The DVMAV data for Bayport (Appendix G-3) show that the area has a lower proportion of ethnic minorities than the overall state minority percentage. Within the 50-square-mile area surrounding this alternative, 15.8 percent of the population is of minority status, as compared with 39.4 percent statewide. The overall minority status is ranked 1.

The DVECO data for Bayport show that the area also has a lower proportion of economically stressed residents than the overall state percentage. Within the 50-square-mile area surrounding this alternative, 15.3 percent of the population is economically stressed, as compared with 27.6 percent statewide. The overall economically stressed status is ranked 1.

According to the EJ Index, the overall EJ potential for the 50-square-mile area at Bayport is ranked 2.

Census Tract Analysis

The percentage of African Americans in the Bayport alternative is 2.5 percent, which is far less than Harris County (18.9 percent) and the state (11.7 percent). Census tracts that exceed the threshold of 10 percent over the county's percentage of African Americans are 366.02 and 366.41. The average percentage of Hispanics is 5.8 percent, which is approximately three-quarters below the county (22.5 percent) and the state (25.2 percent) average. The only census tract that exceeds the threshold of 10 percent over the county's percentage of Hispanics is tract 366.02. The average percentage of "other races" is 1.4 percent which is well below the county (4.1 percent) and the state (2.3 percent). Census tracts that exceed the threshold of 10 percent over the county's percentage of "other races" are 366.41, 367, and 368.02. The average percent of persons living below the poverty line within the census tracts is 6.5 percent. The percentage of people living under the poverty line is 15.5 percent in Harris County and 17.6 percent in the state. Census tracts that exceed the threshold of 10 percent over the county's percentage of residents living below the poverty line includes tract 366.02, 366.41, 367 and 368.02.

The Bayport alternative would be situated between approximately 600 feet and 3,300 feet from the nearest residence. The land use would be consistent with current land uses in the area. If any minority or low-income groups are dependent on the natural resources in the vicinity of the Bayport site (e.g., for subsitence fishing), they would not likely be adversely affected by the project since project activities are not expected to result in long-term adverse impacts on resources of this type (e.g., fishing) (see Section 4.4.15.4). Potential effects of locating the project at this location include increased traffic, noise and air pollution (see Sections 4.4.1, 4.4.2 and 4.4.3); however, the effects would also occur at any

of the alternative sites. Some of the advantages the community would reap as a result of the creation of this project are: increased number of jobs for many levels of experience and the infusion of indirect economic contributions to the community (see Sections 4.4.19). These beneficial effects would also occur at any of the alternative sites.

4.4.20.3 Community Values

The City of La Porte has identified the Bayport Terminal complex as an obstacle to its community's future progress, envisioning low density residential and a community park adjacent to the proposed Bayport site (City of La Porte, undated).

The Mayor of the City of Pasadena made a public statement opposing the Bayport location during the December 12, 2001, public hearing on the Bayport DEIS. The Mayor expressed concern that project-related impacts to traffic and recreation would affect regional residential and retail growth in the area (USACE, 2001c).

The City of Seabrook provided City Resolution No. 2001-17 as an indication of the values of that community in regard to the Bayport alternative site. That resolution cites three earlier resolutions of similar nature and states the community's concerns about potential adverse impacts from a railyard associated with the project and other environmental and safety issues. Resolution No. 2001-17 reaffirms the City's opposition to the expansion of the Bayport terminal facilities.

The City of Shoreacres has passed three resolutions in opposition to the expansion of port facilities at the Bayport site. The construction of the container terminal complex adjacent to that city would be contrary to the values expressed by that community over several years (City of Shoreacres, 1998, 1999, 2000).

4.4.20.4 Housing

Table 4.4.20-1 shows the housing needs of the inmigrant operations families. At full operation, there is expected to be a demand for 350 housing units for worker families.

4.4.20.5 Leading Economic Sectors

Total Demand. Table 4.4.20-2 shows the direct and indirect effect of the construction and operation of the Bayport alternative on the Texas economy and direct non-Texas effects of the project.

For the Bayport alternative, total construction costs from 2002 through 2015 are anticipated to amount to $206.1 million. Direct Texas effects are expected to amount to $167.0 million, with an export effect of $39.2 million. Total Texas effect from construction activities are expected to amount to $737.0 million over the 2002 to 2015 period.

Operations-related effects are expected to be similar for all alternatives, as discussed above. At the point of full operation, the project operations cost is expected to amount to $57.5 million

Table 4.4.20-2
Total Economic Effect of Project *
Bayport Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION ACTIVITIES													
Construction Costs	$43,735,417	$44,264,583	$0	$0	$10,907,997	$36,502,003	$0	$0	$0	$0	$0	$0	$11,567,542
Direct Effects:													
Effect Outside of Texas	$8,307,940	$8,408,460	$0	$0	$2,072,073	$6,933,888	$0	$0	$0	$0	$0	$0	$2,197,360
Texas Direct Effect	$35,427,476	$35,856,123	$0	$0	$8,835,923	$29,568,116	$0	$0	$0	$0	$0	$0	$9,370,182
Total Texas Effect (a)	$157,569,419	$156,628,311	$0	$0	$39,194,614	$130,466,658	$0	$0	$0	$0	$0	$0	$41,564,490
OPERATIONS ACTIVITIES													
Construction Costs	$33,583,333	$11,902,655	$19,502,212	$55,875,369	$25,581,858	$28,621,681	$32,168,142	$35,207,965	$38,247,788	$41,287,611	$44,834,071	$81,207,227	$50,913,717
Direct Effects:													
Effect Outside of Texas	$4,324,368	$1,532,649	$2,511,208	$7,194,809	$3,294,056	$3,685,479	$4,142,140	$4,533,564	$4,924,988	$5,316,412	$5,773,073	$10,456,673	$6,555,920
Texas Direct Effect	$29,258,965	$10,370,006	$16,991,004	$48,680,560	$22,287,803	$24,936,202	$28,026,001	$30,674,400	$33,322,800	$35,971,199	$39,060,998	$70,750,554	$44,357,797
Total Texas Effect (a)	$109,125,683	$38,676,487	$63,370,489	$181,561,423	$83,125,691	$93,003,292	$104,527,159	$114,404,760	$124,282,361	$134,159,962	$145,683,830	$263,874,764	$165,439,031
TOTAL EFFECT													
Total Costs	$77,318,750	$56,167,238	$19,502,212	$55,875,369	$36,489,855	$65,123,685	$32,168,142	$35,207,965	$38,247,788	$41,287,611	$44,834,071	$81,207,227	$62,481,258
Direct Effects:													
Effect Outside of Texas	$12,632,308	$9,941,109	$2,511,208	$7,194,809	$5,366,129	$10,619,367	$4,142,140	$4,533,564	$4,924,988	$5,316,412	$5,773,073	$10,456,673	$8,753,280
Texas Direct Effect	$64,686,442	$46,226,129	$16,991,004	$48,680,560	$31,123,726	$54,504,318	$28,026,001	$30,674,400	$33,322,800	$35,971,199	$39,060,998	$70,750,554	$53,727,979
Total Texas Effect (a)	$266,695,103	$195,304,798	$63,370,489	$181,561,423	$122,320,304	$223,469,950	$104,527,159	$114,404,760	$124,282,361	$134,159,962	$145,683,830	$263,874,764	$207,003,522

* In year-2000 dollars.

Table 4.4.20-2 (concluded)

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION ACTIVITIES												
Construction Costs	$59,162,458	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$206,140,000
Direct Effects:												
Effect Outside of Texas	$11,238,447	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$39,158,169
Texas Direct Effect	$47,924,011	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$166,981,831
Total Texas Effect (a)	$211,544,036	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$736,967,528
OPERATIONS ACTIVITIES												
Construction Costs	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$1,131,433,628
Direct Effects:												
Effect Outside of Texas	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$145,689,391
Texas Direct Effect	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$985,744,238
Total Texas Effect (a)	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$3,676,480,432
TOTAL EFFECT												
Total Costs	$116,662,458	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$1,337,573,628
Direct Effects:												
Effect Outside of Texas	$18,642,452	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$184,847,559
Texas Direct Effect	$98,020,006	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$1,152,726,069
Total Texas Effect (a)	$398,384,536	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$4,413,447,960

Source: Texas Comptroller of Public Accounts, 1989.

annually. The direct Texas effect is anticipated to be $50.1 million each year, with $7.4 million exported. Total Texas effect, including both direct and indirect effects, is projected to be approximately $186.8 million annually.

Impacts to Major Economic Sectors. Table 4.4.20-3 shows the relative economic effect on various major economic sectors from the construction and operation of the Bayport alternative.

For construction-related activities, $224.7 million (41%) of the overall project effect is anticipated to accrue to the construction sector. Other major sectors affected would be manufacturing, with $74.8 million (14%); services, with $69.2 million (13%); and finance, insurance and real estate (FIRE), with $67.8 million (13%).

For operations-related activities at full build-out, 51 percent ($70.3 million) of annual effects would pertain to the transportation, communication and utilities sector, with other major affected sectors being FIRE, with $22.1 million (16%); trade, with $15.0 million (11%); and services, with $14.1 million (10%). These effects would be the same for all alternatives.

The year of greatest effect from construction activities alone would be 2015, which would also be the year of greatest overall effect.

Impacts on Retail and Wholesale Trade. Table 4.4.20-4 provides more specific data on the effects of construction and operations on retail and wholesale trade.

Total construction-related effects on wholesale and retail trade are anticipated to be approximately $52.5 million over the full construction period, with roughly 51 percent of those effects on the retail sector ($27.0 million) and 49 percent ($25.6 million) on the wholesale sector. At full build-out, operation of the project is expected to have an almost $7 million effect on retail trade annually, and a $6.8 million effect on wholesale trade each year. This is the same prospective effect as for all alternatives.

4.4.20.6 Employment

Table 4.4.20-5 shows the number of jobs expected to be generated by the construction and operation of the project at the Bayport alternative site. A job is defined as full-time equivalent employment for one person for one year.

The construction phase of the project is expected to create 202 direct jobs over the 2002 to 2015 construction period, with the creation of an additional 3,673 jobs indirectly. The highest year of employment creation would occur in 2015 during Phase III construction, when 58 direct jobs are anticipated to be created.

When the project is fully operational, it is expected to create approximately 450 direct jobs and almost 800 in indirect employment, the same as all alternatives.

Table 4.4.20-3
Total Texas Effect of Project, by Major Economic Sector *
Bayport Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Agriculture	$1,236,104	$1,228,084	$0	$0	$306,276	$1,020,684	$0	$0	$0	$0	$0	$0	$324,795
Mining	$2,334,947	$2,319,799	$0	$0	$578,542	$1,928,028	$0	$0	$0	$0	$0	$0	$613,523
Construction	$48,126,014	$47,813,793	$0	$0	$11,924,433	$39,738,934	$0	$0	$0	$0	$0	$0	$12,645,436
Manufacturing	$16,014,433	$15,910,539	$0	$0	$3,967,980	$13,223,545	$0	$0	$0	$0	$0	$0	$4,207,901
Transp., Comm., Util.	$7,236,446	$7,189,499	$0	$0	$1,793,012	$5,975,327	$0	$0	$0	$0	$0	$0	$1,901,425
Trade	$12,203,150	$12,123,982	$0	$0	$3,023,638	$10,076,467	$0	$0	$0	$0	$0	$0	$3,206,460
FIRE	$14,520,923	$14,426,717	$0	$0	$3,597,925	$11,990,314	$0	$0	$0	$0	$0	$0	$3,815,471
Services	$14,814,856	$14,718,744	$0	$0	$3,670,754	$12,233,022	$0	$0	$0	$0	$0	$0	$3,892,704
Totals	$116,486,873	$115,731,158	$0	$0	$28,862,559	$96,186,321	$0	$0	$0	$0	$0	$0	$30,607,715
OPERATIONS-RELATED EFFECTS													
Agriculture	$599,169	$212,358	$347,944	$996,886	$456,412	$510,647	$573,920	$628,154	$682,388	$736,623	$799,896	$1,448,838	$908,364
Mining	$1,251,514	$443,563	$726,768	$2,082,247	$953,331	$1,066,613	$1,198,775	$1,312,057	$1,425,339	$1,538,621	$1,670,783	$3,026,262	$1,897,346
Construction	$1,086,438	$385,057	$630,907	$1,807,597	$827,586	$925,926	$1,040,656	$1,138,996	$1,237,336	$1,335,675	$1,450,405	$2,627,095	$1,647,085
Manufacturing	$6,734,895	$2,386,992	$3,911,028	$11,205,402	$5,130,257	$5,739,872	$6,451,089	$7,060,703	$7,670,318	$8,279,933	$8,991,150	$16,285,524	$10,210,379
Transp., Comm., Util.	$41,057,510	$14,551,664	$23,842,549	$68,310,774	$31,275,258	$34,991,612	$39,327,359	$43,043,713	$46,760,067	$50,476,421	$54,812,168	$99,280,393	$62,244,876
Trade	$8,743,194	$3,098,776	$5,077,269	$14,546,775	$6,660,064	$7,451,461	$8,374,758	$9,166,156	$9,957,553	$10,748,950	$11,672,247	$21,141,753	$13,255,042
FIRE	$12,899,391	$4,571,821	$7,490,819	$21,461,783	$9,826,017	$10,993,616	$12,355,814	$13,523,413	$14,691,012	$15,858,611	$17,220,810	$31,191,775	$19,556,008
Services	$8,221,173	$2,913,760	$4,774,126	$13,678,245	$6,262,418	$7,006,565	$7,874,735	$8,618,881	$9,363,028	$10,107,174	$10,975,344	$19,879,464	$12,463,637
Totals	$80,593,283	$28,563,991	$46,801,409	$134,089,710	$61,391,344	$68,686,311	$77,197,106	$84,492,073	$91,787,041	$99,082,008	$107,592,803	$194,881,104	$122,182,738
TOTAL EFFECTS													
Agriculture	$1,835,272	$1,440,443	$347,944	$996,886	$762,688	$1,531,330	$573,920	$628,154	$682,388	$736,623	$799,896	$1,448,838	$1,233,159
Mining	$3,586,461	$2,763,362	$726,768	$2,082,247	$1,531,873	$2,994,641	$1,198,775	$1,312,057	$1,425,339	$1,538,621	$1,670,783	$3,026,262	$2,510,869
Construction	$49,212,452	$48,198,850	$630,907	$1,807,597	$12,752,019	$40,664,860	$1,040,656	$1,138,996	$1,237,336	$1,335,675	$1,450,405	$2,627,095	$14,292,521
Manufacturing	$22,749,329	$18,297,530	$3,911,028	$11,205,402	$9,098,237	$18,963,417	$6,451,089	$7,060,703	$7,670,318	$8,279,933	$8,991,150	$16,285,524	$14,418,280
Transp., Comm., Util.	$48,293,956	$21,741,163	$23,842,549	$68,310,774	$33,068,270	$40,966,939	$39,327,359	$43,043,713	$46,760,067	$50,476,421	$54,812,168	$99,280,393	$64,146,302
Trade	$20,946,344	$15,222,757	$5,077,269	$14,546,775	$9,683,702	$17,527,928	$8,374,758	$9,166,156	$9,957,553	$10,748,950	$11,672,247	$21,141,753	$16,461,502
FIRE	$27,420,314	$18,998,539	$7,490,819	$21,461,783	$13,423,941	$22,983,929	$12,355,814	$13,523,413	$14,691,012	$15,858,611	$17,220,810	$31,191,775	$23,371,479
Services	$23,036,029	$17,632,504	$4,774,126	$13,678,245	$9,933,172	$19,239,586	$7,874,735	$8,618,881	$9,363,028	$10,107,174	$10,975,344	$19,879,464	$16,356,341
Totals	$197,080,156	$144,295,149	$46,801,409	$134,089,710	$90,253,903	$164,872,632	$77,197,106	$84,492,073	$91,787,041	$99,082,008	$107,592,803	$194,881,104	$152,790,452

* In year-2000 dollars.
** Finance, insurance and real estate.

Table 4.4.20-3 (concluded)

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Agriculture	$1,654,835	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$5,770,777
Mining	$3,125,912	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$10,900,751
Construction	$64,428,740	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$224,677,350
Manufacturing	$21,439,336	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$74,763,734
Transp., Comm., Util.	$9,687,798	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$33,783,508
Trade	$16,336,977	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$56,970,675
FIRE	$19,439,897	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$67,791,247
Services	$19,833,400	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$69,163,479
Totals	$155,946,895	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$543,821,520
OPERATIONS-RELATED EFFECTS												
Agriculture	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$20,186,189
Mining	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$42,163,909
Construction	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$36,602,458
Manufacturing	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$226,900,855
Transp., Comm., Util.	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$1,383,241,115
Trade	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$294,561,098
FIRE	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$434,584,757
Services	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$276,974,040
Totals	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$2,715,214,421
TOTAL EFFECTS												
Agriculture	$2,680,707	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$25,956,966
Mining	$5,268,702	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$53,064,660
Construction	$66,288,894	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$261,279,809
Manufacturing	$32,970,546	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$301,664,589
Transp., Comm., Util.	$79,984,775	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$1,417,024,622
Trade	$31,306,714	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$351,531,773
FIRE	$41,525,703	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$502,376,004
Services	$33,909,354	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$346,137,519
Totals	$293,935,395	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$3,259,035,941

Source: Texas Comptroller of Public Accounts, 1989.

** Finance, insurance and real estate.

Table 4.4.20-4
Retail and Wholesale Sales Effect of Project *
Bayport Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Retail Trade	$5,774,473	$5,737,011	$0	$0	$1,430,771	$4,768,137	$0	$0	$0	$0	$0	$0	$1,517,282
Wholesale Trade	$5,480,992	$5,445,433	$0	$0	$1,358,054	$4,525,801	$0	$0	$0	$0	$0	$0	$1,440,168
Totals	$11,255,465	$11,182,444	$0	$0	$2,788,825	$9,293,938	$0	$0	$0	$0	$0	$0	$2,957,450
OPERATIONS-RELATED EFFECTS													
Retail Trade	$4,072,734	$1,443,464	$2,365,081	$6,776,144	$3,102,375	$3,471,022	$3,901,110	$4,269,757	$4,638,404	$5,007,051	$5,437,139	$9,848,201	$6,174,432
Wholesale Trade	$3,974,853	$1,408,773	$2,308,241	$6,613,292	$3,027,815	$3,387,603	$3,807,354	$4,167,141	$4,526,928	$4,886,716	$5,306,467	$9,611,518	$6,026,041
Totals	$8,047,587	$2,852,238	$4,673,323	$13,389,436	$6,130,191	$6,858,625	$7,708,464	$8,436,898	$9,165,332	$9,893,766	$10,743,606	$19,459,719	$12,200,474
TOTAL EFFECTS													
Retail Trade	$9,847,207	$7,180,475	$2,365,081	$6,776,144	$4,533,146	$8,239,159	$3,901,110	$4,269,757	$4,638,404	$5,007,051	$5,437,139	$9,848,201	$7,691,714
Wholesale Trade	$9,455,845	$6,854,207	$2,308,241	$6,613,292	$4,385,869	$7,913,404	$3,807,354	$4,167,141	$4,526,928	$4,886,716	$5,306,467	$9,611,518	$7,466,209
Totals	$19,303,052	$14,034,682	$4,673,323	$13,389,436	$8,919,016	$16,152,562	$7,708,464	$8,436,898	$9,165,332	$9,893,766	$10,743,606	$19,459,719	$15,157,923

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Retail Trade	$7,730,581	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$26,958,255
Wholesale Trade	$7,337,682	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$25,588,130
Totals	$15,068,263	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$52,546,384
OPERATIONS-RELATED EFFECTS												
Retail Trade	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$137,211,752
Wholesale Trade	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$133,914,128
Totals	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$271,125,880
TOTAL EFFECTS												
Retail Trade	$14,703,748	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$164,170,007
Wholesale Trade	$14,143,262	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$159,502,258
Totals	$28,847,010	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$323,672,264

Source: Texas Comptroller of Public Accounts, 1989.
* In year-2000 dollars.

Table 4.2.20-5
Employment Effect of Project
Shoal Point Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED JOBS													
Direct Jobs	23	36	20	9	28	34	0	0	0	0	6	13	29
Indirect Jobs	419	700	719	164	511	664	0	0	0	0	112	247	535
Total Jobs	442	736	739	173	539	698	0	0	0	0	118	260	564
OPERATIONS-RELATED JOBS													
Direct Jobs	0	0	94	153	177	201	225	253	277	301	325	352	376
Indirect Jobs	3	465	165	270	774	354	396	446	488	530	572	621	1,125
Total Jobs	3	465	258	423	951	555	621	698	764	830	896	973	1,501
TOTAL JOBS													
Direct Jobs	23	36	114	162	205	235	225	253	277	301	331	365	405
Indirect Jobs	422	1,165	884	434	1,285	1,019	396	446	488	530	684	868	1,660
Total Jobs	445	1,201	997	596	1,490	1,254	621	698	764	830	1,014	1,233	2,065

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED JOBS												
Direct Jobs	55	0	0	0	0	0	0	0	0	0	0	253
Indirect Jobs	1,053	0	0	0	0	0	0	0	0	0	0	5,124
Total Jobs	1,108	0	0	0	0	0	0	0	0	0	0	5,377
OPERATIONS-RELATED JOBS												
Direct Jobs	400	452	452	452	452	452	452	452	452	452	452	7,654
Indirect Jobs	705	796	796	796	796	796	796	796	796	796	796	14,878
Total Jobs	1,105	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	22,532
TOTAL JOBS												
Direct Jobs	455	452	452	452	452	452	452	452	452	452	452	7,907
Indirect Jobs	1,759	796	796	796	796	796	796	796	796	796	796	20,002
Total Jobs	2,214	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	27,909

Source: Texas Comptroller of Public Accounts, 1989.

Assuming that half of the projected unemployed construction workforce from RAZ 88, 89, 91 and 92 (Bayport and Baytown area) are qualified to work on the project, there is projected to be a larger construction workforce than is needed for the project. This is shown in Table 4.4.20-1.

Using the same assumption of one-half of the unemployed labor force having the necessary qualifications for employment on the project, the operations-related available workforce is projected to amount to 87 to 112 during the 2002 to 2025 time frame, compared with the projected employment of approximately 450. Thus, it is possible that as many as 350 workers may be drawn from outside the immediate region of the project site at Bayport.

4.4.20.7 Household Income Effects

Table 4.4.20-6 shows the effects on household income from the construction and operations phases of the project. The construction phase of the project is projected to have a direct effect of $78.9 million on household income, and an indirect effect of $114.2 million. At full operation, the project is expected to have an annual operations-related direct effect on household income of $23.7 million and an indirect effect of $25.2 yearly, similar to all alternative sites.

4.4.20.8 Residential Property Values

According to Delucchi and Hsu (1998), residential property values may decrease from 0.2–1.5 percent for every dBA above 55 dBA. Those impacts may be temporary in nature (during construction activities) or they may be long-term effects associated with noise from operations at the container terminal site or from increased traffic.

Construction

As discussed in Section 4.4.3, dredging activities at the Bayport alternative site would result in noise levels of 50 dBA to 70 dBA in the residential subdivisions of Shady Oaks and Bay Colony, located approximately 600 feet to the north of the site. Other construction would result in noise levels of 59 dBA to 86 dBA. As discussed in Section 3.3.2.3, ambient noise levels in these neighborhoods range from 51.3 dBA L_{dn} to 67.2 dBA L_{dn}. Thus, construction activities at the Bayport alternative site would likely generate noise impacts that might temporarily affect some residential property values by as much as 3.74–28.1 percent.

Operations

A projected L_{dn} of 67.2 dBA recorded approximately 1,000 feet from the container berths indicates that noise from operations at the terminal would be likely to adversely affect some nearby residential property values. With ambient noise levels ranging from 51.3 dBA L_{dn} to 67.2 dBA L_{dn}, residential property impacts could range from 3.2–23.8 percent for those properties that currently have the lowest ambient noise levels. Other properties may be relatively unaffected since operational project noise is not expected to exceed ambient levels for those residences.

Table 4.2.20-6
Household Income Effect of Project *
Shoal Point Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Direct Effects	$9,019,984	$15,134,729	$14,102,957	$3,531,331	$11,009,072	$14,355,057	$0	$0	$0	$0	$2,413,281	$5,321,944	$11,531,112
Indirect Effects	$13,034,040	$21,750,351	$22,665,419	$5,102,837	$15,908,308	$20,649,595	$0	$0	$0	$0	$3,487,234	$7,690,305	$16,662,665
Total Effects	$22,054,024	$36,885,079	$36,768,376	$8,634,168	$26,917,379	$35,004,653	$0	$0	$0	$0	$5,900,515	$13,012,248	$28,193,776
OPERATIONS-RELATED EFFECTS													
Direct Effects	$102,875	$13,819,542	$4,897,942	$8,025,160	$22,992,714	$10,526,935	$11,777,822	$13,237,190	$14,488,077	$15,738,965	$16,989,852	$18,449,220	$33,416,774
Indirect Effects	$109,525	$14,712,858	$5,214,553	$8,543,919	$24,478,999	$11,207,412	$12,539,159	$14,092,863	$15,424,609	$16,756,356	$18,088,102	$19,641,806	$35,576,886
Total Effects	$212,400	$28,532,400	$10,112,496	$16,569,080	$47,471,713	$21,734,347	$24,316,981	$27,330,053	$29,912,687	$32,495,320	$35,077,954	$38,091,027	$68,993,660
TOTAL EFFECTS													
Direct Effects	$9,122,859	$28,954,270	$19,000,900	$11,556,491	$34,001,786	$24,881,992	$11,777,822	$13,237,190	$14,488,077	$15,738,965	$19,403,133	$23,771,164	$44,947,886
Indirect Effects	$13,143,565	$36,463,209	$27,879,972	$13,646,756	$40,387,307	$31,857,008	$12,539,159	$14,092,863	$15,424,609	$16,756,356	$21,575,336	$27,332,111	$52,239,551
Total Effects	$22,266,424	$65,417,479	$46,880,872	$25,203,247	$74,389,093	$56,739,000	$24,316,981	$27,330,053	$29,912,687	$32,495,320	$40,978,469	$51,103,275	$97,187,436

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Direct Effects	$22,755,534	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$109,175,000
Indirect Effects	$32,741,575	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$159,692,329
Total Effects	$55,497,109	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$268,867,329
OPERATIONS-RELATED EFFECTS												
Direct Effects	$20,950,994	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$442,026,563
Indirect Effects	$22,305,299	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$470,599,848
Total Effects	$43,256,294	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	
TOTAL EFFECTS												
Direct Effects	$43,706,528	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$551,201,563
Indirect Effects	$55,046,874	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$630,292,176
Total Effects	$98,753,403	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$1,181,493,739

Source: Texas Comptroller of Public Accounts, 1989.
* In year-2000 dollars.

Traffic

Table 4.4.3-1 shows that virtually all of the residential receptors along major roadways that would be affected by increased terminal traffic currently have noise levels above 55 dBA, ranging from 67–72 dBA. According to the results of the Delucchi and Hsu research, those properties currently at the 67 dBA level likely have current property values 2.4–18.0 percent lower than similar properties with noise levels below 55 dBA. On the upper end of the range, those receptors with current noise levels of 72 dBA likely have property values 3.4–25.5 percent lower than comparable properties with noise levels less than 55 dBA. Thus, much of the potential loss of property value due to traffic noise is already represented in current market values.

Table 4.4.3-1 also indicates that noise levels are expected to increase by 1–2 dBA over existing conditions, for all residential receptors, by 2025, without the project. Thus, without the project, there may be property values which are 0.2–3.0 percent lower than those of comparable homes at different, quieter locations, in addition to the current estimated lesser property values of 2.4–25.5 percent.

With the project at the Bayport alternative site, some residential receptors may experience an increase in noise of approximately 1 dBA beyond the no-build noise levels projected for 2025. Thus, some properties might be expected to experience an additional 0.2–1.5 percent decrease in relative property values.

4.4.21 Community Infrastructure and Municipal Services

The sections below discuss community infrastructure requirements of the project, to the extent that they are known. The Greater Houston metropolitan area is a very large, growing and economically viable region. Operations inmigrants to the area may locate in any of a large number of communities or in suburban areas. Inmigrants will likely either locate in communities which are able to provide community services or they will commute to locations where services are located. Inmigrants will contribute to local government revenues through ad valorem taxes, sales taxes, mixed beverage taxes, and other local taxes and fees. Typically, residential properties do not contribute enough in tax revenues to support the general fund needs of the residents. On the other hand, property tax revenues from industrial developments, particularly those with high property values such as the proposed project, are generally much greater than the costs on general fund municipal services imposed by such developments. From a regional perspective, the proposed project and its operations inmigrants are expected to contribute more to local governmental revenues than they cost in service provision; however, the locational choices of the inmigrants will determine the specific impacts on individual communities.

4.4.21.1 Utilities

For the projected inmigrant population of 981 persons, it is anticipated that there would be an additional 0.159 MGD in additional municipal water demand.

The proposed container terminal would require access to utilities needed for operation and maintenance, typical of similar facilities. For example, telephone and fiber optic service, water supply,

and electricity would be needed at the site (Berger/Abam, 2001). Detailed studies regarding the ability of current systems to provide the needed utilities would be performed during the design phase of the project. In addition to providing new access to utilities, the removal or realignment of existing utility structures within the project site would be required. Currently available information regarding existing utilities and preliminary plans for utility service requirements and relocations is summarized in Section 2.4.4.6. Utility service providers in the area are discussed in Section 3.20.

The project site is located within a very large, growing and economically viable metropolitan area. Because of the overall growth or demand on services that is typical in a metropolitan area of this size, the addition of the proposed facility and approximately 350 families to the area is not expected to result in major short- or long-term impacts on service levels. Any of several communities within the region could receive the growth anticipated as a result of the project, with the majority of the growth most likely going to communities that are able to provide the desired services.

4.4.21.2 Stormwater and Drainage

Site Stormwater would be treated with appropriate BMPs developed during detailed designs before discharge into Galveston Bay (Berger/Abam, 2001).

4.4.21.3 Solid Waste and Wastewater Collection

An additional 0.098 MGD of municipal wastewater flow is expected to occur from the projected inmigrant population of 981 persons.

Solid waste and wastewater collection services or systems would be needed at the proposed terminal site. Service providers in the area are discussed in Section 3.20.

As discussed above for other utilities, the addition of the proposed facility and inmigrant population to the metropolitan area is not expected to result in major short- or long-term impacts on service levels of local communities. Detailed studies regarding the adequacy of current systems would be performed during the design phase of the project.

4.4.21.4 Fire, Police, Emergency Medical Service, and Port Security

For the projected inmigrant population of 981 persons, the demand for police and fire/EMS personnel and emergency vehicles is projected to be:

1 Firefighter at 1.17 firefighters per 1,000 persons
3 Police officers at 348 persons per officer
0 Additional emergency vehicles (at 6,961 residents per vehicle)
2 EMS personnel at 533 residents per EMS personnel

The container facility would have its own security force that would cooperate with the appropriate Emergency Management Coordinator and local industry to provide security at the port. A

Security Plan and other security measures similar to those described in Section 4.2.21.4 for the Shoal Point site would be developed and implemented.

An assessment of security risks related to container cargo is based on the difference between the number of containers that would enter the Houston area with the proposed project compared with the number of containers that would enter the Houston area with the No-Build alternative. The assessment also considers the increased efforts of all of the Federal, state, and local agencies and private parties (especially including the Port Operator's responsibilities) to assess, prevent, and respond to port security threats, including terrorist events.

Containers, by design, provide for efficient transfer of large quantities of goods from ships to truck and rail for distribution through the transportation grid of the U.S. to virtually every city in the country. Demand for container cargo nationally and in the Houston area is expected to increase in response to market demands. It is anticipated that without the proposed project, container cargo destined for the Houston area would arrive at a more distant port and be transported to the Houston market via truck or rail. The risk of an accidental or intentional event with the Build alternative would increase proportionally to the increased number of containers that enter the Houston area as compared with the No-Build alternative. However, with the increased security measures in place and planned at all U.S. ports, the local Emergency Management Plan, and the coordination of port security among all port users, the potential increased risk of a threat due to the presence of a new marine terminal would be offset.

4.4.21.5 Hospitals/Medical Services

For the projected inmigrant population of 981 persons, the demand for hospital beds and medical personnel needed is projected to be:

4	Hospital beds at 221 residents per hospital bed
2	Direct care physicians at 560 residents per physician
7	Registered nurses at 140 residents per nurse
0	Dentists at 1,982 residents per dentist

4.4.21.6 Schools

For the projected inmigrant population of 981 persons, it is anticipated that the demand for Clear Creek ISD staff would be 13 teachers and 26 public school staff.

4.4.21.7 Libraries

For the projected inmigrant population of 981 persons, the demand for facilities is projected to be:

1,352	Books at 1.38 books per capita
3,720	Total resources at 3.79 per capita
298	Additional square feet of library space

It is not anticipated that local libraries would need to hire additional staff.

4.4.21.8 Parks and Recreation Facilities

The additional projected inmigrant population of 981 persons is likely to create a demand for 7.75 acres of various types of parkland uses, at 0.79 acre per 100 persons.

4.4.21.9 Streets and Public Transportation

Port Road would provide access from the terminal location to SH 146. Port Road is an existing two-lane collector street. An existing interchange is located at the intersection of SH 146 and Port Road. This interchange would remain unchanged as a result of this proposed project. In the future, the interchange would be studied by TxDOT to determine whether the current configuration remains acceptable with the increased traffic generated by the terminal.

Port Road would likely be reclassified as a principal arterial in this location due to the large amount of truck traffic associated with container terminals. It is expected that the existing roadway would be widened to accommodate four lanes of traffic at 12 feet per lane with two 6-foot shoulders. The roadway would be designed for heavy truck traffic. The existing Todville Road, which serves the residents of El Jardin Del Mar, would remain in its current state of two lanes at the initial construction of Phase I. As increased truck traffic occurs at the terminal, Todville Road would be reanalyzed to address the impacts of increased truck traffic.

No intermodal yard is expected for this alternative. It is anticipated that the majority of rail traffic would use the existing Barbours Cut facility. The existing Barbours Cut intermodal yard facility is within 10 miles of the proposed terminal location. There are two additional intermodal yards located in the greater Houston area. It is anticipated that these additional yards would experience a minimal amount of rail traffic originating from this proposed terminal location.

4.4.21.10 Impacts on Local Tax Revenues

Table 4.4.21-1 shows the potential effect of the proposed project at the Bayport site on government revenues. Total government effect of the construction phase of the project is expected to be approximately $6.8 million, of which roughly 10 percent is anticipated to affect local governments. State government is expected to receive approximately 29 percent ($1.9 million) and the Federal government, 61 percent ($4.2 million).

At full operation of the project, annual government effects are expected to amount to $1.8 million annually, with a $0.2 million effect on local government, $0.5 million effect on State government and a $1.1 million effect on the Federal government. Operations-related effects are expected to be generally the same for all alternatives.

Table 4.4.21-1
Government Revenues *
Bayport Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION ACTIVITIES													
Federal Government	$810,898	$1,026,533	$0	$0	$202,245	$735,590	$0	$0	$0	$0	$0	$0	$214,474
State Government	$416,046	$398,923	$0	$0	$103,766	$340,906	$0	$0	$0	$0	$0	$0	$110,040
Local Government	$135,374	$167,885	$0	$0	$33,764	$121,806	$0	$0	$0	$0	$0	$0	$35,805
Total Government	$1,362,319	$1,593,341	$0	$0	$339,774	$1,198,301	$0	$0	$0	$0	$0	$0	$360,319
OPERATIONS ACTIVITIES													
Federal Government	$622,669	$220,687	$361,591	$1,035,985	$474,313	$530,675	$596,430	$652,791	$709,152	$765,514	$831,269	$1,505,663	$943,991
State Government	$319,472	$113,228	$185,521	$531,531	$243,355	$272,272	$306,009	$334,926	$363,844	$392,761	$426,498	$772,508	$484,332
Local Government	$103,950	$36,842	$60,365	$172,951	$79,184	$88,593	$99,570	$108,979	$118,388	$127,798	$138,775	$251,361	$157,593
Total Government	$1,046,091	$370,757	$607,476	$1,740,467	$796,852	$891,540	$1,002,009	$1,096,696	$1,191,384	$1,286,072	$1,396,541	$2,529,532	$1,585,916
TOTAL EFFECT													
Federal Government	$1,433,567	$1,247,220	$361,591	$1,035,985	$676,558	$1,266,265	$596,430	$652,791	$709,152	$765,514	$831,269	$1,505,663	$1,158,465
State Government	$735,518	$512,150	$185,521	$531,531	$347,121	$613,178	$306,009	$334,926	$363,844	$392,761	$426,498	$772,508	$594,372
Local Government	$239,325	$204,728	$60,365	$172,951	$112,947	$210,398	$99,570	$108,979	$118,388	$127,798	$138,775	$251,361	$193,398
Total Government	$2,408,409	$1,964,098	$607,476	$1,740,467	$1,136,626	$2,089,841	$1,002,009	$1,096,696	$1,191,384	$1,286,072	$1,396,541	$2,529,532	$1,946,235

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION ACTIVITIES												
Federal Government	$1,185,141	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$4,174,882
State Government	$553,305	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,922,984
Local Government	$196,357	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$690,991
Total Government	$1,934,803	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$6,788,857
OPERATIONS ACTIVITIES												
Federal Government	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$20,977,911
State Government	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$10,763,102
Local Government	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$3,502,127
Total Government	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$35,243,139
TOTAL EFFECT												
Federal Government	$2,251,249	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$25,152,793
State Government	$1,100,291	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$12,686,086
Local Government	$374,337	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$4,193,117
Total Government	$3,725,876	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$42,031,996

Source: Texas Comptroller of Public Accounts, 1989.
* In year-2000 dollars.

4.5 SPILLMAN'S ISLAND ALTERNATIVE

4.5.1 Air Quality

For this alternative, direct and indirect air quality impacts associated with the construction of the proposed project on Spillman's Island were evaluated.

An estimate of air emissions from this alternative (JDC, 2002) was based on the same methodologies and emission factors developed from the Shoal Point alternative detailed emission calculations (see Section 4.2.1.1). It was assumed that the basic footprint and operation of the site would be similar for either alternative. The calculations were site specific, using the following as a basis:

- Site-specific values for access road length, volume of dredged material, and volume of other fill material.
- Ship emissions were based on the route to the site.
- Truck emissions were based on the route to the site.
- Distribution to the railroad yards was adjusted, as appropriate.

Spillman's Island is located in Harris County, Texas. Under this alternative, the length of the oceangoing transit would be longer when compared with the Pelican Island, Bayport, Shoal Point or Cedar Point alternatives and slightly shorter when compared with the Alexander Island alternative. The motor vehicle (e.g., truck) trips would be shorter when compared with the Pelican Island, Shoal Point or Cedar Point alternatives and longer compared with the Alexander Island and Bayport alternatives. The combined terminal equipment fleets would be the same for this alternative and the other alternatives.

Air monitoring data in the area of this alternative are limited. Air quality monitoring stations closest to the project site are located in La Porte at 3824½ Battleground Road and in Baytown at 7210½ Bayway Drive, on Baker and Decker Road and at 8620 West Bay Road. As shown on Table 3.1.3-2, monitoring of ozone concentrations in the HGA indicates ozone levels above the NAAQS. All other pollutants were monitored below the NAAQS.

4.5.1.1 Impacts

Pollutant emissions from construction activities may result in short-term impacts on air quality in the immediate vicinity of the project site, including increased levels of particulate matter and vehicular exhaust emissions. As shown on Table 4.5.1-1, construction of the proposed project would result in a relative increase in emissions above those resulting from existing sources in this county. Emissions of NO_x, VOC, CO, and SO_2 (highest during Phase I) are expected to result in a less than one percent increase over existing emissions. Emissions of particulate matter from construction activities may result in increased localized concentrations in the ambient air surrounding the facility. The highest emission rates for particulate matter for this alternative would occur during Phase III of construction. Construction emissions during other phases of construction would be below these peak levels.

TABLE 4.5.1-1
PEAK ANNUAL CONSTRUCTION EMISSIONS SUMMARY
COMPARISON WITH HARRIS COUNTY EMISSIONS
SPILLMAN'S ISLAND ALTERNATIVE

Air Contaminant	Maximum Annual Construction Emissions (tpy)	Peak Year	Harris County Emissions (tpy)	Site Emissions % of Harris County Emissions
NO_x	82.0	2003	287,800	0.03
VOC	9.0	2002	182,122	0.005
CO	38.9	2002	856,287	0.005
SO_2	24.9	2002	61,328	0.04
PM_{10}	504.4	2007	152,432	0.33
$PM_{2.5}$	65.5	2002	42,301	0.15

The peak annual operating emissions for this alternative were compared with Harris County emissions as shown on Table 4.5.1-2.

TABLE 4.5.1-2
COMPARISON OF PEAK ANNUAL ONSITE OPERATING
EMISSIONS WITH HARRIS COUNTY EMISSIONS
SPILLMAN'S ISLAND ALTERNATIVE

Air Contaminant	Maximum Annual Operating Emissions (tpy)	Peak Year	Harris County Emissions (tpy)	% of Harris County Emissions
NO_x	48.8	2006	287,800	0.02
VOC	137.4	2026	182,122	0.08
CO	43.6	2026	856,287	0.005
SO_2	56.1	2026	61,328	0.09
PM_{10}	50.3	2026	152,432	0.03
$PM_{2.5}$*	48.85	2026	42,301	0.12
TOTAL	336		1,539,969	0.02

* $PM_{2.5}$ emissions are a subset of PM_{10} emissions and are not included in emissions total.

As shown on this table, the estimated emissions would result in a small percent increase (less than 1%) over the existing Harris County emissions. To minimize emissions, terminal sponsors would comply with the requirements of the SIP including low emission diesel and idling restrictions as well as reductions based on diesel fuel sulfur control requirements. Total operating emissions would be expected to contribute less than 1 percent to total emissions for this county.

Under this alternative, motor vehicle traffic emissions would be less than the Pelican Island or Shoal Point alternatives because this alternative is located closer to the Houston area where the bulk of the containers are expected to go; train trip distances would also be shorter. Because this alternative is farther from the entrance of the Gulf of Mexico, the average ship travel distance would be increased. As these emissions are more regional in nature, they may be compared with emissions from the HGA, as shown on Table 4.5.1-3.

TABLE 4.5.1-3
TRANSPORTATION EMISSIONS SUMMARY
SPILLMAN'S ISLAND ALTERNATIVE COMPARED WITH HGA TRANSPORTATION EMISSIONS (1999)

Air Contaminant	Peak Transportation Emissions* During Operation – 2026 (tpy)	HGA Transportation Emissions (tpy)	Transportation Emissions % of HGA Transportation Emissions
NO_x	2,430	295,613	0.82
VOC	237	84,130	0.28
CO	933	593,057	0.16
SO_2	1,833	26,720	6.9
PM_{10}	112	7,697	1.5
$PM_{2.5}$	100	6,363	1.6

* Transportation emissions would peak after full build-out in 2026.

Because these are non-stationary sources, and because the background concentrations (except for ozone) in the project area are well below the NAAQS, it is expected that ambient air contaminant concentrations for PM_{10}, CO, and SO_2 would not be large enough to cause or contribute to an exceedance of an ambient air quality standard in this region, although localized SO_2 and PM_{10} concentrations may increase. VOC and NO_x emissions from the operation of container terminals, ocean-going vessels, mobile emissions, and associated activities are also included in the inventory for the SIP. These pollutants are not expected to impede attainment of the ozone standard in the HGA. In addition, because of the distance and prevailing southeast winds, emissions from this alternative would not be expected to have a major impact on the nearest Class I air quality areas.

4.5.1.2 State Implementation Plan (SIP) Conformity Review

For this alternative location, the emissions from the portion of the construction activities subject to USACE responsibility are summarized on Table 4.5.1-4 below for each phase of the project:

TABLE 4.5.1-4
SUMMARY OF MAXIMUM ANNUAL CONSTRUCTION EMISSIONS
SUBJECT TO USACE RESPONSIBILITY, SPILLMAN'S ISLAND ALTERNATIVE

Air Contaminant	Phase I (tpy)	Phase II (tpy)	Phase III (tpy)
NO_x	80.7	11.1	5.0
VOC	7.7	1.5	1.0
CO	35.1	7.7	6.8
SO_2	23.7	6.4	4.9
PM_{10}	13.5	26.3	14.0

For this alternative, the NO_x emissions for Phase I of the project construction emissions would exceed the 25 tpy emission rate for requiring a General Conformity Determination. Under this alternative, emissions of NO_x from Phase I would account for approximately 0.9 percent of the construction budget in the SIP (8,827.5 tpy) based on the Post-1999 Rate of Progress and Attainment

Demonstration SIP approved by the EPA on October 2001. Based on previous discussions with the TNRCC and EPA, it is likely they would determine that the project construction emissions at this site would be included in the previously approved SIP and the recent Attainment SIP.

For Phase II and III, the VOC and NO_x emissions for project construction emissions would not exceed the emission rate for requiring a General Conformity Determination. As the emissions from each phase of the project would be less than a 10 percent increase of the VOC and NO_x emissions inventories for the entire nonattainment area, the project would not be regionally significant for purposes of General Conformity.

Because 1) the project construction emissions during Phase II and III would be exempt from the General Conformity Rule, 2) emissions during Phase I are expected to be accounted for in the SIP, and 3) the project is not regionally significant, the emissions from the project construction should not:

- Cause or contribute to any new violation of any of the NAAQS in the project area;
- Increase the frequency or severity of any existing violation of any NAAQS in the project area; or
- Delay timely attainment of the NAAQS or any required interim emission reduction in the project area.

Therefore, the TNRCC would more than likely confirm that emissions from this alternative would comply with the requirements of the General Conformity Rule and would be in conformity with the Texas SIP.

4.5.2 Roadway Traffic Impact Analysis

This section presents analyses for the unsignalized intersections, signalized intersections, and major corridors that would potentially be affected by construction of the proposed project at the Spillman's Island alternative site. Spillman's Island is located along the west shoreline of La Porte, Texas. The traffic impact analysis was conducted for the years 2001, 2005, 2015, and 2025. Existing conditions are represented by the 2001 traffic information. The following sections describe the potential impacts of the project in terms of the differences in traffic LOS between the No-Build and Build conditions for the Spillman's Island alternative.

4.5.2.1 Container Distribution

Anticipated container distribution for the Spillman's Island alternative is presented in Table 4.5.2-1, based on the results of H-GAC's modeling effort. The same intermodal split described for the Shoal Point alternative in Section 4.2.2.1 (i.e., 80 percent by highway/20 percent by rail) was assumed for all alternative sites.

As indicated by Table 4.5.2-1, SH 146 to SH 225 is projected to be the primary corridor, carrying 84, 84, and 65 percent of the container terminal traffic for years 2005, 2015, and 2025, respectively.

TABLE 4.5.2-1
CONTAINER DISTRIBUTION

Corridor	Distribution (% of Container Traffic) 2005	2015	2025
SH 146 to SH 225	84	84	65
SH 146 to IH 10	10	10	10
New Intermodal Railway Facility	0	0	20
Other routes	6	6	5

Projected daily truck volumes described for the Shoal Point alternative (see Table 4.2.2-2) would be the same for all alternative sites.

4.5.2.2 Intersection Analysis – Unsignalized Intersections

One unsignalized intersection was evaluated for this alternative: Barbours Cut at Broadway. As indicated by the No-Build conditions in Table 4.5.2-2, normal growth in the area would cause this intersection to experience a change in LOS from B in 2001 (Figure 4.5.2-1) to F in 2025 (Figure 4.5.2-2). While the project-related traffic would increase the delays at this intersection, the LOS would remain at F in the Build scenario.

4.5.2.3 Intersection Analysis – Signalized Intersections

The Barbours Cut at SH 146 interchange consists of two signalized intersections. The west intersection is congested during the PM peak hour and the east intersection is congested during the AM peak hour. Since the analysis was conducted for the PM peak hour, the west intersection becomes the critical intersection. The analysis indicates that normal growth would cause the LOS at the west intersection to change from B in 2001 (Figure 4.5.2-1) to D in 2025 (Figure 4.5.2-2). The LOS at this intersection would not experience a change in LOS due to the project (i.e., relative to the No-Build scenario). The east intersection would experience a change in LOS in the years 2015 and 2025, when the LOS would change from A to B for both years in the Build scenario (Table 4.5.2-2).

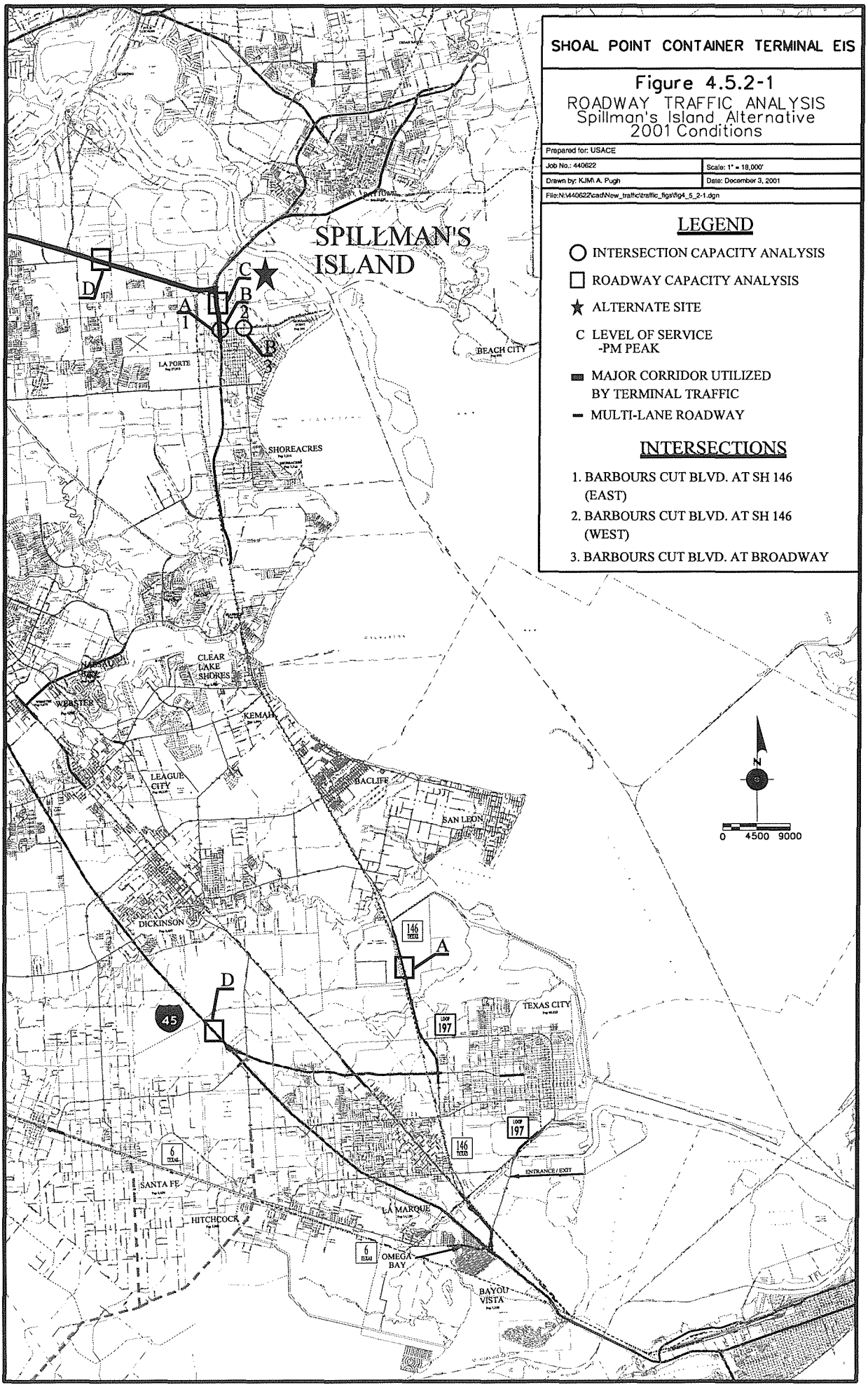
4.5.2.4 Main Corridor Analysis

Two main corridors that analyzed for this alternative: SH 225 and SH 146. The SH 225 corridor included in the analysis for this alternative extends from SH 146 to Beltway 8, and the SH 146 corridor analyzed extends from Barbours Cut to SH 225. The Beltway 8 to Center Road segment of SH 225 is currently experiencing a poor LOS (E) (Table 4.5.2-3). Roadway improvements included in the model for this analysis (see Table 4.2.2-5) would improve the LOS in this segment to D in 2005 and 2015; however, by 2025, normal growth would cause the segment to return to LOS E. No change in LOS is expected on this segment as a result of the proposed project, relative to the No-Build scenario. The Center Road to SH 146 segment of SH 225 would experience similar improvements in 2005 and 2015 when roadway projects would result in a change in the 2001 LOS from D to C. By 2025, the LOS would

TABLE 4.5.2-2

SPILLMAN'S ISLAND INTERSECTION TRAFFIC ANALYSIS

Limits	Year 2001		Year 2005 Build		Year 2005 No Build		Year 2015 Build		Year 2015 No Build		Year 2025 Build		Year 2025 No Build	
	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)
Barbours Cut at SH-146 (East Side)	A	9	A	10	A	9	B	11	A	10	B	13	A	10
Barbours Cut at SH-146 (West Side)	B	11	B	13	B	12	C	18	C	15	D	29	D	25
Barbours Cut at Broadway	B	15	C	22	C	18	E	42	E	35	F	75	F	55


SHOAL POINT CONTAINER TERMINAL EIS
Figure 4.5.2-1
ROADWAY TRAFFIC ANALYSIS
Spillman's Island Alternative
2001 Conditions
Prepared for: USACE
Job No.: 440622
Scale: 1" = 18,000'
Drawn by: KJM\ A. Pugh
Date: December 3, 2001
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LEGEND
INTERSECTION CAPACITY ANALYSIS
ROADWAY CAPACITY ANALYSIS
ALTERNATE SITE
C LEVEL OF SERVICE -PM PEAK
MAJOR CORRIDOR UTILIZED BY TERMINAL TRAFFIC
MULTI-LANE ROADWAY
INTERSECTIONS
1. BARBOURS CUT BLVD. AT SH 146 (EAST)
2. BARBOURS CUT BLVD. AT SH 146 (WEST)
3. BARBOURS CUT BLVD. AT BROADWAY
SPILLMAN'S ISLAND
BEACH CITY
LA PORTE
SHOREACRES
CLEAR LAKE SHORES
WEBSTER
KEMAH
LEAGUE CITY
BACLIFF
SAN LEON
DICKINSON
TEXAS CITY
SANTA FE
HITCHCOCK
LA MARQUE
OMEGA BAY
BAYOU VISTA
ENTRANCE / EXIT
N
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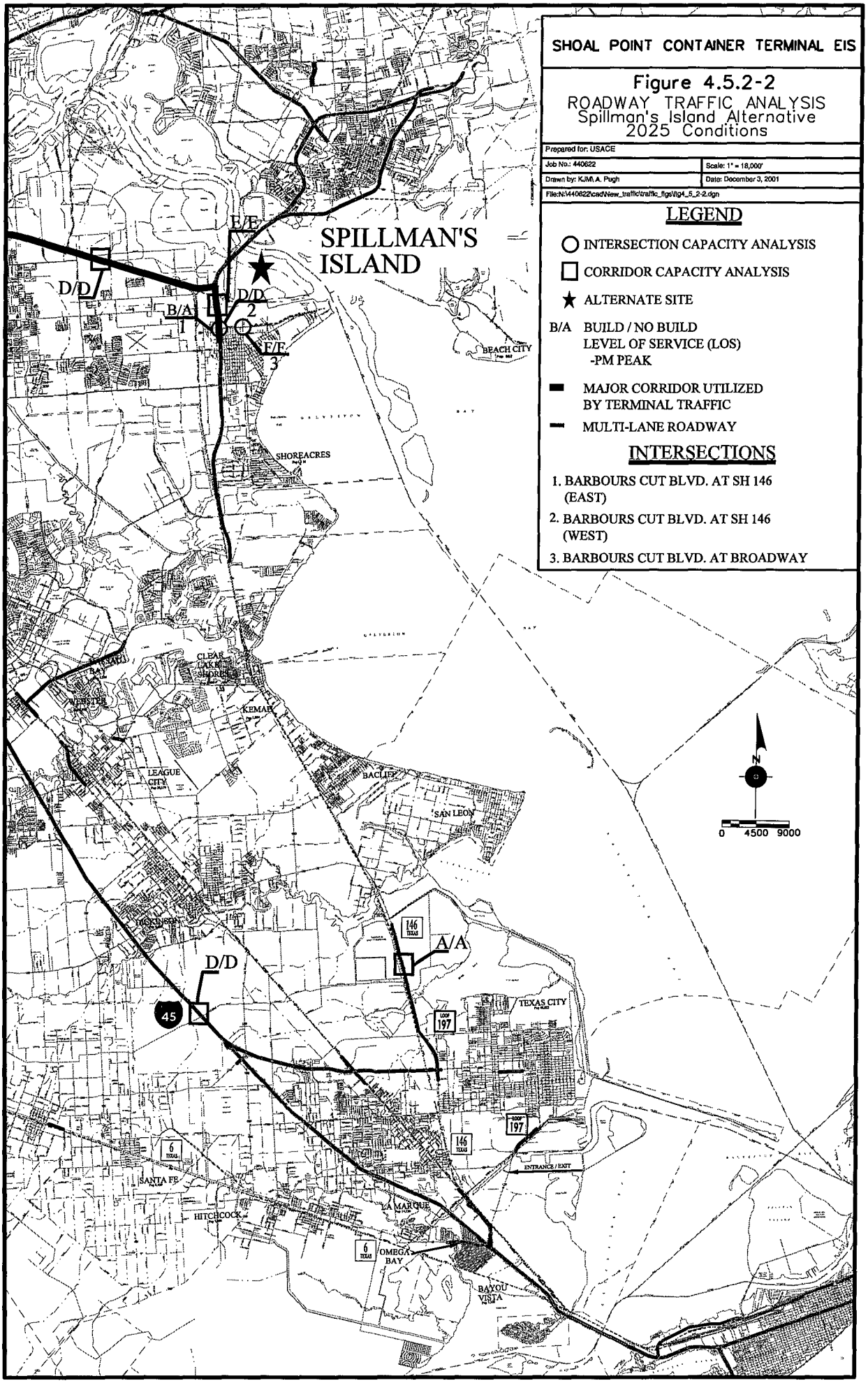

SHOAL POINT CONTAINER TERMINAL EIS
Figure 4.5.2-2
ROADWAY TRAFFIC ANALYSIS
Spillman's Island Alternative
2025 Conditions
Prepared for: USACE
Job No.: 440622
Scale: 1" = 18,000'
Drawn by: KJM\ A. Pugh
Date: December 3, 2001
File:N:\440622\cad\New_traffic\traffic_figs\fig4_5_2-2.dgn
LEGEND
INTERSECTION CAPACITY ANALYSIS
CORRIDOR CAPACITY ANALYSIS
ALTERNATE SITE
B/A BUILD / NO BUILD LEVEL OF SERVICE (LOS) -PM PEAK
MAJOR CORRIDOR UTILIZED BY TERMINAL TRAFFIC
MULTI-LANE ROADWAY
INTERSECTIONS
1. BARBOURS CUT BLVD. AT SH 146 (EAST)
2. BARBOURS CUT BLVD. AT SH 146 (WEST)
3. BARBOURS CUT BLVD. AT BROADWAY
SPILLMAN'S ISLAND
E/E
D/D
B/A
D/D 2
F/E 3
BEACH CITY
SHOREACRES
CLEAR LAKE SHORES
KEMAH
WEBSTER
LEAGUE CITY
BACLIFF
SAN LEON
A/A
D/D
TEXAS CITY
ENTRANCE / EXIT
SANTA FE
HITCHCOCK
LA MARQUE
OMEGA BAY
BAYOU VISTA
0 4500 9000

TABLE 4.5.2-3

SPILLMAN'S ISLAND FREEWAY LEVEL OF SERVICE (LOS) ANALYSIS

	Alternative	Roadway	Limits	Year 2001			Year 2005			Year 2015			Year 2025		
				ADT	Density	LOS	ADT	Density	LOS	ADT	Density	LOS	ADT	Density	LOS
No Build	Spillman's Island	SH-225	Beltway 8 to Center Rd.	111,080	36.1	***E***	122,191	27.0	D	131,524	29.5	D	142,823	33.4	***E***
			Center Rd. to SH-146	90,700	27.0	D	95,062	20.5	C	105,019	22.8	C	112,986	24.7	D
		SH-146	SH-225 to Barbours Cut	73,880	21.7	C	84,108	24.9	D	96,612	29.2	D	112,354	36.9	***E***
Build	Spillman's Island	SH-225	Beltway 8 to Center Rd.	Not Applicable			124,491	27.6	D	134,962	30.6	D	152,964	37.9	***E***
			Center Rd. to SH-146				97,274	21.0	C	108,758	23.6	C	120,386	26.5	D
		SH-146	SH-225 to Barbours Cut				86,700	25.7	D	100,100	30.6	D	121,800	44.9	***E***

Year 2001: Analysis based on TxDOT Provided ADT and Existing Geometry
Year 2005: Analysis based on H-GAC Model Traffic and Geometry
Year 2015: Analysis based on H-GAC Model Traffic and Geometry
Year 2025: Analysis based on H-GAC Model Traffic and Geometry
No-Build: Existing Traffic Generators
Build: Existing Traffic Generators and Terminal Operation

Peak Hour Factor: 0.90
K factor: 10
Directional Distribution: 50-50
Percent Truck Traffic: 10%

ADT: Average Daily Traffic (Bi-directional Daily Traffic Volume)
Density: Passenger Cars per Mile per Lane
LOS: Level of Service (Qualitative Measure of Effectiveness)
- Change in Level of Service
ITALICS - Poor Level of Service
* - Density out of range

return to D as a result of normal growth, and project-related traffic would not cause a change in LOS for this segment. The SH 146 segment from SH 225 to Barbours Cut would experience a gradual change in LOS from C in 2001 to E in 2025 as a result of normal growth in the area. Project-related traffic would not result in any change in LOS on this segment relative to the No-Build scenario (Table 4.5.2-3).

4.5.2.5 Railroad Crossing Impacts

The major railroad intersections that would be affected by the container terminal at the Spillman's Island site are along Center Road. The Spillman's Island alternative would affect a relatively low number of railroad intersections. The difference between the Build and No-Build scenarios would be four trains per day during ultimate design build-out (2025). Estimated increases in future average delays (i.e., seconds per vehicle of delay while a train is crossing the intersection) for each railroad crossing due to the additional train activity related to the project are presented in Table 4.5.2-4.

TABLE 4.5.2-4
ESTIMATED RAILROAD DELAY, SPILLMAN'S ISLAND ALTERNATIVE

Intersection	Year 2025-Build	
	Future Average Delay (sec/veh)	Additional Train Activity (trains per day)
Center Road	0.34	4
SH 225 at Center Road	0.34	4

4.5.2.6 Hurricane Evacuation

In the event of a hurricane, with ample warning from the National Weather Service, the terminal would coordinate efforts of the Port Operations Manager, Terminal Managers, and Shop Foreman to activate its Hurricane Preparedness Plan (HPP) (see Section 4.2.2.7 for a description of the process used to implement the HPP). The HPP would be coordinated with and would be on file with the emergency management systems of the local county or municipality and the USCG's Commander of the Port prior to a hurricane event. Within the HPP, a point of contact would be established with whom the local agencies and USCG would share information prior to, during, and after the hurricane. The goal of the HPP is to allow the terminal to have all equipment and facilities secured and evacuated by the time the USCG's Commander of the Port closes the HSC to vessel traffic.

4.5.2.7 Construction

Most of the construction traffic to build the proposed container terminal would occur on site and most of the raw materials would be barged to the terminal site. The primary source of offsite traffic during construction of the terminal would be from the daily workers. Therefore, minimal construction traffic impact to the transportation network would be anticipated.

4.5.3 Noise

Noise associated with the Spillman's Island alternative would be generated during the construction phase and during the operation of the facility. Major noise sources associated with the proposed project would include the construction equipment, the loading equipment used during operations, and truck traffic. In the following sections, potential impacts at the nearest noise sensitive receptors are quantified.

4.5.3.1 Construction

Noise associated with construction activities is primarily generated by the engines of the construction equipment. Analyses by the USDOT and the EPA have found that the typical noise levels of construction equipment can vary from 74 dBA to 101 dBA at a distance of 50 feet from the source (USDOT, 1995). Typical construction noise decreases by approximately 6 dB as the distance from the source is doubled. For example, if noise generated from a bulldozer is 85 dB at 50 feet, the noise level would decrease to approximately 79 dB at 100 feet and decrease to approximately 73 dB at 200 feet. Typical noise levels generated by construction equipment are listed in Table 4.2.3-1. Construction activities associated with the proposed project include the excavation and dredging of the channel, the moving and grading of placement fill, and the construction of the loading docks and berths.

Dredging within the Spillman's Island project area would occur along the northern shoreline of the project site. Dredging activities during the construction phase of the project could occur as much as 24 hours a day, 7 days a week. Electric dredging equipment would be used where feasible within the project area in order to reduce air emissions. Depending on engine components and configuration, noise levels associated with electric dredges range from 65 dBA to 85 dBA at a distance of 50 feet (USACE, 2001a). Calculations indicate that noise levels associated with dredging activities at the nearest sensitive receptors, located approximately 8,000 feet south of the dredge area, would range from approximately 21 dBA to 41 dBA. These levels are lower than the ambient noise measurements for these receptors; therefore, dredging activities are not expected to cause a noise impact.

Construction of the facilities at the Spillman's Island site would also include the use of typical construction equipment, some of which is included in Table 4.2.3-1. Calculations indicate that propagated noise levels associated with construction of the project could range between 35 dBA and 62 dBA at the nearest sensitive receptors. Although these levels may exceed ambient noise measurements at some receptors, the increases would not be considered an impact under the relative or absolute criterion.

4.5.3.2 Operations

The nearest sensitive receptors are located approximately 7,000 feet south of the main gate for this alternative. Results from the noise monitoring program conducted at the Barbours Cut Terminal (USACE, 2001a) indicate that these receptors would be most influenced by diesel truck engines idling at the entrance of the facility. However, the combined sound level of all operations and activities occurring within the facility would contribute.

A L_{dn} of 56.7 dBA recorded at a distance of approximately 1,500 feet from the main gate (USACE, 2001a) indicates that noise levels associated with operations would not present an impact to the sensitive receptors located approximately 7,000 feet from the Spillman's Island alternative. Noise generated at the Barbours Cut Terminal and facilities influence the noise environment of the surrounding residential receptors.

4.5.3.3 Traffic

As discussed in Section 3.3, a noise analysis was conducted for representative residential structures (Category B receivers) located adjacent to the main roadways that could potentially be affected by construction of the proposed container terminal at the Spillman's Island site. The results of this analysis are presented in Table 4.5.3-1. As indicated in the table, existing noise levels along all of the roadways included in the analysis for the Spillman's Island site are currently exceeding the NAC levels for Category B receivers, and are therefore already impacted under the absolute criterion (defined in Section 3.3).

The noise analysis indicates that all of the roadway segments are expected to experience further noise level increases in 2025 as a result of traffic associated with normal growth in the area (i.e., the No-Build scenario).

In the Build scenario, noise levels on two out of three of the segments analyzed are expected to increase by 1 dBA over the levels predicted for the No-Build scenario in 2025. This indicates that if the project were built, the noise levels would be increased by 1 dBA over the levels predicted for these road segments due to normal growth. The analysis indicates that noise levels on the remaining segment would not experience an increase.

4.5.4 Physiography, Topography, and Bathymetry

Dredging and grading activities would be required for construction of the proposed project at the Spillman's Island site. The most significant effects on bathymetry would be related to permanent alterations resulting from dredging to create new berths and a turning basin for cargo ships along the existing Houston Ship Channel. An estimated 9.6 mcy of material would be dredged during construction. This material would be used as fill for terminal development and placed in upland DMPAs and/or beneficial use areas. Surface topography changes would primarily be associated with site preparation activities for the container yard and associated access road, and dredged material placement. While local changes in bathymetry and topography would occur during construction of the container terminal, these alterations would be expected to have negligible impacts on regional physiography, topography, and bathymetry of the submerged and subaerial portions of the project area.

4.5.5 Geology

The impacts on the local geology during dredging and construction activities associated with the proposed project would include redistribution of existing sediment, local increases in turbidity, and potential increases of local scouring and shoaling rates. Net impacts on local geology would be minimal from these operations.

TABLE 4.5.3-1

EXISTING AND PREDICTED TRAFFIC NOISE LEVELS FOR SPILLMAN'S ISLAND ALTERNATIVE

Study Area	NAC Category	NAC Level (dBA)	Existing 2001 (dBA)	Noise Impact at Present (2001)	Predicted 2025/No Build (dBA)	Change (+/-) (dBA)	Noise Impact with "No-Build" Option	Predicted 2025/Build (dBA)	Increase in dBA over "No-Build" Conditions
SH 225 From Beltway 8 to Center Rd.	B	67	72	Yes	73	+1	Yes	74	+1
SH 225 From Center Road to SH 146	B	67	71	Yes	72	+1	Yes	73	+1
SH 146 From SH 225 to Barbours Cut	B	67	70	Yes	72	+2	Yes	72	+0

4.5.6 Energy and Mineral Resources

The proposed project would have no impacts on the energy resources within the project area. There are petroleum resources in the region but no active wells occur on this alternative project site (see Section 3.6.4). Relocation of some existing petroleum pipelines in the area may be required depending on the exact location of the terminal but would not impact oil and gas resources. Remediation of impacted soil and/or groundwater related to pipeline spills or leaks may be required during relocation activities. Consumptive use of construction products such as sand, gravel, and cement would constitute an irretrievable commitment of these mineral resources.

4.5.7 Surface Soils

Spillman's Island is an active DMPA and the majority of the site consists of poorly consolidated clayey dredged material. No impacts to native surface soils within the project area would be associated with this proposed alternative. During construction of the terminal, the site would require a soil consolidation program to minimize the amount of settlement that could occur after the terminal is in operation. The consolidation program would likely consist of the installation of wick drains, along with soil surcharge. Possible impacts to surface soils exist from the potential release of petroleum products during construction and hazardous material spills from hazardous cargo during facility operations and potential accidents during local highway transport. However, the proposed container terminal is expected to handle a minimal amount of containerized hazardous cargo and the use of BMPs for potential hazardous material spills that could occur at the terminal site would greatly minimize the potential for this type of impact.

Transportation of hazardous cargo is regulated by the U.S. Department of Transportation. Shippers of hazardous materials are required to properly packaging the cargo to reduce the potential of a release during transport and handling. In the event of a release during highway transport, City and local hazardous response teams are trained in spill containment and cleanup. Section 4.5.9 assesses in more detail the potential impact from a release of hazardous cargo due to increase traffic on highways near the site.

4.5.8 Groundwater Quality and Hydrology

Construction and operation activities associated with this alternative are not expected to result in impacts to groundwater hydrology, quantity and quality. The recharge of shallow groundwater underlying the site by precipitation would be reduced in areas at the terminal site occupied by impervious cover. However, shallow groundwater would continue to be recharged by the surrounding bay waters. In addition, the majority of surface soil at the site consists of clay and clayey loam of low permeability. These soils would tend to decrease infiltration of precipitation, and a relatively large amount of rainfall is likely lost to evaporation and surface runoff currently at the site. The decrease in recharge from precipitation would have little affect on local or regional groundwater levels. The primary drinking water aquifers (Chicot and Evangeline aquifers) typically produce fresh water from depth of 300-700 feet and 800-1,500 feet, respectively, in the vicinity of the proposed and alternate sites. Groundwater recharge to these aquifers by precipitation occurs inland in outcrop areas. Groundwater quality in these aquifers becomes poorer near

the coast where saltwater encroachment limits the amount of available fresh water. The regional affects of this relatively small decrease in recharge on the primary aquifers in the region would be negligible.

Other possible impacts to shallow groundwater exist from the potential release of petroleum products during construction and hazardous material spills from hazardous cargo during facility operations and potential accidents during local highway transport. The proposed container terminal is expected to handle some hazardous cargo; however, the use of BMPs for potential hazardous material spills that could occur at the terminal site would greatly minimize the potential for this type of impact to groundwater quality. BMPs which meet local, State, and Federal requirements will be developed and implemented as part of the Spill Response Plan for the project to address potential spills. In addition, packages for hazardous material must conform to standards set by Research and Special Programs Administration (RSPA) of the Department of Transportation and the International Maritime Organization (IMO). A carrier accepting hazardous cargo from a shipper or intermediary is obliged to exercise reasonable care to be sure that the shipment has been properly prepared. This obligation exists each time the cargo is handed off during the transportation process. Specific requirements apply to highway, rail, air and ocean transport. These procedures will greatly reduce the risk of impact to the underlying groundwater at the site. Section 4.5.9 assesses in more detail the potential impact from a release of hazardous cargo due to increase traffic on highways near the site.

4.5.9 Hazardous Materials Site Assessment

No known existing hazardous material sites occur within the Spillman's Island alternative site boundary (see Section 3.9.4). However, according to the regulatory agency database search and site reconnaissance, several hazardous material sites occur adjacent to the project boundary. These facilities are located along the proposed access corridor and in the vicinity of the industrialized Galveston Channel. The environmental impacts that have resulted from these facilities vary greatly; however, these sites do not appear to provide a significant environmental concern to the project.

The greatest potential for encountering contaminated media is during access corridor construction or during potential roadway widening activities along the existing roadways. If contaminated media are encountered, the media should be isolated and segregated for characterization and proper disposal.

4.5.9.1 Hazardous Material Impacts to the Existing Environment from Project Construction Activities

The impacts from hazardous material use and handling during construction activities associated with the proposed project pose a minimal risk of impacts to the environment. Temporary aboveground storage tanks and equipment, vehicles, and machinery that contain oil and use diesel fuel are typically utilized during major construction projects. Impacts from the storage and handling of fuels and lubricants can be eliminated or minimized with the use of mitigation methods. Mitigation will involve the implementation of a Spill Prevention Control and Countermeasure Plan (SPCC). The SPCC plan should effectively minimize impacts of spills that occur during the construction of the facility by requiring all potential contaminants to be stored, handled, and disposed of so that the risk of accidental releases to the

environment is minimized. The SPCC plan utilizes effective best management practices (BMPs), containment and control methods, and cleanup operations. Appropriate BMPs may include secondary containment for storage tanks, and drip pans for refueling, maintenance and storage of vehicles and equipment. In the event of a spill, containment and cleanup may include sorbents such as pillows, mats and booms. The plan will include training personnel for spill prevention, operation of spill response equipment, material handling, equipment inspection and maintenance, refueling procedures, spill control and containment, and spill cleanup.

4.5.9.2 Hazardous Material Impacts to the Project from Operation Activities

Fueling of land-based and water-based equipment and vessels would take place on site. The operational component of the proposed container terminal would be expected to handle some hazardous cargo. The accidental spill of fuel, lubricants, or other potentially toxic material is inevitable; however, with proper precautions in place, the impacts to human health and the environment can be greatly reduced. Precautions include a SPCC plan that would be implemented for emergency response to hazardous material spills on the terminal site. The SPCC plan requires training personnel for proper spill prevention, notification, emergency response and containment. Extensive impervious cover and proper spill response should effectively minimize or eliminate significant impacts to soils and groundwater. The risk of impacts to surface water is greatest and may require additional safeguards. Additional information regarding accidental spills is included in Section 4.5.10.

4.5.9.3 Hazardous Materials Transport

The transport of hazardous material cargo presents the potential for impacts related to accidental spills. However, multimodal transportation is extensively regulated. In the U.S., the authority is the RSPA of the USDOT. International shipments are covered by the IMO of the UN and adhere to the IMDG. Packages for hazardous material must comply with standards set by the RSPA and the UN. A carrier accepting a hazardous cargo from a shipper or intermediary is obliged to exercise reasonable care to be sure that the shipment has been properly prepared. This obligation exists with each change of custody throughout the transportation process. Specific requirements apply to sea, air, rail and highway.

The packaging requirements for hazardous material cargo have reduced environmental impacts during shipping; however, concerns remain regarding public safety issues while the cargo is in transport on local highways. To address these concerns, the increased probability of traffic accidents was assessed along the nearest major arterial highway providing access to the proposed and alternative sites. For the Spillman's Island Alternative, the assessment used traffic and accident data provided by TxDOT for a segment of SH 146 between SH 225 and Barbours Cut Blvd. (see Table 4.5.2-3). The results of the assessment, as shown on Table 4.5.9-1, indicate that under the No-Build scenario, the average daily traffic (ADT) of 73,880 vehicles (as recorded in 2001) would increase approximately 52 percent to 112,354 vehicles in the year 2025. If the proposed cargo facility is constructed, the 2001 ADT is projected to increase an additional 13 percent over baseline conditions to 121,800 vehicles by the year 2025. This increase in traffic would be incremental and would occur as each of the three phases of the cargo facility become operational.

TABLE 4.5.9-1
SPILLMAN'S ISLAND ALTERNATIVE AVERAGE DAILY TRAFFIC PROJECTIONS

			Year 2001	Year 2005		Year 2015		Year 2025	
Option	Roadway	Limits	ADT	ADT	% Truck Traffic Increase	ADT	% Truck Traffic Increase	ADT	% Truck Traffic Increase
No-Build	SH 146	SH 225 to Barbours Cut Blvd.	73,880	84,108	14%	96,612	31%	112,354	52%
Build	SH 146	SH 225 to Barbours Cut Blvd.		86,700	17%	100,100	35%	121,800	65%

For this analysis, it is assumed that an increase in traffic would result in an equivalent increase in traffic accidents. TxDOT reported an average of 24 truck accidents per year from 1997 through 1999 along the segment of SH 146 between SH 225 and Barbours Cut Blvd. Under the No-Build scenario, with a 52 percent increase in traffic, the number of truck accidents in the year 2025 is projected to be 36.5 accidents. If the proposed cargo facility is constructed and traffic increases an additional 13 percent, the number of truck accidents in the year 2025 is projected to be 41.2 accidents. The increase in traffic accidents would also be incremental as each phase becomes operational. It is estimated that less than 5 percent of the truck traffic exiting the Barbours Cut facility is hauling hazardous material (USACE, 2001a). Therefore, while traffic accidents are projected to increase consistent with increased traffic, less than 5 percent of those accidents associated with project-related truck traffic would be expected to involve trucks hauling hazardous material cargo.

According to Federal Motor Carrier Safety Administration (March 2002), 16 percent of the traffic accidents involving trucks transporting hazardous material result in the release of the hazardous material to the environment. The level of impact to human health and the environment that could result from the release is directly proportional to several factors. These factors include the state of the spilled material (i.e., gas, liquid, or solid), the distance to the nearest occupied structures, the distance to the nearest surface water body, the response time of the hazardous material response team, and the amount of time the hazardous material was exposed to the environment. The spilled material is initially classified and is isolated to minimize widespread impacts. Isolation is used to prevent discharge to surface waters or recharge to groundwater. The cleanup of a hazardous material spill typically involves the physical removal of the spilled material. This process is performed by trained hazardous material response teams and is performed by either vacuum extraction or other methods to physically containerize the spilled material. Depending on the nature of the spilled material, an evacuation of the public within a specified radius may be performed. Once the recoverable material has been removed, any impacted soil is excavated and containerized for disposal. The excavated site is backfilled with clean fill.

4.5.10 Surface Water Quality and Hydrology

The Spillman's Island site is on the northeastern shore of the island. There are no perennial surface waters on the island that would be affected by the alternative.

The main effects of this project alternative on surface water hydrology and quality would include turbidity during construction dredging and earthwork on the project site, long-term changes in

runoff characteristics, slight modifications in water circulation, and the introduction of new potential for accidental spills from containers and containerships.

Project construction would involve dredging to deepen the channel and to create berthing and turning areas (see Table 2-3). During the dredging process, higher turbidity and suspended solids concentration would be produced both in the area being dredged and in the area where the dredged material is placed. This would result in a short-term reduction in water quality and the water's ability to support its designated aquatic life use.

Tables D-4a and D-4b in Appendix D list the elutriate and water test results for sediments prior to routine maintenance dredging of the Houston Ship Channel from Red Fish Reef to Morgan's Point since 1989, along with the current (TNRCC, 2000) water quality criteria for each parameter. Based on a comparison of the criteria and observed concentrations, there has been no indication of water concentration data from the elutriate tests exceeding acceptable criteria in the Houston Ship Channel area. New work sediments that might be dredged during construction would be less likely to exhibit contamination because they have not been exposed to anthropogenic influences.

After construction is complete, changes to surface water quality would result from the addition of impervious cover (pavement and pier surface) and associated drainage structures where none currently exist. Impervious cover prevents rain from soaking into the ground where it can be used by plants during dry periods. Instead, most of the rain that falls would be forced to run off of the site. In addition to reducing groundwater recharge, increased impervious cover can have adverse effects on receiving water bodies, causing erosion of the streambed (if the receiving water is a stream) and damaging aquatic habitat. While the higher runoff and reduced recharge conditions would result from the project, the consequences should not be severe at this site. Since little groundwater recharge occurs at this site and drainage is directly to the Houston Ship Channel, rather than to streams, effects would be negligible. The facility would be required to abide by the TPDES construction stormwater and operation permits. Details of the stormwater system would be defined during final design of the project facilities.

Container vessels, like most oceangoing cargo ships, at times need to compensate for changes in cargo and fuel loads by taking on or discharging ballast water. Such water taken aboard in a foreign port could potentially transport and result in the introduction of non-native species to U.S. waters. To minimize this risk, U.S. regulations currently encourage exchange of ballast waters in the open ocean prior to entry and require reporting of any ballast water discharge. Currently there are no special provisions for receiving and treating ballast waters in Texas ports, and none is planned for this project. However, if future regulations require such facilities, they would be provided.

Placing the berths and turning area in tidal flats along the Spillman's Island shore can be expected to alter water circulation patterns to some degree. The most likely consequence of a wider channel in this reach would appear to be some reduction in tidal current velocity. This could in turn lead to a slightly higher rate of sediment accumulation. Deepening the berthing areas would allow the intrusion of deeper, more saline water at those locations. However, only very slight changes in salinity are expected.

The proposed project would introduce a higher potential for accidental spills. The terminal would handle a large number of containers, some (less than 5 percent [USACE, 2001a]) carrying packaged liquid products that are toxic or hazardous in some measure. Ruptures of products in these containers could result in harmful materials being released. To control such events, the facility would be designed with spill response systems to trap and remove spills and oil-water separators built into the site drainage system. A facility emergency response plan that includes appropriate procedures for each type and location of event would be completed prior to facility operation.

Another type of spill event could be associated with the fueling operations of containerships. Since this type of activity does not currently exist at the site, the addition of any fueling activity at the site would generate a new risk of water pollution from accidental spills. While such risk would increase relative to the present condition, fuel spills are rare and, typically, such spills are quite small.

4.5.11 Texas Coastal Management Program (TCMP) Consistency Determination

If this alternative is selected and a permit application is submitted to the USACE, it would automatically trigger a review by the GLO for consistency with TCMP. As part of the permit application to the USACE, the permittee would submit a TCMP consistency statement. Any concerns expressed by the GLO would need to be addressed before the permit was granted.

4.5.12 Vegetation

Most of the proposed footprint (terminal facility and land access corridor) is located on an active, leveed USACE DMPA. The project would displace a narrow strip of intermediate to high salt marsh (3 acres) along the slopes of the shoreline levee. The roadsides and levee slopes are vegetated with disturbed upland shrubland/grassland species (23 acres) which would also be displaced. These communities are described in Section 3.11.2. Although widgeongrass may occur near the project area, no impacts are expected to occur as a result of this project.

4.5.13 Section 404/Section 10 Jurisdictional Areas (Wetlands and Open Water)

The steep shoreline on this site prevents the formation of a significant wetland community because of the abrupt transition from upland to open water. The intermediate to high salt marsh (3 acres) is the only Section 404 wetland within the footprint. The placement of the facility and dredging for the berthing area, turning basin, and channel would impact approximately 183 acres of open water.

4.5.14 Terrestrial Wildlife

The primary direct adverse impact of the proposed construction activities on wildlife at the Spillman's Island site would result from vegetation clearing and the subsequent loss of wildlife habitat. Construction activities might also result in the direct destruction of those organisms not mobile enough to avoid construction equipment. These would potentially include individuals of several species of reptiles, mammals and, if construction occurs during the breeding season, the young of some species, including nestling and fledgling birds. Fossorial animals (i.e., those that live underground), such as mice and

shrews, may similarly be negatively impacted as a result of soil compaction caused by heavy machinery. For the most part, mobile wildlife species, particularly adult birds and larger mammals, would likely avoid the initial construction activity and move into available habitat outside the project area. Each species, however, is dependent upon available resources such as food, shelter, water, territory, and nesting sites in any given area of habitat (Dempster, 1975). It is assumed, for the purpose of impact analysis, that habitats are at their carrying capacity for the species that live there. Therefore, displaced wildlife populations are forced into competition with resident populations in adjoining habitats, creating an inevitable decreased birthrate and/or increased mortality rate until populations are reduced to numbers that the habitat can support. Thus, construction activity would ultimately result in a reduction in the local wildlife populations proportional to the amount of habitat preempted.

The noise of equipment and increased human activity during construction may disturb some local wildlife. In addition, fugitive dust associated with construction activities may have minor impacts on the vegetation, thus decreasing its value as wildlife habitat. Dredging activities may indirectly impact sea birds in the area by potentially reducing the availability of the food supply. Such impacts, however, should be temporary and without significant long-term implications.

Since the footprint of the terminal facility and land access corridor at this site is located on an active, leveed USACE DMPA, no freshwater habitat or significant wetland habitat occurs within or near the Spillman's Island alternative site.

Once the facility is in operation, wildlife remaining in the area could be impacted by noise, lights, and human activity. Furthermore, an increase in vehicular traffic would increase the potential for collision mortality for some wildlife species. The increased possibility of chemical or oil spills poses a threat to the nekton community and, thus, the food source of many coastal birds in the area. Potential impacts related to bird strikes associated with the transmission line would be the same as described for Shoal Point (Section 4.2.14).

4.5.15 Aquatic Ecology

4.5.15.1 Freshwater Habitats and Fauna

The Spillman's Island alternative site supports no freshwater habitats.

4.5.15.2 Open Bay/Open-Bay Bottom

Turbidity in estuarine waters is generally credited with having a complex set of impacts on a wide array of organisms (Hirsch et al., 1978; Stern and Stickle, 1978; EH&A, 1978). Suspended material can play both beneficial and detrimental roles in aquatic environments. Increased turbidity in the area can interfere with light penetration and thus reduce photosynthetic activity by phytoplankton. Such reductions in primary productivity would be localized around the immediate area of the dredging operations. Conversely, the decrease in primary productivity has been found to be offset by increased nutrient content (Morton, 1977).

Potential effects of elevated turbidities on the adult stages of various filter-feeding organisms such as oysters and copepods include reduction of pumping and filter rates and clogging of

filtering mechanisms (Stern and Stickle, 1978). These effects are pronounced with high TSS levels, but are apparently reversible once turbidities return to ambient levels.

Water column turbidity would increase in open-bay habitats near the project site during dredging activities but the effects are expected to be temporary and local. Some studies of turbidity from TSS associated with dredging operations have concluded that dredging had no substantial effects on nekton (Ritchie, 1970; Stickney, 1972; Wright, 1978); however, other studies have shown that elevated TSS levels and prolonged exposure can suffocate and reduce growth rates in adult and juvenile nekton and reduce viability of eggs (Moore, 1977; Stern and Stickle, 1978). Elevated turbidities during construction and maintenance dredging may affect some aquatic organisms near the dredging activity; however, turbidities in the open-bay habitats can be expected to return to near ambient conditions after dredging ceases.

For any Beneficial Use sites that would be created, similar impacts from FLUMF and benefits to the aquatic community as described in the Shoal Point alternative (Section 4.2.15) apply.

In the event an accidental spill should occur, benthic fauna may be killed and phytoplankton may be adversely affected. It is unlikely, however, that a spill in Galveston Bay would result in long-term adverse impacts to phytoplankton, zooplankton, or benthic communities. These communities have the ability to recover rapidly from a spill due primarily to the rapid rate of reproduction of the organisms and to the widespread distribution of the dominant species. Adult crustaceans (shrimp and crabs) and adult finfish are probably mobile enough to avoid most areas of high concentrations of toxins. Larval and juvenile finfish and shellfish tend to be more susceptible to toxins than adults. Juveniles could be affected extensively by a spill during their period of active immigration. The potential for impacts from spills would be minimized by use of BMPs and spill control and prevention measures. Therefore, the impacts of dredging and placement of dredged material are both localized and temporary and are not expected to have long-term adverse impacts on the aquatic environment.

Construction of a new berthing area, turning basin, and channel would slightly increase habitat for nekton species common in deeper offshore waters, which periodically enter the bay through the deep channel corridor (Breuer, 1962). This would also result in a slight increase in the availability of feeding and nursery area for demersal fish (Breuer, 1972). Adverse impacts to benthos affected by construction would likely be short term due to their ability to recolonize the affected area relatively quickly.

The impacts of contaminated dredged material depend on the nature of the biogeochemical environment and the contaminants. Common contaminants of sediment include heavy metals, chemical byproducts, petroleum, and organohalides. Contaminants bind to sediments which are in direct contact with benthic organisms and may be ingested (Montagna et al., 1998). Few studies have examined sediment contaminants in many areas of Galveston Bay, with the exception of the upper Houston Ship Channel, a well documented source of toxicity (GBNEP, 1994b). Based on GBNEP (1994b), elevated levels of contaminants do not occur near this alternative; therefore, impacts to benthic organisms and nekton from contaminated sediments are not expected. Stormwater runoff can carry toxic contaminants into surface waters, depositing them on sediments and potentially affecting the aquatic community. The potential for toxic runoff would increase with the building of the Spillman's Island

alternative; however, runoff from industrial point sources contributes less than 7 percent of the total loading of any pollutant, including heavy metals and biological oxygen demand, in Galveston Bay (GBNEP, 1994b). In addition, pollutant loading is expected to be minimal due to the type of facility (containerized cargo) and to the controls that would be implemented to control runoff and spills. Therefore, impacts from contamination are expected to be minimal.

4.5.15.3 Oyster Reefs

Live oyster reefs occur near the Spillman's Island alternative (GLO, 1996b) and may be affected by project construction. Increased sedimentation due to dredging activities has the potential to cover existing oyster reefs, clogging their filter feeding ability; however, oysters can survive minimal coverage. Dredging activities associated with construction of the Spillman's Island alternative should not pose a long-term threat to oyster populations.

4.5.15.4 Recreational and Commercial Fisheries

The recreational and commercial fishery may be temporarily affected in the vicinity of dredging operations as a result of decreased water quality and increased turbidity during dredging, and the loss of attractiveness to fish in the area due to loss of benthic organisms. This is not a permanent condition; the quality of fishing in the project area should steadily improve after dredging is completed. Recreational fishing impacts would be temporary, potentially resulting in local disturbances to both boat and wade-bank fishing. However, recreational fishing at these locations, while locally important, constitutes a relatively small portion of the overall recreational fishing activity in the project vicinity. Construction and dredging activities in this portion of the bay are not expected to have long-term adverse impacts on fishing in the project area.

If an accidental spill were to occur, adult finfish are mobile enough to avoid the area; however, larval and juvenile finfish and shellfish could be affected extensively. Serious impacts to shrimp could also affect the commercial shrimping industry in the area if the spill is severe and widespread. The potential for impacts from spills would be minimized by the use of BMPs and spill control and prevention measures. Impacts from stormwater runoff are expected to be minimal.

4.5.15.5 Essential Fish Habitat

EFH for adult and juvenile brown and white shrimp, red drum, and Spanish mackerel occurs in the vicinity of the Spillman's Island alternative and may include estuarine emergent wetlands, estuarine mud, sand, sand and shell substrates, SAV, and estuarine water column. Approximately 183 acres of open-bay bottom would be affected by dredging of the berthing areas, turning basin, and channel.

Dredging activities in open-bay bottom habitat would impact benthic communities in those areas. Although recovery of some benthic organisms would likely occur relatively quickly, the assemblage in the sediments at the bottom of the new berthing areas, turning basin, and channel may differ from the assemblage that existed prior to construction.

While dredged material generated by dredging at this site would be available for beneficial uses, a detailed DMMP has not been produced for this alternative. If this alternative was selected for construction of the proposed project, detailed plans for dredged material placement and beneficial uses would be required. Beneficial Use sites created for this alternative would have similar positive effects on EFH and managed species as those discussed in Section 4.2.15.5 for Shoal Point, although the location and size of the Beneficial Use sites would vary.

Increased water column turbidity during construction would be localized and temporary and the amount of open-bay bottom that would be disturbed is a small percentage of the total bay bottom. Accidental spills have the potential to impact EFH, and larval and juvenile finfish could be affected extensively should a spill occur. The potential for adverse impacts from spills would be minimized, however, through the use of BMPs and spill control and prevention measures.

Adult and juvenile brown and white shrimp, and red drum would be temporarily and locally impacted by the loss of open-bay bottom habitat. However, as with the Shoal Point alternative, these species would experience an overall benefit by the creation of Beneficial Use sites. There would be no direct benefits to Spanish mackerel, as they are not marsh dependent; however, it is assumed that marsh habitat would be created as Beneficial Use sites which would increase prey for Spanish mackerel, potentially resulting in an indirect benefit.

4.5.16 Endangered and Threatened Species

4.5.16.1 Plants

No Federally listed endangered, threatened, or SOC plant species are known to occur within or near (less than 2 miles) the Spillman's Island alternative. Of all the alternative sites, the Spillman's Island site has the most limited amount of acreage outside of an active, leveed DMPA. Roadside and levee slope upland grasslands are very disturbed, but could possibly support Texas prairie dawn, Houston machaeranthera and Texas windmillgrass. However, prairie dawn is generally found in western (not eastern) Harris County, and Houston machaeranthera prefers sandy loam soils of the Clodine, Gessner and Wockley series, none of which occur on this site. Texas windmillgrass could occur in the upland grassland and roadside areas, but none were observed during the field visit.

4.5.16.2 Fish and Wildlife

While no Federally or State-listed species are known to occur within 2 miles of this alternative site, sea turtles such as Kemp's ridley and the loggerhead have been recorded from Galveston Bay and, thus, may be present in the Spillman's Island area. If so, they could be impacted by the dredging of the turning basin. Dredging activities could have an impact on these turtles through an increase in sedimentation, turbidity, and resuspension of any toxic sediments. The sedimentation may impact food sources for the turtles, and the turbidity could affect primary productivity. This would be short-term, however. The increased possibility of chemical or oil spills poses a threat to turtles both directly and indirectly through their food source. While adult sea turtles may be mobile enough to avoid areas of high oil or chemical concentrations, hatchlings, post-hatchlings, and juveniles in the area would be more

susceptible. An increase in marine traffic may result in a higher incidence of collision with sea turtles. Sea turtles are not expected to nest at the site due to lack of suitable habitat.

A loggerhead shrike, a Federal SOC, was observed near the marina north of Spillman's Island and across Black Duck Bay during site visits to the area.

4.5.17 Cultural Resources

There is a very low probability of impacts to unrecorded terrestrial cultural resource sites at this location. Due to the historic nature of the area, a possibility exists that significant underwater cultural resources may be present in the surrounding waters.

The Spillman's Island Alternative is located on the La Porte and Morgan's Point quadrangle maps. The TARL files did not identify any previously recorded cultural resource sites within the 400-acre plot for the alternative site. No recorded sites were identified along the proposed access corridor. There are no listed or determined eligible for listing NRHP sites or SAL designated sites within the boundaries of the 400-acre site or along the access corridor.

Multiple phases of settlement and land use in the nineteenth century were identified archivally for Spillman's Island. The extended occupation of the island appears to have been focused around one location of the Houston Ship Channel side of the island as indicated on maps by the USACE in 1851 and 1871. Occupation and development at this site appears to have begun in the 1830s, with James Spillman's occupation of the island and with Sam Houston's interest in developing a vineyard there. After passing through several interim owners, the island and its improvements in 1853 came into the possession of the Thomas J. Jennings family, who retained it through the end of the century. Aside from Sam Houston's agricultural interest, the island's historical associations are also remarkable considering that Thomas Jefferson Jennings served the state of Texas as Attorney General and as a State Representative in the 1850s. However, he apparently was a non-resident owner with his principal places of residence at Tyler and Fort Worth rather than on Spillman's Island.

Throughout the latter nineteenth century, the island continued to be used for agriculture. It appears that improvements on the island apparently were rebuilt following the 1854 and 1875 hurricanes and may have survived into the late nineteenth century. None of the improvements appear to have survived or been rebuilt following the 1900 hurricane, according to cartographic and property records for the post-1900 period. By the early twentieth century the island became the subject of navigation and industrial interests. Actual industrial development of the island, however, was limited largely to levee construction to contain redeposited dredged material.

Considering 1) the inaccessibility of the original landform for archaeological investigation; 2) the destructive effects of hurricanes in 1854, 1875, 1900, and 1915; and 3) further impacts from subsidence and erosion in the twentieth century, Spillman's Island presents a low potential for the presence of intact terrestrial archaeological deposits. Consequently, no further archaeological or historical investigations appear warranted. However, due to the historic nature of the area, the possibility exists that important underwater resources could be present in the waters surrounding Spillman's Island.

4.5.18 Commercial and Recreational Navigation

The Spillman's Island alternative is located directly north of the existing Port of Houston Authority container facility at Barbours Cut. Access to the two-way Houston Ship Channel, recently widened to 530 feet at this point and soon to have 45-foot draft to the Gulf, would be direct. Accordingly, little impact to existing traffic would be produced, and no detailed quantification of traffic effects is included in this document.

In addition to effects to deep draft commercial navigation that is the primary element of the project, this as well as other alternatives would have some effect on commercial bay fishing and recreational boating. As noted in the baseline Section 3.17, Galveston Bay is actively used by both types of small craft--bay commercial fishing vessels and recreational boaters. The northern part of the bay has a major concentration of recreational boating activity. For a variety of navigation and safety reasons, deep draft traffic must have right-of-way over small craft in the restricted deep draft channels. Increases in deep draft commerce will increase the amount of time that small craft traffic will experience some restrictions or the need to yield right-of-way in the deep channels. That would appear to be an unavoidable consequence. However, with very few exceptions, these small craft are not restricted to the dredged channels, so the limitation is small and avoidable. In addition, the amount of time that deep draft channels are actually occupied by deep draft vessels tends to be a very small portion of the day. Overall, there is a measure of use conflict between small craft and deep draft vessels, and increases in deep draft commerce will increase that conflict. However, the conflict is relatively small and will not significantly impact small craft uses.

4.5.19 Land Use/Recreation/Aesthetics

4.5.19.1 Land Use

Site-related Impacts. The Spillman's Island alternative lies on a DMPA that is currently undeveloped. Construction and operation of the proposed project at this site would result in currently undeveloped fill being converted to industrial uses. The proposed site is adjacent to other maritime industrial land uses. Thus, it is not expected that land uses in the nearby environs of the proposed Spillman's Island site would have significant adverse impacts from the location of the terminal facilities, which would be a consistent and compatible land use.

Transport-related Impacts. The major roadways which would receive traffic generated by container terminal activity from the Spillman's Island alternative site are SH 146 and SH 225, which are expected to receive an additional 10,000 ADT from the Spillman's Island alternative.

Traffic volumes along SH 146 are expected to increase by approximately 52 percent by 2025 without the proposed project. The additional project traffic would add an extra 13 percent. SH 146 passes through largely commercial and industrial areas. The introduction of an additional 10,000 truck trips a day along this roadway does not present an incompatible use, although as noted in Section 4.2.2, improvements would be needed to SH 146 to accommodate projected traffic volumes (with or without the project) to maintain an acceptable level of service.

SH 146 intersects with SH 225, which would also receive approximately 10,000 additional truck trips per day from the proposed Spillman's Island alternative site. SH 225 passes through highly industrialized areas and the addition of project truck traffic would not introduce an incompatible land use along this highway.

Labor Force-Related Impacts. Additional housing, commercial and public land uses would be required to serve the projected 978 inmigrant population of operations workers and their families. Assuming the same land uses per 100 individuals shown in Table 4.1.19-1, the demands generated by the inmigrant population would include approximately 40.7 acres of residential land uses, 3.8 acres of commercial uses, 43.3 acres of public, semipublic and park uses, and 40.1 acres of streets.

Secondary Impacts. Construction and operation of the proposed container terminal at this site would contribute to the conversion of currently undeveloped land to industrial use. The addition of the facility to the area may lead to the potential development of secondary, or ancillary growth effects in the general vicinity. This development would likely include facilities associated with the development of private sector commercial support industries, such as transportation centers, convenience stores, or distribution warehouses. These secondary land use changes that may occur as a result of the proposed container facility are consistent with nearby industrial land uses and would not introduce a new element in the area. However, secondary development would contribute to the amount of undeveloped land being converted for industrial or commercial uses. Additionally, the potential addition of these secondary facilities would represent a small portion of the overall land use changes likely to occur in the area over the next several years with or without the project.

4.5.19.2 Recreation

The only park in the vicinity of the Spillman's Island site is Bayland Park. It is not expected that the location of the proposed project on Spillman's Island would have a significant adverse impact on the recreational use of that park. There is a marina in that park with recreational boats. It is possible that the additional shipping traffic in the Bay would have some adverse affect on the recreational enjoyment of the Bay.

Location of the port facilities on Spillman's Island is not expected to interfere with recreational fishing (see Section 4.5.15), except to the extent that additional ship traffic in the Bay would lessen the recreational enjoyment of the area which already experiences a considerable level of industrial traffic. However, additional ships in the channel would provide greater opportunities for ship watching.

Bird watching activities could be adversely affected if bird nesting or roosting is disturbed at the project site or in the nearby environs of the project site (see Section 4.5.14 for additional information).

4.5.19.3 Aesthetics

As discussed in Section 3.18.4, Bayland Park lies across from the Spillman's Island alternative site. The view from this park is currently heavily industrial and maritime. It is likely that the port site would not be visible from the park. However, additional ship traffic may be seen in the vicinity of the

park. Given the nature of the current viewscape, it is unlikely that the location of the proposed project near Bayland Park would adversely affect the view from this location; the addition of more ship traffic in the Bay may somewhat increase the dynamic aspect of the maritime theme of the waterscape.

4.5.20 Socioeconomics

4.5.20.1 Population

For all alternatives, including the Spillman's Island site, the available construction labor force is expected to offer adequate labor to complete construction work without the importation of workers from outside the subregion most proximate to the site.

For operations-phase employment, an adequate local labor force would not likely be available to fill all employment positions. Table 4.5.20-1 shows the number of operations workers which may relocate to the Spillman's Island region. Inmigration of workers is expected to begin in 2004, with four workers, and escalate to 349 when the project becomes fully operational. Also shown in Table 4.5.20-1 are the additional family members which could be expected to accompany the project operations workers. Total population increase resulting from direct employment during the operations phase of the project is expected to amount to 978 at full operation.

4.5.20.2 Environmental Justice

EJ Index Methodology

The DVMAV data for Spillman's Island (Appendix G-4) show that the area has a higher proportion of ethnic minorities than the overall state minority percentage. Within the 50-square-mile area surrounding this alternative, 51.4 percent of the population is of minority status, as compared with 39.4 percent statewide. The overall minority status is ranked 2.

The DVECO data for Spillman's Island show that the area has only a slightly higher proportion of economically stressed residents than the overall state percentage. Within the 50-square-mile area surrounding this alternative, 28.3 percent of the population is economically stressed, as compared with 27.6 percent statewide. The overall economically stressed status is ranked 2.

According to the EJ Index, the overall EJ potential for the 50-square-mile area at Spillman's Island is ranked 8.

Census Tract Analysis

The percentage of African Americans in the Spillman's Island alternative is 20.8 percent which is slightly higher than Harris County (18.9 percent) but about twice as high as the state (11.7 percent). The only census tract that exceeds the threshold of 10 percent over the county's percentage of African Americans is tract 365.01. The average percentage of Hispanics is 15.7 percent, which is about 40 percent less than both the county (22.5 percent) and state (25.2 percent) average. The only census tract that exceeds the threshold of 10 percent over the county's percentage of Hispanics is

Table 4.5.20-1
Population and Housing Effects
Spillman's Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
SPILLMAN'S ISLAND ALTERNATIVE														
Direct Construction Jobs Created	17	51	53	2	16	38	0	0	0	0	6	10	20	59
Available Construction Workforce (RAZ 88,89,91,92)	75	76	77	78	80	81	82	83	84	85	85	86	87	88
Inmigration of Construction Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Operations Jobs Created	0	0	94	153	177	201	225	253	277	301	325	352	376	400
Available Operations Workforce (RAZ 88, 89, 91. 92)	87	88	90	91	92	94	95	96	97	98	99	100	101	102
Inmigration of Operations Workers	0	0	4	62	85	108	130	157	180	203	225	252	275	298
Secondary Family Growth	0	0	7	112	153	194	235	283	324	365	407	455	496	538
Total Potential Inmigration	0	0	11	174	238	302	365	440	504	568	632	707	772	836
Housing Units Needed for Inmigration	0	0	4	62	85	108	130	157	180	203	225	252	275	298

Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
SPILLMAN'S ISLAND ALTERNATIVE										
Direct Construction Jobs Created	0	0	0	0	0	0	0	0	0	0
Available Construction Workforce (RAZ 88,89,91,92)	89	90	90	91	92	93	94	95	96	96
Inmigration of Construction Workers	0	0	0	0	0	0	0	0	0	0
Direct Operations Jobs Created	452	452	452	452	452	452	452	452	452	452
Available Operations Workforce (RAZ 88, 89, 91. 92)	103	104	105	106	107	108	109	110	111	112
Inmigration of Operations Workers	349	348	347	346	345	344	343	342	341	340
Secondary Family Growth	629	627	626	624	622	620	619	617	615	613
Total Potential Inmigration	978	975	973	970	967	964	962	959	956	953
Housing Units Needed for Inmigration	349	348	347	346	345	344	343	342	341	340

tract 365.02. The average percentage of "other races" is 0.3 percent, which is much less than that of the county (4.1 percent) and state (2.3 percent). The only census tract that exceeds the threshold of 10 percent over the county's percentage of "other races" is tract 364. The average percentage of persons living below the poverty line within the census tracts is 17.0 percent. The percentage of people living under the poverty line is 15.5 percent in Harris County and 17.6 percent in the state. The only census tract that exceeds the threshold of 10 percent over the county's percentage of residents living below the poverty line is tract 365.01.

The Spillman's Island alternative would be situated more than 4,000 feet from the nearest residence. The land use would be consistent with current land uses in the area. If any minority or low-income groups are dependent on the natural resources in the vicinity of the Spillman's Island site (e.g., subsitence fishing), they would not likely be adversely affected by the project since project activities are not expected to result in long-term adverse impacts on resources of this type (e.g., fishing) (see Section 4.5.15.4). Potential effects of locating the project in this location include increased traffic, noise and air pollution (see Sections 4.5.1, 4.5.2 and 4.5.3); however, these effects would also occur at any of the alternative sites. Some of the advantages the community would reap as a result of the creation of this project are increased number of jobs for many levels of experience and the infusion of indirect economic contributions to the community (see Sections 4.5.19). These beneficial effects would also occur at any of the alternative sites.

4.5.20.3 Community Values

The La Porte Comprehensive Plan does not directly address potential port development on Spillman's Island, although it supports economic development generally (City of La Porte, undated). The land use map in the City's comprehensive plan shows planned industrial development in the vicinity of Spillman's Island, a compatible land use for the proposed project. The Spillman's Island site is also proximate to the City of Morgan's Point. Morgan's Point has stated a desire for no additional industrial development within its corporate boundaries. The Spillman's Island site is not within the Morgan's Point city limits.

4.5.20.4 Housing

Table 4.5.20-1 shows the housing needs of the inmigrant operations families. At full operation, there is expected to be a demand of 349 housing units for worker families.

4.5.20.5 Leading Economic Sectors

Total Demand. Table 4.5.20-2 shows the direct and indirect effect of the construction and operation of the Spillman's Island alternative on the Texas economy and direct non-Texas effects of the project.

For the Spillman's Island alternative, total construction costs from 2002 through 2015 are anticipated to amount to $278.3 million. Direct Texas effects are expected to amount to $225.4 million,

Table 4.5.20-2
Total Economic Effect of Project *
Spillman's Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION ACTIVITIES													
Construction Costs	$17,373,677	$52,074,223	$53,752,101	$2,253,201	$16,058,084	$38,888,715	$0	$0	$0	$0	$6,422,649	$10,018,234	$20,870,583
Direct Effects:													
Effect Outside of Texas	$3,300,288	$9,891,972	$10,210,701	$428,016	$3,050,379	$7,387,265	$0	$0	$0	$0	$1,220,041	$1,903,055	$3,964,557
Texas Direct Effect	$14,073,389	$42,182,250	$43,541,400	$1,825,185	$13,007,705	$31,501,450	$0	$0	$0	$0	$5,202,608	$8,115,179	$16,906,026
Total Texas Effect (a)	$62,427,095	$187,113,096	$191,347,839	$8,096,200	$57,699,907	$139,042,592	$0	$0	$0	$0	$23,077,861	$35,997,519	$74,992,179
OPERATIONS ACTIVITIES													
Construction Costs	$250,000	$33,583,333	$11,902,655	$19,502,212	$55,875,369	$25,581,858	$28,621,681	$32,168,142	$35,207,965	$38,247,788	$41,287,611	$44,834,071	$81,207,227
Direct Effects:													
Effect Outside of Texas	$32,191	$4,324,368	$1,532,649	$2,511,208	$7,194,809	$3,294,056	$3,685,479	$4,142,140	$4,533,564	$4,924,988	$5,316,412	$5,773,073	$10,456,673
Texas Direct Effect	$217,809	$29,258,965	$10,370,006	$16,991,004	$48,680,560	$22,287,803	$24,936,202	$28,026,001	$30,674,400	$33,322,800	$35,971,199	$39,060,998	$70,750,554
Total Texas Effect (a)	$812,350	$109,125,683	$38,676,487	$63,370,489	$181,561,423	$83,125,691	$93,003,292	$104,527,159	$114,404,760	$124,282,361	$134,159,962	$145,683,830	$263,874,764
TOTAL EFFECT													
Total Costs	$17,623,677	$85,657,556	$65,654,756	$21,755,413	$71,933,453	$64,470,574	$28,621,681	$32,168,142	$35,207,965	$38,247,788	$47,710,259	$54,852,305	$102,077,810
Direct Effects:													
Effect Outside of Texas	$3,332,479	$14,216,340	$11,743,350	$2,939,224	$10,245,188	$10,681,321	$3,685,479	$4,142,140	$4,533,564	$4,924,988	$6,536,452	$7,676,127	$14,421,230
Texas Direct Effect	$14,291,197	$71,441,215	$53,911,406	$18,816,189	$61,688,265	$53,789,253	$24,936,202	$28,026,001	$30,674,400	$33,322,800	$41,173,807	$47,176,178	$87,656,580
Total Texas Effect (a)	$63,239,445	$296,238,780	$230,024,325	$71,466,689	$239,261,331	$222,168,283	$93,003,292	$104,527,159	$114,404,760	$124,282,361	$157,237,823	$181,681,349	$338,866,943

* In year-2000 dollars

Table 4.5.20-2 (concluded)

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION ACTIVITIES												
Construction Costs	$60,588,534	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$278,300,000
Direct Effects:												
Effect Outside of Texas	$11,509,343	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$52,865,618
Texas Direct Effect	$49,079,191	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$225,434,382
Total Texas Effect (a)	$216,668,210	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$996,462,500
OPERATIONS ACTIVITIES												
Construction Costs	$50,913,717	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$1,074,183,628
Direct Effects:												
Effect Outside of Texas	$6,555,920	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$138,317,577
Texas Direct Effect	$44,357,797	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$935,866,051
Total Texas Effect (a)	$165,439,031	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$3,490,452,282
TOTAL EFFECT												
Total Costs	$111,502,251	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$1,352,483,628
Direct Effects:												
Effect Outside of Texas	$18,065,263	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$191,183,195
Texas Direct Effect	$93,436,987	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$1,161,300,434
Total Texas Effect (a)	$382,107,242	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$4,486,914,782

Source: Texas Comptroller of Public Accounts, 1989.

with an export effect of $52.9 million. Total Texas effect from construction activities are expected to amount to $996.5 million over the 2002 to 2015 period.

Operations-related effects are expected to be similar for all alternatives, as discussed above. At the point of full operation, the project operations cost is expected to amount to $57.5 million annually. The direct Texas effect is anticipated to amount to $50.1 million each year, with $7.4 million exported. Total Texas effect, including both direct and indirect effects, is projected to be approximately $186.8 million annually.

Effects to Major Economic Sectors. Table 4.5.20-3 shows the relative economic effect on various major economic sectors from the construction and operation of the Spillman's Island alternative.

For construction-related activities, $303.7 million (41%) of the overall project effect is anticipated to accrue to the construction sector. Other major sectors affected would be manufacturing, with $101.1 million (14%); services, with $93.5 million (13%); and finance, insurance and real estate (FIRE), with $91.6 million (13%).

For operations-related activities at full build-out, 51 percent ($70.3 million) of annual effects would pertain to the transportation, communication and utilities sector, with other major affected sectors being FIRE, with $22.1 million (16%); trade, with $15.0 million (11%); and services, with $14.1 million (10%). These effects would be the same for all alternatives.

The year of greatest effect from construction activities alone would be 2015, which would also be the year of greatest overall effect.

Effects on Retail and Wholesale Trade. Table 4.5.20-4 provides more specific data on the effects of construction and operations on retail and wholesale trade.

Total construction-related effects on wholesale and retail trade are anticipated to be approximately $71.0 million over the full construction period, with roughly 51 percent of those effects on the retail sector ($36.4 million) and 49 percent ($34.6 million) on the wholesale sector. At full build-out, operation of the project is expected to have an almost $7 million effect on retail trade annually, and a $6.8 million effect on wholesale trade each year. This is the same prospective effect as for all alternatives.

4.5.20.6 Employment

Table 4.5.20-5 shows the number of jobs expected to be generated by the construction and operation of the project at the Spillman's Island alternative site. A job is defined as full-time equivalent employment for one person for one year.

The construction phase of the project is expected to create 272 direct jobs over the 2002 to 2015 construction period, with the creation of an additional 4,969 jobs indirectly. The highest year of

Table 4.5.20-3
Total Texas Effect of Project, by Major Economic Sector *
Spillman's Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Agriculture	$487,820	$1,462,145	$1,506,620	$63,266	$450,880	$1,087,698	$0	$0	$0	$0	$180,336	$281,293	$586,006
Mining	$921,471	$2,761,930	$2,845,941	$119,506	$851,694	$2,054,615	$0	$0	$0	$0	$340,647	$531,350	$1,106,941
Construction	$18,992,602	$56,926,638	$58,658,203	$2,463,160	$17,554,419	$42,348,047	$0	$0	$0	$0	$7,021,128	$10,951,760	$22,815,360
Manufacturing	$6,319,987	$18,942,933	$19,519,129	$819,642	$5,841,416	$14,091,755	$0	$0	$0	$0	$2,336,354	$3,644,312	$7,592,049
Transp., Comm., Util.	$2,855,814	$8,559,748	$8,820,114	$370,372	$2,639,562	$6,367,645	$0	$0	$0	$0	$1,055,729	$1,646,756	$3,430,621
Trade	$4,815,890	$14,434,695	$14,873,762	$624,575	$4,451,215	$10,738,051	$0	$0	$0	$0	$1,780,324	$2,777,001	$5,785,214
FIRE **	$5,730,583	$17,176,310	$17,698,770	$743,202	$5,296,644	$12,777,554	$0	$0	$0	$0	$2,118,465	$3,304,443	$6,884,013
Services	$5,846,582	$17,523,993	$18,057,029	$758,246	$5,403,859	$13,036,197	$0	$0	$0	$0	$2,161,347	$3,371,332	$7,023,359
Totals	$45,970,748	$137,788,393	$141,979,569	$5,961,969	$42,489,690	$102,501,561	$0	$0	$0	$0	$16,994,329	$26,508,248	$55,223,563
OPERATIONS-RELATED EFFECTS													
Agriculture	$4,460	$599,169	$212,358	$347,944	$996,886	$456,412	$510,647	$573,920	$628,154	$682,388	$736,623	$799,896	$1,448,838
Mining	$9,316	$1,251,514	$443,563	$726,768	$2,082,247	$953,331	$1,066,613	$1,198,775	$1,312,057	$1,425,339	$1,538,621	$1,670,783	$3,026,262
Construction	$8,088	$1,086,438	$385,057	$630,907	$1,807,597	$827,586	$925,926	$1,040,656	$1,138,996	$1,237,336	$1,335,675	$1,450,405	$2,627,095
Manufacturing	$50,136	$6,734,895	$2,386,992	$3,911,028	$11,205,402	$5,130,257	$5,739,872	$6,451,089	$7,060,703	$7,670,318	$8,279,933	$8,991,150	$16,285,524
Transp., Comm., Util.	$305,639	$41,057,510	$14,551,664	$23,842,549	$68,310,774	$31,275,258	$34,991,612	$39,327,359	$43,043,713	$46,760,067	$50,476,421	$54,812,168	$99,280,393
Trade	$65,086	$8,743,194	$3,098,776	$5,077,269	$14,546,775	$6,660,064	$7,451,461	$8,374,758	$9,166,156	$9,957,553	$10,748,950	$11,672,247	$21,141,753
FIRE **	$96,025	$12,899,391	$4,571,821	$7,490,819	$21,461,783	$9,826,017	$10,993,616	$12,355,814	$13,523,413	$14,691,012	$15,858,611	$17,220,810	$31,191,775
Services	$61,200	$8,221,173	$2,913,760	$4,774,126	$13,678,245	$6,262,418	$7,006,565	$7,874,735	$8,618,881	$9,363,028	$10,107,174	$10,975,344	$19,879,464
Totals	$599,950	$80,593,283	$28,563,991	$46,801,409	$134,089,710	$61,391,344	$68,686,311	$77,197,106	$84,492,073	$91,787,041	$99,082,008	$107,592,803	$194,881,104
TOTAL EFFECTS													
Agriculture	$492,280	$2,061,314	$1,718,978	$411,209	$1,447,767	$1,544,110	$510,647	$573,920	$628,154	$682,388	$916,958	$1,081,189	$2,034,845
Mining	$930,787	$4,013,444	$3,289,504	$846,274	$2,933,941	$3,007,947	$1,066,613	$1,198,775	$1,312,057	$1,425,339	$1,879,267	$2,202,133	$4,133,203
Construction	$19,000,690	$58,013,076	$59,043,260	$3,094,066	$19,362,016	$43,175,633	$925,926	$1,040,656	$1,138,996	$1,237,336	$8,356,804	$12,402,165	$25,442,456
Manufacturing	$6,370,122	$25,677,828	$21,906,121	$4,730,670	$17,046,819	$19,222,012	$5,739,872	$6,451,089	$7,060,703	$7,670,318	$10,616,286	$12,635,462	$23,877,573
Transp., Comm., Util.	$3,161,453	$49,617,258	$23,371,778	$24,212,921	$70,950,337	$37,642,903	$34,991,612	$39,327,359	$43,043,713	$46,760,067	$51,532,150	$56,458,924	$102,711,014
Trade	$4,880,976	$23,177,889	$17,972,538	$5,701,844	$18,997,989	$17,398,115	$7,451,461	$8,374,758	$9,166,156	$9,957,553	$12,529,274	$14,449,248	$26,926,966
FIRE **	$5,826,608	$30,075,701	$22,270,591	$8,234,021	$26,758,428	$22,603,570	$10,993,616	$12,355,814	$13,523,413	$14,691,012	$17,977,076	$20,525,253	$38,075,787
Services	$5,907,781	$25,745,166	$20,970,789	$5,532,372	$19,082,104	$19,298,615	$7,006,565	$7,874,735	$8,618,881	$9,363,028	$12,268,521	$14,346,676	$26,902,823
Totals	$46,570,698	$218,381,676	$170,543,560	$52,763,378	$176,579,400	$163,892,905	$68,686,311	$77,197,106	$84,492,073	$91,787,041	$116,076,337	$134,101,051	$250,104,667

* In year-2000 dollars.
** Finance, insurance and real estate.

Table 4.5.20-3 (concluded)

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Agriculture	$1,694,876	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$7,800,941
Mining	$3,201,549	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$14,735,644
Construction	$65,987,701	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$303,719,019
Manufacturing	$21,958,096	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$101,065,674
Transp., Comm., Util.	$9,922,211	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$45,668,572
Trade	$16,732,278	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$77,013,004
FIRE **	$19,910,278	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$91,640,261
Services	$20,313,302	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$93,495,245
Totals	$159,720,291	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$735,138,360
OPERATIONS-RELATED EFFECTS												
Agriculture	$908,364	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$19,164,778
Mining	$1,897,346	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$40,030,435
Construction	$1,647,085	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$34,750,391
Manufacturing	$10,210,379	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$215,419,780
Transp., Comm., Util.	$62,244,876	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$1,313,249,777
Trade	$13,255,042	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$279,656,448
FIRE **	$19,556,008	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$412,594,976
Services	$12,463,637	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$262,959,286
Totals	$122,182,738	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$2,577,825,871
TOTAL EFFECTS												
Agriculture	$2,603,240	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$26,965,718
Mining	$5,098,895	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$54,766,079
Construction	$67,634,786	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$338,469,411
Manufacturing	$32,168,475	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$316,485,454
Transp., Comm., Util.	$72,167,087	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$1,358,918,349
Trade	$29,987,320	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$356,669,451
FIRE **	$39,466,286	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$504,235,237
Services	$32,776,939	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$356,454,531
Totals	$281,903,028	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$3,312,964,231

Source: Texas Comptroller of Public Accounts, 1989.

** Finance, insurance and real estate.

Table 4.5.20-4
Retail and Wholesale Sales Effect of Project *
Spillman's Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Retail Trade	$2,278,856	$6,830,430	$7,038,194	$295,546	$2,106,294	$5,081,195	$0	$0	$0	$0	$842,441	$1,314,064	$2,737,536
Wholesale Trade	$2,163,036	$6,483,280	$6,680,485	$280,525	$1,999,244	$4,822,949	$0	$0	$0	$0	$799,625	$1,247,278	$2,598,403
Totals	$4,441,892	$13,313,710	$13,718,679	$576,071	$4,105,537	$9,904,144	$0	$0	$0	$0	$1,642,065	$2,561,341	$5,335,939
OPERATIONS-RELATED EFFECTS													
Retail Trade	$30,318	$4,072,734	$1,443,464	$2,365,081	$6,776,144	$3,102,375	$3,471,022	$3,901,110	$4,269,757	$4,638,404	$5,007,051	$5,437,139	$9,848,201
Wholesale Trade	$29,589	$3,974,853	$1,408,773	$2,308,241	$6,613,292	$3,027,815	$3,387,603	$3,807,354	$4,167,141	$4,526,928	$4,886,716	$5,306,467	$9,611,518
Totals	$59,908	$8,047,587	$2,852,238	$4,673,323	$13,389,436	$6,130,191	$6,858,625	$7,708,464	$8,436,898	$9,165,332	$9,893,766	$10,743,606	$19,459,719
TOTAL EFFECTS													
Retail Trade	$2,309,175	$10,903,163	$8,481,658	$2,660,627	$8,882,438	$8,183,570	$3,471,022	$3,901,110	$4,269,757	$4,638,404	$5,849,491	$6,751,202	$12,585,737
Wholesale Trade	$2,192,625	$10,458,134	$8,089,259	$2,588,766	$8,612,536	$7,850,764	$3,387,603	$3,807,354	$4,167,141	$4,526,928	$5,686,340	$6,553,745	$12,209,922
Totals	$4,501,800	$21,361,297	$16,570,917	$5,249,394	$17,494,974	$16,034,334	$6,858,625	$7,708,464	$8,436,898	$9,165,332	$11,535,832	$13,304,947	$24,795,659

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Retail Trade	$7,917,635	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$36,442,190
Wholesale Trade	$7,515,229	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$34,590,054
Totals	$15,432,864	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$71,032,244
OPERATIONS-RELATED EFFECTS												
Retail Trade	$6,174,432	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$130,268,903
Wholesale Trade	$6,026,041	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$127,138,137
Totals	$12,200,474	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$257,407,040
TOTAL EFFECTS												
Retail Trade	$14,092,067	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$166,711,093
Wholesale Trade	$13,541,271	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$161,728,191
Totals	$27,633,338	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$328,439,284

Source: Texas Comptroller of Public Accounts, 1989.
* In year-2000 dollars.

Table 4.5.20-5
Employment Effect of Project
Spillman's Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED JOBS													
Direct Jobs	17	51	53	2	16	38	0	0	0	0	6	10	20
Indirect Jobs	312	936	947	41	289	694	0	0	0	0	115	180	375
Total Jobs	329	987	1,000	43	305	732	0	0	0	0	121	190	395
OPERATIONS-RELATED JOBS													
Direct Jobs	0	0	94	153	177	201	225	253	277	301	325	352	376
Indirect Jobs	3	465	165	270	774	354	396	446	488	530	572	621	1,125
Total Jobs	3	465	258	423	951	555	621	698	764	830	896	973	1,501
TOTAL JOBS													
Direct Jobs	17	51	147	155	193	239	225	253	277	301	331	362	396
Indirect Jobs	316	1,401	1,111	311	1,063	1,048	396	446	488	530	687	801	1,500
Total Jobs	333	1,452	1,258	466	1,256	1,287	621	698	764	830	1,018	1,163	1,896

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED JOBS												
Direct Jobs	59	0	0	0	0	0	0	0	0	0	0	272
Indirect Jobs	1,081	0	0	0	0	0	0	0	0	0	0	4,969
Total Jobs	1,140	0	0	0	0	0	0	0	0	0	0	5,241
OPERATIONS-RELATED JOBS												
Direct Jobs	400	452	452	452	452	452	452	452	452	452	452	7,654
Indirect Jobs	705	796	796	796	796	796	796	796	796	796	796	14,878
Total Jobs	1,105	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	22,532
TOTAL JOBS												
Direct Jobs	459	452	452	452	452	452	452	452	452	452	452	7,926
Indirect Jobs	1,786	796	796	796	796	796	796	796	796	796	796	19,847
Total Jobs	2,245	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	27,773

Source: Texas Comptroller of Public Accounts, 1989.

employment creation would occur in 2015 during Phase III construction, when 59 direct jobs are anticipated to created.

When the project is fully operational, it is expected to create approximately 450 direct jobs and almost 800 in indirect employment, the same as all alternatives.

Assuming that half of the projected unemployed construction workforce from RAZ 88, 89, 91 and 92 (Bayport and Baytown area) are qualified to work on the project, there is projected to be a larger construction workforce than is needed for the project. This is shown in Table 4.5.20-1.

Using the same assumption of one-half of the unemployed labor force having the necessary qualifications for employment on the project, the operations-related available workforce is projected to amount to 87 to 112 during the 2002 to 2025 time frame, compared with the projected employment of approximately 450. Thus, it is possible that as many as 349 workers may be drawn from outside the immediate region of the project site at Spillman's Island.

4.5.20.7 Household Income Effects

Table 4.5.20-6 shows the effects on household income from the construction and operations phases of the project. The construction phase of the project is projected to have a direct effect of $106.7 million on household incomes, and an indirect effect of $154.7 million. At full operation, the project is expected to have an annual operations-related direct effect on household income of $23.7 million and an indirect effect of $25.2 yearly, similar to all alternative sites.

4.5.20.8 Residential Property Values

According to Delucchi and Hsu (1998), residential property values may decrease from 0.2–1.5 percent for every dBA above 55 dBA. Those impacts may be temporary in nature (during construction activities) or they may be long-term effects associated with noise from operations at the container terminal site or from increased traffic.

Construction

As discussed in Section 4.5.3, dredging activities at the Spillman's Island alternative site would result in noise levels of 21 dBA to 41 dBA at the nearest sensitive receptor, located approximately 8,000 feet to the south of the dredging area. Other construction would result in noise levels of 35 dBA to 62 dBA. As discussed in Section 3.3.2.4, ambient noise levels for the closest residences range from 56.2 dBA L_{dn} to 74.0 dBA L_{dn}. The nearest residential receptors are located within residential areas approximately 4,500 feet from the site. While dredging activities are unlikely to generate noise levels that would affect property values since dredging-related noise would be lower than ambient noise levels, other construction activities might generate noise that could temporarily affect residential property values for those properties that currently have ambient noise levels below 62 dBA L_{dn}. Those impacts may range from 1.2–8.7 percent for the most affected properties.

Table 4.5.20-6
Household Income Effect of Project *
Spillman's Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Direct Effects	$6,730,562	$20,173,554	$19,888,234	$872,890	$6,220,902	$14,983,428	$0	$0	$0	$0	$2,488,134	$3,881,064	$8,085,264
Indirect Effects	$9,725,784	$29,151,150	$29,480,036	$1,261,342	$8,989,315	$21,557,603	$0	$0	$0	$0	$3,595,399	$5,608,207	$11,683,352
Total Effects	$16,456,347	$49,324,704	$49,368,270	$2,134,232	$15,210,217	$36,541,031	$0	$0	$0	$0	$6,083,533	$9,489,271	$19,768,616
OPERATIONS-RELATED EFFECTS													
Direct Effects	$102,875	$13,819,542	$4,897,942	$8,025,160	$22,992,714	$10,526,935	$11,777,822	$13,237,190	$14,488,077	$15,738,965	$16,989,852	$18,449,220	$33,416,774
Indirect Effects	$109,525	$14,712,858	$5,214,553	$8,543,919	$24,478,999	$11,207,412	$12,539,159	$14,092,863	$15,424,609	$16,756,356	$18,088,102	$19,641,806	$35,576,886
Total Effects	$212,400	$28,532,400	$10,112,496	$16,569,080	$47,471,713	$21,734,347	$24,316,981	$27,330,053	$29,912,687	$32,495,320	$35,077,954	$38,091,027	$68,993,660
TOTAL EFFECTS													
Direct Effects	$6,833,437	$33,993,095	$24,786,176	$8,898,050	$29,213,616	$25,510,363	$11,777,822	$13,237,190	$14,488,077	$15,738,965	$19,477,986	$22,330,284	$41,502,038
Indirect Effects	$9,835,309	$43,864,008	$34,694,589	$9,805,261	$33,468,314	$32,765,015	$12,539,159	$14,092,863	$15,424,609	$16,756,356	$21,683,501	$25,250,014	$47,260,239
Total Effects	$16,668,747	$77,857,104	$59,480,765	$18,703,311	$62,681,930	$58,275,378	$24,316,981	$27,330,053	$29,912,687	$32,495,320	$41,161,487	$47,580,298	$88,762,277

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Direct Effects	$23,348,908	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$106,672,940
Indirect Effects	$33,599,011	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$154,651,200
Total Effects	$56,947,919	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$261,324,140
OPERATIONS-RELATED EFFECTS												
Direct Effects	$20,950,994	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$442,026,563
Indirect Effects	$22,305,299	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$470,599,848
Total Effects	$43,256,294	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$912,626,411
TOTAL EFFECTS												
Direct Effects	$44,299,903	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$548,699,503
Indirect Effects	$55,904,311	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$625,251,048
Total Effects	$100,204,213	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$1,173,950,551

Source: Texas Comptroller of Public Accounts, 1989.
* In year-2000 dollars.

Operations

Ambient noise in the residential neighborhood nearest the proposed Spillman's Island site (approximately 4,500 feet) ranges from 56.2 dBA to 74.0 dBA. A projected L_{dn} of 56.7 dBA recorded approximately 1,500 feet from the main gate indicates that noise from operations at the terminal would be unlikely to adversely affect property values of the nearest residences, which are located 4,500 feet distant.

Traffic

Table 4.5.3-1 shows that virtually all of the residential receptors along major roadways that would be affected by increased terminal traffic currently have noise levels above 55 dBA, ranging from 70–72 dBA. According to the results of the Delucchi and Hsu research, those properties currently at the 70 dBA level likely have current property values 3.0–22.5 percent lower than similar properties with noise levels below 55 dBA. On the upper end of the range, those receptors with current noise levels of 72 dBA likely have property values 3.4–25.5 percent lower than comparable properties with noise levels less than 55 dBA. Thus, much of the potential loss of property value due to traffic noise is already represented in current market values.

Table 4.5.3-1 also indicates that noise levels are expected to increase by 1–2 dBA over existing conditions, for all residential receptors, by 2025, without the project. Thus, without the project, there may be property values which are 0.2–3.0 percent lower than those of comparable homes at different, quieter locations, in addition to the current estimated lesser property values of 3.0–25.5 percent.

With the project at the Spillman's Island alternative site, some residential receptors may experience an increase in noise of approximately 1 dBA beyond the no-build noise levels projected for 2025. Thus, some properties might be expected to experience an additional 0.2–1.5 percent decrease in relative property values.

4.5.21 Community Infrastructure and Municipal Services

The sections below discuss community infrastructure requirements of the project, to the extent that they are known. The Greater Houston metropolitan area is a very large, growing and economically viable region. Operations inmigrants to the area may locate in any of a large number of communities or in suburban areas. Inmigrants will likely either locate in communities which are able to provide community services or they will commute to locations where services are located. Inmigrants will contribute to local government revenues through ad valorem taxes, sales taxes, mixed beverage taxes, and other local taxes and fees. Typically, residential properties do not contribute enough in tax revenues to support the general fund needs of the residents. On the other hand, property tax revenues from industrial developments, particularly those with high property values such as the proposed project, are generally much greater than the costs on general fund municipal services imposed by such developments. From a regional perspective, the proposed project and its operations inmigrants are expected to contribute more to local governmental revenues than they cost in service provision; however, the locational choices of the inmigrants will determine the specific impacts on individual communities.

4.5.21.1 Utilities

For the projected inmigrant population of 978 persons, it is anticipated that there would be an additional 0.158 MGD in additional municipal water demand.

The proposed container terminal would require access to utilities needed for operation and maintenance, typical of similar facilities. For example, telephone and fiber optic service, water supply, and electricity would be needed at the site (Berger/Abam, 2001). Detailed studies regarding the ability of current systems to provide the needed utilities would be performed during the design phase of the project. In addition to providing new access to utilities, the removal or realignment of existing utility structures within the project site would be required. Currently available information regarding existing utilities and preliminary plans for utility service requirements and relocations is summarized in Section 2.4.5.6. Utility service providers in the area are discussed in Section 3.20.

The project site is located within a very large, growing and economically viable metropolitan area. Because of the overall growth or demand on services that is typical in a metropolitan area of this size, the addition of the proposed facility and approximately 349 families to the area is not expected to result in major short- or long-term impacts on service levels. Any of several communities within the region could receive the growth anticipated as a result of the project, with the majority of the growth most likely going to communities that are able to provide the desired services.

4.5.21.2 Stormwater and Drainage

Stormwater would be treated at the project site with oil-water separators before discharge into Galveston Bay (Berger/Abam, 2001).

4.5.21.3 Solid Waste and Wastewater Collection

An additional 0.098 MGD of municipal wastewater flow is expected to occur from the projected inmigrant population of 978 persons.

Solid waste and wastewater collection services or systems would be needed at the proposed terminal site. Service providers in the area are discussed in Section 3.20.

As discussed above for other utilities, the addition of the proposed facility and inmigrant population to the metropolitan area is not expected to result in major short- or long-term impacts on service levels of local communities. Detailed studies regarding the adequacy of current systems would be performed during the design phase of the project.

4.5.21.4 Fire, Police, Emergency Medical Service, and Port Security

For the projected inmigrant population of 978 persons, the demand for police and fire/EMS personnel and emergency vehicles is projected to be:

1 Firefighter at 1.17 firefighters per 1,000 persons
3 Police officers at 348 persons per officer

0 Additional emergency vehicles (at 6,961 residents per vehicle)
2 EMS personnel at 533 residents per EMS personnel

The container facility would have its own security force that would cooperate with the appropriate Emergency Management Coordinator and local industry to provide security at the port. A Security Plan and other security measures similar to those described in Section 4.2.21.4 for the Shoal Point site would be developed and implemented.

An assessment of security risks related to container cargo is based on the difference between the number of containers that would enter the Houston area with the proposed project compared with the number of containers that would enter the Houston area with the No-Build alternative. The assessment also considers the increased efforts of all of the Federal, state, and local agencies and private parties (especially including the Port Operator's responsibilities) to assess, prevent, and respond to port security threats, including terrorist events.

Containers, by design, provide for efficient transfer of large quantities of goods from ships to truck and rail for distribution through the transportation grid of the U.S. to virtually every city in the country. Demand for container cargo nationally and in the Houston area is expected to increase in response to market demands. It is anticipated that without the proposed project, container cargo destined for the Houston area would arrive at a more distant port and be transported to the Houston market via truck or rail. The risk of an accidental or intentional event with the Build alternative would increase proportionally to the increased number of containers that enter the Houston area as compared with the No-Build alternative. However, with the increased security measures in place and planned at all U.S. ports, the local Emergency Management Plan, and the coordination of port security among all port users, the potential increased risk of a threat due to the presence of a new marine terminal would be offset.

4.5.21.5 Hospitals/Medical Services

For the projected inmigrant population of 978 persons, the demand for hospital beds and medical personnel needed is projected to be:

4 Hospital beds at 221 residents per hospital bed
2 Direct care physicians at 560 residents per physician
7 Registered nurses at 140 residents per nurse
0 Dentists at 1,982 residents per dentist

4.5.21.6 Schools

For the projected inmigrant population of 978 persons, it is anticipated that the demand for La Porte ISD staff would be 13 teachers and 26 public school staff.

4.5.21.7 Libraries

For the projected inmigrant population of 978 persons, the demand for facilities is projected to be:

1,349 Books at 1.38 books per capita
3,709 Total resources at 3.79 per capita
297 Additional square feet of library space

It is not anticipated that local libraries would need to hire additional staff.

4.5.21.8 Parks and Recreation Facilities

The additional projected inmigrant population of 978 persons is likely to create a demand for 7.7 acres of various types of parkland uses, at 0.79 acre per 100 persons.

4.5.21.9 Streets and Public Transportation

Roadway infrastructure is currently available within the proposed project area. It is assumed that the proposed project would tie-in with the existing network of roadway systems currently available at the Barbours Cut terminal.

No intermodal yard is expected for this alternative. It is anticipated that the majority of rail traffic would use the existing Barbours Cut facility. There are two additional intermodal yards located in the greater Houston area. It is anticipated that these additional yards would see a minimal amount of rail traffic originating from this proposed terminal location.

4.5.21.10 Effects on Local Tax Revenues

Table 4.5.21-1 shows the potential effect of the proposed project at the Spillman's Island site on government revenues. Total government effect of the construction phase of the project is expected to be approximately $9.0 million, of which roughly 10 percent is anticipated to affect local governments. State government is expected to receive approximately 29 percent ($2.6 million) and the Federal government, 61 percent ($5.5 million).

At full operation of the project, annual government effects are expected to amount to $1.8 million annually, with a $0.2 million effect on local government, $0.5 million effect on State government and a $1.1 million effect on the Federal government. Operations-related effects are expected to be generally the same for all alternatives.

4.6 ALEXANDER ISLAND ALTERNATIVE

4.6.1 Air Quality

For this alternative, direct and indirect air quality impacts associated with the construction of the proposed project on Alexander Island were evaluated.

An estimate of air emissions from this alternative (JDC, 2002) was based on the same methodologies and emission factors developed from the Shoal Point alternative detailed emission calculations (see Section 4.2.1.1). It was assumed that the basic footprint and operation of the site would be similar for either alternative. The calculations were site specific, using the following as a basis:

Table 4.5.21-1
Government Revenues *
Spillman's Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION ACTIVITIES													
Federal Government	$322,125	$965,508	$1,202,441	$41,777	$297,733	$779,842	$0	$0	$0	$0	$119,082	$185,748	$386,961
State Government	$165,272	$495,372	$489,175	$21,434	$152,757	$363,610	$0	$0	$0	$0	$61,097	$95,301	$198,538
Local Government	$53,777	$161,185	$197,252	$6,974	$49,705	$129,193	$0	$0	$0	$0	$19,880	$31,009	$64,601
Total Government	$541,174	$1,622,065	$1,888,869	$70,185	$500,195	$1,272,645	$0	$0	$0	$0	$200,060	$312,059	$650,100
OPERATIONS ACTIVITIES													
Federal Government	$4,635	$622,669	$220,687	$361,591	$1,035,985	$474,313	$530,675	$596,430	$652,791	$709,152	$765,514	$831,269	$1,505,663
State Government	$2,378	$319,472	$113,228	$185,521	$531,531	$243,355	$272,272	$306,009	$334,926	$363,844	$392,761	$426,498	$772,508
Local Government	$774	$103,950	$36,842	$60,365	$172,951	$79,184	$88,593	$99,570	$108,979	$118,388	$127,798	$138,775	$251,361
Total Government	$7,787	$1,046,091	$370,757	$607,476	$1,740,467	$796,852	$891,540	$1,002,009	$1,096,696	$1,191,384	$1,286,072	$1,396,541	$2,529,532
TOTAL EFFECT													
Federal Government	$326,761	$1,588,177	$1,423,128	$403,367	$1,333,718	$1,254,156	$530,675	$596,430	$652,791	$709,152	$884,596	$1,017,017	$1,892,625
State Government	$167,651	$814,843	$602,403	$206,955	$684,289	$606,965	$272,272	$306,009	$334,926	$363,844	$453,858	$521,799	$971,046
Local Government	$54,551	$265,136	$234,094	$67,340	$222,656	$208,377	$88,593	$99,570	$108,979	$118,388	$147,678	$169,784	$315,961
Total Government	$548,962	$2,668,156	$2,259,625	$677,662	$2,240,662	$2,069,497	$891,540	$1,002,009	$1,096,696	$1,191,384	$1,486,132	$1,708,600	$3,179,632

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION ACTIVITIES												
Federal Government	$1,211,582	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$5,512,800
State Government	$566,871	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,609,428
Local Government	$200,771	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$914,347
Total Government	$1,979,224	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,036,576
OPERATIONS ACTIVITIES												
Federal Government	$943,991	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$19,916,439
State Government	$484,332	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$10,218,494
Local Government	$157,593	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$3,324,921
Total Government	$1,585,916	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$33,459,853
TOTAL EFFECT												
Federal Government	$2,155,573	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$25,429,239
State Government	$1,051,203	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$12,827,922
Local Government	$358,364	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$4,239,268
Total Government	$3,565,140	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$42,496,429

Source: Texas Comptroller of Public Accounts, 1989.
* In year-2000 dollars.

- Site-specific values for access road length, volume of dredged material, and volume of other fill material.
- Ship emissions were based on the route to the site.
- Truck emissions were based on the route to the site.
- Distribution to the railroad yards was adjusted, as appropriate.

Alexander Island is located in Harris County, Texas. Under this alternative, the length of the oceangoing transit would be longer when compared with the Pelican Island, Shoal Point, Bayport, Spillman's Island or Cedar Point alternatives. The motor vehicle trips into the Houston area would be shorter compared with the Pelican Island, Shoal Point or Cedar Point alternatives and comparable to the Alexander Island and Bayport alternatives. The combined terminal equipment fleets would be the same for this alternative and the other alternatives.

Air monitoring data in the area of this alternative are limited. Air quality monitoring stations closest to the project site are located in La Porte at 3824½ Battleground Road and in Baytown at 7210½ Bayway Drive, on Baker and Decker Road and at 8620 West Bay Road. As shown on Table 3.1.3-2, monitoring of ozone concentrations in the HGA indicates ozone levels above the NAAQS. All other pollutants were monitored below the NAAQS.

4.6.1.1 Impacts

Pollutant emissions from construction activities may result in short-term impacts on air quality in the immediate vicinity of the project site, including increased levels of particulate matter and vehicular exhaust emissions. As shown on Table 4.6.1-1, construction of the proposed project would result in a relative increase in emissions above those resulting from existing sources in this county. Emissions of NO_x, VOC, CO, and SO_2 (highest during Phase I) are expected to result in a less than 1 percent increase over existing emissions. Emissions of particulate matter from construction activities may result in increased localized concentrations in the ambient air surrounding the facility. The highest emission rates for particulate matter for this alternative would occur during Phase I of construction. Construction emissions during other phases of construction would be below these peak levels.

TABLE 4.6.1-1
PEAK ANNUAL CONSTRUCTION EMISSIONS SUMMARY
COMPARISON WITH HARRIS COUNTY EMISSIONS
ALEXANDER ISLAND ALTERNATIVE

Air Contaminant	Maximum Annual Construction Emissions (tpy)	Peak Year	Harris County Emissions (tpy)	Site Emissions % of Harris County Emissions
NO_x	75.0	2002	287,800	0.03
VOC	9.0	2003	182,122	0.005
CO	36.9	2003	856,287	0.004
SO_2	25.6	2003	61,328	0.04
PM_{10}	389.6	2003	152,432	0.26
$PM_{2.5}$	54.7	2003	42,301	0.13

The peak annual operating emissions for this alternative were compared with Harris County emissions as shown on Table 4.6.1-2.

TABLE 4.6.1-2
COMPARISON OF PEAK ANNUAL ONSITE OPERATING
EMISSIONS WITH HARRIS COUNTY EMISSIONS
ALEXANDER ISLAND ALTERNATIVE

Air Contaminant	Maximum Annual Operating Emissions (tpy)	Peak Year	Harris County Emissions (tpy)	% of Harris County Emissions
NO_x	48.8	2006	287,800	0.02
VOC	137.4	2026	182,122	0.08
CO	43.6	2026	856,287	0.005
SO_2	56.1	2026	61,328	0.09
PM_{10}	50.3	2026	152,432	0.03
$PM_{2.5}$*	48.9	2026	42,301	0.12
TOTAL	336		1,539,969	0.02

* $PM_{2.5}$ emissions are a subset of PM_{10} emissions and are not included in emissions total.

As shown on this table, the estimated emissions would result in a small percent increase (less than 1%) over the existing Harris County emissions. To minimize emissions, terminal sponsors would comply with the requirements of the SIP including low emission diesel and idling restrictions as well as reductions based on diesel fuel sulfur control requirements. Total operating emissions would be expected to contribute less than 1 percent to total emissions for this county.

Under this alternative, motor vehicle traffic emissions would be less than the Pelican Island or Shoal Point alternatives because this alternative is located closer to the Houston area where the bulk of the containers are expected to go. The train trip distances would also be shorter. Because this alternative is farther from the entrance of the Gulf of Mexico, the average ship travel distance would increase. As these transportation-related emissions are more regional in nature, they may be compared with emissions from the HGA, as shown on Table 4.6.1-3.

TABLE 4.6.1-3
TRANSPORTATION EMISSIONS SUMMARY
ALEXANDER ISLAND ALTERNATIVE COMPARED WITH HGA TRANSPORTATION EMISSIONS (1999)

Air Contaminant	Peak Transportation Emissions* During Operation – 2026 (tpy)	HGA Transportation Emissions (tpy)	Transportation Emissions % of HGA Transportation Emissions
NO_x	2,512	295,613	0.85
VOC	255	84,130	0.30
CO	964	593,057	0.16
SO_2	1,907	26,720	7.1
PM_{10}	117	7,697	1.5
$PM_{2.5}$	105	6,363	1.65

* Transportation emissions would peak after full build-out in 2026.

Because these are non-stationary sources, and because the background concentrations (except for ozone) in the project area are well below the NAAQS, it is expected that ambient air contaminant concentrations for PM_{10}, CO, and SO_2 would not be large enough to cause or contribute to an exceedance of an ambient air quality standard in this region, although localized SO_2 and PM_{10} concentrations may increase. VOC and NO_x emissions from the operation of container terminals, ocean-going vessels, mobile emissions, and associated activities are also included in the inventory for the SIP. These pollutants are not expected to impede attainment of the ozone standard in the HGA. In addition, because of the distance and prevailing southeast winds, emissions from this alternative would not be expected to have a major impact on the nearest Class I air quality areas.

4.6.1.2 State Implementation Plan (SIP) Conformity Review

For this alternative location, the emissions from the portion of the construction activities subject to USACE responsibility are summarized on Table 4.6.1-4 for each phase of the project:

For this alternative, the NO_x emissions for Phase I of the project construction emissions would exceed the 25 tpy emission rate for requiring a General Conformity Determination. Under this alternative, emissions of NO_x from Phase I would account for approximately 0.7 percent of the construction budget in the SIP (8,827.5 tpy) based on the Post-1999 Rate of Progress and Attainment Demonstration SIP approved by the EPA in October 2001. Based on previous discussions with the TNRCC and EPA, it is likely they would determine that the project construction emissions at this site would be included in the previously approved SIP and the recent Attainment SIP.

For Phase II and III, the VOC and NO_x emissions for project construction emissions would not exceed the emission rate for requiring a General Conformity Determination. As the emissions from each phase of the project would be less than a 10 percent increase of the VOC and NO_x emissions inventories for the entire nonattainment area, the project would not be regionally significant for purposes of General Conformity.

TABLE 4.6.1-4
SUMMARY OF MAXIMUM ANNUAL CONSTRUCTION EMISSIONS
SUBJECT TO USACE RESPONSIBILITY, ALEXANDER ISLAND ALTERNATIVE

Air Contaminant	Phase I (tpy)	Phase II (tpy)	Phase III (tpy)
NO_x	61.0	8.5	5.0
VOC	6.0	1.2	1.0
CO	25.5	7.7	6.8
SO_2	17.4	4.9	4.9
PM_{10}	20.1	13.7	14.0
$PM_{2.5}$	4.3	2.6	2.6

Because 1) the project construction emissions during Phase II and III would be exempt from the General Conformity Rule, 2) emissions during Phase I are expected to be accounted for in the SIP, and 3) the project is not regionally significant, the emissions from the project construction should not:

- Cause or contribute to any new violation of any of the NAAQS in the project area;
- Increase the frequency or severity of any existing violation of any NAAQS in the project area; or
- Delay timely attainment of the NAAQS or any required interim emission reduction in the project area.

Therefore, the TNRCC would more than likely confirm that emissions from this alternative would comply with the requirements of the General Conformity Rule and would be in conformity with the Texas SIP.

4.6.2 Roadway Traffic Impact Analysis

This section presents analyses for the unsignalized intersections, signalized intersections, and major corridors that would potentially be affected by construction of the proposed project at the Alexander Island alternative site. This site is located along the eastern shoreline of Alexander Island in La Porte, Texas. Currently there is no bridge that allows access to Alexander Island. The construction of the container terminal at Alexander Island would require a new 4-lane bridge to accommodate the terminal traffic. The traffic impact analysis was conducted for the years 2001, 2005, 2015, and 2025. Existing conditions are represented by the 2001 traffic information. The following sections describe the potential impacts of the project in terms of differences in traffic LOS between the No-Build and Build conditions for the Alexander Island alternative.

4.6.2.1 Container Distribution

Anticipated container distribution for the Alexander Island alternative is presented in Table 4.6.2-1, based on the results of H-GAC's modeling effort. The same intermodal split described for the Shoal Point alternative in Section 4.2.2.1 (i.e., 80 percent by highway/20 percent by rail) was assumed for all alternative sites.

TABLE 4.6.2-1
CONTAINER DISTRIBUTION

	Distribution (% of Container Traffic)		
Corridor	2005	2015	2025
SH 225	84	84	65
SH 146 to IH 10	10	10	10
New Intermodal Railway Facility	0	0	20
Other routes	6	6	5

As indicated by Table 4.6.2-1, SH 225 is projected to be the primary corridor, carrying 84, 84, and 65 percent of the container terminal traffic for years 2005, 2015, and 2025, respectively.

Projected daily truck volumes described for the Shoal Point alternative (see Table 4.2.2-2) would be the same for all alternative sites.

4.6.2.2 Intersection Analysis – Unsignalized Intersections

No unsignalized intersections were evaluated for this alternative.

4.6.2.3 Intersection Analysis – Signalized Intersections

Two signalized interchanges and one signalized intersection were evaluated for this alternative. Table 4.6.2-2 and figures 4.6.2-1 and 4.6.2-2 present existing conditions and results of the analysis at those intersections. The two interchanges are SH 225 at Battleground and SH 225 at Miller's Cut Off. The SH 225 at Battleground interchange consists of a north intersection and a south intersection. As a result of normal growth in the area, the north intersection would experience a change in LOS from C in 2001 to F in 2025, and the south intersection would experience a change in LOS from B in 2001 to F in 2025. Additional project traffic would increase delays at each intersection but would not result in a change in the LOS relative to the No-Build scenario. The SH 225 at Miller's Cut Off interchange also consists of a north intersection and a south intersection. The south intersection is congested during the PM peak hour and the north intersection is congested during the AM peak hour. Since the analysis was conducted for the PM peak hour, the south intersection becomes the critical intersection. The south intersection would experience a change in LOS due to the project in the year 2025, when the LOS would change from B to C. The north intersection is currently an LOS A and would remain an LOS A through 2025 for both the No-Build and Build conditions. The signalized intersection analyzed is Miller's Cut Off at Battleground Road. The Miller's Cut Off at Battleground Road intersection would experience a change in LOS due to the project in the year 2025, when the LOS would change from A to B.

4.6.2.4 Main Corridor Analysis

One main corridor was analyzed in two segments for this alternative. The corridor analyzed was SH 225 from SH 146 to Beltway 8. Table 4.6.2-3 and figures 4.6.2-1 and 4.6.2-2 present existing conditions and results of the analysis on this corridor. The Beltway 8 to Center Road segment of SH 225 is currently experiencing a poor LOS (E). Roadway improvements included in the model for this analysis (see Table 4.2.2-5) would improve the LOS in this segment to D in 2005 and 2015; however, by 2025, normal growth would cause the segment to return to LOS E. No change in LOS is expected on this segment as a result of the proposed project, relative to the No-Build scenario. The Center Road to SH 146 segment of SH 225 would experience similar improvements in 2005 and 2015 when roadway projects would result in a change in the 2001 LOS from D to C. By 2025, the LOS would return to D as a result of normal growth, and project-related traffic would not cause a change in LOS for this segment relative to the No-Build conditions.

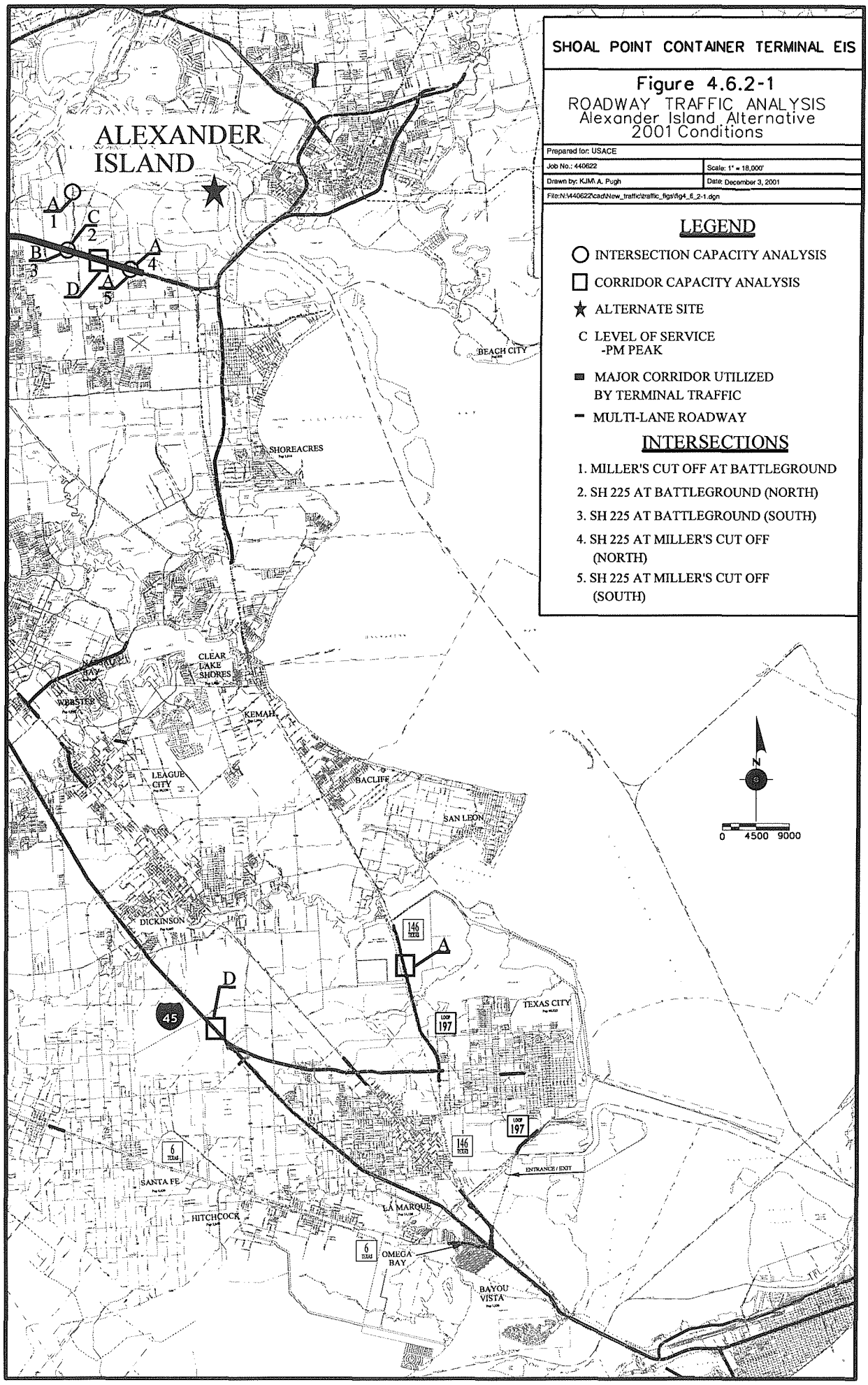
4.6.2.5 Railroad Crossing Impacts

The major railroad intersections that would be affected by the Alexander Island site are Miller Cut Off Road, Battleground Road, Tidal Road, and Center Road. The Alexander Island alternative would potentially affect a relatively high number of railroad intersections. The difference between the Build and No-Build scenarios would be four trains per day during ultimate design build-out (2025). Estimated increases in future average delays (i.e., seconds per vehicle of delay while a train is crossing the

TABLE 4.6.2-2

ALEXANDER ISLAND INTERSECTION TRAFFIC ANALYSIS

Limits	Year 2001		Year 2005 Build		Year 2005 No Build		Year 2015 Build		Year 2015 No Build		Year 2025 Build		Year 2025 No Build	
	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)
SH-225 at Battleground (North Side)	C	27	D	41	D	35	D	54	D	45	F	90	F	63
SH-225 at Battleground (South Side)	B	20	C	34	C	31	E	73	E	68	F	92	F	90
SH-225 at Miller's Cut Off (North Side)	A	7	A	7	A	7	A	8	A	7	A	9	A	8
SH-225 at Miller's Cut Off (South Side)	A	10	B	12	B	11	B	17	B	15	C	21	B	18
Miller's Cut Off at Battleground Rd.	A	7	A	8	A	7	A	10	A	9	B	11	A	9



SHOAL POINT CONTAINER TERMINAL EIS

Figure 4.6.2-1
ROADWAY TRAFFIC ANALYSIS
Alexander Island Alternative
2001 Conditions

Prepared for: USACE	
Job No.: 440622	Scale: 1" = 18,000'
Drawn by: KJM\ A. Pugh	Date: December 3, 2001
File:N:\440622\cad\New_traffic\traffic_figs\fig4_6_2-1.dgn	

LEGEND

- ○ INTERSECTION CAPACITY ANALYSIS
- □ CORRIDOR CAPACITY ANALYSIS
- ★ ALTERNATE SITE
- C LEVEL OF SERVICE -PM PEAK
- ▬ MAJOR CORRIDOR UTILIZED BY TERMINAL TRAFFIC
- ━ MULTI-LANE ROADWAY

INTERSECTIONS

1. MILLER'S CUT OFF AT BATTLEGROUND
2. SH 225 AT BATTLEGROUND (NORTH)
3. SH 225 AT BATTLEGROUND (SOUTH)
4. SH 225 AT MILLER'S CUT OFF (NORTH)
5. SH 225 AT MILLER'S CUT OFF (SOUTH)

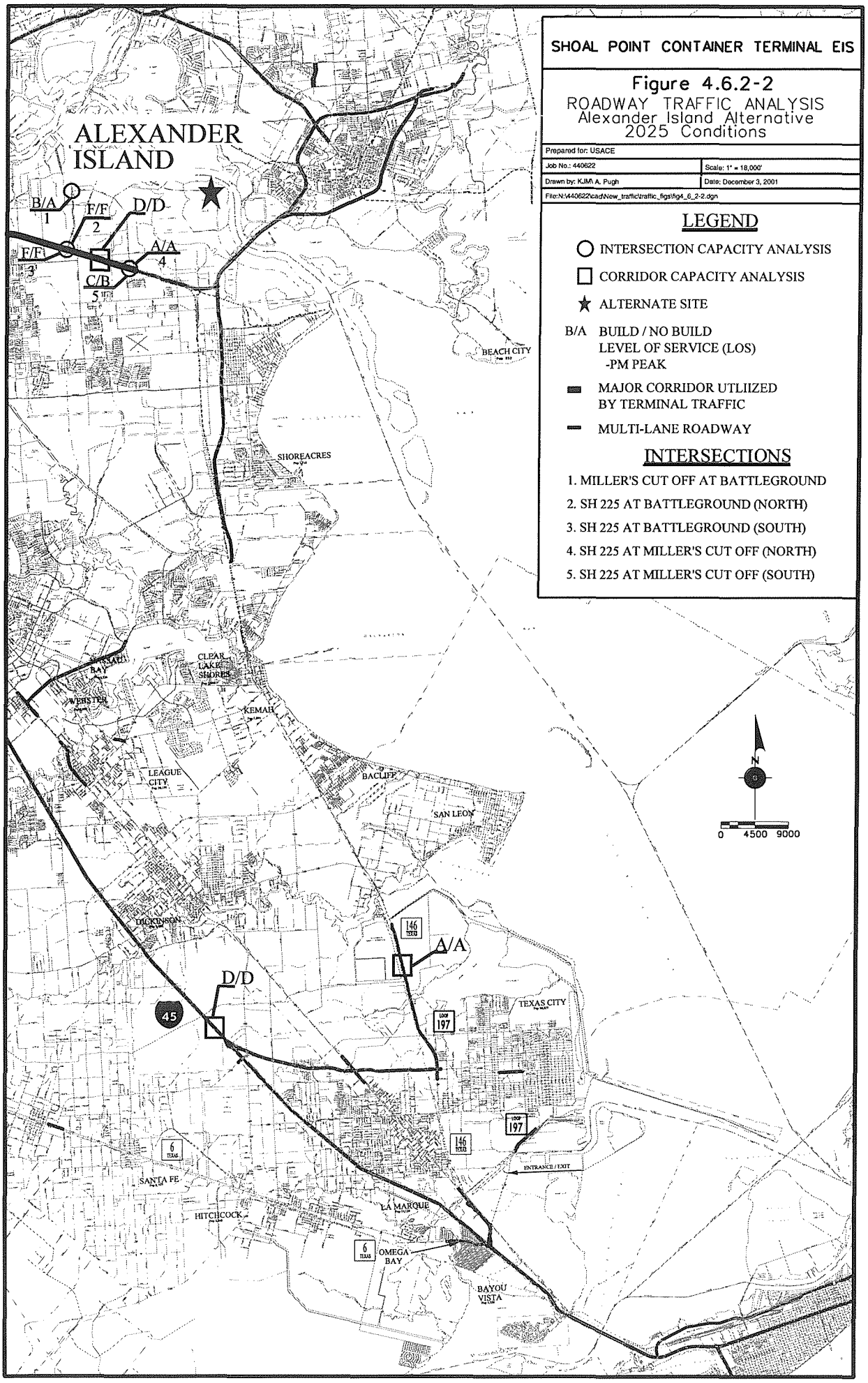

SHOAL POINT CONTAINER TERMINAL EIS
Figure 4.6.2-2
ROADWAY TRAFFIC ANALYSIS
Alexander Island Alternative
2025 Conditions
Prepared for: USACE
Job No.: 440622
Scale: 1" = 18,000'
Drawn by: KJM\ A. Pugh
Date: December 3, 2001
File:N:\440622\cad\New_traffic\traffic_figs\fig4_6_2-2.dgn
LEGEND
INTERSECTION CAPACITY ANALYSIS
CORRIDOR CAPACITY ANALYSIS
ALTERNATE SITE
B/A BUILD / NO BUILD LEVEL OF SERVICE (LOS) -PM PEAK
MAJOR CORRIDOR UTLIIZED BY TERMINAL TRAFFIC
MULTI-LANE ROADWAY
INTERSECTIONS
1. MILLER'S CUT OFF AT BATTLEGROUND
2. SH 225 AT BATTLEGROUND (NORTH)
3. SH 225 AT BATTLEGROUND (SOUTH)
4. SH 225 AT MILLER'S CUT OFF (NORTH)
5. SH 225 AT MILLER'S CUT OFF (SOUTH)
ALEXANDER ISLAND
B/A 1
F/F 2
D/D
F/F 3
A/A 4
C/B 5
BEACH CITY
SHOREACRES
CLEAR LAKE SHORES
KEMAH
WEBSTER
LEAGUE CITY
BACLIFF
SAN LEON
DICKINSON
TEXAS CITY
SANTA FE
HITCHCOCK
LA MARQUE
OMEGA BAY
BAYOU VISTA
ENTRANCE / EXIT
45
146
197
6
N
0 4500 9000

TABLE 4.6.2-3

ALEXANDER ISLAND FREEWAY LEVEL OF SERVICE (LOS) ANALYSIS

	Alternative	Roadway	Limits	Year 2001			Year 2005			Year 2015			Year 2025		
				ADT	Density	LOS	ADT	Density	LOS	ADT	Density	LOS	ADT	Density	LOS
No Build	Alexander Island	SH-225	Beltway 8 to Center Rd.	111,080	36.1	***E***	122,191	27.0	D	131,524	29.5	D	142,823	33.4	***E***
			Center Rd. to SH-146	90,700	27.0	D	95,062	20.5	C	105,019	22.8	C	112,986	24.7	D
Build	Alexander Island	SH-225	Beltway 8 to Center Rd.	Not Applicable			124,706	27.6	D	133,901	30.3	D	152,111	37.5	***E***
			Center Rd. to SH-146				97,120	21.0	C	108,400	23.6	C	122,632	27.1	D

Year 2001: Analysis based on TxDOT Provided ADT and Existing Geometry
Year 2005: Analysis based on H-GAC Model Traffic and Geometry
Year 2015: Analysis based on H-GAC Model Traffic and Geometry
Year 2025: Analysis based on H-GAC Model Traffic and Geometry
No-Build: Existing Traffic Generators
Build: Existing Traffic Generators and Terminal Operation

Peak Hour Factor: 0.90
K factor: 10
Directional Distribution: 50-50
Percent Truck Traffic: 10%

ADT: Average Daily Traffic (Bi-directional Daily Traffic Volume)
Density: Passenger Cars per Mile per Lane
LOS: Level of Service (Qualitative Measure of Effectiveness)
- Change in Level of Service
ITALICS - Poor Level of Service
* - Density out of range

intersection) for each railroad crossing due to the additional train activity related to the project are presented in Table 4.6.2-4.

TABLE 4.6.2-4
ESTIMATED RAILROAD DELAY, ALEXANDER ISLAND ALTERNATIVE

Intersection	Year 2025-Build	
	Future Average Delay (sec/veh)	Additional Train Activity (trains per day)
Miller Cut Off Road	0.50	4
Battleground Road	0.36	4
Tidal Road	0.23	4
Center Road	0.34	4

4.6.2.6 Hurricane Evacuation

In the event of a hurricane, with ample warning from the National Weather Service, the terminal would coordinate efforts of the Port Operations Manager, Terminal Managers, and Shop Foreman to activate its Hurricane Preparedness Plan (HPP) (see Section 4.2.2.7 for a description of the process used to implement the HPP). The HPP would be coordinated with and would be on file with the emergency management systems of the local county or municipality and the USCG's Commander of the Port prior to a hurricane event. Within the HPP, a point of contact would be established with whom the local agencies and USCG would share information prior to, during, and after the hurricane. The goal of the HPP is to allow the terminal to have all equipment and facilities secured and evacuated by the time the USCG's Commander of the Port closes the HSC to vessel traffic.

4.6.2.7 Construction

Most of the construction traffic to build the proposed container terminal would occur on site and most of the raw materials would be barged to the terminal site. The primary source of offsite traffic during construction of the terminal would be from the daily workers. Therefore, minimal construction traffic impact to the transportation network would be anticipated.

4.6.3 Noise

Noise associated with the Alexander Island alternative would be generated during the construction phase and during the operation of the facility. Major noise sources associated with the proposed project would include the construction equipment, the loading equipment used during operations, and truck traffic. In the following sections, potential impacts at the nearest noise sensitive receptors are quantified.

4.6.3.1 Construction

Noise associated with construction activities is primarily generated by the engines of the construction equipment. Analyses by the USDOT and the EPA have found that the typical noise levels of construction equipment can vary from 74 dBA to 101 dBA at a distance of 50 feet from the source (USDOT, 1995). Typical construction noise decreases by approximately 6 dB as the distance from the source is doubled. For example, if noise generated from a bulldozer is 85 dB at 50 feet, the noise level would decrease to approximately 79 dB at 100 feet and decrease to approximately 73 dB at 200 feet. Typical noise levels generated by construction equipment are listed in Table 4.2.3-1. Construction activities associated with the proposed project include the excavation and dredging of the channel, the moving and grading of placement fill, and the construction of the loading docks and berths.

Dredging within the Alexander Island project area would occur along the eastern shoreline of the project site. Dredging activities during the construction phase of the project could occur as much as 24 hours a day, 7 days a week. Electric dredging equipment would be used where feasible within the project area in order to reduce air emissions. Depending on engine components and configuration, noise levels associated with electric dredges range from 65 dBA to 85 dBA at a distance of 50 feet (USACE, 2001a). Calculations indicate that the nearest residential receptors, located approximately 5,000 feet east of the dredge area, would be exposed to noise levels that range from 26 dBA to 46 dBA. These levels do not exceed the acceptable range for residential areas and would therefore not result in a noise impact.

Construction of the facilities at the Alexander Island site would also include the use of typical construction equipment, some of which is included in Table 4.2.3-1. Calculations indicate that propagated noise levels associated with construction of the project would range between 35 dBA and 62 dBA at the nearest residential receptors. These levels do not exceed the acceptable range for residential areas and would therefore not result in a noise impact.

4.6.3.2 Operations

The nearest residential receptors are located approximately 5,000 feet east of the container berths for this alternative. Results from the noise monitoring program conducted at the Barbours Cut Terminal (USACE, 2001a) indicate that these receptors would be most influenced by activities occurring dockside, along the container berths. However, the combined sound level of all operations and activities occurring within the facility would contribute.

A L_{dn} of 59.0 dBA recorded at a distance of approximately 2,000 feet from the berths (USACE, 2001a) indicates that noise levels associated with dockside operations would not present an impact to residential receptors located approximately 5,000 feet from the Alexander Island alternative.

4.6.3.3 Traffic

As discussed in Section 3.3, a noise analysis was conducted for representative residential structures (Category B receivers) located adjacent to the main roadways that could potentially be affected by construction of the proposed container terminal at the Alexander Island site. The results of this analysis are presented in Table 4.6.3-1. As indicated in the table, existing noise levels along both of the

TABLE 4.6.3-1

EXISTING AND PREDICTED TRAFFIC NOISE LEVELS FOR ALEXANDER ISLAND ALTERNATIVE

Study Area	NAC Category	NAC Level (dBA)	Existing 2001 (dBA)	Noise Impact at Present (2001)	Predicted 2025/No Build (dBA)	Change (+/-) (dBA)	Noise Impact with "No-Build" Option	Predicted 2025/Build (dBA)	Increase in dBA over "No-Build" Conditions
SH 225 From Beltway 8 to Center Rd.	B	67	72	Yes	73	+1	Yes	74	+1
SH 225 From Center Road to SH 146	B	67	71	Yes	72	+1	Yes	73	+1

roadways included in the analysis for the Alexander Island site are currently exceeding the NAC levels for Category B receivers, and are therefore already impacted under the absolute criterion (defined in Section 3.3).

The noise analysis indicates that both of the roadway segments are expected to experience further noise level increases in 2025 as a result of traffic associated with normal growth in the area (i.e., the No-Build scenario).

In the Build scenario, noise levels on both of the segments analyzed are expected to increase by 1 dBA over the levels predicted for the No-Build scenario in 2025. This indicates that if the project were built, the noise levels would be increased by 1 dBA over the levels predicted for these road segments due to normal growth.

4.6.4 Physiography, Topography, and Bathymetry

Construction of the project at the Alexander Island site would include dredging and grading activities. The most significant effects on bathymetry would be related to permanent alterations resulting from dredging to create a new entrance channel and berthing area for cargo ships west of the existing Houston Ship Channel. An estimated 12.4 mcy of material dredged for construction of the facility would be used for terminal development and placed into existing upland DMPAs and/or potential beneficial use areas. Surface topography changes would primarily be associated with site preparation activities for the container yard and associated access road and dredged material placement. While local changes in bathymetry and topography would occur during construction of the container terminal, these alterations would be expected to have negligible impacts on regional physiography, topography, and bathymetry of the submerged and subaerial portions of the project area.

4.6.5 Geology

The impacts on the local geology during dredging and construction activities associated with the proposed project would include redistribution of existing sediment, local increases in turbidity, and potential increases of local scouring and shoaling rates. Net impacts on local geology would be minimal from these operations.

4.6.6 Energy and Mineral Resources

The proposed project would have no impacts on the energy resources within the project area. There are petroleum resources in the region but no active wells occur on this alternative site (see Section 3.6.5). Relocation of some or all of these existing petroleum pipelines would likely be required depending on the exact location of the terminal, but would not impact oil and gas resources. Due to the large number of pipelines at the site, pipeline relocation could impact construction of the facility. In addition, remediation of impacted soil and/or groundwater related to pipeline spills or leaks may be required during relocation activities. Consumptive use of construction products such as sand, gravel, and cement would constitute an irretrievable commitment of these mineral resources.

4.6.7 Surface Soils

Alexander Island is an active DMPA and the majority of the site consists of poorly consolidated clayey dredged material. No impacts to native surface soils within the project area would be associated with this alternative. During construction of the terminal, the site would require a soil consolidation program to minimize the amount of settlement that could occur after the terminal is in operation. The consolidation program would likely consist of the installation of wick drains, along with soil surcharge. Possible impacts to surface soils exist from the potential release of petroleum products during construction and hazardous material spills from hazardous cargo during facility operations and potential accidents during local highway transport. However, the proposed container terminal is expected to handle a minimal amount of containerized hazardous cargo and the use of BMPs for potential hazardous material spills that could occur at the terminal site would greatly minimize the potential for this type of impact.

Transportation of hazardous cargo is regulated by the U.S. Department of Transportation. Shippers of hazardous materials are required to properly packaging the cargo to reduce the potential of a release during transport and handling. In the event of a release during highway transport, City and local hazardous response teams are trained in spill containment and cleanup. Section 4.6.9 assesses in more detail the potential impact from a release of hazardous cargo due to increase traffic on highways near the site.

4.6.8 Groundwater Quality and Hydrology

Construction and operation activities associated with this alternative are not expected to result in impacts to groundwater hydrology, quantity and quality. The recharge of shallow groundwater underlying the site by precipitation would be reduced in areas at the terminal site occupied by impervious cover. However, shallow groundwater would continue to be recharged by the surrounding bay waters. In addition, the majority of surface soil at the site consists of clay and clayey loam of low permeability. These soils would tend to decrease infiltration of precipitation, and a relatively large amount of rainfall is likely lost to evaporation and surface runoff currently at the site. The decrease in recharge from precipitation would have little affect on local or regional groundwater levels. The primary drinking water aquifers (Chicot and Evangeline aquifers) typically produce fresh water from depth of 300-700 feet and 800-1,500 feet, respectively, in the vicinity of the proposed and alternate sites. Groundwater recharge to these aquifers by precipitation occurs inland in outcrop areas. Groundwater quality in these aquifers becomes poorer near the coast where saltwater encroachment limits the amount of available fresh water. The regional affects of this relatively small decrease in recharge on the primary aquifers in the region would be negligible.

Other possible impacts to shallow groundwater exist from the potential release of petroleum products during construction and hazardous material spills from hazardous cargo during facility operations and potential accidents during local highway transport. The proposed container terminal is expected to handle some hazardous cargo; however, the use of BMPs for potential hazardous material spills that could occur at the terminal site would greatly minimize the potential for this type of impact to groundwater quality. BMPs which meet local, State, and Federal requirements will be developed and implemented as part of the Spill Response Plan for the project to address potential spills. In addition, packages for hazardous material must conform to standards set by Research and Special Programs

Administration (RSPA) of the Department of Transportation and the International Maritime Organization (IMO). A carrier accepting hazardous cargo from a shipper or intermediary is obliged to exercise reasonable care to be sure that the shipment has been properly prepared. This obligation exists each time the cargo is handed off during the transportation process. Specific requirements apply to highway, rail, air and ocean transport. These procedures will greatly reduce the risk of impact to the underlying groundwater at the site. Section 4.6.9 assesses in more detail the potential impact from a release of hazardous cargo due to increase traffic on highways near the site.

4.6.9 Hazardous Materials Site Assessment

No known existing hazardous material sites occur within the Alexander Island alternative site boundary (see Section 3.9.5). However, according to the regulatory agency database search and site reconnaissance, several hazardous material sites occur adjacent to the project boundary. These facilities are located along the proposed access corridor and adjacent to petrochemical industrial facilities along the Upper San Jacinto Bay and the Houston Ship Channel. The environmental impacts that have resulted from these facilities vary greatly; however, these sites do not appear to provide a significant environmental concern to the project.

The greatest potential for encountering contaminated media is during construction of the access corridor. A new four-lane roadway with a new multi-span bridge will be required for access to the proposed project site. If contaminated media are encountered, the media should be isolated and segregated for characterization and proper disposal.

4.6.9.1 Hazardous Material Impacts to the Existing Environment from Project Construction Activities

The impacts from hazardous material use and handling during construction activities associated with the proposed project pose a minimal risk of impacts to the environment. Temporary aboveground storage tanks and equipment, vehicles, and machinery that contain oil and use diesel fuel are typically utilized during major construction projects. Impacts from the storage and handling of fuels and lubricants can be eliminated or minimized with the use of mitigation methods. Mitigation will involve the implementation of a Spill Prevention Control and Countermeasure Plan (SPCC). The SPCC plan should effectively minimize impacts of spills that occur during the construction of the facility by requiring all potential contaminants to be stored, handled, and disposed of so that the risk of accidental releases to the environment is minimized. The SPCC plan utilizes effective best management practices (BMPs), containment and control methods, and cleanup operations. Appropriate BMPs may include secondary containment for storage tanks, and drip pans for refueling, maintenance and storage of vehicles and equipment. In the event of a spill, containment and cleanup may include sorbents such as pillows, mats and booms. The plan will include training personnel for spill prevention, operation of spill response equipment, material handling, equipment inspection and maintenance, refueling procedures, spill control and containment, and spill cleanup.

4.6.9.2 Hazardous Material Impacts to the Project from Operation Activities

Fueling of land-based and water-based equipment and vessels would take place on site. The operational component of the proposed container terminal would be expected to handle some hazardous cargo. The accidental spill of fuel, lubricants, or other potentially toxic material is inevitable; however, with proper precautions in place, the impacts to human health and the environment can be greatly reduced. Precautions include a SPCC plan that would be implemented for emergency response to hazardous material spills on the terminal site. The SPCC plan requires training personnel for proper spill prevention, notification, emergency response and containment. Extensive impervious cover and proper spill response should effectively minimize or eliminate significant impacts to soils and groundwater. The risk of impacts to surface water is greatest and may require additional safeguards. Additional information regarding accidental spills is included in Section 4.6.10.

4.6.9.3 Hazardous Materials Transport

The transport of hazardous material cargo presents the potential for impacts related to accidental spills. However, multimodal transportation is extensively regulated. In the U.S., the authority is the RSPA of the USDOT. International shipments are covered by the IMO of the UN and adhere to the IMDG. Packages for hazardous material must comply with standards set by the RSPA and the UN. A carrier accepting a hazardous cargo from a shipper or intermediary is obliged to exercise reasonable care to be sure that the shipment has been properly prepared. This obligation exists with each change of custody throughout the transportation process. Specific requirements apply to sea, air, rail and highway.

The packaging requirements for hazardous material cargo have reduced environmental impacts during shipping; however, concerns remain regarding public safety issues while the cargo is in transport on local highways. To address these concerns, the increased probability of traffic accidents was assessed along the nearest major arterial highway providing access to the proposed and alternative sites. For the Alexander Island Alternative, the assessment used traffic and accident data provided by TxDOT for a segment of SH 225 between Center Road and SH 146 (see Table 4.6.2-3). The results of the assessment, as shown on Table 4.6.9-1, indicate that under the No-Build scenario, the average daily traffic (ADT) of 90,700 vehicles (as recorded in 2001) would increase approximately 25 percent to 112,986 vehicles in the year 2025. If the proposed cargo facility is constructed, the 2001 ADT is projected to increase an additional ten percent over baseline conditions to 122,632 vehicles by the year 2025. This increase in traffic would be incremental and would occur as each of the three phases of the cargo facility become operational.

TABLE 4.6.9-1
ALEXANDER ISLAND ALTERNATIVE AVERAGE DAILY TRAFFIC PROJECTIONS

			Year 2001	Year 2005		Year 2015		Year 2025	
Option	Roadway	Limits	ADT	ADT	% Truck Traffic Increase	ADT	% Truck Traffic Increase	ADT	% Truck Traffic Increase
No-Build	SH 225	Center Road to SH 146	90,700	95,062	5%	105,019	16%	112,986	25%
Build	SH 225	Center Road to SH 146		97,120	7%	108,400	20%	122,632	35%

For this analysis, it is assumed that an increase in traffic would result in an equivalent increase in traffic accidents. TxDOT reported an average of six truck accidents per year from 1997 through 1999 along the segment of SH 225 between Center Road and SH 146. Under the No-Build scenario, with a 25 percent increase in traffic, the number of truck accidents in the year 2025 is projected to be 7.5 accidents. If the proposed cargo facility is constructed and traffic increases an additional 10 percent, the number of truck accidents in the year 2025 is projected to be 8.25 accidents. The increase in traffic accidents would also be incremental as each phase becomes operational. It is estimated that less than 5 percent of the truck traffic exiting the Barbours Cut facility is hauling hazardous material (USACE, 2001a). Therefore, while traffic accidents are projected to increase consistent with increased traffic, less than 5 percent of those accidents associated with project-related truck traffic would be expected to involve trucks hauling hazardous material cargo.

According to Federal Motor Carrier Safety Administration (March 2002), 16 percent of the traffic accidents involving trucks transporting hazardous material result in the release of the hazardous material to the environment. The level of impact to human health and the environment that could result from the release is directly proportional to several factors. These factors include the state of the spilled material (i.e., gas, liquid, or solid), the distance to the nearest occupied structures, the distance to the nearest surface water body, the response time of the hazardous material response team, and the amount of time the hazardous material was exposed to the environment. The spilled material is initially classified and is isolated to minimize widespread impacts. Isolation is used to prevent discharge to surface waters or recharge to groundwater. The cleanup of a hazardous material spill typically involves the physical removal of the spilled material. This process is performed by trained hazardous material response teams and is performed by either vacuum extraction or other methods to physically containerize the spilled material. Depending on the nature of the spilled material, an evacuation of the public within a specified radius may be performed. Once the recoverable material has been removed, any impacted soil is excavated and containerized for disposal. The excavated site is backfilled with clean fill.

4.6.10 Surface Water Quality and Hydrology

The Alexander Island site is on the eastern shore of the island, fronting on the Houston Ship Channel and adjacent to San Jacinto Bay. There are no perennial surface waters on the island that would be affected by the alternative.

The main effects of this project alternative on surface water hydrology and quality would include turbidity during construction dredging and earthwork on the project site, long-term changes in runoff characteristics, slight modifications in water circulation, and the introduction of new potential for accidental spills from containers and containerships.

Project construction would involve dredging to deepen the channel and to create the berthing and turning areas (see Table 2-3). During the dredging process, higher turbidity and suspended solids concentration would be produced both in the area being dredged and in the area where the dredged material is placed. This would result in short-term reduction in water quality and the water's ability to support its designated aquatic life use.

Tables D-3a and D3b in Appendix D list the elutriate and water test results for sediments prior to routine maintenance dredging of the Houston Ship Channel from Red Fish Reef to Morgan's Point since 1989, along with the current (TNRCC, 2000) water quality criteria for each parameter. Based on a comparison of the criteria and observed levels, there has been no indication of water concentration data exceeding acceptable standards in the Houston Ship Channel area. New work sediments that might be dredged during construction would be less likely to exhibit contamination because they have not been exposed to anthropogenic influences.

After construction is complete, changes to surface water quality would result from the addition of impervious cover (pavement and pier surface) and associated drainage structures where none currently exist. Because the berthing areas would front on the existing 45-foot channel, there should be no salinity effect. Impervious cover prevents rain from soaking into the ground where it can be used by plants during dry periods. Instead, most of the rain that falls is forced to run off of the site. In addition to reducing groundwater recharge, increased impervious cover can have adverse effects on receiving water bodies, causing erosion of the streambed (if the receiving water is a stream) and damaging aquatic habitat. While the higher runoff and reduced recharge conditions would result from the project, the consequences should not be severe at this site. Since little groundwater recharge occurs at this site and drainage is directly to the Houston Ship Channel, rather than to streams, effects would be negligible. The facility would be required to abide by the TPDES construction and operation stormwater permits. Details of the stormwater system would be defined during final design of the project facilities.

Container vessels, like most oceangoing cargo ships, at times need to compensate for changes in cargo and fuel loads by taking on or discharging ballast water. Such water taken aboard in a foreign port could potentially transport and result in the introduction of non-native species to U.S. waters. To minimize this risk, U.S. regulations currently encourage exchange of ballast waters in the open ocean prior to entry and require reporting of any ballast water discharge. Currently there are no special provisions for receiving and treating ballast waters in Texas ports, and none is planned for this project. However, if future regulations require such facilities, they would be provided.

The proposed project would introduce a higher potential for accidental spills. The terminal would handle a large number of containers, some (less than 5 percent [USACE, 2001a]) carrying packaged products that are toxic or hazardous in some measure. Ruptures of products in these containers could result in harmful materials being released. To control such events, the facility would be designed with spill response systems to trap and remove spills and oil-water separators built into the site drainage system. A facility emergency response plan that includes appropriate procedures for each type and location of event would be completed prior to facility operation.

Another type of spill event could be associated with the fueling operations of containerships. Since this type of activity does not currently exist at the site, the addition of any fueling activity at the site would generate a new risk of water pollution from accidental spills. While such risk would increase relative to the present condition, fuel spills are rare and, typically, such spills are quite small.

4.6.11 Texas Coastal Management Program (TCMP) Consistency Determination

If this alternative is selected and a permit application is submitted to the USACE, it would automatically trigger a review by the GLO for consistency with TCMP. As part of the permit application to the USACE, the permittee would submit a TCMP consistency statement. Any concerns expressed by the GLO would need to be addressed before the permit was granted.

4.6.12 Vegetation

Most of the footprint of the proposed facility at the Alexander Island site would be located inside an active, leveed USACE DMPA (360 acres); however, an area outside of the levee on the island and on the mainland (land access corridor for the terminal facility) that supports estuarine and palustrine marshes and uplands (NWI, 1999; K. Calnan-PBS&J, pers. obs.) would be lost. The proposed facility's footprint would primarily impact the southern and eastern shorelines. In addition, an accreting area (approximately 1,000 by 1,300 feet) on the south side of the island with an unconsolidated shoreline and some low salt marsh (western side of the spit and west of the spit) would be impacted or lost. The eastern shoreline (exterior of levee slopes) has a broad area ranging from less than 100 feet to approximately 1,000 feet wide which supports a shrubland/grassland. The levee roadside and slopes also support an upland shrubland/grassland community. The acreages for all vegetation types within the footprint, including the land access corridor and areas that would be displaced by the proposed facility, such as the accreted area on the south shoreline, are 91 acres of upland shrubland/grassland, 5 acres of salt/brackish marsh, and less than 1 acre of fresh/brackish pond. No impacts are expected to occur to widgeongrass that may be present in the bay near the site. However, widgeongrass that has been reported in a freshwater pond on the island (Glass, 2001a) would be lost from the construction of the proposed facility.

4.6.13 Section 404/Section 10 Jurisdictional Areas (Wetlands and Open Water)

Section 404 jurisdictional wetlands potentially impacted by this alternative cover approximately 5 acres. An additional 116 acres of open water would be impacted by dredging activities associated with the channel and berthing area.

4.6.14 Terrestrial Wildlife

The primary direct adverse impact of the proposed construction activities on wildlife at the Alexander Island site would result from vegetation clearing and the subsequent loss of wildlife habitat. Construction activities might also result in the direct destruction of those organisms not mobile enough to avoid construction equipment. These would potentially include individuals of several species of reptiles, mammals and, if construction occurs during the breeding season, the young of some species, including nestling and fledgling birds. Fossorial animals (i.e., those that live underground), such as mice and shrews, may similarly be negatively impacted as a result of soil compaction caused by heavy machinery. For the most part, mobile wildlife species, particularly adult birds and larger mammals, would avoid the initial construction activity and move into available habitat outside the project area. Each species, however, is dependent upon available resources such as food, shelter, water, territory, and nesting sites in any given area of habitat (Dempster, 1975). It is assumed, for the purpose of impact analysis, that habitats are at their carrying capacity for the species that live there. Therefore, displaced wildlife

populations are forced into competition with resident populations in adjoining habitats, creating an inevitable decreased birthrate and/or increased mortality rate until populations are reduced to numbers that the habitat can support. Thus, construction activity would ultimately result in a reduction in the local wildlife populations proportional to the amount of habitat preempted.

The noise of equipment and increased human activity during construction may disturb some local wildlife. In addition, fugitive dust associated with construction activities may have minor impacts on the vegetation, thus decreasing its value as wildlife habitat. Dredging activities may indirectly impact sea birds in the area by potentially reducing the availability of the food supply. Such impacts, however, should be temporary and without significant long-term implications.

Wildlife habitat types that would be impacted by selection of the Alexander Island site include upland shrubland/grassland; fresh water, brackish, and salt marshes; and tidal flats and beach (i.e., unconsolidated shoreline). One small pond formed by previous dredged material placement activity occurs at the Alexander Island site. Because of its elevation, the salinity of the pond is probably variable and influenced by precipitation and storm surges. This pond, which is utilized extensively by waterfowl, would lie within the ship channel of the docking facility and thus be excavated during construction, resulting in habitat loss for waterfowl and other wildlife.

Although the rookery on the northeastern part of Alexander Island has supported hundreds of nesting pairs of birds in the past, no nests have been recorded since 1996, either through inactivity of the rookery or a lack of monitoring. If this rookery is still active, construction would remove a large portion. Even if construction were to take place outside of the breeding season so that the birds were not harmed directly, as mentioned above, the loss of habitat would effectively remove many individuals from the breeding population. The remaining part of the rookery would be impacted during construction if it were to take place during the breeding season.

Two other rookeries occur within approximately 3,000 feet of the site, one on Goat Island in Scott Bay and one to the northeast of the site (see Section 3.13.1.3). While neither of these bird areas would be impacted directly by construction of the Alexander Island site, dredging activities in the area may indirectly impact them if they take place during the nesting season by potentially reducing the availability of the food supply.

Once the facility is in operation, wildlife remaining in the area could be impacted by noise, lights, and human activity. Furthermore, an increase in vehicular traffic would increase the potential for collision mortality for some of these and other wildlife species. The increased possibility of chemical or oil spills poses a threat to the nekton community and, thus, the food source of many coastal birds in the area.

4.6.15 Aquatic Ecology

4.6.15.1 Freshwater Habitats and Fauna

The Alexander Island alternative site supports one small pond that was formed by previous dredged material placement activity. Due to its elevation, the salinity of the pond is probably variable and is influenced by precipitation and storm surges. Widgeongrass occurs in the pond and is

utilized extensively by waterfowl (Glass, 2001a). Under this alternative, the pond would lie within the ship channel of the docking facility and would be excavated during construction, resulting in loss of habitat to waterfowl and other wildlife.

4.6.15.2 Open Bay/Open-Bay Bottom

Turbidity in estuarine waters is generally credited with having a complex set of impacts on a wide array of organisms (Hirsch et al., 1978; Stern and Stickle, 1978; EH&A, 1978). Suspended material can play both beneficial and detrimental roles in aquatic environments. Increased turbidity in the area can interfere with light penetration and thus reduce photosynthetic activity by phytoplankton. Such reductions in primary productivity would be localized around the immediate area of the dredging operations. Conversely, the decrease in primary productivity has been found to be offset by increased nutrient content (Morton, 1977).

Potential effects of elevated turbidities on the adult stages of various filter-feeding organisms such as oysters and copepods include reduction of pumping and filter rates and clogging of filtering mechanisms (Stern and Stickle, 1978). These effects are pronounced with high total suspended solids (TSS) levels, but are apparently reversible once turbidities return to ambient levels.

Water column turbidity would increase in open-bay habitats near the project site during dredging activities but the effects are expected to be temporary and local. Some studies of turbidity from TSS associated with dredging operations have concluded that dredging had no substantial effects on nekton (Ritchie, 1970; Stickney, 1972; Wright, 1978); however, other studies have shown that elevated TSS levels and prolonged exposure can suffocate and reduce growth rates in adult and juvenile nekton and reduce viability of eggs (Moore, 1977; Stern and Stickle, 1978). Elevated turbidities during construction and maintenance dredging may affect some aquatic organisms near the dredging activity; however, turbidities in the open-bay habitats can be expected to return to near ambient conditions after dredging ceases.

For any Beneficial Use sites that would be created, similar impacts from FLUMF and benefits to the aquatic community as described in the Shoal Point alternative (Section 4.2.15) apply.

In the event an accidental spill should occur, benthic fauna may be killed and phytoplankton may be adversely affected. It is unlikely, however, that a spill in Galveston Bay would result in long-term adverse impacts to phytoplankton, zooplankton, or benthic communities. These communities have the ability to recover rapidly from a spill due primarily to the rapid rate of reproduction of the organisms and to the widespread distribution of the dominant species. Adult crustaceans (shrimp and crabs) and adult finfish are probably mobile enough to avoid most areas of high concentrations of toxins. Larval and juvenile finfish and shellfish tend to be more susceptible to toxins than adults. Juveniles could be affected extensively by a spill during their period of active immigration. The potential for impacts from spills would be minimized by use of BMPs and spill control and prevention measures. Therefore, the impacts of dredging and placement of dredged material are both localized and temporary and are not expected to have long-term adverse impacts on the aquatic environment.

Construction of a berthing area and entrance channel would slightly increase habitat for nekton species common in deeper offshore waters, which periodically enter the bay through the deep channel corridor (Breuer, 1962). This would also result in a slight increase in the availability of feeding and nursery area for demersal fish (Breuer, 1972). Adverse impacts to benthos affected by construction would likely be short term due to their ability to recolonize the affected area relatively quickly.

The impacts of contaminated dredged material depend on the nature of the biogeochemical environment and the contaminants. Common contaminants of sediment include heavy metals, chemical byproducts, petroleum, and organohalides. Contaminants bind to sediments which are in direct contact with benthic organisms and may be ingested (Montagna et al., 1998). Few studies have examined sediment contaminants in many areas of Galveston Bay, with the exception of the upper Houston Ship Channel, a well documented source of toxicity (GBNEP, 1994b). Based on GBNEP (1994b), elevated levels of contaminants do not occur near this alternative; therefore, impacts to benthic organisms and nekton from contaminated sediments are not expected. Stormwater runoff can carry toxic contaminants into surface waters, depositing them on sediments and potentially affecting the aquatic community. The potential for toxic runoff would increase with the building of the Alexander Island alternative; however, runoff from industrial point sources contributes less than 7 percent of the total loading of any pollutant, including heavy metals and biological oxygen demand, in Galveston Bay (GBNEP, 1994b). In addition, pollutant loading is expected to be minimal due to the type of facility (containerized cargo) and to the controls that would be implemented to control runoff and spills. Therefore, impacts from contamination are expected to be minimal.

4.6.15.3 Oyster Reefs

No live oyster reefs occur at or near the Alexander Island alternative site; therefore, no live oyster reefs are expected to be impacted as a result of construction or maintenance dredging operations.

4.6.15.4 Recreational and Commercial Fisheries

The recreational and commercial fishery may be temporarily affected in the vicinity of dredging operations as a result of decreased water quality and increased turbidity during dredging, and the loss of attractiveness to fish in the area due to loss of benthic organisms. This is not a permanent condition; the quality of fishing in the project area should steadily improve after dredging is completed. Recreational fishing impacts would be temporary, potentially resulting in local disturbances to both boat and wade-bank fishing. However, recreational fishing at these locations, while locally important, constitutes a relatively small portion of the overall recreational fishing activity in the project vicinity. Construction and dredging activities in this portion of the bay are not expected to have long-term adverse impacts on fishing in the project area.

If an accidental spill were to occur, adult finfish are mobile enough to avoid the area; however, larval and juvenile finfish and shellfish could be affected extensively. Serious impacts to shrimp could also affect the commercial shrimping industry in the area if the spill is severe and widespread. The

potential for impacts from spills would be minimized by the use of BMPs and spill control and prevention measures. Impacts from stormwater runoff are expected to be minimal.

4.6.15.5 Essential Fish Habitat

EFH for adult and juvenile brown and white shrimp, red drum, and Spanish mackerel occurs in the vicinity of the Alexander Island alternative and may include estuarine emergent wetlands, estuarine mud, sand, sand and shell substrates, SAV, and estuarine water column. Approximately 116 acres of open-bay bottom would be affected by dredging of the berthing areas and entrance channel.

Dredging activities in open-bay bottom habitat would impact benthic communities in those areas. Although recovery of some benthic organisms would likely occur relatively quickly, the assemblage in the sediments at the bottom of the berthing areas and entrance channel may differ from the assemblage that existed prior to construction.

While dredged material generated by dredging at this site would be available for beneficial uses, a detailed DMMP has not been produced for this alternative. If this alternative was selected for construction of the proposed project, detailed plans for dredged material placement and beneficial uses would be required. Beneficial Use sites created for this alternative would have similar positive effects on EFH and managed species as those discussed in Section 4.2.15.5 for Shoal Point, although the location and size of the Beneficial Use sites would vary.

Increased water column turbidity during construction would be localized and temporary and the amount of open-bay bottom that would be disturbed is a small percentage of the total bay bottom. Accidental spills have the potential to impact EFH, and larval and juvenile finfish could be affected extensively should a spill occur. The potential for adverse impacts from spills would be minimized, however, through the use of BMPs and spill control and prevention measures.

Adult and juvenile brown and white shrimp, and red drum would be temporarily and locally impacted by the loss of open-bay bottom habitat. However, as with the Shoal Point alternative, these species would experience an overall benefit by the creation of Beneficial Use sites. There would be no direct benefits to Spanish mackerel, as they are not marsh dependent; however, it is assumed that marsh habitat would be created as Beneficial Use sites which would increase prey for Spanish mackerel, potentially resulting in an indirect benefit.

4.6.16 Endangered and Threatened Species

4.6.16.1 Plants

No Federally listed endangered, threatened, or SOC plant species are known to occur within or near (less than 2 miles) the Alexander Island alternative. This site's upland grasslands may be able to support species including Texas prairie dawn, Houston machaeranthera, and Texas windmillgrass; however, prairie dawn is generally found in western Harris County and Houston machaeranthera prefers sandy loam soils of the Clodine, Gessner and Wockley series, none of which occur on this site. Texas

windmillgrass could occur in the upland grassland and roadside areas, but none were observed during field visits.

4.6.16.2 Fish and Wildlife

While no Federally or State-listed species are known to occur within 2 miles of this alternative site, sea turtles such as Kemp's ridley and the loggerhead have been recorded from Galveston Bay and, thus, may be present in the Spillman's Island area. If so, they could be impacted by dredging activities. Such activities in the area could have an impact on these turtles through an increase in sedimentation, turbidity, and resuspension of any toxic sediments. The sedimentation may impact food sources for the turtles, and the turbidity could affect primary productivity. This would be short-term, however. The increased possibility of chemical or oil spills poses a threat to turtles both directly and indirectly through their food source. While adult sea turtles may be mobile enough to avoid areas of high oil or chemical concentrations, hatchlings, post-hatchlings, and juveniles in the area would be more susceptible. An increase in marine traffic may result in a higher incidence of collision with sea turtles. Sea turtles are not expected to nest at the site due to lack of suitable habitat.

4.6.17 Cultural Resources

A very low probability exists that unrecorded terrestrial archaeological sites will be impacted at this location. Due to the historic nature of the area, a possibility exists that significant submerged cultural resources may be present in the surrounding waters.

The Alexander Island alternative site, located on the La Porte quad map, does not contain any previously recorded cultural resources sites. One previously recorded site, 41HR73, is recorded along a portion of the proposed access corridor on a small inlet between San Jacinto Bay and Peggy Lake. It is on the south side of the Houston Lighting and Power Company plant outfall. The site is a *Rangia* clam, shell midden culturally affiliated to the Atakapan or Karankawa (TARL Site Form). The site has yielded *Goose Creek* Plain ceramics, *Goose Creek* Incised ceramics, bone awls, *Perdiz*, *Frio*, *Kent*, and *Yarbrough* projectile points along with knives, scrapers, and debitage. Site 41HR73 is not listed or been determined eligible for listing on the NRHP nor has it been designated a SAL; however, it is not known if the THC has undertaken a status eligibility review of this site.

Five phases of occupation and agricultural land use dating from ca. 1828 to 1875 were investigated for Badgers Island (later named Alexander Island and Busch Island). Some of the occupations were associated with early and locally prominent individuals, such as William Bloodgood and Robert Alexander. While the locations of the individual occupation sites on the island remain uncertain, the original land surface of the island is currently submerged as a result of ground surface subsidence in the region.

Evidence suggests that the effect of the 1875 storm was so devastating to the upper Galveston Bay and San Jacinto River area that survival of any surficial remains of these occupations is unlikely. Similarly, any developments that arose between 1875 and 1900 were probably erased by the 1900 hurricane. Thus, the archaeological potential for the entire island is considered to be very low.

There are no recorded shipwrecks in the waters surrounding Alexander Island; however, due to the historic nature of the area, a possibility exists that unrecorded historic resources are present in the waters surrounding this alternative site.

4.6.18 Commercial and Recreational Navigation

The Alexander Island Alternative is located on the east side of the dredged material placement island. Access from the Houston Ship Channel is immediately upstream of the Highway 146 bridge. Access to the two-way Houston Ship Channel, recently widened to 530 feet at this point and soon to have 45-foot draft to the Gulf, would be direct. Accordingly, little impact to existing traffic would be produced, and no detailed quantification of traffic effects is included in this document.

In addition to effects to deep draft commercial navigation that is the primary element of the project, this as well as other alternatives would have some effect on commercial bay fishing and recreational boating. As noted in the baseline Section 3.17, Galveston Bay is actively used by both types of small craft--bay commercial fishing vessels and recreational boaters. The northern part of the bay has a major concentration of recreational boating activity. For a variety of navigation and safety reasons, deep draft traffic must have right-of-way over small craft in the restricted deep draft channels. Increases in deep draft commerce will increase the amount of time that small craft traffic will experience some restrictions or the need to yield right-of-way in the deep channels. That would appear to be an unavoidable consequence. However, with very few exceptions, these small craft are not restricted to the dredged channels, so the limitation is small and avoidable. In addition, the amount of time that deep draft channels are actually occupied by deep draft vessels tends to be a very small portion of the day. Overall, there is a measure of use conflict between small craft and deep draft vessels, and increases in deep draft commerce will increase that conflict. However, the conflict is relatively small and will not significantly impact small craft uses.

4.6.19 Land Use/Recreation/Aesthetics

4.6.19.1 Land Use

Site-related Impacts. The Alexander Island alternative lies on a DMPA with a fringe of shrub/brush rangeland and is currently undeveloped. Construction and operation of the proposed project at this site would result in currently undeveloped fill being converted to industrial uses. The proposed site is adjacent to other maritime and petrochemical industrial land uses. Thus, it is not expected that land uses in the nearby environs of the site would have significant adverse impacts from the location of the port facilities, which would be a consistent and compatible land use. There are residential land uses within 1 mile of this site, although not contiguous to the site. Since these residential areas are already within sight of heavily industrialized areas, the impact on these properties would be one of degree rather than introducing a new and incompatible use.

Transport-related Impacts. The major roadway which would receive traffic generated by container terminal activity from the Alexander Island alternative site is SH 225, which is expected to receive an additional 10,000 ADT from the Alexander Island alternative.

SH 225 passes through highly industrialized areas and the addition of project truck traffic would not introduce an incompatible land use along this highway.

Labor Force-Related Impacts. Housing, commercial and public land uses would be required to serve the projected 975 inmigrant population of operations workers and their families. Assuming the same land uses per 100 individuals shown in Table 4.1.19-1, the demands generated by the inmigrant population would include approximately 40.4 acres of residential land uses, 3.8 acres of commercial uses, 43.2 acres of public, semipublic and park uses, and 40.6 acres of streets.

Secondary Impacts. Construction and operation of the proposed container terminal at this site would contribute to the conversion of currently undeveloped land to industrial use. The addition of the facility to the area may lead to the potential development of secondary, or ancillary growth effects in the general vicinity. This development would likely include facilities associated with the development of private sector commercial support industries, such as transportation centers, convenience stores, or distribution warehouses. These secondary land use changes that may occur as a result of the proposed container facility are consistent with nearby industrial land uses and would not introduce a new element in the area. However, residential neighborhoods within one mile of the site may be affected by increased industrial or commercial activity in the area. Regardless, the potential addition of these secondary facilities would represent a small portion of the overall land use changes likely to occur in the area over the next several years with or without the project.

4.6.19.2 Recreation

There are no public parks in the nearby vicinity of the Alexander Island site. It is not expected that the location of the proposed project at the Alexander Island alternative site would have significant adverse impacts on recreation.

Since only a few commercial and recreational fish species utilize the area near this alternative, the location of the port facilities on Alexander Island is not expected to interfere with recreational fishing (see Section 4.6.15), except to the extent that additional ship traffic in the Bay would lessen the recreational enjoyment of the area which already experiences a considerable level of industrial traffic. However, additional ships in the channel would provide greater opportunities for ship watching.

Several rookeries exist on Alexander Island or in the vicinity. Bird watching activities could be adversely affected if bird nesting or roosting is disturbed at the project site or in the nearby environs of the project site (see Section 4.6.14 for additional information).

4.6.19.3 Aesthetics

As discussed in Section 3.18.4, Alexander Island is in an area which is dominated by industrial maritime and petrochemical uses. The addition of the proposed project to the view in this area would not have a significant adverse impact on the quality of the waterscape.

4.6.20 Socioeconomics

4.6.20.1 Population

For all alternatives, including the Alexander Island site, the available construction labor force is expected to offer adequate labor to complete construction work without the importation of workers from outside the subregion most proximate to the site.

For operations-phase employment, an adequate local labor force would not likely be available to fill all employment positions. Table 4.6.20-1 shows the number of operations workers which may relocate to the Alexander Island region. Inmigration of workers is expected to begin in 2005, with two workers, and escalate to 348 when the project becomes fully operational. Also shown in Table 4.6.20-1 are the additional family members which could be expected to accompany the project operations workers. Total population increase resulting from direct employment during the operations phase of the project is expected to amount to 975 at full operation.

4.6.20.2 Environmental Justice

EJ Index Methodology

The DVMAV data for Alexander Island (Appendix G-5) show that the area has a higher proportion of ethnic minorities than the overall state minority percentage. Within the 50-square-mile area surrounding this alternative, 48.0 percent of the population is of minority status, as compared with 39.4 percent statewide. The overall minority status is ranked 2.

The DVECO data for Alexander Island show that the area has an almost equal proportion of economically stressed residents as the overall state percentage. Within the 50-square-mile area surrounding this alternative, 27.9 percent of the population is economically stressed, as compared with 27.6 percent statewide. The overall economically stressed status is ranked 2.

According to the EJ Index, the overall EJ potential for the 50-square-mile area at Alexander Island is ranked 8.

Census Tract Analysis

The percentage of African Americans in the Alexander Island alternative is 16.0 percent, which is slightly less than Harris County (18.9 percent) and about 40 percent greater than the state (11.7 percent). The only census tract that exceeds the threshold of 10 percent over the county's percentage of African Americans is tract 264. The average percentage of Hispanics is 54.0 percent, which is more than twice as high as both the county (22.5 percent) and state (25.2 percent) average. Census tracts that exceed the threshold of 10 percent over the county's percentage of Hispanics are tracts 264 and 273. The average percentage of "other races" is 0.3 percent, which is much less than both the county (4.1 percent) and state (2.3 percent). The only census tract that exceeds the threshold of 10 percent over the county's percentage of "other races" is tract 364. The average percentage of persons living below the poverty line within the census tracts is 22.9 percent, which is at least a 45 percent increase from Harris

Table 4.6.20-1
Population and Housing Effects
Alexander Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ALEXANDER ISLAND ALTERNATIVE														
Direct Construction Jobs Created	45	14	57	49	15	38	0	0	0	0	6	10	21	60
Available Construction Workforce (RAZ 88,89,91,92)	75	76	77	78	80	81	82	83	84	85	85	86	87	88
Inmigration of Construction Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Operations Jobs Created	0	0	0	94	153	177	201	225	253	277	301	325	352	376
Available Operations Workforce (RAZ 88, 89, 91. 92)	87	88	90	91	92	94	95	96	97	98	99	100	101	102
Inmigration of Operations Workers	0	0	0	2	61	84	106	129	156	179	202	224	251	274
Secondary Family Growth	0	0	0	4	110	151	192	233	281	322	363	405	453	495
Total Potential Inmigration	0	0	0	7	171	235	298	362	437	501	565	629	705	769
Housing Units Needed for Inmigration	0	0	0	2	61	84	106	129	156	179	202	224	251	274

Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ALEXANDER ISLAND ALTERNATIVE										
Direct Construction Jobs Created	0	0	0	0	0	0	0	0	0	0
Available Construction Workforce (RAZ 88,89,91,92)	89	90	90	91	92	93	94	95	96	96
Inmigration of Construction Workers	0	0	0	0	0	0	0	0	0	0
Direct Operations Jobs Created	400	452	452	452	452	452	452	452	452	452
Available Operations Workforce (RAZ 88, 89, 91. 92)	103	104	105	106	107	108	109	110	111	112
Inmigration of Operations Workers	297	348	347	346	345	344	343	342	341	340
Secondary Family Growth	536	627	626	624	622	620	619	617	615	613
Total Potential Inmigration	833	975	973	970	967	964	962	959	956	953
Housing Units Needed for Inmigration	297	348	347	346	345	344	343	342	341	340

County (15.5 percent) and the state (17.6 percent). There are no census tracts that exceed the threshold of 10 percent over the county's percentage of residents living below the poverty line.

The Alexander Island alternative would be situated more than 5,000 feet from the nearest residence. The land use would be consistent with current land uses in the area. If any minority or low-income groups are dependent on the natural resources in the vicinity of the Alexander Island site (e.g., subsitence fishing), they would not likely be adversely affected since the project activities are not expected to result in long-term adverse impacts on resources of this type (e.g., fishing) (see Section 4.6.15.4). Potential effects of locating the project at this site include increased traffic, noise and air pollution (see Sections 4.6.1, 4.6.2 and 4.6.3); however, the effects would also occur at any of the alternative sites. Some of the advantages the community would reap as a result of the creation of this project are: increased number of jobs for many levels of experience and the infusion of indirect economic contributions to the community (see Sections 4.6.19). These beneficial effects would also occur at any of the other alternative sites.

4.6.20.3 Community Values

The Alexander Island alternative site is nearest to Baytown among area communities. Baytown's comprehensive plan makes no definitive statement about the construction of a container port or other similar facility on Alexander Island, although the plan does support industrial development and job production for the community generally.

4.6.20.4 Housing

Table 4.6.20-1 shows the housing needs of the inmigrant operations families. At full operation, there is expected to be a demand of 348 housing units for worker families.

4.6.20.5 Leading Economic Sectors

Total Demand. Table 4.6.20-2 shows the direct and indirect effect of the construction and operation of the Alexander Island alternative on the Texas economy and direct non-Texas effects.

For the Alexander Island alternative, total construction costs from 2002 to 2015 are anticipated to amount to $321.2 million. Direct Texas effects are expected to amount to $260.2 million, with an export effect of $61.0 million. Total Texas effect from construction activities are expected to amount to $1.1531 billion over the 2002 to 2015 period.

Operations-related effects are expected to be similar for all alternatives, as discussed above. At the point of full operation, the project operations cost is expected to amount to $57.5 million annually. The direct Texas effect is anticipated to amount to $50.1 million each year, with $7.4 million exported. Total Texas effect, including both direct and indirect effects, is expected to be approximately $186.8 million annually.

Effects to Major Economic Sectors. Table 4.6.20-3 shows the relative economic effect to various major economic sectors from the construction and operation of the Alexander Island alternative.

Table 4.6.20-2
Total Economic Effect of Project *
Alexander Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION ACTIVITIES													
Construction Costs	$46,079,320	$14,422,816	$57,697,780	$50,096,927	$15,637,852	$38,265,305	$0	$0	$0	$0	$6,229,429	$10,105,518	$21,410,048
Direct Effects:													
Effect Outside of Texas	$8,753,186	$2,739,745	$10,960,218	$9,516,367	$2,970,552	$7,268,843	$0	$0	$0	$0	$1,183,337	$1,919,635	$4,067,033
Texas Direct Effect	$37,326,134	$11,683,070	$46,737,562	$40,580,560	$12,667,299	$30,996,462	$0	$0	$0	$0	$5,046,092	$8,185,883	$17,343,015
Total Texas Effect (a)	$165,572,214	$51,824,061	$208,816,865	$179,232,789	$56,189,928	$136,802,553	$0	$0	$0	$0	$22,383,584	$36,311,147	$76,930,585
OPERATIONS ACTIVITIES													
Construction Costs	$250,000	$250,000	$33,583,333	$11,902,655	$19,502,212	$55,875,369	$25,581,858	$28,621,681	$32,168,142	$35,207,965	$38,247,788	$41,287,611	$44,834,071
Direct Effects:													
Effect Outside of Texas	$32,191	$32,191	$4,324,368	$1,532,649	$2,511,208	$7,194,809	$3,294,056	$3,685,479	$4,142,140	$4,533,564	$4,924,988	$5,316,412	$5,773,073
Texas Direct Effect	$217,809	$217,809	$29,258,965	$10,370,006	$16,991,004	$48,680,560	$22,287,803	$24,936,202	$28,026,001	$30,674,400	$33,322,800	$35,971,199	$39,060,998
Total Texas Effect (a)	$812,350	$812,350	$109,125,683	$38,676,487	$63,370,489	$181,561,423	$83,125,691	$93,003,292	$104,527,159	$114,404,760	$124,282,361	$134,159,962	$145,683,830
TOTAL EFFECT													
Total Costs	$46,329,320	$14,672,816	$91,281,114	$61,999,582	$35,140,064	$94,140,674	$25,581,858	$28,621,681	$32,168,142	$35,207,965	$44,477,216	$51,393,129	$66,244,119
Direct Effects:													
Effect Outside of Texas	$8,785,378	$2,771,936	$15,284,586	$11,049,016	$5,481,760	$14,463,651	$3,294,056	$3,685,479	$4,142,140	$4,533,564	$6,108,325	$7,236,047	$9,840,106
Texas Direct Effect	$37,543,943	$11,900,879	$75,996,527	$50,950,566	$29,658,304	$79,677,022	$22,287,803	$24,936,202	$28,026,001	$30,674,400	$38,368,892	$44,157,082	$56,404,013
Total Texas Effect (a)	$166,384,564	$52,636,411	$317,942,548	$217,909,276	$119,560,417	$318,363,976	$83,125,691	$93,003,292	$104,527,159	$114,404,760	$146,665,945	$170,471,109	$222,614,415

* In year-2000 dollars.

Table 4.6.20-2 (concluded)

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION ACTIVITIES												
Construction Costs	$61,255,005	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$321,200,000
Direct Effects:												
Effect Outside of Texas	$11,635,946	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$61,014,863
Texas Direct Effect	$49,619,059	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$260,185,137
Total Texas Effect (a)	$219,062,974	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,153,126,700
OPERATIONS ACTIVITIES												
Construction Costs	$81,207,227	$50,913,717	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$1,016,933,628
Direct Effects:												
Effect Outside of Texas	$10,456,673	$6,555,920	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$130,945,764
Texas Direct Effect	$70,750,554	$44,357,797	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$885,987,865
Total Texas Effect (a)	$263,874,764	$165,439,031	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$3,304,424,132
TOTAL EFFECT												
Total Costs	$142,462,232	$50,913,717	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$1,338,133,628
Direct Effects:												
Effect Outside of Texas	$22,092,619	$6,555,920	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$191,960,627
Texas Direct Effect	$120,369,614	$44,357,797	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$1,146,173,002
Total Texas Effect (a)	$482,937,738	$165,439,031	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$4,457,550,832

Source: Texas Comptroller of Public Accounts, 1989.

Table 4.6.20-3
Total Texas Effect of Project, by Major Economic Sector *
Alexander Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Agriculture	$1,293,820	$404,965	$1,654,114	$1,418,497	$439,081	$1,070,194	$0	$0	$0	$0	$174,911	$283,744	$601,153
Mining	$2,443,970	$764,962	$3,124,551	$2,679,480	$829,406	$2,021,551	$0	$0	$0	$0	$330,399	$535,980	$1,135,553
Construction	$50,373,115	$15,766,772	$64,400,680	$55,227,246	$17,095,029	$41,666,545	$0	$0	$0	$0	$6,809,904	$11,047,177	$23,405,094
Manufacturing	$16,762,180	$5,246,558	$21,429,999	$18,377,443	$5,688,549	$13,864,978	$0	$0	$0	$0	$2,266,067	$3,676,064	$7,788,289
Transp., Comm., Util.	$7,574,331	$2,370,764	$9,683,579	$8,304,220	$2,570,486	$6,265,171	$0	$0	$0	$0	$1,023,968	$1,661,104	$3,519,296
Trade	$12,772,940	$3,997,927	$16,329,862	$14,003,786	$4,334,729	$10,565,245	$0	$0	$0	$0	$1,726,764	$2,801,195	$5,934,750
FIRE **	$15,198,934	$4,757,263	$19,431,431	$16,663,557	$5,158,033	$12,571,926	$0	$0	$0	$0	$2,054,733	$3,333,233	$7,061,951
Services	$15,506,591	$4,853,559	$19,824,762	$17,000,861	$5,262,443	$12,826,407	$0	$0	$0	$0	$2,096,324	$3,400,704	$7,204,899
Totals	$121,925,882	$38,162,770	$155,878,978	$133,675,089	$41,377,755	$100,852,017	$0	$0	$0	$0	$16,483,069	$26,739,200	$56,650,987
OPERATIONS-RELATED EFFECTS													
Agriculture	$4,460	$4,460	$599,169	$212,358	$347,944	$996,886	$456,412	$510,647	$573,920	$628,154	$682,388	$736,623	$799,896
Mining	$9,316	$9,316	$1,251,514	$443,563	$726,768	$2,082,247	$953,331	$1,066,613	$1,198,775	$1,312,057	$1,425,339	$1,538,621	$1,670,783
Construction	$8,088	$8,088	$1,086,438	$385,057	$630,907	$1,807,597	$827,586	$925,926	$1,040,656	$1,138,996	$1,237,336	$1,335,675	$1,450,405
Manufacturing	$50,136	$50,136	$6,734,895	$2,386,992	$3,911,028	$11,205,402	$5,130,257	$5,739,872	$6,451,089	$7,060,703	$7,670,318	$8,279,933	$8,991,150
Transp., Comm., Util.	$305,639	$305,639	$41,057,510	$14,551,664	$23,842,549	$68,310,774	$31,275,258	$34,991,612	$39,327,359	$43,043,713	$46,760,067	$50,476,421	$54,812,168
Trade	$65,086	$65,086	$8,743,194	$3,098,776	$5,077,269	$14,546,775	$6,660,064	$7,451,461	$8,374,758	$9,166,156	$9,957,553	$10,748,950	$11,672,247
FIRE **	$96,025	$96,025	$12,899,391	$4,571,821	$7,490,819	$21,461,783	$9,826,017	$10,993,616	$12,355,814	$13,523,413	$14,691,012	$15,858,611	$17,220,810
Services	$61,200	$61,200	$8,221,173	$2,913,760	$4,774,126	$13,678,245	$6,262,418	$7,006,565	$7,874,735	$8,618,881	$9,363,028	$10,107,174	$10,975,344
Totals	$599,950	$599,950	$80,593,283	$28,563,991	$46,801,409	$134,089,710	$61,391,344	$68,686,311	$77,197,106	$84,492,073	$91,787,041	$99,082,008	$107,592,803
TOTAL EFFECTS													
Agriculture	$1,298,280	$409,426	$2,253,283	$1,630,855	$787,025	$2,067,080	$456,412	$510,647	$573,920	$628,154	$857,299	$1,020,366	$1,401,049
Mining	$2,453,287	$774,279	$4,376,064	$3,123,043	$1,556,173	$4,103,797	$953,331	$1,066,613	$1,198,775	$1,312,057	$1,755,737	$2,074,600	$2,806,336
Construction	$50,381,203	$15,774,860	$65,487,118	$55,612,303	$17,725,935	$43,474,142	$827,586	$925,926	$1,040,656	$1,138,996	$8,047,239	$12,382,853	$24,855,499
Manufacturing	$16,812,316	$5,296,694	$28,164,894	$20,764,434	$9,599,577	$25,070,380	$5,130,257	$5,739,872	$6,451,089	$7,060,703	$9,936,385	$11,955,996	$16,779,439
Transp., Comm., Util.	$7,879,970	$2,676,403	$50,741,089	$22,855,883	$26,413,035	$74,575,945	$31,275,258	$34,991,612	$39,327,359	$43,043,713	$47,784,035	$52,137,525	$58,331,464
Trade	$12,838,026	$4,063,013	$25,073,056	$17,102,562	$9,411,998	$25,112,019	$6,660,064	$7,451,461	$8,374,758	$9,166,156	$11,684,317	$13,550,146	$17,606,998
FIRE **	$15,294,959	$4,853,288	$32,330,822	$21,235,378	$12,648,852	$34,033,710	$9,826,017	$10,993,616	$12,355,814	$13,523,413	$16,745,745	$19,191,844	$24,282,761
Services	$15,567,791	$4,914,759	$28,045,935	$19,914,622	$10,036,568	$26,504,653	$6,262,418	$7,006,565	$7,874,735	$8,618,881	$11,459,352	$13,507,878	$18,180,244
Totals	$122,525,832	$38,762,720	$236,472,261	$162,239,080	$88,179,165	$234,941,726	$61,391,344	$68,686,311	$77,197,106	$84,492,073	$108,270,109	$125,821,208	$164,243,790

* In year-2000 dollars.
** Finance, insurance and real estate.

Table 4.6.20-3 (concluded)

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Agriculture	$1,713,589	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,054,068
Mining	$3,236,897	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$17,102,749
Construction	$66,716,275	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$352,507,837
Manufacturing	$22,200,537	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$117,300,662
Transp., Comm., Util.	$10,031,762	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$53,004,681
Trade	$16,917,020	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$89,384,219
FIRE **	$20,130,109	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$106,361,169
Services	$20,537,583	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$108,514,135
Totals	$161,483,774	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$853,229,520
OPERATIONS-RELATED EFFECTS												
Agriculture	$1,448,838	$908,364	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$18,143,366
Mining	$3,026,262	$1,897,346	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$37,896,961
Construction	$2,627,095	$1,647,085	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$32,898,325
Manufacturing	$16,285,524	$10,210,379	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$203,938,706
Transp., Comm., Util.	$99,280,393	$62,244,876	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$1,243,258,438
Trade	$21,141,753	$13,255,042	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$264,751,797
FIRE **	$31,191,775	$19,556,008	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$390,605,196
Services	$19,879,464	$12,463,637	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$248,944,532
Totals	$194,881,104	$122,182,738	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$2,440,437,321
TOTAL EFFECTS												
Agriculture	$3,162,428	$908,364	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$27,197,434
Mining	$6,263,159	$1,897,346	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$54,999,710
Construction	$69,343,371	$1,647,085	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$385,406,161
Manufacturing	$38,486,061	$10,210,379	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$321,239,368
Transp., Comm., Util.	$109,312,156	$62,244,876	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$1,296,263,119
Trade	$38,058,773	$13,255,042	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$354,136,016
FIRE **	$51,321,884	$19,556,008	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$496,966,365
Services	$40,417,047	$12,463,637	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$357,458,667
Totals	$356,364,877	$122,182,738	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$3,293,666,841

Source: Texas Comptroller of Public Accounts, 1989.

** Finance, insurance and real estate.

For construction-related activities, $352.5 million (41%) of the overall project effect is anticipated to accrue to the construction sector. Other major sectors affected would be manufacturing, with $117.3 million (14%); services, with $108.5 million (13%); and finance, insurance and real estate (FIRE), with $106.4 million (13%).

For operations-related activities at full build-out, 51 percent ($70.3 million) of annual effects would pertain to the transportation, communication and utilities sector, with other major affected sectors being FIRE, with $22.1 million (16%); trade, with $15.0 million (11%); and services, with $14.1 million (10%). These effects would be the same for all alternatives.

The year of greatest effect from construction activities alone would be 2015, which would also be the year of greatest overall effect.

Effects on Retail and Wholesale Trade. Table 4.6.20-4 provides more specific data on the effects of construction and operations on retail and wholesale trade.

Total construction-related effects on wholesale and retail trade are anticipated to be approximately $82.4 million over the full construction period, with roughly 51 percent of those effects on the retail sector ($42.3 million) and 49 percent ($40.1 million) on the wholesale sector. At full build-out, operation of the project is expected to have an almost $7 million effect on retail trade annually, and a $6.8 million effect on wholesale trade each year. This is the same prospective effect as for all alternatives.

4.6.20.6 Employment

Table 4.6.20-5 shows the number of jobs expected to be generated by the construction and operation of the project at the Alexander Island alternative site. A job is defined as full-time equivalent employment for one person for one year.

The construction phase of the project is expected to create 315 direct jobs over the 2002 to 2015 construction period, with the creation of an additional 5,737 jobs indirectly. The highest year of employment creation would occur in 2015 during Phase III construction, when 60 direct jobs are anticipated to be created.

When the project is fully operational, it is expected to create approximately 450 direct jobs and almost 800 in indirect employment, the same as all alternatives.

Assuming that one-half of the projected unemployed construction workforce from RAZ 88, 89, 91 and 92 (Bayport and Baytown area) is qualified to work on the project, there is projected to be a larger construction workforce than is needed for the project. This is shown in Table 4.6.20-1.

Using the same assumption of one-half of the unemployed labor force having the necessary qualifications for employment on the project, the operations-related available workforce is projected to amount to 87–112 during the 2002–2025 time frame, compared with the projected

Table 4.6.20-4
Retail and Wholesale Sales Effect of Project *
Alexander Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Retail Trade	$6,044,095	$1,891,800	$7,727,214	$6,626,525	$2,051,173	$4,999,424	$0	$0	$0	$0	$817,097	$1,325,512	$2,808,296
Wholesale Trade	$5,736,910	$1,795,651	$7,334,486	$6,289,739	$1,946,924	$4,745,333	$0	$0	$0	$0	$775,569	$1,258,145	$2,665,567
Totals	$11,781,005	$3,687,452	$15,061,700	$12,916,265	$3,998,097	$9,744,757	$0	$0	$0	$0	$1,592,665	$2,583,657	$5,473,863
OPERATIONS-RELATED EFFECTS													
Retail Trade	$30,318	$30,318	$4,072,734	$1,443,464	$2,365,081	$6,776,144	$3,102,375	$3,471,022	$3,901,110	$4,269,757	$4,638,404	$5,007,051	$5,437,139
Wholesale Trade	$29,589	$29,589	$3,974,853	$1,408,773	$2,308,241	$6,613,292	$3,027,815	$3,387,603	$3,807,354	$4,167,141	$4,526,928	$4,886,716	$5,306,467
Totals	$59,908	$59,908	$8,047,587	$2,852,238	$4,673,323	$13,389,436	$6,130,191	$6,858,625	$7,708,464	$8,436,898	$9,165,332	$9,893,766	$10,743,606
TOTAL EFFECTS													
Retail Trade	$6,074,413	$1,922,118	$11,799,948	$8,069,990	$4,416,255	$11,775,568	$3,102,375	$3,471,022	$3,901,110	$4,269,757	$5,455,500	$6,332,563	$8,245,434
Wholesale Trade	$5,766,500	$1,825,241	$11,309,340	$7,698,513	$4,255,166	$11,358,626	$3,027,815	$3,387,603	$3,807,354	$4,167,141	$5,302,497	$6,144,860	$7,972,034
Totals	$11,840,913	$3,747,359	$23,109,287	$15,768,502	$8,671,420	$23,134,194	$6,130,191	$6,858,625	$7,708,464	$8,436,898	$10,757,998	$12,477,423	$16,217,469

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Retail Trade	$8,005,054	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$42,296,191
Wholesale Trade	$7,598,206	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$40,146,531
Totals	$15,603,260	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$82,442,722
OPERATIONS-RELATED EFFECTS												
Retail Trade	$9,848,201	$6,174,432	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$123,326,054
Wholesale Trade	$9,611,518	$6,026,041	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$120,362,146
Totals	$19,459,719	$12,200,474	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$243,688,200
TOTAL EFFECTS												
Retail Trade	$17,853,255	$6,174,432	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$165,622,245
Wholesale Trade	$17,209,724	$6,026,041	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$160,508,678
Totals	$35,062,979	$12,200,474	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$326,130,922

Source: Texas Comptroller of Public Accounts, 1989.
* In year-2000 dollars.

Table 4.6.20-5
Employment Effect of Project
Alexander Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED JOBS													
Direct Jobs	45	14	57	49	15	38	0	0	0	0	6	10	21
Indirect Jobs	828	259	1,032	883	281	682	0	0	0	0	112	182	385
Total Jobs	873	273	1,089	932	296	720	0	0	0	0	118	192	406
OPERATIONS-RELATED JOBS													
Direct Jobs	0	0	0	94	153	177	201	225	253	277	301	325	352
Indirect Jobs	3	3	465	165	270	774	354	396	446	488	530	572	621
Total Jobs	3	3	465	258	423	951	555	621	698	764	830	896	973
TOTAL JOBS													
Direct Jobs	45	14	57	143	168	215	201	225	253	277	307	335	373
Indirect Jobs	832	263	1,497	1,048	551	1,456	354	396	446	488	642	753	1,006
Total Jobs	877	277	1,554	1,190	720	1,672	555	621	698	764	948	1,088	1,379

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED JOBS												
Direct Jobs	60	0	0	0	0	0	0	0	0	0	0	315
Indirect Jobs	1,093	0	0	0	0	0	0	0	0	0	0	5,737
Total Jobs	1,153	0	0	0	0	0	0	0	0	0	0	6,052
OPERATIONS-RELATED JOBS												
Direct Jobs	376	400	452	452	452	452	452	452	452	452	452	7,202
Indirect Jobs	1,125	705	796	796	796	796	796	796	796	796	796	14,085
Total Jobs	1,501	1,105	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	21,287
TOTAL JOBS												
Direct Jobs	436	400	452	452	452	452	452	452	452	452	452	7,517
Indirect Jobs	2,218	705	796	796	796	796	796	796	796	796	796	19,822
Total Jobs	2,654	1,105	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	27,339

Source: Texas Comptroller of Public Accounts, 1989.

employment of approximately 450. Thus, it is possible that as many as 348 workers may be drawn from outside the immediate region of the project site at Alexander Island.

4.6.20.7 Household Income Effects

Table 4.6.20-6 shows the effects on household income from the construction and operations phases of the project. The construction phase of the project is projected to have a direct effect of $120.7 million on household incomes and an indirect effect of $179.2 million. At full operation, the project is expected to have an annual operations-related direct effect on household income of $23.7 million and an indirect effect of $25.2 yearly, similar to all alternative sites.

4.6.20.8 Residential Property Values

According to Delucchi and Hsu (1998), residential property values may decrease from 0.2–1.5 percent for every dBA above 55 dBA. Those impacts may be temporary in nature (during construction activities) or they may be long-term effects associated with noise from operations at the container terminal site or from increased traffic.

Construction

As discussed in Section 4.6.3, dredging activities at the Alexander Island alternative site would result in noise levels of 26 dBA to 46 dBA at the nearest sensitive residential receptors, located approximately 5,000 feet to the east of the dredging area. Other construction would result in noise levels of 35 dBA to 62 dBA in the nearest residential areas. Since construction-related noise is unlikely to be above ambient noise levels, impacts on residential property values are not expected.

Operations

A projected L_{dn} of 59.0 dBA recorded approximately 2,000 feet from the main gate indicates that noise from operations at the terminal would be unlikely to adversely affect property values at the nearest residences, which are located within 5,000 feet.

Traffic

Table 4.6.3-1 shows that residential receptors along major roadways that would be affected by increased terminal traffic currently have noise levels above 55 dBA, ranging from 71–72 dBA. According to the results of the Delucchi and Hsu research, those properties currently at the 71 dBA level likely have current property values 3.2–24.0 percent lower than similar properties with noise levels below 55 dBA. Those receptors with current noise levels of 72 dBA likely have property values 3.4–25.5 percent lower than comparable properties with noise levels less than 55 dBA. Thus, much of the potential loss of property value due to traffic noise is already represented in current market values.

Table 4.6.3-1 also indicates that noise levels are expected to increase by 1 dBA over existing conditions, for all residential receptors, by 2025, without the project. Thus, without the project,

Table 4.6.20-6
Household Income Effect of Project *
Alexander Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Direct Effects	$17,851,129	$5,587,399	$20,360,305	$17,871,555	$6,058,104	$14,741,919	$0	$0	$0	$0	$2,413,281	$3,914,878	$8,294,253
Indirect Effects	$25,795,204	$8,073,892	$32,577,582	$27,686,145	$8,754,069	$21,208,618	$0	$0	$0	$0	$3,487,234	$5,657,069	$11,985,345
Total Effects	$43,646,332	$13,661,291	$52,937,887	$45,557,700	$14,812,173	$35,950,537	$0	$0	$0	$0	$5,900,515	$9,571,947	$20,279,598
OPERATIONS-RELATED EFFECTS													
Direct Effects	$102,875	$102,875	$13,819,542	$4,897,942	$8,025,160	$22,992,714	$10,526,935	$11,777,822	$13,237,190	$14,488,077	$15,738,965	$16,989,852	$18,449,220
Indirect Effects	$109,525	$109,525	$14,712,858	$5,214,553	$8,543,919	$24,478,999	$11,207,412	$12,539,159	$14,092,863	$15,424,609	$16,756,356	$18,088,102	$19,641,806
Total Effects	$212,400	$212,400	$28,532,400	$10,112,496	$16,569,080	$47,471,713	$21,734,347	$24,316,981	$27,330,053	$29,912,687	$32,495,320	$35,077,954	$38,091,027
TOTAL EFFECTS													
Direct Effects	$17,954,004	$5,690,274	$34,179,846	$22,769,497	$14,083,264	$37,734,633	$10,526,935	$11,777,822	$13,237,190	$14,488,077	$18,152,245	$20,904,729	$26,743,473
Indirect Effects	$25,904,729	$8,183,417	$47,290,440	$32,900,698	$17,297,989	$45,687,617	$11,207,412	$12,539,159	$14,092,863	$15,424,609	$20,243,590	$23,745,171	$31,627,151
Total Effects	$43,858,732	$13,873,691	$81,470,287	$55,670,196	$31,381,253	$83,422,250	$21,734,347	$24,316,981	$27,330,053	$29,912,687	$38,395,835	$44,649,901	$58,370,624

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Direct Effects	$23,607,099	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$120,699,920
Indirect Effects	$33,972,102	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$179,197,260
Total Effects	$57,579,201	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$299,897,180
OPERATIONS-RELATED EFFECTS												
Direct Effects	$33,416,774	$20,950,994	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$418,468,188
Indirect Effects	$35,576,886	$22,305,299	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$445,518,623
Total Effects	$68,993,660	$43,256,294	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$863,986,811
TOTAL EFFECTS												
Direct Effects	$57,023,873	$20,950,994	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$539,168,108
Indirect Effects	$69,548,988	$22,305,299	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$624,715,883
Total Effects	$126,572,861	$43,256,294	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$1,163,883,991

Source: Texas Comptroller of Public Accounts, 1989.
* In year 2000-dollars.

there may be property values which are 0.2–1.5 percent lower than those of comparable homes at different, quieter locations, in addition to the current estimated lesser property values of 3.2–25.5 percent.

With the project at the Alexander Island alternative site, some residential receptors may experience an increase in noise of approximately 1 dBA beyond the no-build noise levels projected for 2025. Thus some properties might be expected to experience an additional 0.2–1.5 percent decrease in relative property values.

4.6.21 Community Infrastructure and Municipal Services

The sections below discuss community infrastructure requirements of the project, to the extent that they are known. The Greater Houston metropolitan area is a very large, growing and economically viable region. Operations inmigrants to the area may locate in any of a large number of communities or in suburban areas. Inmigrants will likely either locate in communities which are able to provide community services or they will commute to locations where services are located. Inmigrants will contribute to local government revenues through ad valorem taxes, sales taxes, mixed beverage taxes, and other local taxes and fees. Typically, residential properties do not contribute enough in tax revenues to support the general fund needs of the residents. On the other hand, property tax revenues from industrial developments, particularly those with high property values such as the proposed project, are generally much greater than the costs on general fund municipal services imposed by such developments. From a regional perspective, the proposed project and its operations inmigrants are expected to contribute more to local governmental revenues than they cost in service provision; however, the locational choices of the inmigrants will determine the specific impacts on individual communities.

4.6.21.1 Utilities

For the projected inmigrant population of 975 persons, it is anticipated that there would be an additional 0.158 MGD in additional municipal water demand.

The proposed container terminal would require access to utilities needed for operation and maintenance, typical of similar facilities. For example, telephone and fiber optic service, water supply, and electricity would be needed at the site (Berger/Abam, 2001). Detailed studies regarding the ability of current systems to provide the needed utilities would be performed during the design phase of the project. In addition to providing new access to utilities, the removal or realignment of existing utility structures within the project site would be required. Currently available information regarding existing utilities and preliminary plans for utility service requirements and relocations is summarized in Section 2.4.6.6. Utility service providers in the area are discussed in Section 3.20.

The project site is located within a very large, growing and economically viable metropolitan area. Because of the overall growth or demand on services that is typical in a metropolitan area of this size, the addition of the proposed facility and approximately 348 families to the area is not expected to result in major short- or long-term impacts on service levels. Any of several communities within the region could receive the growth anticipated as a result of the project, with the majority of the growth most likely going to communities that are able to provide the desired services.

4.6.21.2 Stormwater and Drainage

Stormwater would be treated at the project site with oil-water separators before discharge into Galveston Bay (Berger/Abam, 2001).

4.6.21.3 Solid Waste and Wastewater Collection

An additional 0.098 MGD of municipal wastewater flow is expected to occur from the projected inmigrant population of 975 persons.

Solid waste and wastewater collection services or systems would be needed at the proposed terminal site. Service providers in the area are discussed in Section 3.20.

As discussed above for other utilities, the addition of the proposed facility and inmigrant population to the metropolitan area is not expected to result in major short- or long-term impacts on service levels of local communities. Detailed studies regarding the adequacy of current systems would be performed during the design phase of the project.

4.6.21.4 Fire, Police, Emergency Medical Service, and Port Security

For the projected inmigrant population of 975 persons, the demand for police and fire/EMS personnel and emergency vehicles is projected to be:

1 Firefighter at 1.17 firefighters per 1,000 persons
3 Police officers at 348 persons per officer
0 Additional emergency vehicles (at 6,961 residents per vehicle)
2 EMS personnel at 533 residents per EMS personnel

The container facility would have its own security force that would cooperate with the appropriate Emergency Management Coordinator and local industry to provide security at the port. A Security Plan and other security measures similar to those described in Section 4.2.21.4 for the Shoal Point site would be developed and implemented.

An assessment of security risks related to container cargo is based on the difference between the number of containers that would enter the Houston area with the proposed project compared with the number of containers that would enter the Houston area with the No-Build alternative. The assessment also considers the increased efforts of all of the Federal, state, and local agencies and private parties (especially including the Port Operator's responsibilities) to assess, prevent, and respond to port security threats, including terrorist events.

Containers, by design, provide for efficient transfer of large quantities of goods from ships to truck and rail for distribution through the transportation grid of the U.S. to virtually every city in the country. Demand for container cargo nationally and in the Houston area is expected to increase in response to market demands. It is anticipated that without the proposed project, container cargo destined for the Houston area would arrive at a more distant port and be transported to the Houston market via

truck or rail. The risk of an accidental or intentional event with the Build alternative would increase proportionally to the increased number of containers that enter the Houston area as compared with the No-Build alternative. However, with the increased security measures in place and planned at all U.S. ports, the local Emergency Management Plan, and the coordination of port security among all port users, the potential increased risk of a threat due to the presence of a new marine terminal would be offset.

4.6.21.5 Hospitals/Medical Services

For the projected inmigrant population of 975 persons, the demand for hospital beds and medical personnel needed is projected to be:

4	Hospital beds at 221 residents per hospital bed
2	Direct care physicians at 560 residents per physician
7	Registered nurses at 140 residents per nurse
0	Dentists at 1,982 residents per dentist

4.6.21.6 Schools

For the projected inmigrant population of 975 persons, it is anticipated that the demand for La Porte ISD staff would be 13 teachers and 25 public school staff.

4.6.21.7 Libraries

For the projected inmigrant population of 975 persons, the demand for facilities is projected to be:

1,345	Books at 1.38 books per capita
3,699	Total resources at 3.79 per capita
296	Additional square feet of library space

It is not anticipated that local libraries would need to hire additional staff.

4.6.21.8 Parks and Recreation Facilities

The additional projected inmigrant population of 975 persons is likely to create a demand for 7.7 acres of various types of parkland uses, at 0.79 acre per 100 persons.

4.6.21.9 Streets and Public Transportation

Because there is no current access to Alexander Island, a new four-lane access roadway with a new multi-span bridge would be required for access to the project site. Improvements would also be required to various roadways once the roadway is terminated onto the mainland.

No intermodal yard is expected for this alternative. It is anticipated that the majority of rail traffic would use the existing Barbours Cut facility. There are two additional intermodal yards located in

the greater Houston area. It is anticipated that these additional yards would see a minimal amount of rail traffic originating from this proposed terminal location.

4.6.21.10 Effects on Local Tax Revenues

Table 4.6.21-1 shows the potential effect of the proposed project at the Alexander Island site on government revenues. Total government effect of the construction phase of the project is expected to be approximately $10.4 million, of which roughly 10 percent is anticipated to affect local governments. State government is expected to receive approximately 29 percent ($3.0 million) and the Federal government 61 percent ($6.3 million).

At full operation of the project, annual government effects are expected to amount to $1.8 million annually, with a $0.2 million effect on local government, $0.5 million effect on State government and a $1.1 million effect on the Federal government. Operations-related effects are expected to be generally the same for all alternatives.

4.7 CEDAR POINT ALTERNATIVE

4.7.1 Air Quality

For this alternative, direct and indirect air quality impacts associated with the construction of the proposed project on Cedar Point were evaluated.

An estimate of air emissions from this alternative (JDC, 2002) was based on the same methodologies and emission factors developed from the Shoal Point alternative detailed emission calculations (see Section 4.2.1.1). It was assumed that the basic footprint and operation of the site would be similar for either alternative. The calculations were site specific, using the following as a basis:

- Site-specific values for access road length, volume of dredged material, and volume of other fill material.
- Ship emissions were based on the route to the site.
- Truck emissions were based on the route to the site.
- Distribution to the railroad yards was adjusted, as appropriate.

Cedar Point is located in Chambers County, Texas, which is included in the HGA. Under this alternative, the length of the oceangoing transit would be longer compared with the Pelican Island, Shoal Point, and Bayport alternatives, but shorter compared with the Spillman's Island or Alexander Island alternatives. The motor vehicle trips into the Houston area would be shorter compared with the Pelican Island and Shoal Point, but longer when compared with the Spillman's Island, Alexander Island and Bayport alternatives. The combined terminal equipment fleets would be the same for this alternative and the other alternatives.

Based on the most recent air emissions inventory information provided by the EPA, Table 4.7.1-1 shows a summary of emissions for Chambers County. The emissions information is broken out by area source, non-road mobile, on-road mobile, and point source emissions based on emissions

Table 4.6.21-1
Government Revenues *
Alexander Island Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION ACTIVITIES													
Federal Government	$854,357	$267,413	$1,102,972	$1,101,473	$289,941	$768,284	$0	$0	$0	$0	$115,500	$187,366	$396,964
State Government	$438,343	$137,201	$545,294	$457,978	$148,760	$357,679	$0	$0	$0	$0	$59,259	$96,132	$203,670
Local Government	$142,629	$44,643	$183,571	$180,959	$48,404	$127,263	$0	$0	$0	$0	$19,282	$31,280	$66,271
Total Government	$1,435,329	$449,258	$1,831,837	$1,740,410	$487,105	$1,253,227	$0	$0	$0	$0	$194,041	$314,778	$666,904
OPERATIONS ACTIVITIES													
Federal Government	$4,635	$4,635	$622,669	$220,687	$361,591	$1,035,985	$474,313	$530,675	$596,430	$652,791	$709,152	$765,514	$831,269
State Government	$2,378	$2,378	$319,472	$113,228	$185,521	$531,531	$243,355	$272,272	$306,009	$334,926	$363,844	$392,761	$426,498
Local Government	$774	$774	$103,950	$36,842	$60,365	$172,951	$79,184	$88,593	$99,570	$108,979	$118,388	$127,798	$138,775
Total Government	$7,787	$7,787	$1,046,091	$370,757	$607,476	$1,740,467	$796,852	$891,540	$1,002,009	$1,096,696	$1,191,384	$1,286,072	$1,396,541
TOTAL EFFECT													
Federal Government	$858,992	$272,049	$1,725,640	$1,322,160	$651,532	$1,804,269	$474,313	$530,675	$596,430	$652,791	$824,652	$952,880	$1,228,232
State Government	$440,722	$139,580	$864,765	$571,206	$334,280	$889,211	$243,355	$272,272	$306,009	$334,926	$423,103	$488,893	$630,167
Local Government	$143,403	$45,417	$287,522	$217,801	$108,769	$300,215	$79,184	$88,593	$99,570	$108,979	$137,670	$159,077	$205,045
Total Government	$1,443,117	$457,045	$2,877,928	$2,111,167	$1,094,581	$2,993,694	$796,852	$891,540	$1,002,009	$1,096,696	$1,385,425	$1,600,850	$2,063,445

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION ACTIVITIES												
Federal Government	$1,223,939	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$6,308,209
State Government	$573,211	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,017,527
Local Government	$202,834	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,047,136
Total Government	$1,999,984	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$10,372,872
OPERATIONS ACTIVITIES												
Federal Government	$1,505,663	$943,991	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$18,854,966
State Government	$772,508	$484,332	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$9,673,886
Local Government	$251,361	$157,593	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$3,147,715
Total Government	$2,529,532	$1,585,916	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$31,676,567
TOTAL EFFECT												
Federal Government	$2,729,602	$943,991	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$25,163,176
State Government	$1,345,719	$484,332	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$12,691,413
Local Government	$454,195	$157,593	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$4,194,850
Total Government	$4,529,516	$1,585,916	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$42,049,439

Source: Texas Comptroller of Public Accounts, 1989.
* In year-2000 dollars.

inventory information for 1999. In assimilating data for $PM_{2.5}$ emissions, the EPA database was accessed. As this database appears to provide more current and comprehensive emissions information, the database was used as a basis for emissions information in the Final EIS. Although this emissions inventory is not current, it is the most recent data available, and it provides a relative basis from which to compare the proposed project emissions.

TABLE 4.7.1-1
SUMMARY OF AIR EMISSIONS FOR CHAMBERS COUNTY (1999), BY SOURCE CATEGORY

Air Contaminant	Area tpy (1996)	Non-Road Mobile tpy (1996)	On-Road Mobile tpy (1996)	Point Source tpy (1999)	Total (tpy)
NO_x	42	850	2,399	10,044	13,335
VOC	1,262	1,159	901	2,922	6,244
CO	588	3,575	6,737	5,856	16,756
SO_2	3	359	83	147	592
PM_{10}	10,341	352	90	144	10,927
$PM_{2.5}$	1,744	323	74	136	2,277

Source: EPA, 2002a.

Air monitoring data in the area of this alternative are limited. Air quality monitoring stations closest to the project site are located in Baytown at 7210½ Bayway Drive, on Baker and Decker Road and at 8620 West Bay Road. Measurements at the Bayway Drive site do not include air emissions concentrations. The monitors at the other two sites are operated by the Houston Regional Monitoring Network and are not currently included in the EPA's monitoring values database. However, based on monitoring data for HGA, ozone levels are above the NAAQS. All other pollutants were monitored below the NAAQS.

4.7.1.1 Impacts

Pollutant emissions from construction activities may result in short-term impacts on air quality in the immediate vicinity of the project site, including increased levels of particulate matter and vehicular exhaust emissions. As shown on Table 4.7.1-2, construction of the proposed project would result in a relative increase in emissions above those resulting from existing sources in this county. Emissions of NO_x, VOC, and CO (highest during Phase I) are expected to result in a less than one percent increase over existing emissions. Emissions of particulate matter and SO_2 from construction activities may result in increased localized concentrations in the ambient air surrounding the facility. The highest emissions rates for SO_2 and particulate matter for this alternative would occur during Phase I and Phase III, respectively, of construction. Construction emissions during other phases of construction would be below these peak levels.

TABLE 4.7.1-2
PEAK ANNUAL CONSTRUCTION EMISSIONS SUMMARY
COMPARISON WITH CHAMBERS COUNTY EMISSIONS (1999)
CEDAR POINT ALTERNATIVE

Air Contaminant	Maximum Annual Construction Emissions (tpy)	Peak Year	Chambers County Emissions (tpy)	Site Emissions % of Chambers County Emissions
NO_x	65.6	2005	13,335	0.49
VOC	6.8	2005	6,244	0.11
CO	35.1	2006	16,756	0.21
SO_2	19.6	2006	592	3.3
PM_{10}	177.6	2015	10,927	1.6
$PM_{2.5}$	24.3	2015	2,277	1.1

The peak annual operating emissions for this alternative were compared with Chambers County emissions as shown on Table 4.7.1-3.

As shown on this table, the estimated emissions of NO_x, PM_{10}, and CO would result in a small increase (less than 1%) over the existing Chambers County emissions. Emissions of SO_2 may increase area emissions by about 9.5, compared with the Chambers County emissions inventory. VOC and $PM_{2.5}$ emissions may increase by about 2 percent. To minimize emissions, terminal sponsors would comply with the requirements of the SIP, including low emission diesel and idling restrictions as well as reductions based on diesel fuel sulfur control requirements. Total operating emissions would be expected to contribute less than one percent to total emissions for this county.

TABLE 4.7.1-3
COMPARISON OF PEAK ANNUAL ONSITE OPERATING
EMISSIONS WITH CHAMBERS COUNTY EMISSIONS (1999)
CEDAR POINT ALTERNATIVE

Air Contaminant	Maximum Annual Operating Emissions (tpy)	Peak Year	Chambers County Emissions (tpy)	% of Chambers County Emissions
NO_x	48.8	2006	13,335	0.37
VOC	137.4	2026	6,244	2.2
CO	43.6	2026	16,756	0.26
SO_2	56.1	2026	592	9.5
PM_{10}	50.3	2026	10,927	0.5
$PM_{2.5}$*	48.9	2026	2,277	2.1
TOTAL	336		47,854	0.70

* $PM_{2.5}$ emissions are a subset of PM_{10} emissions and are not included in emissions total.

Under this alternative, motor vehicle traffic emissions would be less than the Pelican Island or Shoal Point alternatives because this alternative is located closer to the Houston area where the bulk of the containers are expected to go. The train trip distances would also be shorter. Because this alternative is farther from the entrance of the Gulf of Mexico, the average ship travel distance would

increase. As these transportation-related emissions are more regional in nature, they may be compared with emissions from the HGA, as shown on Table 4.7.1-4.

TABLE 4.7.1-4
TRANSPORTATION EMISSIONS SUMMARY
CEDAR POINT ALTERNATIVE COMPARED WITH HGA TRANSPORTATION EMISSIONS (1999)

Air Contaminant	Peak Transportation Emissions* During Operation – 2026 (tpy)	HGA Transportation Emissions (tpy)	Transportation Emissions % of HGA Transportation Emissions
NO_x	2,601	295,613	0.88
VOC	255	84,130	0.30
CO	974	593,057	0.16
SO_2	1,926	26,720	7.2
PM_{10}	118	7,697	1.5
$PM_{2.5}$	106.2	6,363	1.7

* Transportation emissions would peak after full build-out in 2026.

Because these are stationary sources, and because the background concentrations (except for ozone) in the HGA are well below the NAAQS, it is expected that ambient air contaminant concentrations for PM_{10}, CO, and SO_2 would not be large enough to cause or contribute to an exceedance of an ambient air quality standard in this region, although localized SO_2 and PM_{10} concentrations may increase. VOC and NO_x emissions from the operation of container terminals, oceangoing vessels, mobile emissions, and associated activities are also included in the inventory for the SIP. These pollutants are not expected to impede attainment of the ozone standard in the HGA. In addition, because of the distance and prevailing southeast winds, emissions from this alternative would not be expected to have a major impact on the nearest Class I air quality areas.

4.7.1.2 State Implementation Plan (SIP) Conformity Review

For this alternative location, the emissions from the portion of the construction activities subject to USACE responsibility are summarized on Table 4.7.1-5 below for each phase of the project:

TABLE 4.7.1-5
SUMMARY OF MAXIMUM ANNUAL CONSTRUCTION EMISSIONS
SUBJECT TO USACE RESPONSIBILITY, CEDAR POINT ALTERNATIVE

Air Contaminant	Phase I (tpy)	Phase II (tpy)	Phase III (tpy)
NO_x	61.0	28.0	5.5
VOC	6.7	3.1	0.9
CO	31.5	18.7	6.4
SO_2	17.7	11.1	5.0
PM_{10}	6.4	20.2	13.6
$PM_{2.5}$	4.4	4.4	2.6

For this alternative, the NO_x emissions for Phase I and Phase II of the project construction emissions would exceed the 25 tpy emission rate for requiring a General Conformity Determination. Under this alternative, emissions of NO_x from Phase I and Phase II would account for approximately 0.7 and 0.3 percent, respectively, of the construction budget in the SIP (8,827.5 tpy) based on the Post-1999 Rate of Progress and Attainment Demonstration SIP approved by the EPA in October 2001. Based on previous discussions with the TNRCC and EPA, it is likely they would determine that the project construction emissions at this site would be included in the previously approved SIP and the recent Attainment SIP.

For Phase III, the VOC and NO_x emissions for project construction emissions would not exceed the emission rate for requiring a General Conformity Determination. As the emissions from each phase of the project would be less than a 10 percent increase of the VOC and NO_x emissions inventories for the entire nonattainment area, the project would not be regionally significant for purposes of General Conformity.

Because 1) the project construction emissions during Phase III would be exempt from the General Conformity Rule, 2) emissions during Phases I and II are expected to be accounted for in the SIP, and 3) the project is not regionally significant, the emissions from the project construction should not:

- Cause or contribute to any new violation of any of the NAAQS in the project area;
- Increase the frequency or severity of any existing violation of any NAAQS in the project area; or
- Delay timely attainment of the NAAQS or any required interim emission reduction in the project area.

Therefore, the TNRCC would more than likely confirm that emissions from this alternative would comply with the requirements of the General Conformity Rule and would be in conformity with the Texas SIP.

4.7.2 Roadway Traffic Impact Analysis

This section presents analyses for the unsignalized intersections, signalized intersections, and major corridors that would potentially be affected by construction of the proposed project at the Cedar Point alternative site. This site is located along the east shoreline of Galveston Bay, southeast of Baytown, Texas. The traffic impact analysis was conducted for the years 2001, 2005, 2015, and 2025. Existing conditions are represented by the 2001 traffic information. The following sections describe the potential impacts of the project in terms of the differences in traffic LOS between the No-Build and Build conditions for the Cedar Point alternative.

4.7.2.1 Container Distribution

Anticipated container distribution for the Cedar Point alternative is presented in Table 4.7.2-1, based on the results of H-GAC's modeling effort. The same intermodal split described for the Shoal Point alternative in Section 4.2.2.1 (i.e., 80 percent by highway/20 percent by rail) was assumed for all alternative sites.

TABLE 4.7.2-1
CONTAINER DISTRIBUTION

Corridor	Distribution (% of Container Traffic) 2005	2015	2025
SH 146 to SH 225	84	84	65
SH 146 to IH 10	10	10	10
New Intermodal Railway Facility	0	0	20
Other routes	6	6	5

As indicated by Table 4.7.2-1, SH 146 to SH 225 is projected to be the primary corridor, carrying 84, 84, and 65 percent of the container terminal traffic for years 2005, 2015, and 2025, respectively.

Projected daily truck volumes described for the Shoal Point alternative (see Table 4.2.2-2) would be the same for all alternative sites.

4.7.2.2 Intersection Analysis – Unsignalized Intersections

Two unsignalized intersections were evaluated for this alternative: SH 146 at FM 1405 and Business SH 146 at Spur 55. These intersections are currently experiencing an LOS of F (see Table 4.7.2-2 and Figure 4.7.2-1) and would remain LOS F through the year 2025 for the No-Build and Build conditions (see Table 4.7.2-2 and Figure 4.7.2-2).

4.7.2.3 Intersection Analysis – Signalized Intersections

No signalized intersections were evaluated for this alternative.

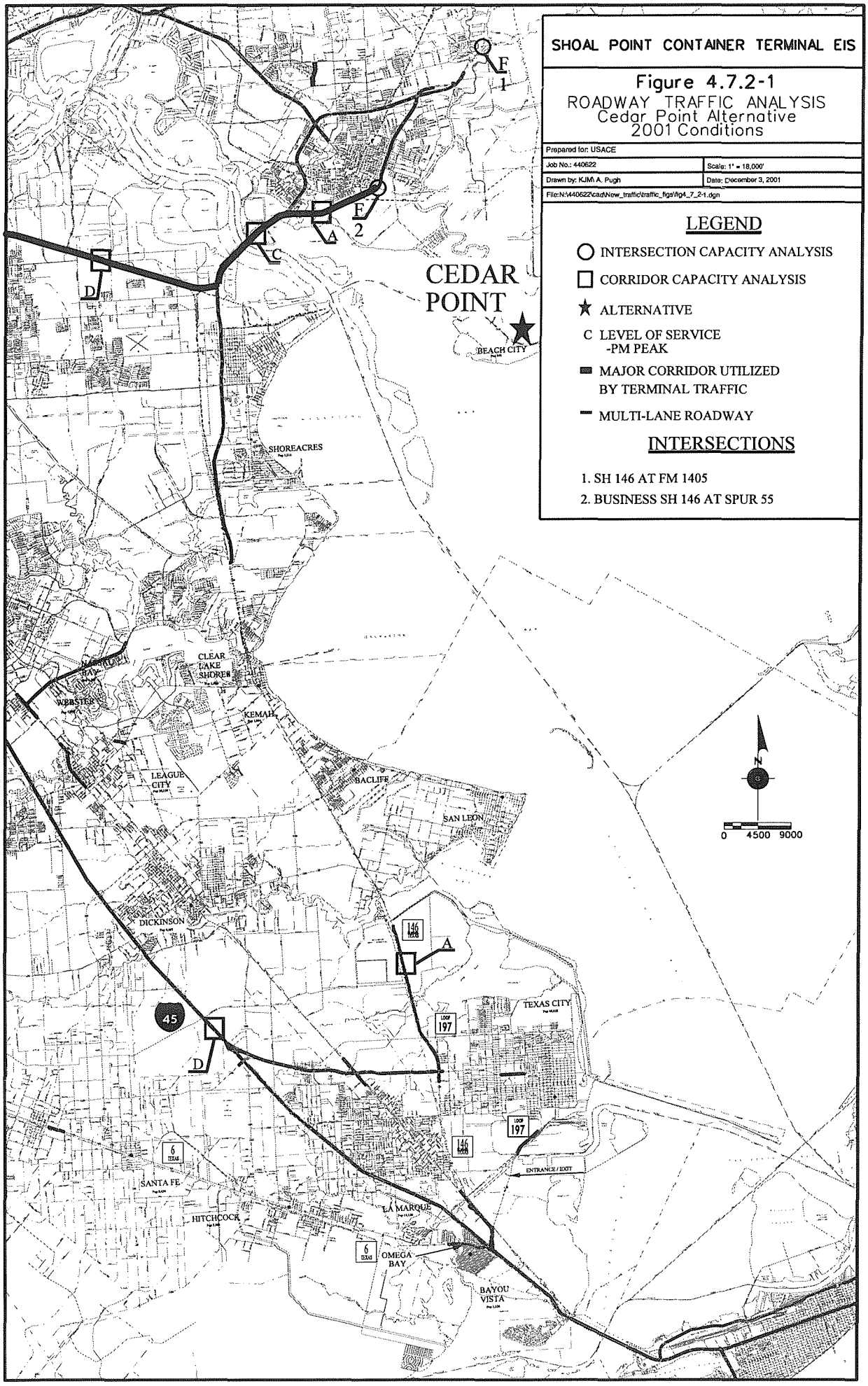
4.7.2.4 Main Corridor Analysis

Two main corridors were analyzed for this alternative: SH 225 and SH 146. The SH 225 corridor included in the analysis extends from SH 146 to Beltway 8, and the SH 146 corridor extends from Spur 55 to SH 225 for this alternative. Table 4.7.2-3 and figures 4.7.2-1 and 4.7.2-2 depict existing conditions and the results of the analysis on these corridors. The Beltway 8 to Center Road segment of SH 225 is currently experiencing a poor LOS (E). Roadway improvements included in the model for this analysis (see Table 4.2.2-5) would improve the LOS in this segment to D in 2005 and 2015; however, by 2025, normal growth would cause the segment to return to LOS E. No change in LOS is expected on this segment as a result of the proposed project, relative to the No-Build scenario (Table 4.7.2-3). The Center Road to SH 146 segment of SH 225 would experience similar improvements in 2005 and 2015 when roadway projects would result in a change in the 2001 LOS from D to C. By 2025, the LOS would return to D as a result of normal growth, and project-related traffic would not cause a change in LOS for this segment (Table 4.7.2-3). Two segments were analyzed for the SH 146 corridor. SH 225 to SH 146/ Business SH 146 Split would experience a change in LOS from C in 2001 to D in 2025 as a result of normal growth in the area. Project-related traffic would not result in a change in LOS relative to the No-

TABLE 4.7.2-2

CEDAR POINT INTERSECTION TRAFFIC ANALYSIS

Limits	Year 2001		Year 2005 Build		Year 2005 No Build		Year 2015 Build		Year 2015 No Build		Year 2025 Build		Year 2025 No Build	
	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)	Level of Service	Delay (Sec.)
SH-146 at FM 1405	F	200	F	350	F	300	F	480	F	430	F	800	F	750
Bus. SH-146 at Spur 55	F	200	F	360	F	310	F	470	F	420	F	800	F	750


SHOAL POINT CONTAINER TERMINAL EIS
Figure 4.7.2-1
ROADWAY TRAFFIC ANALYSIS
Cedar Point Alternative
2001 Conditions
Prepared for: USACE
Job No.: 440622
Scale: 1" = 18,000'
Drawn by: KJM A. Pugh
Date: December 3, 2001
File:N:\440622\cad\New_traffic\traffic_figs\fig4_7_2-1.dgn
LEGEND
INTERSECTION CAPACITY ANALYSIS
CORRIDOR CAPACITY ANALYSIS
ALTERNATIVE
C LEVEL OF SERVICE -PM PEAK
MAJOR CORRIDOR UTILIZED BY TERMINAL TRAFFIC
MULTI-LANE ROADWAY
INTERSECTIONS
1. SH 146 AT FM 1405
2. BUSINESS SH 146 AT SPUR 55
CEDAR POINT
BEACH CITY
SHOREACRES
CLEAR LAKE SHORES
WEBSTER
KEMAH
LEAGUE CITY
BACLIFF
SAN LEON
DICKINSON
TEXAS CITY
SANTA FE
HITCHCOCK
LA MARQUE
OMEGA BAY
BAYOU VISTA
ENTRANCE / EXIT
0 4500 9000

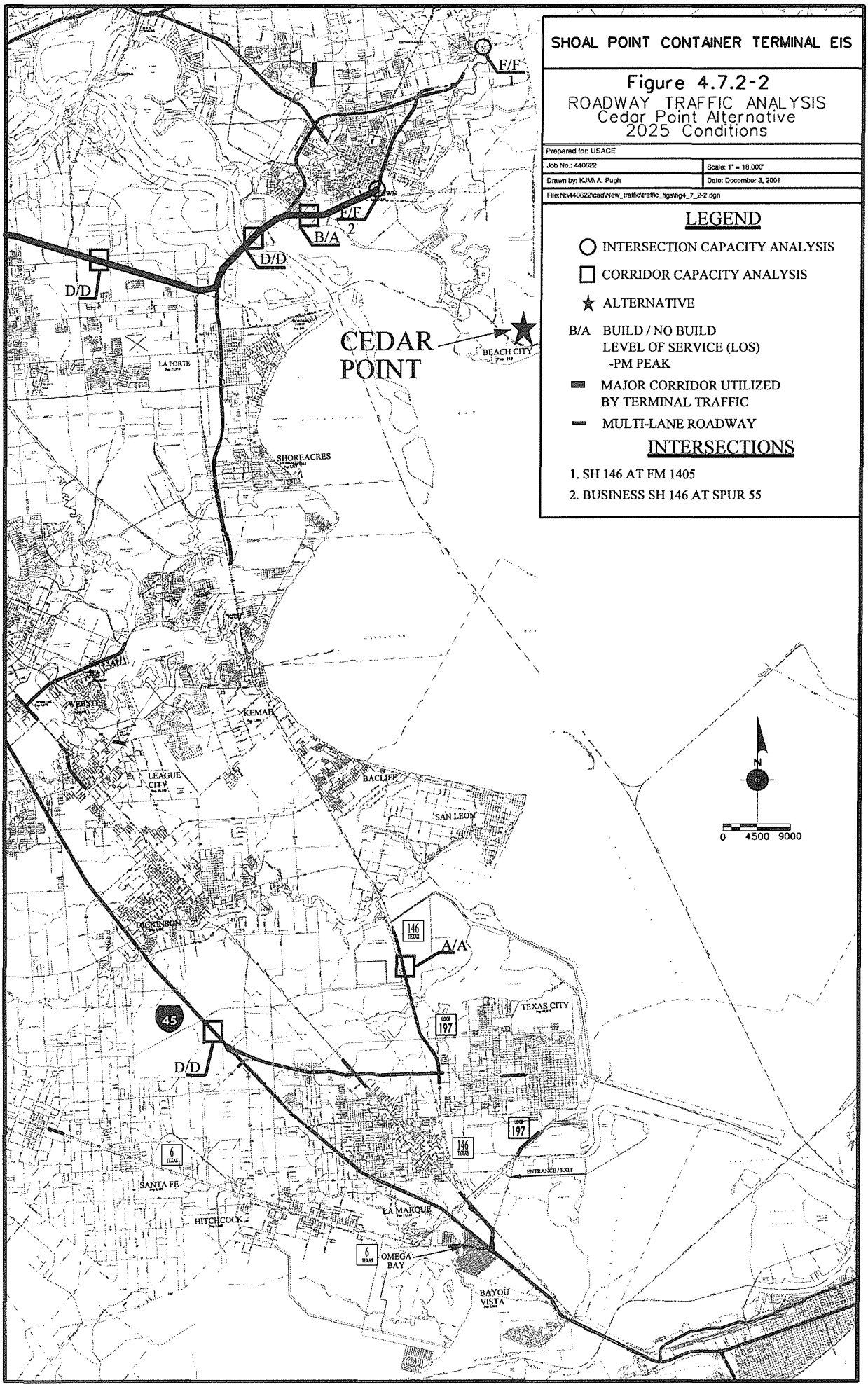

SHOAL POINT CONTAINER TERMINAL EIS
Figure 4.7.2-2
ROADWAY TRAFFIC ANALYSIS
Cedar Point Alternative
2025 Conditions
Prepared for: USACE
Job No.: 440622
Scale: 1" = 18,000'
Drawn by: KJM\ A. Pugh
Date: December 3, 2001
File:N:\440622\cad\New_traffic\traffic_figs\fig4_7_2-2.dgn
LEGEND
INTERSECTION CAPACITY ANALYSIS
CORRIDOR CAPACITY ANALYSIS
ALTERNATIVE
B/A BUILD / NO BUILD LEVEL OF SERVICE (LOS) -PM PEAK
MAJOR CORRIDOR UTILIZED BY TERMINAL TRAFFIC
MULTI-LANE ROADWAY
INTERSECTIONS
1. SH 146 AT FM 1405
2. BUSINESS SH 146 AT SPUR 55
F/F 1
F/F 2
B/A
D/D
D/D
CEDAR POINT
BEACH CITY
LA PORTE
SHOREACRES
WEBSTER
KEMAH
LEAGUE CITY
BACLIFF
SAN LEON
DICKINSON
A/A
TEXAS CITY
D/D
SANTA FE
HITCHCOCK
LA MARQUE
OMEGA BAY
BAYOU VISTA
ENTRANCE / EXIT
N
0 4500 9000

TABLE 4.7.2-3

CEDAR POINT FREEWAY LEVEL OF SERVICE (LOS) ANALYSIS

	Alternative	Roadway	Limits	Year 2001			Year 2005			Year 2015			Year 2025		
				ADT	Density	LOS	ADT	Density	LOS	ADT	Density	LOS	ADT	Density	LOS
No Build	Cedar Point	SH-225	Beltway 8 to Center Rd.	111,080	36.1	***E***	122,191	27.0	D	131,524	29.5	D	142,823	33.4	***E***
			Center Rd. to SH-146	90,700	27.0	D	95,062	20.5	C	105,019	22.8	C	112,986	24.7	D
		SH-146	SH-225 to SH-146/Bus. SH-146 Split	58,300	16.9	C	64,130	18.6	C	76,546	22.7	C	92,347	27.6	D
			Spur 55 to SH-146/Bus. SH-146 Split	16,112	4.7	A	17,788	5.2	A	21,121	6.1	A	25,344	7.4	A
Build	Cedar Point	SH-225	Beltway 8 to Center Rd.	Not Applicable			123,942	27.4	D	134,001	30.3	D	151,923	37.3	***E***
			Center Rd. to SH-146				96,124	20.7	C	108,100	23.5	C	121,935	26.9	D
		SH-146	SH-225 to SH-146/Bus. SH-146 Split				67,100	19.5	C	79,800	23.5	C	102,128	31.4	D
			Spur 55 to SH-146/Bus. SH-146 Split				20,001	5.9	A	25,111	7.3	A	35,132	10.2	B

Year 2001: Analysis based on TxDOT Provided ADT and Existing Geometry
Year 2005: Analysis based on H-GAC Model Traffic and Geometry
Year 2015: Analysis based on H-GAC Model Traffic and Geometry
Year 2025: Analysis based on H-GAC Model Traffic and Geometry
No-Build: Existing Traffic Generators
Build: Existing Traffic Generators and Terminal Operation

Peak Hour Factor: 0.90
K factor: 10
Directional Distribution: 50-50
Percent Truck Traffic: 10%

ADT: Average Daily Traffic (Bi-directional Daily Traffic Volume)
Density: Passenger Cars per Mile per Lane
LOS: Level of Service (Qualitative Measure of Effectiveness)
- Change in Level of Service
ITALICS - Poor Level of Service
* - Density out of range

Build scenario. Spur 55 to SH 146/Business SH 146 Split would change from LOS A to B due to the project in the year 2025.

4.7.2.5 Railroad Crossing Impacts

The major railroad intersections that would be affected by the container terminal at the Cedar Point site are along Business 146. Relative to the other alternatives, the Cedar Point alternative would have access to fewer direct train routes to Houston. The difference between the Build and No-Build scenarios would be four trains per day during ultimate design build-out (2025). Estimated increases in future average delays (i.e., seconds per vehicle of delay while a train is crossing the intersection) for each railroad crossing due to the additional train activity related to the project are presented in Table 4.7.2-4.

TABLE 4.7.2-4
ESTIMATED RAILROAD DELAY, CEDAR POINT ALTERNATIVE

Intersection	Year 2025-Build	
	Future Average Delay (sec/veh)	Additional Train Activity (trains per day)
Business 146	0.30	4

4.7.2.6 Hurricane Evacuation

In the event of a hurricane, with ample warning from the National Weather Service, the terminal would coordinate efforts of the Port Operations Manager, Terminal Managers, and Shop Foreman to activate its Hurricane Preparedness Plan (HPP) (see Section 4.2.2.7 for a description of the process used to implement the HPP). The HPP would be coordinated with and would be on file with the emergency management systems of the local county or municipality and the USCG's Commander of the Port prior to a hurricane event. Within the HPP, a point of contact would be established with whom the local agencies and USCG would share information prior to, during, and after the hurricane. The goal of the HPP is to allow the terminal to have all equipment and facilities secured and evacuated by the time the USCG's Commander of the Port closes the HSC to vessel traffic.

4.7.2.7 Construction

Most of the construction traffic to build the proposed container terminal would occur on site and most of the raw materials would be barged to the terminal site. The primary source of offsite traffic during construction of the terminal would be from the daily workers. Therefore, minimal construction traffic impact to the transportation network would be anticipated.

4.7.3 Noise

Noise associated with the Cedar Point alternative would be generated during the construction phase and during the operation of the facility. Major noise sources associated with the proposed project would include the construction equipment, the loading equipment used during operations, and truck traffic. In the following sections, potential impacts at the nearest noise sensitive receptors are quantified.

4.7.3.1 Construction

Noise associated with construction activities is primarily generated by the engines of the construction equipment. Analyses by the USDOT and the EPA have found that the typical noise levels of construction equipment can vary from 74 dBA to 101 dBA at a distance of 50 feet from the source (USDOT, 1995). Typical construction noise decreases by approximately 6 dB as the distance from the source is doubled. For example, if noise generated from a bulldozer is 85 dB at 50 feet, the noise level would decrease to approximately 79 dB at 100 feet and decrease to approximately 73 dB at 200 feet. Typical noise levels generated by construction equipment are listed in Table 4.2.3-1. Construction activities associated with the proposed project include the excavation and dredging of the channel, the moving and grading of placement fill, and the construction of the loading docks and berths.

Dredging within the Cedar Point project area would occur southwest of the existing Houston Ship Channel. Dredging activities during the construction phase of the project could occur as much as 24 hours per day, 7 days per week. It is estimated that the extensive dredging required for this alternative could take as much as 4 years to complete. Electric dredging equipment would be used where feasible within the project area in order to reduce air emissions. Depending on engine components and configuration, noise levels associated with electric dredges range from 65 dBA to 85 dBA at a distance of 50 feet (USACE, 2001a). Calculations indicate that noise levels associated with dredging activities at the nearest sensitive receptors, located approximately 1,000 feet south of the dredge area, would range from approximately 40 dBA to 60 dBA. Dredging activities could result in a noise impact at residential receptors because the ambient noise environment is as low as 49.9 dBA (USACE, 2001a).

Construction of the facilities at the Cedar Point site would also include the use of typical construction equipment, some of which is included in Table 4.2.3-1. Calculations indicate that propagated noise levels associated with construction of the project could range between 49 dBA and 76 dBA at the nearest sensitive receptors. These levels exceed the existing noise environment and would therefore result in a noise impact.

4.7.3.2 Operations

The nearest sensitive receptors are located approximately 500 feet southwest of the entrance and storage area for this alternative. Results from the noise monitoring program conducted at the Barbours Cut Terminal (USACE, 2001a) indicate that these receptors would be most influenced by diesel truck engines idling at the entrance of the facility. However, the combined sound level of all operations and activities occurring within the facility would contribute.

A L_{dn} of 61.3 dBA recorded at a distance of approximately 380 feet from the main gate (USACE, 2001a) indicates that noise levels associated with operations would present a noise impact to the sensitive receptors located approximately 500 feet southwest of the Cedar Point alternative. This would exceed the ambient noise environment by as much as 11 dBA.

4.7.3.3 Traffic

As discussed in Section 3.3, a noise analysis was conducted for representative residential structures (Category B receivers) located adjacent to the main roadways that could potentially be affected by construction of the proposed container terminal at the Cedar Point site. The results of this analysis are presented in Table 4.7.3-1. As indicated in the table, existing noise levels along three out of four of the roadways included in the analysis for the Cedar Point site are currently exceeding the NAC levels for Category B receivers, and are therefore already impacted under the absolute criterion (defined in Section 3.3).

The noise analysis indicates that all of the roadway segments are expected to experience further noise level increases in 2025 as a result of traffic associated with normal growth in the area (i.e., the No-Build scenario). In this scenario, only the segment of SH 146 from Spur 55 to SH 146/Businesss SH 146 Split would exhibit noise levels below the NAC level.

In the Build scenario, noise levels on two out of four of the segments analyzed are not expected to increase over the levels predicted for the No-Build scenario in 2025. This indicates that if the project were built, the noise levels would not be increased over the levels predicted for these road segments due to normal growth in the area. Noise levels on the remaining segments are expected to increase by 1 dBA or 2 dBA in the Build scenario. The 2 dBA increase in noise levels on the segment of SH 146 from Spur 55 to SH 146/Businesss SH 146 Split would constitute an impact under the absolute criterion because the predicted noise level (67 dBA) would meet the NAC level of 67 dBA for Category B receivers.

4.7.4 Physiography, Topography, and Bathymetry

Dredging and grading activities are required for construction of the project at the Cedar Point alternative site. The most significant effects on bathymetry would be related to permanent alterations resulting from dredging to create a new deepwater channel, berthing area and a turning basin for cargo ships. It is estimated that approximately 34 mcy of material would be dredged during development of this alternative. The dredged material would be placed in existing DMPAs and/or beneficial use areas. Surface topography changes would primarily be associated with site preparation activities for the container yard and associated access road and dredged material placement. While local changes in bathymetry and topography would occur during construction of the container terminal, these alterations would be expected to have negligible impacts on regional physiography, topography, and bathymetry of the submerged and subaerial portions of the project area.

TABLE 4.7.3-1

EXISTING AND PREDICTED TRAFFIC NOISE LEVELS FOR CEDAR POINT ALTERNATIVE

Study Area	NAC Category	NAC Level (dBA)	Existing 2001 (dBA)	Noise Impact at Present (2001)	Predicted 2025/No Build (dBA)	Change (+/-) (dBA)	Noise Impact with "No-Build" Option	Predicted 2025/Build (dBA)	Increase in dBA over "No-Build" Conditions
SH 225 From Beltway 8 to Center Rd.	B	67	72	Yes	73	+1	Yes	73	+0
SH 225 From Center Road to SH 146	B	67	71	Yes	72	+1	Yes	72	+0
SH 146 from SH 225 to SH 146/Bus. SH 146 Split	B	67	69	Yes	71	+2	Yes	72	+1
SH 146 from Spur 55 to SH 146/Bus. SH 146 Split	B	67	63	No	65	+2	No	67	+2*

* Noise level increase at this receptor meets the absolute criterion for impact. Therefore, this receptor which was not impacted under existing, or no-build conditions, would be impacted under the build scenario.

4.7.5 Geology

The impacts on the local geology during dredging and construction activities associated with the proposed project would include redistribution of existing sediment, local increases in turbidity, and potential increases of local scouring and shoaling rates. Net impacts on local geology would be minimal from these operations

4.7.6 Energy and Mineral Resources

The proposed project would have no impacts on the energy resources within the project area. There are petroleum resources in the region but no active wells occur on this alternative site (see Section 3.6.6). Relocation of some existing petroleum pipelines in the area may be required depending on the exact location of the terminal but would not impact oil and gas resources. Remediation of impacted soil and/or groundwater related to pipeline spills or leaks may be required during relocation activities. Consumptive use of construction products such as sand, gravel, and cement would constitute an irretrievable commitment of these mineral resources.

4.7.7 Surface Soils

Other than disruption of surface soils during construction in the immediate area of the terminal site, no impacts to the surface soils within the project area would be associated with this alternative. No undesirable geotechnical phenomena would be expected at the site. A surcharge program would likely not be required with the exception of possibly some isolated areas. Possible impacts to surface soils exist from the potential release of petroleum products during construction and hazardous material spills from hazardous cargo during facility operations and potential accidents during local highway transport. However, the proposed container terminal is expected to handle a minimal amount of containerized hazardous cargo and the use of BMPs for potential hazardous material spills that could occur at the terminal site would greatly minimize the potential for this type of impact.

Transportation of hazardous cargo is regulated by the U.S. Department of Transportation. Shippers of hazardous materials are required to properly packaging the cargo to reduce the potential of a release during transport and handling. In the event of a release during highway transport, City and local hazardous response teams are trained in spill containment and cleanup. Section 4.7.9 assesses in more detail the potential impact from a release of hazardous cargo due to increase traffic on highways near the site.

4.7.8 Groundwater Quality and Hydrology

Construction and operation activities associated with this alternative are not expected to result in major impacts to groundwater hydrology, quantity and quality. Minimal, localized increases in turbidity (TSS) of shallow groundwater would be short term and associated with dredging activities related to construction of the facility. The recharge of shallow groundwater underlying the site by precipitation would be reduced in areas at the terminal site occupied by impervious cover. A large portion of the surface soil at the site consists of low permeability clay and clayey loam that would tend to decrease

infiltration of precipitation, and currently causes much of the rainfall to be lost to evaporation and surface runoff. The decrease in recharge from precipitation would have little affect on local or regional groundwater levels. The primary drinking water aquifers (Chicot and Evangeline aquifers) typically produce fresh water from depth of 300-700 feet and 800-1,500 feet, respectively, in the vicinity of the proposed and alternate sites. Groundwater recharge to these aquifers by precipitation occurs inland in outcrop areas. Groundwater quality in these aquifers becomes poorer near the coast where saltwater encroachment limits the amount of available fresh water. The regional affects of this relatively small decrease in recharge on the primary aquifers in the region would be negligible.

Other possible impacts to shallow groundwater exist from the potential release of petroleum products during construction and hazardous material spills from hazardous cargo during facility operations and potential accidents during local highway transport. The proposed container terminal is expected to handle some hazardous cargo; however, the use of BMPs for potential hazardous material spills that could occur at the terminal site would greatly minimize the potential for this type of impact to groundwater quality. BMPs which meet local, State, and Federal requirements will be developed and implemented as part of the Spill Response Plan for the project to address potential spills. In addition, packages for hazardous material must conform to standards set by Research and Special Programs Administration (RSPA) of the Department of Transportation and the International Maritime Organization (IMO). A carrier accepting hazardous cargo from a shipper or intermediary is obliged to exercise reasonable care to be sure that the shipment has been properly prepared. This obligation exists each time the cargo is handed off during the transportation process. Specific requirements apply to highway, rail, air and ocean transport. These procedures will greatly reduce the risk of impact to the underlying groundwater at the site. Section 4.7.9 (reference Hazardous Material Site Assessment section for the particular alternative) assess in more detail the potential impact from a release of hazardous cargo due to increase traffic on highways near the site.

4.7.9 Hazardous Materials Site Assessment

The regulatory agency database search and site reconnaissance revealed one unregistered UST facility and a private equipment storage site within the Cedar Point alternative project boundary, a solid waste landfill and oil/gas well tank battery within 0.25 mile of the project boundary, and a steel plant within 0.5 mile of the project boundary (see Section 3.9.6). The landfill, well location, and steel plant do not appear to provide a significant environmental concern to the project. The unregistered UST facility and equipment storage yard may require surface/subsurface investigations to determine the potential impacts to the project. If USTs are discovered at the facility, the tanks should be removed according to applicable State and Federal standards.

The greatest potential for encountering contaminated media is either at the UST facility or the equipment storage site. There is a minor potential for encountering contaminated media during future roadway widening activities along FM 1405 and Beach Road. If contaminated media are encountered, the media should be isolated and segregated for characterization and proper disposal.

4.7.9.1 Hazardous Material Impacts to the Existing Environment from Project Construction Activities

The impacts from hazardous material use and handling during construction activities associated with the proposed project pose a minimal risk of impacts to the environment. Temporary aboveground storage tanks and equipment, vehicles, and machinery that contain oil and use diesel fuel are typically utilized during major construction projects. Impacts from the storage and handling of fuels and lubricants can be eliminated or minimized with the use of mitigation methods. Mitigation will involve the implementation of a Spill Prevention Control and Countermeasure Plan (SPCC). The SPCC plan should effectively minimize impacts of spills that occur during the construction of the facility by requiring all potential contaminants to be stored, handled, and disposed of so that the risk of accidental releases to the environment is minimized. The SPCC plan utilizes effective best management practices (BMPs), containment and control methods, and cleanup operations. Appropriate BMPs may include secondary containment for storage tanks, and drip pans for refueling, maintenance and storage of vehicles and equipment. In the event of a spill, containment and cleanup may include sorbents such as pillows, mats and booms. The plan will include training personnel for spill prevention, operation of spill response equipment, material handling, equipment inspection and maintenance, refueling procedures, spill control and containment, and spill cleanup.

4.7.9.2 Hazardous Material Impacts to the Project from Operation Activities

Fueling of land-based and water-based equipment and vessels would take place on site. The operational component of the proposed container terminal would be expected to handle some hazardous cargo. The accidental spill of fuel, lubricants, or other potentially toxic material is inevitable; however, with proper precautions in place, the impacts to human health and the environment can be greatly reduced. Precautions include a SPCC plan that would be implemented for emergency response to hazardous material spills on the terminal site. The SPCC plan requires training personnel for proper spill prevention, notification, emergency response and containment. Extensive impervious cover and proper spill response should effectively minimize or eliminate significant impacts to soils and groundwater. The risk of impacts to surface water is greatest and may require additional safeguards. Additional information regarding accidental spills is included in Section 4.7.10.

4.7.9.3 Hazardous Materials Transport

The transport of hazardous material cargo presents the potential for impacts related to accidental spills. However, multimodal transportation is extensively regulated. In the U.S., the authority is the RSPA of the USDOT. International shipments are covered by the IMO of the UN and adhere to the IMDG. Packages for hazardous material must comply with standards set by the RSPA and the UN. A carrier accepting a hazardous cargo from a shipper or intermediary is obliged to exercise reasonable care to be sure that the shipment has been properly prepared. This obligation exists with each change of custody throughout the transportation process. Specific requirements apply to sea, air, rail and highway.

The packaging requirements for hazardous material cargo have reduced environmental impacts during shipping; however, concerns remain regarding public safety issues while the cargo is in

transport on local highways. To address these concerns, the increased probability of traffic accidents was assessed along the nearest major arterial highway providing access to the proposed and alternative sites. For the Cedar Point Alternative, the assessment used traffic and accident data provided by TxDOT for a segment of SH 225 between Cedar Road to SH 146 (see Table 4.7.2-3). The results of the assessment, as shown on Table 4.7.9-1, indicate that under the No-Build scenario, the average daily traffic (ADT) of 90,700 vehicles (as recorded in 2001) would increase approximately 25 percent to 112,986 vehicles in the year 2025. If the proposed cargo facility is constructed, the 2001 ADT is projected to increase an additional nine percent over baseline conditions to 121,935 vehicles by the year 2025. This increase in traffic would be incremental and would occur as each of the three phases of the cargo facility become operational.

TABLE 4.7.9-1
CEDAR POINT ALTERNATIVE AVERAGE DAILY TRAFFIC PROJECTIONS

			Year 2001	Year 2005		Year 2015		Year 2025	
Option	Roadway	Limits	ADT	ADT	% Truck Traffic Increase	ADT	% Truck Traffic Increase	ADT	% Truck Traffic Increase
No-Build	SH 225	Center Point to SH 146	90,700	95,062	51%	105,019	16%	112,986	25%
Build	SH 225	Center Point to SH 1466		96,124	6%	108,100	19%	121,935	34%

For this analysis, it is assumed that an increase in traffic would result in an equivalent increase in traffic accidents. TxDOT reported an average of six truck accidents per year from 1997 through 1999 along the segment of SH 225 between Center Road and SH 146. Under the No-Build scenario, with a 25 percent increase in traffic, the number of truck accidents in the year 2025 is projected to be 7.5 accidents. If the proposed cargo facility is constructed and traffic increases an additional 9 percent, the number of truck accidents in the year 2025 is projected to be 8.2 accidents. The increase in traffic accidents would also be incremental as each phase becomes operational. It is estimated that less than 5 percent of the truck traffic exiting the Barbours Cut facility is hauling hazardous material (USACE, 2001a). Therefore, while traffic accidents are projected to increase consistent with increased traffic, less than 5 percent of those accidents associated with project-related truck traffic would be expected to involve trucks hauling hazardous material cargo.

According to Federal Motor Carrier Safety Administration (March 2002), 16 percent of the traffic accidents involving trucks transporting hazardous material result in the release of the hazardous material to the environment. The level of impact to human health and the environment that could result from the release is directly proportional to several factors. These factors include the state of the spilled material (i.e., gas, liquid, or solid), the distance to the nearest occupied structures, the distance to the nearest surface water body, the response time of the hazardous material response team, and the amount of time the hazardous material was exposed to the environment. The spilled material is initially classified and is isolated to minimize widespread impacts. Isolation is used to prevent discharge to surface waters or recharge to groundwater. The cleanup of a hazardous material spill typically involves the physical removal of the spilled material. This process is performed by trained hazardous material response teams and is performed by either vacuum extraction or other methods to physically containerize the spilled material. Depending on the nature of the spilled material, an evacuation of the public within a specified

radius may be performed. Once the recoverable material has been removed, any impacted soil is excavated and containerized for disposal. The excavated site is backfilled with clean fill.

4.7.10 Surface Water Quality and Hydrology

The Cedar Point site is on the southwestern shore of Cedar Point, below the mouth of Cedar Bayou, fronting on upper Galveston Bay. Although no apparent perennial surface waters on the island would be affected by the alternative, there are tidal wetlands on the site that would be affected.

The main effects of this project alternative on surface water hydrology and quality would include turbidity during construction dredging and earthwork on the project site, long-term changes in runoff characteristics, slight modifications in water circulation, and the introduction of new potential for accidental spills from containers and containerships.

Project construction would involve dredging to deepen the channel and to create berthing and turning areas (see Table 2-3). During the dredging process, higher turbidity and suspended solids concentration would be produced both in the area being dredged and in the area where the dredged material is placed. This would result in a short-term reduction in water quality and the water's ability to support its designated aquatic life use.

Tables D-3a and D-3b in Appendix D list the elutriate and water test results for sediments prior to routine maintenance dredging of the Houston Ship Channel from Red Fish Reef to Morgan's Point since 1989, along with the current (TNRCC, 2000) water quality criteria for each parameter. Based on a comparison of the criteria and observed levels, there has been no indication of water concentration data exceeding acceptable standards in the Houston Ship Channel area. New work sediments that might be dredged during construction would be less likely to exhibit contamination because they have not been exposed to anthropogenic influences.

After construction is complete, changes to surface water quality would result from the addition of impervious cover (pavement and pier surface) and associated drainage structures where none currently exist, and from a deep channel that would allow more saline water to move to the area. Impervious cover prevents rain from soaking into the ground where it can be used by plants during dry periods. Instead, most of the rain that falls would be forced to run off of the site. In addition to reducing groundwater recharge, increased impervious cover can have adverse effects on receiving water bodies, causing erosion of the streambed (if the receiving water is a stream) and damaging aquatic habitat. While higher runoff and reduced recharge would result from the project, the consequences should not be severe at this site. Since little groundwater recharge occurs at this site and drainage is directly to Galveston Bay, rather than to streams, effects would be negligible. The facility would be required to abide by the TPDES construction and operation stormwater permits. Details of the stormwater system would be defined during final design of the project facilities. The effect of the 45-foot channel from the HSC to Cedar Point would be to allow the more saline bottom water in the channel to move to the site. It is expected that this would result in a small but possibly detectable difference in salinity.

Container vessels, like most oceangoing cargo ships, at times need to compensate for changes in cargo and fuel loads by taking on or discharging ballast water. Such water taken aboard in a

foreign port could potentially transport and result in the introduction of non-native species to U.S. waters. To minimize this risk, U.S. regulations currently encourage exchange of ballast waters in the open ocean prior to entry and require reporting of any ballast water discharge. Currently there are no special provisions for receiving and treating ballast waters in Texas ports, and none is planned for this project. However, if future regulations require such facilities, they would be provided.

The proposed project would introduce a higher potential for accidental spills. The terminal would handle a large number of containers, some (less than 5 percent [USACE, 2001a]) carrying packaged liquid products that are toxic or hazardous in some measure. Ruptures of products in these containers could result in harmful materials being released. To control such events, the facility would be designed with spill response systems to trap and remove spills and spill oil-water separators built into the site drainage system. A facility emergency response plan that includes appropriate procedures for each type and location of event would be completed prior to facility operation.

Another type of spill event could be associated with the fueling operations of containerships. Since this type of activity does not currently exist at the site, the addition of any fueling activity at the site would generate a new risk of water pollution from accidental spills. While such risk would increase relative to the present condition, fuel spills are rare and, typically, such spills are quite small.

4.7.11 Texas Coastal Management Program (TCMP) Consistency Determination

If this alternative is selected and a permit application is submitted to the USACE, it would automatically trigger a review by the GLO for consistency with TCMP. As part of the permit application to the USACE, the permittee would submit a TCMP consistency statement. Any concerns expressed by the GLO would need to be addressed before the permit was granted.

4.7.12 Vegetation

The footprint of the proposed facility at Cedar Point is primarily upland forest, shrub/scrub, and grassland. According to the NWI map (1998), there are significant areas of forested and shrub/scrub wetlands and marshes north of FM 2354 and east of FM 1405. These were not confirmed because they were mostly inaccessible; however, the areas mapped by the NWI as forested and shrub/scrub wetlands that were observable from FM 2354 appeared to support species similar to bottomland hardwoods rather than wetlands. Representative species included pecan, American elm, cedar elm, sugarberry, yaupon and willow oak. The forested wetlands may be farther north. Acreage values for areas not visible from the road were calculated based on NWI maps. These areas included palustrine marshes and ponds. Common species in the upland forests and woodlands included cedar elm, live oak, willow oak, southern red oak, sugarberry, yaupon, Chinese tallow and Japanese ligustrum, with St. Augustine (*Stenotaphrum secundatum*) ground cover where light was sufficient. The upland shrubland and grassland areas included huisache (*Acacia smallii*), eastern baccharis, Chinese tallow, and sugarberry saplings in the shrub layer, with St. Augustine and bermudagrass as the dominant grass species. Upland forest (including small pockets of shrub/scrub) covers approximately 245 acres within the proposed footprint; upland shrub/scrub covers approximately 142 acres; and upland grassland covers 165 acres. Forested

wetlands (based on NWI, 1998, mapping less those areas observed to be nonwetland along the roadside) cover approximately 6 acres; shrub/scrub wetlands (NWI, 1998) cover approximately 37 acres; freshwater marshes (NWI, 1998) cover approximately 31 acres; and inland open water areas cover approximately 1 acre. The only estuarine marsh (less than 1 acre as mapped by the NWI) within the footprint is located along the southwestern shoreline along the proposed ship channel. No impacts are expected to occur to widgeongrass that may be present in the bay near the site. However, widgeongrass may occur in interior freshwater ponds and could be lost from construction of the proposed facility.

4.7.13 Section 404/Section 10 Jurisdictional Areas (Wetlands and Open Water)

The wetlands and ponds located on inland positions are considered isolated and are, therefore, not jurisdictional under Section 404 of the Clean Water Act according to USACE-Galveston District guidance (USACE, 2001b) regarding the recent U.S. Supreme Court ruling. Section 404 jurisdictional areas at this site include only the estuarine marsh (less than 1.0 acre) addressed above. An additional 202 acres of open water would be impacted by dredging activities associated with deepening an existing channel and creating a new channel.

4.7.14 Terrestrial Wildlife

The primary direct, adverse impact of the proposed construction activities on wildlife at the Cedar Point site would result from vegetation clearing and the subsequent loss of wildlife habitat. Construction activities might also result in the direct destruction of those organisms not mobile enough to avoid construction equipment. These would potentially include individuals of several species of reptiles, mammals and, if construction occurs during the breeding season, the young of some species, including nestling and fledgling birds. Fossorial animals (i.e., those that live underground), such as mice and shrews, may similarly be negatively impacted as a result of soil compaction caused by heavy machinery. For the most part, mobile wildlife species, particularly adult birds and larger mammals, would likely avoid the initial construction activity and move into available habitat outside the project area. Each species, however, is dependent upon available resources such as food, shelter, water, territory, and nesting sites in any given area of habitat (Dempster, 1975). It is assumed, for the purpose of impact analysis, that habitats are at their carrying capacity for the species that live there. Therefore, displaced wildlife populations are forced into competition with resident populations in adjoining habitats, creating an inevitable decreased birthrate and/or increased mortality rate until populations are reduced to numbers that the habitat can support. Thus, construction activity would ultimately result in a reduction in the local wildlife populations proportional to the amount of habitat preempted.

The noise of equipment and increased human activity during construction may disturb some local wildlife. In addition, fugitive dust associated with construction activities may have minor impacts on the vegetation, thus decreasing its value as wildlife habitat. Such impacts, however, should be temporary and without significant long-term implications.

The footprint for the Cedar Point alternative falls primarily on the following habitat types: upland forest, shrub/scrub, grassland, wetland (including freshwater and estuarine marshes and forested

wetlands), and open water. A large, manmade pond that provides freshwater habitat occurs at the Cedar Point site. This pond would probably be filled during construction.

Dredging activities for the channel would occur within 2,000 feet of a rookery of Forster's terns, least terns, and black skimmers on the northern end of Boaz Island (FWS, 2001c; TXBCD, 2001). This rookery, however, has been unused since 1995 and was inactive during PBS&J's site visit in June 2001. Unless this rookery becomes active again, dredging activities would have no impact. If the rookery does become active, dredging activities in the area may indirectly impact it, if they take place during the nesting season, by potentially reducing the availability of the food supply. Once the facility is in operation, wildlife remaining in the area could be impacted by noise, lights, and human activity. Furthermore, an increase in vehicular traffic would increase the potential for collision mortality for several wildlife species. The increased possibility of chemical or oil spills poses a threat to the nekton community and, thus, the food source of many coastal birds in the area.

4.7.15 Aquatic Ecology

4.7.15.1 Freshwater Habitats and Fauna

The Cedar Point alternative site supports a large, manmade pond that provides permanent freshwater habitat. It is likely that a variety of freshwater fish species occur in the pond including bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), bullhead catfish, and western mosquitofish. Since the pond is anthropogenic, it is probably used for livestock watering and sportfishing or other recreational activities. This pond would likely be filled during construction, resulting in loss of aquatic and recreational resources.

4.7.15.2 Open Bay/Open-Bay Bottom

Turbidity in estuarine waters is generally credited with having a complex set of impacts on a wide array of organisms (Hirsch et al., 1978; Stern and Stickle, 1978; EH&A, 1978). Suspended material can play both beneficial and detrimental roles in aquatic environments. Increased turbidity in the area can interfere with light penetration and thus reduce photosynthetic activity by phytoplankton. Such reductions in primary productivity would be localized around the immediate area of the dredging operations. Conversely, the decrease in primary productivity has been found to be offset by increased nutrient content (Morton, 1977).

Potential effects of elevated turbidities on the adult stages of various filter-feeding organisms such as oysters and copepods include reduction of pumping and filter rates and clogging of filtering mechanisms (Stern and Stickle, 1978). These effects are pronounced with high total suspended solids (TSS) levels, but are apparently reversible once turbidities return to ambient levels.

Water column turbidity would increase in open-bay habitats near the project site during dredging activities but the effects are expected to be temporary and local. Some studies of turbidity from TSS associated with dredging operations have concluded that dredging had no substantial effects on nekton (Ritchie, 1970; Stickney, 1972; Wright, 1978); however, other studies have shown that elevated TSS levels and prolonged exposure can suffocate and reduce growth rates in adult and juvenile nekton

and reduce viability of eggs (Moore, 1977; Stern and Stickle, 1978). Elevated turbidities during construction and maintenance dredging may affect some aquatic organisms near the dredging activity; however, turbidities in the open-bay habitats can be expected to return to near ambient conditions after dredging ceases.

For any Beneficial Use sites that would be created, similar impacts from FLUMF and benefits to the aquatic community as described in the Shoal Point alternative (Section 4.2.15) apply.

In the event an accidental spill should occur, benthic fauna may be killed and phytoplankton may be adversely affected. It is unlikely, however, that a spill in Galveston Bay would result in long-term adverse impacts to phytoplankton, zooplankton, or benthic communities. These communities have the ability to recover rapidly from a spill due primarily to the rapid rate of reproduction of the organisms and to the widespread distribution of the dominant species. Adult crustaceans (shrimp and crabs) and adult finfish are probably mobile enough to avoid most areas of high concentrations of toxins. Larval and juvenile finfish and shellfish tend to be more susceptible to toxins than adults. Juveniles could be affected extensively by a spill during their period of active immigration. The potential for impacts from spills would be minimized by use of BMPs and spill control and prevention measures. Therefore, the impacts of dredging and placement of dredged material are both localized and temporary and are not expected to have long-term adverse impacts on the aquatic environment.

Construction of a new berthing area, deepwater channel, and turning basin would slightly increase habitat for nekton species common in deeper offshore waters, which periodically enter the bay through the deep channel corridor (Breuer, 1962). This would also result in a slight increase in the availability of feeding and nursery area for demersal fish (Breuer, 1972). Adverse impacts to benthos affected by construction would likely be short term due to their ability to recolonize the affected area relatively quickly.

The impacts of contaminated dredged material depend on the nature of the biogeochemical environment and the contaminants. Common contaminants of sediment include heavy metals, chemical byproducts, petroleum, and organohalides. Contaminants bind to sediments which are in direct contact with benthic organisms and may be ingested (Montagna et al., 1998). Few studies have examined sediment contaminants in many areas of Galveston Bay, with the exception of the upper Houston Ship Channel, a well documented source of toxicity (GBNEP, 1994b). Based on GBNEP (1994b), elevated levels of contaminants do not occur near this alternative; therefore, impacts to benthic organisms and nekton from contaminated sediments are not expected. Stormwater runoff can carry toxic contaminants into surface waters, depositing them on sediments and potentially affecting the aquatic community. The potential for toxic runoff would increase with the building of the Cedar Point alternative; however, runoff from industrial point sources contributes less than 7 percent of the total loading of any pollutant, including heavy metals and biological oxygen demand, in Galveston Bay (GBNEP, 1994b). In addition, pollutant loading is expected to be minimal due to the type of facility (containerized cargo) and to the controls that would be implemented to control runoff and spills. Therefore, impacts from contamination are expected to be minimal.

4.7.15.3 Oyster Reefs

Live oyster reefs occur near the Cedar Point alternative site and may be affected by project construction. Increased sedimentation due to dredging activities has the potential to cover existing oyster reefs, clogging their filter feeding ability; however, oysters can survive minimal coverage. Dredging activities associated with construction of the Cedar Point alternative should not pose a long-term threat to oyster populations.

4.7.15.4 Recreational and Commercial Fisheries

The recreational and commercial fishery may be temporarily affected in the vicinity of dredging operations as a result of decreased water quality and increased turbidity during dredging, and the loss of attractiveness to fish in the area due to loss of benthic organisms. This is not a permanent condition; the quality of fishing in the project area should steadily improve after dredging is completed. Recreational fishing impacts would be temporary, potentially resulting in local disturbances to both boat and wade-bank fishing. However, recreational fishing at these locations, while locally important, constitutes a relatively small portion of the overall recreational fishing activity in the project vicinity. Construction and dredging activities in this portion of the bay are not expected to have long-term adverse impacts on fishing in the project area.

If an accidental spill were to occur, adult finfish are mobile enough to avoid the area; however, larval and juvenile finfish and shellfish could be affected extensively. Serious impacts to shrimp could also affect the commercial shrimping industry in the area if the spill is severe and widespread. The potential for impacts from spills would be minimized by the use of BMPs and spill control and prevention measures. Impacts from stormwater runoff are expected to be minimal.

4.7.15.5 Essential Fish Habitat

EFH for adult and juvenile brown and white shrimp, red drum, and Spanish mackerel occurs in the vicinity of the Cedar Point alternative and may include estuarine emergent wetlands, estuarine mud, sand, sand and shell substrates, SAV, and estuarine water column. Approximately 202 acres of open-bay bottom would be affected by dredging of the berthing areas, channel, and turning basin.

Dredging activities in open-bay bottom habitat would impact benthic communities in those areas. Although recovery of some benthic organisms would likely occur relatively quickly, the assemblage in the sediments at the bottom of the berthing areas, channel, and turning basin may differ from the assemblage that existed prior to construction.

While dredged material generated by dredging at this site would be available for beneficial uses, a detailed DMMP has not been produced for this alternative. If this alternative was selected for construction of the proposed project, detailed plans for dredged material placement and beneficial uses would be required. Beneficial Use sites created for this alternative would have similar positive effects on EFH and managed species as those discussed in Section 4.2.15.5 for Shoal Point, although the location and size of the Beneficial Use sites would vary.

Increased water column turbidity during construction would be localized and temporary and the amount of open-bay bottom that would be disturbed is a small percentage of the total bay bottom. Accidental spills have the potential to impact EFH, and larval and juvenile finfish could be affected extensively should a spill occur. The potential for adverse impacts from spills would be minimized, however, through the use of BMPs and spill control and prevention measures.

Adult and juvenile brown and white shrimp, and red drum would be temporarily and locally impacted by the loss of open-bay bottom habitat. However, as with the Shoal Point alternative, these species would experience an overall benefit by the creation of Beneficial Use sites. There would be no direct benefits to Spanish mackerel, as they are not marsh dependent; however, it is assumed that marsh habitat would be created as Beneficial Use sites which would increase prey for Spanish mackerel, potentially resulting in an indirect benefit.

4.7.16 Endangered and Threatened Species

4.7.16.1 Plants

Cedar Point is the only alternative that supports a significant area of upland grassland and possibly mima mounds, the habitat of Texas prairie dawn; however, this species is only known to occur in Fort Bend and Harris counties, west of this alternative. This site's upland grasslands could also support Houston machaeranthera and Texas windmillgrass. Houston machaeranthera prefers sandy loam soils of the Clodine, Gessner and Wockley series, none of which occur on this site. Texas windmillgrass could possibly occur in the upland grassland and roadside areas. No Federally listed endangered, threatened, or SOC plant species are known to occur within or near (less than 2 miles) the Cedar Point alternative. None of these species were observed during field visits to the site although there was limited access to the actual proposed footprint.

4.7.16.2 Fish and Wildlife

While no Federally or State-listed species are known to occur within 2 miles of this alternative site, sea turtles such as Kemp's ridley and the loggerhead have been recorded from Galveston Bay and, thus, may be present in the Cedar Point area. If so, they could be impacted by dredging activities. Such activities in the area could have an impact on these turtles through an increase in sedimentation, turbidity, and resuspension of any toxic sediments. The sedimentation may impact food sources for the turtles, and the turbidity could affect primary productivity. This would be short-term, however. The increased possibility of chemical or oil spills poses a threat to turtles both directly and indirectly through their food source. While adult sea turtles may be mobile enough to avoid areas of high oil or chemical concentrations, hatchling, post-hatchling, and juvenile turtles in the area would be more susceptible. An increase in marine traffic may result in a higher incidence of collision with sea turtles. Sea turtles are not expected to nest at the site due to lack of suitable habitat.

The Cedar Point site may support suitable habitat for the American alligator; however, this species is protected due to its similarity of appearance to the crocodile rather than biological vulnerability.

4.7.17 Cultural Resources

This location has a high probability for containing potentially significant unrecorded terrestrial archaeological sites. Based on information from the State Marine Archeologist, the water surrounding Cedar Point also has a high probability for containing potentially significant unrecorded submerged cultural resources.

The Cedar Point Alternative is located on the Morgan's Point quadrangle map. The TARL files did not identify any previously recorded cultural resource sites within the 400-acre plot for the proposed alternative site. Five known sites (41CH282, 41CH283, 41CH284, 41CH285, 41CH307) were identified during the Galveston Bay Archaeological Survey within 1,000 feet of the proposed access corridor. Sites 41CH285 and 41CH307 appear to be within the access corridor boundaries, while 41CH282, 41CH283, and 41CH284 are located within 1,000 feet. All of the sites are located west of the southwest corner of the 400-acre plot and north of the Channel. There are no listed or determined eligible for listing NRHP sites or SAL designated sites within the boundaries of the 400 acres. A determination of NRHP or SAL status has not been made.

Sites 41CH282, 41CH283, and 41CH284 are all identified as Rangia shell middens. These middens yielded shell, ceramics, and lithics. Site 41CH283 yielded deer bones in addition to the shell, ceramics, and lithics, and Site 41CH284 yielded one *Kent* projectile point. Sites 41CH285 and 41CH307 are Rangia and oyster shell middens. There exists a probability that unrecorded shell midden sites may be present in the project study area.

Based on information received from the State Marine Archeologist, the Cedar Point Alternative and the waters surrounding it are considered to have a high probability for containing significant unrecorded cultural resources.

4.7.18 Commercial and Recreational Navigation

The Cedar Point Alternative is located along the Cedar Bayou barge channel well to the east of the Houston Ship Channel. No impacts to oceangoing commercial navigation are expected, and impacts on barge navigation would be largely restricted to construction-related delays. Accordingly, no analysis is produced.

In addition to effects to deep draft commercial navigation that is the primary element of the project, this as well as other alternatives would have some effect on commercial bay fishing and recreational boating. As noted in the baseline Section 3.17, Galveston Bay is actively used by both types of small craft--bay commercial fishing vessels and recreational boaters. The northern part of the bay has a major concentration of recreational boating activity. For a variety of navigation and safety reasons, deep draft traffic must have right-of-way over small craft in the restricted deep draft channels. Increases in deep draft commerce will increase the amount of time that small craft traffic will experience some restrictions or the need to yield right-of-way in the deep channels. That would appear to be an unavoidable consequence. However, with very few exceptions, these small craft are not restricted to the dredged channels, so the limitation is small and avoidable. In addition, the amount of time that deep draft channels are actually occupied by deep draft vessels tends to be a very small portion of the day. Overall, there is a

measure of use conflict between small craft and deep draft vessels, and increases in deep draft commerce will increase that conflict. However, the conflict is relatively small and will not significantly impact small craft uses.

4.7.19 Land Use/Recreation/Aesthetics

4.7.19.1 Land Use

Site-related Impacts. The Cedar Point site is largely composed of pasture, shrub/brush rangeland, mixed forest and forested wetlands. Development of the proposed project at this site would require the removal of several homes along Cedar Point Road within the site area, as well as the TriCity Beach Grocery. Additionally, pastureland would be converted to industrial uses.

In addition to the adverse impacts at this alternative site, impacts to adjacent and nearby land uses would likely be significant. The Cedar Point area is currently suburban and rural, with a small community of homes lining the Bay at Beach City. The introduction of an industrial use of the size and magnitude of the proposed project would change the nature of the land use from a relatively quiet and undeveloped environment to a heavily industrialized environment. This would introduce a qualitative change to the residential enjoyment of property in the area. Moreover, the enjoyment of relatively secluded fishing piers and docks used by the neighborhoods would likely be adversely affected by the introduction of heavy shipping traffic in the nearby environs.

Transport-related Impacts. The major roadways that would receive traffic generated by container terminal activity from the Cedar Point alternative site are SH 146 and SH 225, which would be expected to receive an additional 10,000 ADT from the Cedar Point alternative.

Traffic volumes along SH 146 are expected to increase by approximately 52 percent by 2025 without the proposed project. The additional project traffic would add an extra 17 percent from SH 225 to the SH 146/Business SH 146 Split and 60 percent from the Business SH 146 Split to Spur 55. SH 146 passes through largely commercial and industrial areas, as well as some undeveloped lands. This traffic would pass through developed areas of Baytown. The introduction of an additional 10,000 truck trips a day along this roadway does not present an incompatible use, but it does represent a significant increase in truck volumes in an area which currently has a relatively low ADT value.

SH 146 intersects with SH 225, which would also receive approximately 10,000 additional truck trips per day from the proposed Cedar Point alternative site. SH 225 passes through highly industrialized areas, and the addition of project truck traffic would not introduce an incompatible land use along this highway.

The access road for the Cedar Point site would be FM 1405 and FM 2354. Traffic counts for those roadways were not available. However, these roadways currently pass through areas which are suburban or rural in nature. The introduction of 10,000 new truck trips daily on these roads would significantly affect the enjoyment of rural and suburban land uses in the vicinity through the introduction of a significant industrial element, noise, and congestion in an otherwise quiet and rural setting.

Labor Force-Related Impacts. Housing, commercial and public land uses would be required to serve the projected 1,158 inmigrant population of operations workers and their families. Assuming the same land uses per 100 individuals shown in Table 4.1.19-1, the demands generated by the inmigrant population would include approximately 48.2 acres of residential land uses, 4.5 acres of commercial uses, 51.3 acres of public, semipublic and park uses, and 47.5 acres of streets.

Secondary Impacts. Construction and operation of the proposed container terminal at this site would contribute to the conversion of currently undeveloped land to industrial use. The addition of the facility to the area may lead to the potential development of secondary, or ancillary growth effects in the general vicinity. This development would likely include facilities associated with the development of private sector commercial support industries, such as transportation centers, convenience stores, or distribution warehouses. These secondary land use changes that may occur as a result of the proposed container facility would introduce a new land use element in the area and increase the amount of undeveloped land being converted to industrial or commercial uses. Additionally, they would increase the amount of industrial or commercial land uses in close proximity to residential developments. Residential and industrial/commercial developments are generally considered incompatible land uses. However, the potential addition of these secondary facilities would represent a small portion of the overall land use changes likely to occur in the general vicinity over the next several years with or without the project.

4.7.19.2 Recreation

There are no public parks within the nearby vicinity of the Cedar Point site. Nevertheless, there are private and neighborhood piers and docks in Beach City and along Cedar Point Road and Bayside Road and FM 2354. Private recreational enjoyment of these facilities is likely to be somewhat impaired with the development of the Cedar Point site due to the proximity of the site to residential areas, although there would be some additional opportunities for recreational ship watching.

A large manmade pond providing permanent freshwater habitat for sport fishing species will likely be filled during construction of the Cedar Point site, thus resulting in the loss of that recreational resource (see Section 4.7.15). Marine sport fishing is not expected to be significantly affected.

Bird watching activities could be adversely affected if bird nesting or roosting is disturbed at the project site or in the nearby environs of the project site (see Section 4.7.14 for additional information).

4.7.19.3 Aesthetics

Although there are no recognized areas of unique aesthetic quality in the vicinity of the Cedar Point site, the area as a whole is in a considerably more natural state than the more urbanized areas surrounding the Bay and offers relatively undeveloped, although not pristine, waterscapes with views of the open bay and wildlife (see Section 3.18.4). The introduction of the proposed project at the Cedar Point location would qualitatively alter the nature of the bayscape from its current relatively natural state to a view dominated by maritime industrial activity.

4.7.20 Socioeconomics

4.7.20.1 Population

For all alternatives, including the Cedar Point site, the available construction labor force is expected to offer adequate labor to complete construction work without the importation of workers from outside the subregion most proximate to the site. However, Cedar Point has little available or projected housing available for temporary workers; thus it is likely that construction workers for this site would come primarily from the Baytown area.

For operations-phase employment, an adequate local labor force would not likely be available to fill all employment positions. Table 4.7.20-1 shows the number of operations workers which may relocate to the Cedar Point region. Inmigration of workers is expected to begin in 2006, with 58 workers, and escalate to 413 when the project becomes fully operational. Also shown in Table 4.7.20-1 are the additional family members which could be expected to accompany the project operations workers. Total population increase resulting from direct employment during the operations phase of the project is expected to amount to 1,158 at full operation.

4.7.20.2 Environmental Justice

EJ Index Methodology

The DVMAV data for Cedar Point (Appendix G-6) show that the area has a lower proportion of ethnic minorities than the overall state minority percentage. Within the 50-square-mile area surrounding this alternative, 10.0 percent of the population is of minority status, as compared with 39.4 percent statewide. The overall minority status is ranked 2.

The DVECO data for Cedar Point show that the area also has a lower proportion of economically stressed residents than the overall state percentage. Within the 50-square-mile area surrounding this alternative, 16.5 percent of the population is economically stressed, as compared with 27.6 percent statewide. The overall economically stressed status is ranked 2.

According to the EJ Index, the overall EJ potential for the 50-square-mile area at Cedar Point is ranked 1.

Census Tract Analysis

The percentage of African Americans in the Cedar Point alternative is 4.6 percent, which is about one-third of those who live in Chambers County (12.1 percent) and the state (11.7 percent). There are no census tracts that exceed the threshold of 10 percent over the county's percentage of African Americans. The average percentage of Hispanics is 4.3 percent which is about equal to that of the county (5.0 percent) and about one-fifth that of the state (25.2 percent). There are no census tracts that exceed the threshold of 10 percent over the county's percentage of Hispanics. The average percentage of "other races" is 0.6 percent, which is less than that of the county (1.5 percent) and state (2.3 percent). There are no census tracts that exceed the threshold of 10 percent over the county's percentage of "other

Table 4.7.20-1
Population and Housing Effects
Cedar Point Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CEDAR POINT ALTERNATIVE														
Direct Construction Jobs Created	20	22	22	24	58	45	0	0	0	0	0	0	11	58
Available Construction Workforce (RAZ 88,89, 191)	29	30	30	30	31	31	31	32	32	32	32	33	33	33
Inmigration of Construction Workers	0	0	0	0	27	14	0	0	0	0	0	0	0	25
Direct Operations Jobs Created	0	0	2	2	94	153	177	201	225	253	277	301	325	352
Available Operations Workforce (RAZ 88, 89, 91)	34	34	35	35	36	36	36	37	37	37	38	38	38	38
Inmigration of Operations Workers	0	0	0	0	58	117	141	164	188	216	239	263	287	314
Secondary Family Growth	0	0	0	0	104	212	254	297	339	389	431	474	517	567
Total Potential Inmigration	0	0	0	0	190	343	395	461	527	604	671	737	803	906
Housing Units Needed for Inmigration	0	0	0	0	68	122	141	164	188	216	239	263	287	323

Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
CEDAR POINT ALTERNATIVE										
Direct Construction Jobs Created	0	0	0	0	0	0	0	0	0	0
Available Construction Workforce (RAZ 88,89, 191)	33	33	34	34	34	34	35	35	35	35
Inmigration of Construction Workers	0	0	0	0	0	0	0	0	0	0
Direct Operations Jobs Created	376	400	452	452	452	452	452	452	452	452
Available Operations Workforce (RAZ 88, 89, 91)	39	39	39	39	40	40	40	40	41	41
Inmigration of Operations Workers	338	361	413	413	412	412	412	412	411	411
Secondary Family Growth	609	652	745	744	744	743	743	742	742	741
Total Potential Inmigration	947	1,013	1,158	1,157	1,156	1,155	1,155	1,154	1,153	1,153
Housing Units Needed for Inmigration	338	361	413	413	412	412	412	412	411	411

races." The average percent of persons living below the poverty line within the census tracts is 5.3 percent. The percentage of people living under the poverty line is 12.3 percent in Chambers County and 17.6 percent in the state. There are no census tracts that exceed the threshold of 10 percent over the county's percentage of residents living below the poverty line.

With the exception of two residences that are within the footprint, the berths and docks of the Cedar Point alternative would be situated approximately 2,000 feet from the nearest population. It is assumed that the two homes within the footprint would be taken if the Cedar Point alternative were implemented. The land use would be consistent with current land uses in the area. If any minority or low-income groups are dependent on the natural resources in the vicinity of the Cedar Point site (e.g., subsistence fishing) they would not likely be adversely affected by the project since project activities are not expected to result in long-term adverse impacts on resources of this type (e.g., fishing) (see Section 4.7.15.4). Potential effects of locating the project at this location include increased traffic, noise and air pollution (see Sections 4.7.1, 4.7.2 and 4.7.3); however, these effects would also occur at any of the alternative sites. Some of the advantages the community would reap as a result of the creation of this project are: increased number of jobs for many levels of experience and the infusion of indirect economic contributions to the community (see Sections 4.7.19). These beneficial effects would also occur at any of the alternative sites.

4.7.20.3 Community Values

The Cedar Point alternative site is nearest to Beach City and Baytown. Beach City has not yet completed its long-range planning process and thus has no official documents which define the values of the community. Baytown's comprehensive plan makes no definitive statement about the construction of a container port or other similar facility at the Cedar Point site, although the plan does support industrial development and job production for the community generally. The Baytown plan does envision large areas of residential development proximate to the Cedar Point site, which would be generally incompatible with industrial development, although other existing industrial development is also proximate to the planned residential areas.

4.7.20.4 Housing

Table 4.7.20-1 shows the housing needs of the inmigrant operations families. At full operation, there is expected to be a demand of 413 housing units needed for worker families.

4.7.20.5 Leading Economic Sectors

Total Demand. Table 4.7.20-2 shows the direct and indirect effect of the construction and operation of the Cedar Point alternative on the Texas economy and direct non-Texas effects.

For the Cedar Point alternative, total construction costs from 2002 through 2015 are anticipated to amount to $321.2 million. Direct Texas effects are expected to amount to $215.1 million, with an export effect of $50.4 million. Total Texas effect from construction activities are expected to amount to $950.5 million over the 2002 to 2015 period.

Table 4.7.20-2
Total Economic Effect of Project *
Cedar Point Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION ACTIVITIES													
Construction Costs	$20,243,398	$22,322,780	$22,383,938	$24,405,570	$59,148,352	$46,305,962	$0	$0	$0	$0	$0	$0	$11,567,542
Direct Effects:													
Effect Outside of Texas	$3,845,418	$4,240,415	$4,252,033	$4,636,060	$11,235,768	$8,796,239	$0	$0	$0	$0	$0	$0	$2,197,360
Texas Direct Effect	$16,397,980	$18,082,365	$18,131,905	$19,769,510	$47,912,584	$37,509,724	$0	$0	$0	$0	$0	$0	$9,370,182
Total Texas Effect (a)	$72,738,577	$80,210,213	$80,429,967	$87,694,093	$211,066,463	$165,260,600	$0	$0	$0	$0	$0	$0	$41,564,490
OPERATIONS ACTIVITIES													
Construction Costs	$250,000	$250,000	$250,000	$33,583,333	$11,902,655	$19,502,212	$55,875,369	$25,581,858	$28,621,681	$32,168,142	$35,207,965	$38,247,788	$41,287,611
Direct Effects:													
Effect Outside of Texas	$32,191	$32,191	$32,191	$4,324,368	$1,532,649	$2,511,208	$7,194,809	$3,294,056	$3,685,479	$4,142,140	$4,533,564	$4,924,988	$5,316,412
Texas Direct Effect	$217,809	$217,809	$217,809	$29,258,965	$10,370,006	$16,991,004	$48,680,560	$22,287,803	$24,936,202	$28,026,001	$30,674,400	$33,322,800	$35,971,199
Total Texas Effect (a)	$812,350	$812,350	$812,350	$109,125,683	$38,676,487	$63,370,489	$181,561,423	$83,125,691	$93,003,292	$104,527,159	$114,404,760	$124,282,361	$134,159,962
TOTAL EFFECT													
Total Costs	$20,493,398	$22,572,780	$22,633,938	$57,988,903	$71,051,007	$65,808,175	$55,875,369	$25,581,858	$28,621,681	$32,168,142	$35,207,965	$38,247,788	$52,855,152
Direct Effects:													
Effect Outside of Texas	$3,877,609	$4,272,607	$4,284,224	$8,960,428	$12,768,417	$11,307,447	$7,194,809	$3,294,056	$3,685,479	$4,142,140	$4,533,564	$4,924,988	$7,513,771
Texas Direct Effect	$16,615,789	$18,300,173	$18,349,714	$49,028,475	$58,282,590	$54,500,728	$48,680,560	$22,287,803	$24,936,202	$28,026,001	$30,674,400	$33,322,800	$45,341,381
Total Texas Effect (a)	$73,550,927	$81,022,563	$81,242,317	$196,819,777	$249,742,949	$228,631,089	$181,561,423	$83,125,691	$93,003,292	$104,527,159	$114,404,760	$124,282,361	$175,724,452

* In year-2000 dollars.

Table 4.7.20-2 (concluded)

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION ACTIVITIES												
Construction Costs	$59,162,458	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$265,540,000
Direct Effects:												
Effect Outside of Texas	$11,238,447	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$50,441,739
Texas Direct Effect	$47,924,011	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$215,098,261
Total Texas Effect (a)	$211,544,036	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$950,508,438
OPERATIONS ACTIVITIES												
Construction Costs	$44,834,071	$81,207,227	$50,913,717	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$959,683,628
Direct Effects:												
Effect Outside of Texas	$5,773,073	$10,456,673	$6,555,920	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$123,573,950
Texas Direct Effect	$39,060,998	$70,750,554	$44,357,797	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$836,109,678
Total Texas Effect (a)	$145,683,830	$263,874,764	$165,439,031	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$3,118,395,982
TOTAL EFFECT												
Total Costs	$103,996,529	$81,207,227	$50,913,717	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$57,500,000	$1,225,223,628
Direct Effects:												
Effect Outside of Texas	$17,011,520	$10,456,673	$6,555,920	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$7,404,005	$174,015,690
Texas Direct Effect	$86,985,009	$70,750,554	$44,357,797	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$50,095,995	$1,051,207,939
Total Texas Effect (a)	$357,227,865	$263,874,764	$165,439,031	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$186,840,500	$4,068,904,420

Source: Texas Comptroller of Public Accounts, 1989.

Operations-related effects are expected to be similar for all alternatives, as discussed above. At the point of full operation, the project operations cost is expected to amount to $57.5 million annually. The direct Texas effect is anticipated to amount to $50.1 million each year, with $7.4 million exported. Total Texas effect, including both direct and indirect effects, is projected to be approximately $186.8 million annually.

Effects to Major Economic Sectors. Table 4.7.20-3 shows the relative economic effect on various major economic sectors from the construction and operation of the Cedar Point alternative.

For construction-related activities, $289.7 million (41%) of the overall project effect would accrue to the construction sector. Other major sectors affected would be manufacturing, with $96.4 million (14%); services, with $89.2 million (13%); and FIRE, with $87.4 million (13%).

For operations-related activities at full build-out, 51 percent ($70.3 million) of annual effects would pertain to the transportation, communication and utilities sector, with other major affected sectors being FIRE, with $22.1 million (16%); trade, with $15.0 million (11%); and services, with $14.1 million (10%). These effects would be the same for all alternatives.

The year of greatest effect from construction activities alone would be 2006, and 2015 would be the year of greatest overall effect.

Effects on Retail and Wholesale Trade. Table 4.7.20-4 provides more specific data on the effects of construction and operations on retail and wholesale trade.

Total construction-related effects on wholesale and retail trade are anticipated to be approximately $67.8 million over the full construction period, with roughly 51 percent of those effects on the retail sector ($334.8 million) and 49 percent ($33.0 million) on the wholesale sector. At full build-out, operation of the project is expected to have an almost $7 million effect on retail trade annually, and a $6.8 million effect on wholesale trade each year. This is the same prospective effect as for all alternatives.

4.7.20.6 Employment

Table 4.7.20-5 shows the number of jobs expected to be generated by the construction and operation of the project at the Cedar Point alternative site. A job is defined as full-time equivalent employment for one person for one year.

The construction phase of the project is expected to create 260 direct jobs over the 2002 through 2015 construction period, with the creation of an additional 4,740 jobs indirectly. The highest year of employment creation would occur in 2015 during Phase III construction, when 58 direct jobs are anticipated to be created.

When the project is fully operational, it is expected to create approximately 450 direct jobs and almost 800 in indirect employment, the same as all alternatives.

Table 4.7.20-3
Total Texas Effect of Project, by Major Economic Sector *
Cedar Point Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Agriculture	$568,396	$626,781	$628,498	$685,262	$1,657,553	$1,294,520	$0	$0	$0	$0	$0	$0	$324,795
Mining	$1,073,676	$1,183,963	$1,187,207	$1,294,431	$3,131,046	$2,445,293	$0	$0	$0	$0	$0	$0	$613,523
Construction	$22,129,732	$24,402,876	$24,469,734	$26,679,746	$64,534,558	$50,400,383	$0	$0	$0	$0	$0	$0	$12,645,436
Manufacturing	$7,363,899	$8,120,312	$8,142,559	$8,877,964	$21,474,548	$16,771,253	$0	$0	$0	$0	$0	$0	$4,207,901
Transp., Comm., Util.	$3,327,527	$3,669,327	$3,679,380	$4,011,688	$9,703,710	$7,578,431	$0	$0	$0	$0	$0	$0	$1,901,425
Trade	$5,611,361	$6,187,755	$6,204,708	$6,765,093	$16,363,810	$12,779,854	$0	$0	$0	$0	$0	$0	$3,206,460
FIRE **	$6,677,140	$7,363,009	$7,383,182	$8,050,003	$19,471,826	$15,207,162	$0	$0	$0	$0	$0	$0	$3,815,471
Services	$6,812,299	$7,512,052	$7,532,632	$8,212,951	$19,865,975	$15,514,985	$0	$0	$0	$0	$0	$0	$3,892,704
Totals	$53,564,030	$59,066,076	$59,227,901	$64,577,138	$156,203,024	$121,991,881	$0	$0	$0	$0	$0	$0	$30,607,715
OPERATIONS-RELATED EFFECTS													
Agriculture	$4,460	$4,460	$4,460	$599,169	$212,358	$347,944	$996,886	$456,412	$510,647	$573,920	$628,154	$682,388	$736,623
Mining	$9,316	$9,316	$9,316	$1,251,514	$443,563	$726,768	$2,082,247	$953,331	$1,066,613	$1,198,775	$1,312,057	$1,425,339	$1,538,621
Construction	$8,088	$8,088	$8,088	$1,086,438	$385,057	$630,907	$1,807,597	$827,586	$925,926	$1,040,656	$1,138,996	$1,237,336	$1,335,675
Manufacturing	$50,136	$50,136	$50,136	$6,734,895	$2,386,992	$3,911,028	$11,205,402	$5,130,257	$5,739,872	$6,451,089	$7,060,703	$7,670,318	$8,279,933
Transp., Comm., Util.	$305,639	$305,639	$305,639	$41,057,510	$14,551,664	$23,842,549	$68,310,774	$31,275,258	$34,991,612	$39,327,359	$43,043,713	$46,760,067	$50,476,421
Trade	$65,086	$65,086	$65,086	$8,743,194	$3,098,776	$5,077,269	$14,546,775	$6,660,064	$7,451,461	$8,374,758	$9,166,156	$9,957,553	$10,748,950
FIRE **	$96,025	$96,025	$96,025	$12,899,391	$4,571,821	$7,490,819	$21,461,783	$9,826,017	$10,993,616	$12,355,814	$13,523,413	$14,691,012	$15,858,611
Services	$61,200	$61,200	$61,200	$8,221,173	$2,913,760	$4,774,126	$13,678,245	$6,262,418	$7,006,565	$7,874,735	$8,618,881	$9,363,028	$10,107,174
Totals	$599,950	$599,950	$599,950	$80,593,283	$28,563,991	$46,801,409	$134,089,710	$61,391,344	$68,686,311	$77,197,106	$84,492,073	$91,787,041	$99,082,008
TOTAL EFFECTS													
Agriculture	$572,856	$631,242	$632,959	$1,284,431	$1,869,911	$1,642,464	$996,886	$456,412	$510,647	$573,920	$628,154	$682,388	$1,061,417
Mining	$1,082,993	$1,193,280	$1,196,523	$2,545,944	$3,574,610	$3,172,061	$2,082,247	$953,331	$1,066,613	$1,198,775	$1,312,057	$1,425,339	$2,152,144
Construction	$22,137,819	$24,410,964	$24,477,821	$27,766,184	$64,919,615	$51,031,289	$1,807,597	$827,586	$925,926	$1,040,656	$1,138,996	$1,237,336	$13,981,111
Manufacturing	$7,414,035	$8,170,448	$8,192,695	$15,612,859	$23,861,540	$20,682,281	$11,205,402	$5,130,257	$5,739,872	$6,451,089	$7,060,703	$7,670,318	$12,487,833
Transp., Comm., Util.	$3,633,166	$3,974,966	$3,985,019	$45,069,198	$24,255,373	$31,420,980	$68,310,774	$31,275,258	$34,991,612	$39,327,359	$43,043,713	$46,760,067	$52,377,847
Trade	$5,676,447	$6,252,841	$6,269,793	$15,508,287	$19,462,585	$17,857,124	$14,546,775	$6,660,064	$7,451,461	$8,374,758	$9,166,156	$9,957,553	$13,955,411
FIRE **	$6,773,165	$7,459,035	$7,479,207	$20,949,394	$24,043,647	$22,697,980	$21,461,783	$9,826,017	$10,993,616	$12,355,814	$13,523,413	$14,691,012	$19,674,082
Services	$6,873,499	$7,573,251	$7,593,832	$16,434,124	$22,779,735	$20,289,111	$13,678,245	$6,262,418	$7,006,565	$7,874,735	$8,618,881	$9,363,028	$13,999,877
Totals	$54,163,980	$59,666,026	$59,827,851	$145,170,421	$184,767,016	$168,793,291	$134,089,710	$61,391,344	$68,686,311	$77,197,106	$84,492,073	$91,787,041	$129,689,723

* In year-2000 dollars.
** Finance, insurance and real estate.

Table 4.7.20-3 (concluded)

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Agriculture	$1,654,835	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$7,440,640
Mining	$3,125,912	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$14,055,052
Construction	$64,428,740	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$289,691,205
Manufacturing	$21,439,336	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$96,397,772
Transp., Comm., Util.	$9,687,798	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$43,559,286
Trade	$16,336,977	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$73,456,018
FIRE **	$19,439,897	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$87,407,689
Services	$19,833,400	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$89,176,998
Totals	$155,946,895	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$701,184,660
OPERATIONS-RELATED EFFECTS												
Agriculture	$799,896	$1,448,838	$908,364	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$17,121,955
Mining	$1,670,783	$3,026,262	$1,897,346	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$35,763,488
Construction	$1,450,405	$2,627,095	$1,647,085	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$31,046,258
Manufacturing	$8,991,150	$16,285,524	$10,210,379	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$192,457,631
Transp., Comm., Util.	$54,812,168	$99,280,393	$62,244,876	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$1,173,267,100
Trade	$11,672,247	$21,141,753	$13,255,042	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$249,847,147
FIRE **	$17,220,810	$31,191,775	$19,556,008	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$368,615,415
Services	$10,975,344	$19,879,464	$12,463,637	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$234,929,778
Totals	$107,592,803	$194,881,104	$122,182,738	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$2,303,048,771
TOTAL EFFECTS												
Agriculture	$2,454,731	$1,448,838	$908,364	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$1,025,872	$24,562,595
Mining	$4,796,695	$3,026,262	$1,897,346	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$2,142,790	$49,818,540
Construction	$65,879,145	$2,627,095	$1,647,085	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$1,860,154	$320,737,463
Manufacturing	$30,430,485	$16,285,524	$10,210,379	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$11,531,210	$288,855,403
Transp., Comm., Util.	$64,499,966	$99,280,393	$62,244,876	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$70,296,977	$1,216,826,386
Trade	$28,009,225	$21,141,753	$13,255,042	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$14,969,736	$323,303,165
FIRE **	$36,660,707	$31,191,775	$19,556,008	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$22,085,806	$456,023,104
Services	$30,808,744	$19,879,464	$12,463,637	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$14,075,954	$324,106,776
Totals	$263,539,698	$194,881,104	$122,182,738	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$137,988,500	$3,004,233,431

Source: Texas Comptroller of Public Accounts, 1989.

** Finance, insurance and real estate.

Table 4.7.20-4
Retail and Wholesale Sales Effect of Project *
Cedar Point Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Retail Trade	$2,655,270	$2,928,016	$2,936,038	$3,201,210	$7,743,277	$6,047,367	$0	$0	$0	$0	$0	$0	$1,517,282
Wholesale Trade	$2,520,318	$2,779,203	$2,786,817	$3,038,512	$7,349,733	$5,740,016	$0	$0	$0	$0	$0	$0	$1,440,168
Totals	$5,175,588	$5,707,219	$5,722,856	$6,239,722	$15,093,011	$11,787,383	$0	$0	$0	$0	$0	$0	$2,957,450
OPERATIONS-RELATED EFFECTS													
Retail Trade	$30,318	$30,318	$30,318	$4,072,734	$1,443,464	$2,365,081	$6,776,144	$3,102,375	$3,471,022	$3,901,110	$4,269,757	$4,638,404	$5,007,051
Wholesale Trade	$29,589	$29,589	$29,589	$3,974,853	$1,408,773	$2,308,241	$6,613,292	$3,027,815	$3,387,603	$3,807,354	$4,167,141	$4,526,928	$4,886,716
Totals	$59,908	$59,908	$59,908	$8,047,587	$2,852,238	$4,673,323	$13,389,436	$6,130,191	$6,858,625	$7,708,464	$8,436,898	$9,165,332	$9,893,766
TOTAL EFFECTS													
Retail Trade	$2,685,588	$2,958,334	$2,966,356	$7,273,944	$9,186,742	$8,412,448	$6,776,144	$3,102,375	$3,471,022	$3,901,110	$4,269,757	$4,638,404	$6,524,333
Wholesale Trade	$2,549,908	$2,808,792	$2,816,407	$7,013,365	$8,758,507	$8,048,257	$6,613,292	$3,027,815	$3,387,603	$3,807,354	$4,167,141	$4,526,928	$6,326,883
Totals	$5,235,496	$5,767,127	$5,782,763	$14,287,309	$17,945,249	$16,460,705	$13,389,436	$6,130,191	$6,858,625	$7,708,464	$8,436,898	$9,165,332	$12,851,216

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Retail Trade	$7,730,581	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$34,759,041
Wholesale Trade	$7,337,682	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$32,992,449
Totals	$15,068,263	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$67,751,491
OPERATIONS-RELATED EFFECTS												
Retail Trade	$5,437,139	$9,848,201	$6,174,432	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$116,383,205
Wholesale Trade	$5,306,467	$9,611,518	$6,026,041	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$113,586,156
Totals	$10,743,606	$19,459,719	$12,200,474	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$229,969,361
TOTAL EFFECTS												
Retail Trade	$13,167,719	$9,848,201	$6,174,432	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$6,973,167	$151,142,247
Wholesale Trade	$12,644,149	$9,611,518	$6,026,041	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$6,805,580	$146,578,605
Totals	$25,811,868	$19,459,719	$12,200,474	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$13,778,747	$297,720,852

Source: Texas Comptroller of Public Accounts, 1989.
* In year-2000 dollars.

Table 4.7.20-5
Employment Effect of Project
Cedar Point Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED JOBS													
Direct Jobs	20	22	22	24	58	45	0	0	0	0	0	0	11
Indirect Jobs	364	401	402	439	1,048	823	0	0	0	0	0	0	208
Total Jobs	384	423	424	463	1,106	868	0	0	0	0	0	0	219
OPERATIONS-RELATED JOBS													
Direct Jobs	0	0	2	2	94	153	177	201	225	253	277	301	325
Indirect Jobs	3	3	3	465	165	270	774	354	396	446	488	530	572
Total Jobs	3	3	5	467	258	423	951	555	621	698	764	830	896
TOTAL JOBS													
Direct Jobs	20	22	24	26	152	198	177	201	225	253	277	301	336
Indirect Jobs	367	405	406	904	1,213	1,093	774	354	396	446	488	530	780
Total Jobs	387	427	430	930	1,364	1,291	951	555	621	698	764	830	1,115

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED JOBS												
Direct Jobs	58	0	0	0	0	0	0	0	0	0	0	260
Indirect Jobs	1,055	0	0	0	0	0	0	0	0	0	0	4,740
Total Jobs	1,113	0	0	0	0	0	0	0	0	0	0	5,000
OPERATIONS-RELATED JOBS												
Direct Jobs	352	376	400	452	452	452	452	452	452	452	452	6,754
Indirect Jobs	621	1,125	705	796	796	796	796	796	796	796	796	13,292
Total Jobs	973	1,501	1,105	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	20,046
TOTAL JOBS												
Direct Jobs	410	376	400	452	452	452	452	452	452	452	452	7,014
Indirect Jobs	1,676	1,125	705	796	796	796	796	796	796	796	796	18,032
Total Jobs	2,087	1,501	1,105	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	25,046

Source: Texas Comptroller of Public Accounts, 1989.

Assuming that half of the projected unemployed construction workforce from RAZ 88, 89, 91 and 92 (Baytown and Cedar Point area) are qualified to work on the project, there is projected to be a larger construction workforce than is needed for the project. This is shown in Table 4.7.20-1.

Using the same assumption of one-half of the unemployed labor force having the necessary qualifications for employment on the project, the operations-related available workforce is projected to amount to 34 to 41 during the 2001 to 2025 time frame, compared with the projected employment of approximately 450. Thus, it is possible that as many as 413 workers may be drawn from outside the immediate region of the project site at Cedar Point.

4.7.20.7 Household Income Effects

Table 4.7.20-6 shows the effects on household income from the construction and operations phases of the project. The construction phase of the project is projected to have a direct effect of $101.8 million on household incomes, and an indirect effect of $147.5 million. At full operation, the project is expected to have an annual operations-related direct effect on household income of $23.7 million and an indirect effect of $25.2 yearly, similar to all alternative sites.

4.7.20.8 Residential Property Values

According to Delucchi and Hsu (1998), residential property values may decrease from 0.2–1.5 percent for every dBA above 55 dBA. Those impacts may be temporary in nature (during construction activities) or they may be long-term effects associated with noise from operations at the container terminal site or from increased traffic.

Construction

As discussed in Section 4.7.3, dredging activities at the Cedar Point alternative site would result in noise levels of 40 dBA to 60 dBA at the nearest residential receptors, located approximately 1,000 feet to the south of the dredging area. This would occur over the extensive dredging period of approximately four years. Other construction would result in noise levels of 49 dBA to 76 dBA in the nearest residential areas. Ambient noise in neighborhoods within 500 feet to the southwest range from 49.9 dBA L_{dn} to 61.5 dBA L_{dn} Thus, construction activities at the Cedar Point alternative site would likely generate noise impacts which might affect some residential property values by as much as 5.2–39.2 percent.

Operations

A projected L_{dn} of 61.3 dBA recorded approximately 380 feet from the main gate indicates that noise from operations at the terminal would be likely to adversely affect some residential property values located within 500 feet southwest of the proposed Cedar Point facility. With ambient noise levels ranging from 49.9 dBA L_{dn} to 61.5 dBA L_{dn}, residential property impacts could range from 2.3–17.1 percent for those properties that currently have the lowest ambient noise levels. Other properties may have

Table 4.7.20-6
Household Income Effect of Project *
Cedar Point Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION-RELATED EFFECTS													
Direct Effects	$7,842,292	$8,647,845	$8,671,538	$9,454,718	$22,242,984	$17,700,648	$0	$0	$0	$0	$0	$0	$4,481,266
Indirect Effects	$11,332,254	$12,496,292	$12,530,529	$13,662,238	$32,620,454	$25,568,071	$0	$0	$0	$0	$0	$0	$6,475,510
Total Effects	$19,174,546	$21,144,137	$21,202,066	$23,116,956	$54,863,438	$43,268,719	$0	$0	$0	$0	$0	$0	$10,956,775
OPERATIONS-RELATED EFFECTS													
Direct Effects	$102,875	$102,875	$102,875	$13,819,542	$4,897,942	$8,025,160	$22,992,714	$10,526,935	$11,777,822	$13,237,190	$14,488,077	$15,738,965	$16,989,852
Indirect Effects	$109,525	$109,525	$109,525	$14,712,858	$5,214,553	$8,543,919	$24,478,999	$11,207,412	$12,539,159	$14,092,863	$15,424,609	$16,756,356	$18,088,102
Total Effects	$212,400	$212,400	$212,400	$28,532,400	$10,112,496	$16,569,080	$47,471,713	$21,734,347	$24,316,981	$27,330,053	$29,912,687	$32,495,320	$35,077,954
TOTAL EFFECTS													
Direct Effects	$7,945,167	$8,750,720	$8,774,413	$23,274,259	$27,140,926	$25,725,808	$22,992,714	$10,526,935	$11,777,822	$13,237,190	$14,488,077	$15,738,965	$21,471,117
Indirect Effects	$11,441,779	$12,605,817	$12,640,054	$28,375,096	$37,835,007	$34,111,990	$24,478,999	$11,207,412	$12,539,159	$14,092,863	$15,424,609	$16,756,356	$24,563,612
Total Effects	$19,386,946	$21,356,537	$21,414,466	$51,649,356	$64,975,934	$59,837,798	$47,471,713	$21,734,347	$24,316,981	$27,330,053	$29,912,687	$32,495,320	$46,034,729

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION-RELATED EFFECTS												
Direct Effects	$22,796,446	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$101,837,736
Indirect Effects	$32,800,694	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$147,486,042
Total Effects	$55,597,141	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$249,323,778
OPERATIONS-RELATED EFFECTS												
Direct Effects	$18,449,220	$33,416,774	$20,950,994	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$394,909,813
Indirect Effects	$19,641,806	$35,576,886	$22,305,299	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$420,437,398
Total Effects	$38,091,027	$68,993,660	$43,256,294	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$815,347,211
TOTAL EFFECTS												
Direct Effects	$41,245,667	$33,416,774	$20,950,994	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$23,661,250	$496,747,549
Indirect Effects	$52,442,501	$35,576,886	$22,305,299	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$25,190,750	$567,923,440
Total Effects	$93,688,167	$68,993,660	$43,256,294	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$48,852,000	$1,064,670,989

Source: Texas Comptroller of Public Accounts, 1989.
* In year-2000 dollars.

relatively unaffected property values since operational project noise is not expected to exceed ambient levels for those residences.

Traffic

Table 4.7.3-1 shows that all residential receptors along major roadways that would be affected by increased terminal traffic currently have noise levels above 55 dBA, ranging from 63–72 dBA. According to the results of the Delucchi and Hsu research, those properties currently at the 63 dBA level likely have current property values 1.6–12.0 percent lower than similar properties with noise levels below 55 dBA. Those receptors with current noise levels of 72 dBA likely have property values 3.4–25.5 percent lower than comparable properties with noise levels less than 55 dBA. Thus, much of the potential loss of property value due to traffic noise is already represented in current market values.

Table 4.7.3-1 also indicates that noise levels are expected to increase by 1–2 dBA over existing conditions, for all residential receptors, by 2025, without the project. Thus, without the project, there may be property values which are 0.2–3.0 percent lower than those of comparable homes at different, quieter locations, in addition to the current estimated lesser property values of 3.0–25.5 percent.

With the project at the Cedar Point alternative site, some residential receptors may experience an increase in noise of approximately 1–2 dBA beyond the no-build noise levels projected for 2025. Thus, some properties might be expected to experience an additional 0.2–3.0 percent decrease in relative property values.

4.7.21 Community Infrastructure and Municipal Services

The sections below discuss community infrastructure requirements of the project, to the extent that they are known. The Greater Houston metropolitan area is a very large, growing and economically viable region. Operations inmigrants to the area may locate in any of a large number of communities or in suburban areas. Inmigrants will likely either locate in communities which are able to provide community services or they will commute to locations where services are located. Inmigrants will contribute to local government revenues through ad valorem taxes, sales taxes, mixed beverage taxes, and other local taxes and fees. Typically, residential properties do not contribute enough in tax revenues to support the general fund needs of the residents. On the other hand, property tax revenues from industrial developments, particularly those with high property values such as the proposed project, are generally much greater than the costs on general fund municipal services imposed by such developments. From a regional perspective, the proposed project and its operations inmigrants are expected to contribute more to local governmental revenues than they cost in service provision; however, the locational choices of the inmigrants will determine the specific impacts on individual communities.

4.7.21.1 Utilities

For the projected inmigrant population of 1,158 persons, it is anticipated that there would be an additional 0.187 MGD in additional municipal water demand.

The proposed container terminal would require access to utilities needed for operation and maintenance, typical of similar facilities. For example, telephone and fiber optic service, water supply, and electricity would be needed at the site (Berger/Abam, 2001). Detailed studies regarding the ability of current systems to provide the needed utilities would be performed during the design phase of the project. In addition to providing new access to utilities, the removal or realignment of existing utility structures within the project site would be required. Currently available information regarding existing utilities and preliminary plans for utility service requirements and relocations is summarized in Section 2.4.7.6. Utility service providers in the area are discussed in Section 3.20.

The project site is located within a very large, growing and economically viable metropolitan area. Because of the overall growth or demand on services that is typical in a metropolitan area of this size, the addition of the proposed facility and approximately 413 families to the area is not expected to result in major short- or long-term impacts on service levels. Any of several communities within the region could receive the growth anticipated as a result of the project, with the majority of the growth most likely going to communities that are able to provide the desired services. Compared to the other alternative sites, however, the Cedar Point alternative is located at a greater distance from communities with infrastructure and services. A container terminal in this location could result in considerable demand on services in the immediate area; potentially resulting in longer commute times relative to the other alternative sites.

4.7.21.2 Stormwater and Drainage

Stormwater would be treated at the project site with oil-water separators before discharge into Galveston Bay (Berger/Abam, 2001).

4.7.21.3 Solid Waste and Wastewater Collection

An additional 0.116 MGD of municipal wastewater flow is expected to occur from the projected inmigrant population of 1,158 persons.

Solid waste and wastewater collection services or systems would be needed at the proposed terminal site. Service providers in the area are discussed in Section 3.20.

As discussed above for other utilities, the addition of the proposed facility and inmigrant population to the metropolitan area is not expected to result in major short- or long-term impacts on service levels of local communities, although development of the Cedar Point site would result in greater demand on the small communities nearby relative to the other alternatives; or greater commute times may be necessary to reach communities with available services. Detailed studies regarding the adequacy of current systems would be performed during the design phase of the project.

4.7.21.4 Fire, Police, Emergency Medical Service, and Port Security

For the projected inmigrant population of 1,149 persons, the demand for police and fire/EMS personnel and emergency vehicles is projected to be:

1 Firefighter at 1.17 firefighters per 1,000 persons
3 Police officers at 348 persons per officer
0 Additional emergency vehicles (at 6,961 residents per vehicle)
2 EMS personnel at 533 residents per EMS personnel

The container facility would have its own security force that would cooperate with the appropriate Emergency Management Coordinator and local industry to provide security at the port. A Security Plan and other security measures similar to those described in Section 4.2.21.4 for the Shoal Point site would be developed and implemented.

An assessment of security risks related to container cargo is based on the difference between the number of containers that would enter the Houston area with the proposed project compared with the number of containers that would enter the Houston area with the No-Build alternative. The assessment also considers the increased efforts of all of the Federal, state, and local agencies and private parties (especially including the Port Operator's responsibilities) to assess, prevent, and respond to port security threats, including terrorist events.

Containers, by design, provide for efficient transfer of large quantities of goods from ships to truck and rail for distribution through the transportation grid of the U.S. to virtually every city in the country. Demand for container cargo nationally and in the Houston area is expected to increase in response to market demands. It is anticipated that without the proposed project, container cargo destined for the Houston area would arrive at a more distant port and be transported to the Houston market via truck or rail. The risk of an accidental or intentional event with the Build alternative would increase proportionally to the increased number of containers that enter the Houston area as compared with the No-Build alternative. However, with the increased security measures in place and planned at all U.S. ports, the local Emergency Management Plan, and the coordination of port security among all port users, the potential increased risk of a threat due to the presence of a new marine terminal would be offset.

4.7.21.5 Hospitals/Medical Services

For the projected inmigrant population of 1,158 persons, the demand for hospital beds and medical personnel needed is projected to be:

5 Hospital beds at 221 residents per hospital bed
2 Direct care physicians at 560 residents per physician
8 Registered nurses at 140 residents per nurse
1 Dentist at 1,982 residents per dentist

4.7.21.6 Schools

For the projected inmigrant population of 1,158 persons, it is anticipated that the demand for Goose Creek Consolidated ISD staff would be 16 teachers and 30 public school staff.

4.7.21.7 Libraries

For the projected inmigrant population of 1,158 persons, the demand for facilities is projected to be:

1,596 Books at 1.38 books per capita
4,390 Total resources at 3.79 per capita
352 Additional square feet of library space

It is not anticipated that local libraries would need to hire additional staff.

4.7.21.8 Parks and Recreation Facilities

The additional projected inmigrant population of 1,158 persons is likely to create a demand for 9.2 acres of various types of parkland uses, at 0.79 acre per 100 persons.

4.7.21.9 Streets and Public Transportation

Both FM 1405 and Beach Road are two-lane arterials. They would both likely need to be improved to four lanes as a result of the project. Beach Road would have to be realigned to account for the terminal location. It is assumed that the access corridor alignment would also serve as a permanent realignment for Beach Road.

There is no rail service currently available at this alternative site. The nearest rail spur is approximately 2.5 miles from the site. In the early years of the project, the container traffic destined for movement by rail is expected to be distributed evenly between Barbours Cut, the UPRR intermodal yard and the BNSF intermodal yard. It is assumed that a separate intermodal yard would be developed in the future. This proposed intermodal yard is not part of this project.

4.7.21.10 Impacts on Local Tax Revenues

Table 4.7.21-1 shows the potential effect of the proposed project at the Cedar Point site on government revenues. Total government impact of the construction phase of the project is expected to be approximately $8.6 million, of which roughly 10 percent is anticipated to affect local governments. State government is expected to receive approximately 29 percent ($2.5 million) and the Federal government, 61 percent ($5.3 million).

At full operation of the project, annual government effects are expected to amount to $1.8 million annually, with a $0.2 million effect on local government, $0.5 million effect on State government and a $1.1 million effect on the Federal government. Operations-related effects are expected to be generally the same for all alternatives.

Table 4.7.21-1
Government Revenues *
Cedar Point Alternative

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CONSTRUCTION ACTIVITIES													
Federal Government	$375,333	$413,887	$415,021	$452,504	$1,257,910	$961,948	$0	$0	$0	$0	$0	$0	$214,474
State Government	$192,571	$212,352	$212,934	$232,165	$545,308	$429,369	$0	$0	$0	$0	$0	$0	$110,040
Local Government	$62,659	$69,096	$69,285	$75,543	$207,268	$158,839	$0	$0	$0	$0	$0	$0	$35,805
Total Government	$630,564	$695,335	$697,240	$760,212	$2,010,486	$1,550,156	$0	$0	$0	$0	$0	$0	$360,319
OPERATIONS ACTIVITIES													
Federal Government	$4,635	$4,635	$4,635	$622,669	$220,687	$361,591	$1,035,985	$474,313	$530,675	$596,430	$652,791	$709,152	$765,514
State Government	$2,378	$2,378	$2,378	$319,472	$113,228	$185,521	$531,531	$243,355	$272,272	$306,009	$334,926	$363,844	$392,761
Local Government	$774	$774	$774	$103,950	$36,842	$60,365	$172,951	$79,184	$88,593	$99,570	$108,979	$118,388	$127,798
Total Government	$7,787	$7,787	$7,787	$1,046,091	$370,757	$607,476	$1,740,467	$796,852	$891,540	$1,002,009	$1,096,696	$1,191,384	$1,286,072
TOTAL EFFECT													
Federal Government	$379,968	$418,522	$419,656	$1,075,172	$1,478,597	$1,323,539	$1,035,985	$474,313	$530,675	$596,430	$652,791	$709,152	$979,987
State Government	$194,950	$214,730	$215,312	$551,637	$658,536	$614,890	$531,531	$243,355	$272,272	$306,009	$334,926	$363,844	$502,800
Local Government	$63,433	$69,870	$70,059	$179,493	$244,110	$219,204	$172,951	$79,184	$88,593	$99,570	$108,979	$118,388	$163,603
Total Government	$638,351	$703,122	$705,027	$1,806,302	$2,381,243	$2,157,633	$1,740,467	$796,852	$891,540	$1,002,009	$1,096,696	$1,191,384	$1,646,390

Description	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
CONSTRUCTION ACTIVITIES												
Federal Government	$1,185,141	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$5,276,217
State Government	$553,305	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,488,045
Local Government	$196,357	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$874,851
Total Government	$1,934,803	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$8,639,113
OPERATIONS ACTIVITIES												
Federal Government	$831,269	$1,505,663	$943,991	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$17,793,494
State Government	$426,498	$772,508	$484,332	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$9,129,278
Local Government	$138,775	$251,361	$157,593	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$2,970,509
Total Government	$1,396,541	$2,529,532	$1,585,916	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$29,893,281
TOTAL EFFECT												
Federal Government	$2,016,410	$1,505,663	$943,991	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$1,066,108	$23,069,711
State Government	$979,802	$772,508	$484,332	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$546,986	$11,617,323
Local Government	$335,132	$251,361	$157,593	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$177,980	$3,845,360
Total Government	$3,331,344	$2,529,532	$1,585,916	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$1,791,073	$38,532,394

Source: Texas Comptroller of Public Accounts, 1989.
* In year-2000 dollars.

4.8 CUMULATIVE EFFECTS

4.8.1 Introduction

The Council on Environmental Quality's regulations for implementing NEPA define cumulative effects as the effects on the environment which result from the incremental effect of the action when added to other past, present and reasonably foreseeable future actions regardless of the agency (Federal or non-Federal) or person undertaking such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. Effects include both direct effects which are caused by an action and occur at the same time and place as the action, and indirect effects which are caused by the action and occur later in time and are farther removed in distance but are still reasonably foreseeable. Ecological effects refer to effects on natural resources and on the components, structures, and functioning of affected ecosystems, whether direct, indirect, or cumulative. Identifying major cumulative effects involves defining the direct and indirect effects of the proposed action on the resources, ecosystems, and human communities affected and determining which of these effects are important from a cumulative effect perspective.

In assessing cumulative effect, consideration is given to 1) the degree to which the proposed action affects public health or safety; (2) the unique characteristics of the geographic area; 3) the degree to which the effects on the quality of the human environment are likely to be highly controversial; 4) the degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks; and 5) whether the action is related to other actions with individually insignificant but cumulatively significant impacts on the environment.

Cumulative effects can result from many different activities including the addition of materials to the environment from multiple sources, repeated removal of materials or organisms from the environment, and repeated environmental changes over large areas or long periods. More complicated cumulative effects occur when stressors of different types combine to produce a single effect or suite of effects. Cumulative effects may also occur when the timing of perturbations are so close that the effects of one have not dissipated before the next occurs or when the timing of perturbations are so close in space that their effects overlap.

No standard approach or methodology is provided by NEPA to quantify cumulative effects or to define the geographic scope of the area which will be impacted by the project. Therefore, it is necessary to evaluate each project on an individual basis, define its area of influence, and understand the current social and economic conditions and transportation infrastructure of the area.

4.8.2 Area of Influence

The area of influence (AOI) identified for the Shoal Point Container Terminal project generally includes Galveston, Harris and Chambers counties. For the air and traffic analysis, the eight-county area identified by the H-GAC as the Houston Galveston Area is used. The proposed container terminal location on Shoal Point, as well as the five alternative sites, are located within this AOI.

Assessing potential cumulative effects related to the proposed action involves a summary and assessment of other projects occurring within the AOI. A number of actions that have been (or are likely to be) undertaken by Federal and non-Federal agencies within the AOI are discussed in this section.

4.8.3 Data Collection

For this project, impacts to specific resource categories are addressed in a qualitative manner, based on the projects identified by Federal, State, and local government entities as occurring in the general vicinity of Shoal Point. Requests for project information were coordinated with representatives of the work groups assembled for this project and included the USACE, GLO, TNRCC, TPWD, FWS, NMFS, H-GAC, National Oceanic and Atmospheric Administration (NOAA), FHWA, TxDOT, USCG, EPA, Galveston County Health Department, Texas City Pilots, Port of Texas City Users, Texas City Terminal Railway, and the Audubon Society.

In addition, letters requesting information to assist in identifying specific planned or permitted activities in the vicinity of Shoal Point were sent to the following organizations (see example letter in Appendix H-11):

- The City of Houston
- The City of Pasadena
- The City of Baytown
- The City of Seabrook
- The City of Friendswood
- The City of Kemah
- The City of La Marque
- The City of Hitchcock
- The City of Galveston
- The City of Cove
- The City of Clear Lake Shores
- The City of El Lago
- The City of Morgan's Point
- The City of Bellaire
- The City of Southside Place
- The Chambers County Economic Development Foundation
- The Clear Lake Area Economic Development Foundation
- The Galveston County Economic Development Alliance
- The City of Jacinto City
- The City of Deer Park
- The City of La Porte
- The City of Webster
- The City of League City
- The City of Dickinson
- The City of Texas City
- The City of Bayou Vista
- The City of Mont Belview
- The City of Beach City
- The City of Taylor Lake Village
- The City of Tiki Island Village
- The City of Shoreacres
- The City of West University Place
- The City of Galena Park
- The Baytown-West Chambers County Economic Development Foundation
- Galveston County Community Services

All of the projects identified by agencies and various organizations would have some degree of direct or indirect impact on the environment. These projects are discussed in Section 4.8.10 and under the various receptors (e.g., Traffic, Ecological Resources, etc.).

The potential impacts of general trends in population growth, economic development, habitat resources, etc., plus all of the projects described below, as well as the proposed action, combine and interact to result in cumulative effects upon the AOI. The potential cumulative effects are addressed in the following sections. Beneficial effects include new economic opportunities, housing alternatives, employment opportunities and recreational resources. As development occurs, the need for additional infrastructure and services (schools, transportation, utilities, fire, police, and emergency medical services) would increase. Potentially adverse cumulative effects associated with the continued development of the AOI include loss of habitat, water quality impacts, and the conversion of land uses.

The EPA was asked to perform a Geographic Information System screening process called the Cumulative Analysis Screening Tool (CAST), which evaluates environmental vulnerability and impact through the use of over 100 different types of environmental resource and stressor "criteria" developed by the EPA Region 6 (EPA, 2001e). The CAST's utility is in its mapping and analytical capabilities. It combines the collective technical assessments performed by the EPA into a mathematical algorithm and uses natural weighting to identify and map environmental concerns. This means that the weight is driven by the environmental information or criteria characterizing a particular geographic area and not by an arbitrary assignment.

The CAST algorithm yields a number that represents the cumulative environmental concern of an area. Each environmental impact is ranked on a scale from 1 to 5, with 1 indicating low vulnerability or impact, and 5 indicating high vulnerability or impact. This process was performed for the Shoal Point area, the area with a 2-mile buffer, and the area with a 4-mile buffer. The results of this analysis are included in the discussion that follows.

4.8.4 Land Use

The CAST land use scores indicate that the average land use cover in the Shoal Point area was given the highest possible ranking (5). Road density, or road mile per square mile, as well as the number of other sites around the proposed facility also scored the highest ranking possible (5). The score given to channelization was a 1, or the lowest possible ranking (EPA, 2001e).

The historical development patterns typical of the eight-county Houston-Galveston-Brazoria Metropolitan Statistical Area (CMSA) are described in Section 3.19 of this document. Since the 1970s, the growth of the Houston area has been driven by an increase in bedroom communities in surrounding counties. The distribution of metropolitan growth has shifted over time. In comparison with the state's 86 percent increase in population over the past 30 years (1970-2000), the Houston CMSA has more than doubled (114%). Residential development in the AOI has been occurring at a relatively rapid pace and primarily involves the mass construction of a large number of homes as well as the infrastructure necessary to support this development.

Section 4.1.20.1 provides a discussion of population growth projections for the area (see Table 4.1.20-1). Additional housing, infrastructure, and commercial and public land uses required to serve this projected population would result in continued development and land use changes in the region.

Predicted regional housing needs appear in Table 4.1.20-2. Predicted regional infrastructure needs appear in Table 4.1.21-1.

Extensive residential development is proposed in many of the surrounding communities in the AOI. League City has plans for the construction of approximately 10,555 new residential lots within the next 5 years. Plans in Texas City include construction of a master community along each side of IH 45 and more than 7,000 new homes over the next 5 to 10 years. Schools, churches, parks and other construction associated with new development will also occur. The City of Houston added over 10,616 new developments, or 25,485 new lots, in 2000 (City of Houston Planning and Development Department, 2001). Virtually all of the surrounding areas are currently undergoing residential construction or are planning for development within the next 5 years.

According to the City of Galveston Comprehensive Plan and Parks Master Plan (2001), efforts to develop and strengthen the area economy include improvements to tourism, higher education, research, technology and information-based businesses, and industrial activities related to the oil and gas industry and at the Port of Galveston.

Typically, retail and institutional construction follows close behind residential areas in build-out. Office and industrial park construction requires that a degree of residential and retail development be in place before it is economically feasible. Consequently, there is typically a substantial time lag between residential development and office/industrial growth. However, projects in the AOI may generate retail/industrial development with or without residential expansion. Table 4.1.20-4 shows employment projections for the area.

Each of the municipal areas in the general project area has plans for commercial development. Restaurants, retail shops, marinas, office complexes, business parks, and convenience stores are among the commercial developments currently being designed or constructed.

Development impacts associated with normal growth in the region are expected to result in conversion of wetland and riparian habitat and agricultural lands into commercial, residential or industrial expansion, as well as additional infrastructure and services as people continue to move into the area. See Section 4.8.8 for a discussion of the effects of population growth on impervious cover. Recent USACE permitting information demonstrates this conversion by the large amount of fill activities proposed for the purpose of constructing residential, commercial or industrial developments in Harris, Chambers, and Galveston counties. See Section 4.8.7 for a discussion of permitting activities and impacts to ecological resources.

4.8.5 Transportation

The No-Build scenario presented as part of the roadway traffic impact analyses (in sections 4.1 through 4.7) describes the level of service analyses for each alternative site expected at area intersections and on main corridors as a result of normal growth in the region. This information is based on growth projections and modeling by H-GAC.

Transportation improvement projects in the region include highway, road, bridge, or overpass construction, reconstruction, widening, or upgrades (TxDOT, 2001a) to accommodate current and projected traffic in the area (see Table 4.2.2-5).

The cumulative effects of development on transportation facilities and traffic volumes in the region depend largely on the origin and destination points associated with traffic-generating developments. Modeling performed by H-GAC on the proposed Shoal Point Container Terminal project and the Port of Houston's proposed Bayport Container Terminal project indicates that while the traffic generated by the two proposed projects would increase traffic volumes primarily on three major corridors (IH 45 for Shoal Point; SH 146 and SH 225 for Bayport), no single corridor would be required to accommodate the entire traffic load of both container terminals. Merging of Shoal Point and Bayport traffic would be likely on portions of SH 146 and SH 225, but the contribution of the Shoal Point project to traffic volumes on these roadways would be small relative to the total projected traffic volume of the project. As indicated in Table 4.8.5-1, the cumulative effect of the proposed container terminal projects at Shoal Point and Bayport would result in a change in the 2025 LOS on two roadway segments relative to the No-Build scenario. On SH 146 between Shoreacres and Port Road, the 2025 LOS would change from C to D, and between Shoreacres and SH 225, the 2025 LOS would change from E to F. While traffic increases would be expected on these segments during earlier years as well, they would not be sufficient to change the LOS relative to the No-Build conditions (see Table 4.8.5-1).

4.8.6 Social and Economic Impacts

Residential, commercial, office and industrial types of development would be accompanied by increased economic opportunity and area employment. The degree and type of employment hinges on the economy and area demand. Current and projected employment figures are shown in tables 4.1.20-4 and 4.1.20-5.

Among the various cities in the study area, there is considerable variation in growth history. The major cities of Baytown and Pasadena have grown by 51 and 57 percent, respectively, over the past 30 years, less than half the growth rate of the region as a whole. La Porte has quadrupled in size from 1970 to 2000, with a population of 7,149 increasing to 31,880. Texas City has maintained a relatively stable population, experiencing only 7 percent growth over the same period, including a period of decline in the 1980s. Galveston has been steadily losing population, with a 7 percent loss in population since 1970. The small community of Beach City, near Cedar Point, has more than tripled in population since 1970, doubling in size in the last ten years. Seabrook has grown by 248 percent from 1970 to 2000, while Morgan's Point has lost almost half of its population, decreasing from 593 in 1970 to 336 in 2000. The City of Shoreacres has also lost population, diminishing by 21 percent over 30 years (from 1,872 to 1,488).

The largest number of employees in Chambers County is in the manufacturing sector, followed by accommodation and food services. In Galveston County, the largest employment is found in health care and social assistance jobs, followed closely by retail trade. In Harris County, major employment sectors are retail trade, manufacturing, administrative and support, waste management, and remediation services.

TABLE 4.8.5-1
CUMULATIVE (SHOAL POINT AND BAYPORT) FREEWAY LEVEL OF SERVICE (LOS) ANALYSIS

Option	Alternative	Roadway	Limits	Year 2001			Year 2005			Year 2015			Year 2025		
				ADT	Density	LOS	ADT	Density	LOS	ADT	Density	LOS	ADT	Density	LOS
No-Build	Shoal Point / Bayport	IH 45	Beltway 8 to FM 2351	203,913	*	*F*	214,146	*	*F*	232,834	38.5	*E*	262,171	56.8	*F*
			FM 2351 to Nasa Road 1	157,680	*	*F*	160,321	*	*F*	175,134	25.2	D	187,142	27.2	D
			Nasa Road 1 to FM 518	155,520	*	*F*	159,542	*	*F*	173,112	24.8	D	183,115	26.5	D
			FM 518 to FM 646	104,760	32.7	*E*	122,154	45.3	*F*	142,362	33.2	*E*	160,145	42.4	*E*
			FM 646 to FM 517	83,428	24.7	D	97,664	29.6	D	116,158	25.4	D	122,164	27.0	D
			FM 517 to FM 1764	82,080	24.2	D	93,121	27.9	D	107,764	23.4	C	118,631	26.1	D
			FM 1764 to FM 1765	55,080	16.0	B	60,821	17.7	C	70,124	14.9	B	77,096	16.4	C
			FM 1765 to FM 519	52,920	15.4	B	59,245	17.2	C	66,172	14.1	B	73,504	15.6	B
			FM 519 to State Highway 6	46,440	13.5	B	51,771	15.0	B	57,273	12.2	B	65,728	14.0	B
		SH 225	Beltway 8 to Center Road	111,080	36.1	*E*	122,191	27.0	D	131,524	29.5	D	142,823	33.4	*E*
			Center Road to SH 146	90,700	27.0	D	95,062	20.5	C	105,019	22.8	C	112,986	24.7	D
		SH 146	SH 225 to Shoreacres	73,880	21.7	C	84,108	24.9	D	96,612	29.2	D	112,354	36.9	*E*
			Shoreacres to Port Road	44,112	12.8	B	48,523	14.1	B	58,227	17.1	C	69,873	20.4	C
			Port Road to Red Bluff	39,252	11.4	B	43,177	12.6	B	51,740	15.1	B	66,489	19.5	C
			Red Bluff to FM 518	34,980	10.1	B	38,478	11.2	B	46,173	13.4	B	55,408	16.1	C
			FM 518 to FM 517	23,100	6.7	A	25,410	7.4	A	30,492	8.9	A	36,590	10.7	B
			FM 517 to Loop 197	17,490	5.1	A	19,239	5.6	A	23,011	6.7	A	27,704	8.1	A
			Loop 197 to FM 519	15,264	4.4	A	16,790	4.9	A	20,148	5.9	A	24,178	7.0	A
Build	Shoal Point / Bayport	IH 45	Beltway 8 to FM 2351	Not Applicable			216,106	*	*F*	234,701	39.5	*E*	266,601	62.1	*F*
			FM 2351 to Nasa Road 1				163,141	*	*F*	177,158	25.5	D	191,472	28.0	D
			Nasa Road 1 to FM 518				160,941	*	*F*	175,181	25.2	D	187,112	27.2	D
			FM 518 to FM 646				124,111	47.7	*F*	144,781	34.1	*E*	164,710	46.1	*F*
			FM 646 to FM 517				98,902	30.1	D	117,982	25.9	D	126,871	28.2	D
			FM 517 to FM 1764				94,984	28.6	D	109,101	23.8	C	124,012	27.5	D
			FM 1764 to FM 1765				62,174	18.0	C	72,174	15.4	B	81,012	17.3	C
			FM 1765 to FM 519				60,870	17.7	C	68,704	14.6	B	76,179	16.2	C
			FM 519 to State Highway 6				53,771	15.6	B	59,210	12.6	B	69,124	14.7	B
		SH 225	***Beltway 8 to Center Road***				125,709	27.9	D	135,876	30.9	D	154,897	39.0	*E*
			Center Road to SH 146				98,711	21.3	C	109,683	23.9	C	123,326	27.3	D
		SH 146	***SH 225 to Shoreacres***				88,546	27.2	D	102,240	31.5	D	125,856	50.1	*F*
			Shoreacres to Port Road				52,163	15.2	B	63,167	18.4	C	82,873	24.6	D
			Port Road to Red Bluff				44,017	12.8	B	52,880	15.4	B	69,489	20.2	C
			Red Bluff to FM 518				39,718	11.4	B	47,913	13.9	B	58,908	17.2	C
			FM 518 to FM 517				26,850	7.8	A	32,132	9.3	A	39,890	11.6	B
			FM 517 to Loop 197				20,879	6.1	A	24,851	7.2	A	31,204	9.1	A
			Loop 197 to FM 519				17,930	5.2	A	21,788	6.3	A	27,978	8.1	A

Year 2001: Analysis based on TxDOT Provided ADT and Existing Geometry
Year 2005: Analysis based on H-GAC Model Traffic and Geometry
Year 2015: Analysis based on H-GAC Model Traffic and Geometry
Year 2025: Analysis based on H-GAC Model Traffic and Geometry
No-Build: Existing Traffic Generators
Build: Existing Traffic Generators and Terminal Operation

Peak Hour Factor: 0.90
K factor: 10
Directional Distribution: 50-50
Percent Truck Traffic: 10%
Note: Limits in bold and italics indicate sections of roadway where Shoal Point and Bayport traffic merge.

ADT: Average Daily Traffic (Bi-directional Daily Traffic Volume)
Density: Passenger Cars per Mile per Lane
LOS: Level of Service (Qualitative Measure of Effectiveness)
- Change in Level of Service
ITALICS - Poor Level of Service
* - Density out of range

EPA CAST results demonstrate that unemployment for the Shoal Point area is low (2) to average (3) (EPA, 2001e). Employment in the state and in the study area has grown at a faster rate than the labor force. The state's employment figures increased by 24 percent from 1990 to 2000, and employment in the Houston CMSA grew by almost 19 percent. Harris County increased by 16 percent, and even Galveston County, which experienced a modest increase in the labor force, produced more growth in its employment (5.5%) than in its labor force (4%). Only Chambers County had slightly slower employment growth (21%) than labor force growth (22%).

Because employment growth has exceeded labor force growth over the past ten years, unemployment rates have dropped during the period. Statewide, the unemployment rate dropped from 7.2 percent in 1990 to 4.2 percent in 2000. The unemployment rate for the study region has historically been lower than that of the state. Nevertheless, unemployment for the Houston CMSA dropped from 5.1 percent in 1990 to 4.3 percent in 2000, which also reflects the change for Harris County. Galveston County also experienced a decline in unemployment, from 7.0 to 5.9 percent. Only Chambers County saw an increase in unemployment rates, rising from a low 3.8 percent in 1990 to 4.6 percent in 2000. Despite the increase, Chambers County unemployment rates are nevertheless indicative of a healthy level of employment.

4.8.7 Ecological Resources

4.8.7.1 Terrestrial Habitats (Including Wetlands)

EPA CAST scores were given to several biological attributes in the Shoal Point area. Percent of wildlife habitat scored approximately 80 percent, receiving the highest CAST ranking score (5). Habitat fragmentation also received a CAST ranking of 5 (EPA, 2001e). Past development in the general project vicinity has resulted in the loss of natural habitats through residential, commercial and industrial development. Habitat fragmentation from infrastructure construction or changes in land use have disrupted and dispersed fish and wildlife populations. The cumulative effects of existing and future development and associated habitat conversion are expected to continue this trend. See Section 4.8.8 for predicted population growth and associated changes to impervious cover.

Based on analysis presented in the GBNEP's Trends and Status of Wetland and Aquatic Habitats in the Galveston Bay System, Texas (White et al., 1993), a net loss in vegetated wetlands of approximately 32,400 acres (19%) occurred from 1950 through 1989. Both natural and artificial processes, including historical, human-induced subsidence and relative sea level rise as well as draining and filling wetlands for development (industrial, commercial, residential, agricultural, and transportation) have resulted in the conversion of wetland habitats to open water or upland habitat (White et al., 1993).

The GBNEP document states that the most substantial losses of emergent wetlands (estuarine and palustrine) have occurred in the southwest portion of the Galveston Bay study area including the Virginia Point, Texas City, Hitchcock, Hoskins Mound and Sea Isle USGS topographic map locations (White et al., 1993). However, some losses have been partly offset by gains in emergent wetlands that took place in transitional areas peripheral to wetlands (related to subsidence or water management programs) (White et al., 1993).

Between 1950 and 1989, scrub-shrub and forested wetland habitats experienced a net loss and net gain, respectively, with the gain in forested wetlands likely a result of taller growing shrubs and trees and/or inconsistent delineation of forested wetlands on different sets of aerial photographs (White et al., 1993).

Monitoring of ground levels by the Harris County Subsidence District (1998) indicate that the changeover of industrial users from ground to surface water has virtually solved the problem of subsidence in the immediate Bay area. This was an important factor in the success of marsh restoration efforts because historical rates of subsidence would have made most restoration efforts infeasible.

According to White et al. (1993), a decrease of approximately 70 percent of estuarine aquatic beds occurred during the 1950 to 1989 time frame. Pulich and White (1991) attributed the loss of submerged vegetation to subsidence, Hurricane Carla, and human impacts including development, wastewater discharges, dredging activities, chemical spills and boat traffic. Restoration of seagrass in the Galveston Bay system is still in the early stages; however, promising results of restoration projects are available, primarily in West Bay (Sheridan, 2001; Glass, 2001b). The proposed action should not impact the original seagrass beds in Christmas Bay or the restored beds in West Bay and would not add to difficulties in restoring seagrass communities to the Galveston Bay system. In fact, the mitigation proposed in Swan Lake and Beneficial Uses of dredged material proposed in nearby areas of Galveston Bay would create areas suitable to seagrass establishment in addition to restoring marsh and tidal flat habitats.

The GLO provided a list of all easements located in any State-owned waterbodies in the general vicinity of the project area in Harris, Chambers, and Galveston counties, currently being processed or active (Table 4.8.7-1). Each file requiring a GLO easement was evaluated and categorized by activity. The largest number of activities are categorized as construction, maintenance or removal of marine structures (piers, docks, boathouses and lifts), followed by the installation, maintenance or removal of pipelines (water, gas, natural gas and hazardous material). Other activities include shoreline stabilization, habitat creation, transportation projects, communication/electric line construction and miscellaneous marine-related structures.

Permitted activities occurring within the AOI in Harris, Chambers and Galveston counties between 1995 and 2001 were researched by the USACE (Table 4.8.7-2). Dredge and fill activities along with the construction, maintenance or removal of marine structures proved to be the most widely permitted activities. Other activities include shoreline stabilization, habitat creation, wells and drilling activities, transportation projects, transmission line construction, stormwater and wastewater activities, commercial and industrial construction, and miscellaneous permitted activities. Unfortunately, many permits do not designate the areal extent of wetlands and other habitats impacted, and there is no available database that provides these data. Efforts by GBEP and others to remedy this problem is discussed below.

Although there have been significant losses to wetlands and other habitats since the 1950s and the continued urbanization and industrialization of the Houston-Galveston area will cause continued pressure on these habitats and the ecosystem, several entities are now in place to preserve, restore and create valuable habitat. The Galveston Bay Plan (GBNEP,1994a) is a comprehensive plan for

TABLE 4.8.7-1

TEXAS GENERAL LAND OFFICE PERMITTING ACTIVITY

	Permitting Activity Categories *						
	MS	MI	SS	PL	CL	HC	TP
Chambers County/Galveston Bay	416	59	241	435	2	10	0
Galveston County/Galveston Bay	193	22	65	111	9	3	3
Galveston County/Gulf of Mexico	3	8	0	46	1	5	0
Other Waterbodies	814	144	143	459	18	7	2
Totals	1426	233	449	1051	30	25	5

Source: GLO, 2001.

* Abbreviations:

MS Marine Structures
MI Miscellaneous Marine
SS Shoreline Stabilization
PL Pipelines
CL Communication/Electric Lines
HC Habitat Creation
TP Transportation

TABLE 4.8.7-2
USACE PERMITTING ACTIVITY

	Permitting Activity Categories *																				
Year	MI	NC	SS	MS	D/F	TP	R	S	W/D	TL	PL	FOL	BH	SW	WW	DC	ET	HR	C	I	RR
2001	4	4	10	27	24	8	2	0	25	4	14	1	16	9	4	0	5	4	0	0	0
2000	12	1	33	79	116	9	2	7	16	7	56	7	33	26	0	1	10	10	0	0	0
1999	8	23	29	110	152	4	2	8	15	0	35	3	28	28	4	2	16	6	0	0	0
1998	6	45	17	75	122	7	2	4	22	2	60	4	30	16	6	0	15	4	0	0	0
1997	12	26	28	86	74	5	1	2	33	0	34	1	44	26	0	0	7	1	0	0	0
1996	4	16	19	81	107	4	0	3	14	0	28	1	43	13	3	1	20	1	1	0	1
1995	27	7	60	82	67	4	0	2	8	0	46	3	24	9	0	0	13	2	0	0	0
Totals	73	122	196	540	662	41	9	26	133	13	273	20	218	127	17	4	86	28	1	0	1

Source: USACE, 2001.

* Abbreviations:

MI	Miscellaneous	FOL	Fiber Optic Lines
NC	No Construction	BH	Bulkheads
SS	Shoreline Stabilization	SW	Stormwater
MS	Marine Structures	WW	Waste Water
D/F	Dredge/Fill	DC	Discharge
TP	Transportation	ET	Extension of Time
R	Residential	HR	Habitat Creation
SS	Seismic	C	Commercial
W/D	Wells/Drilling	I	Industrial
TL	Transmission Lines	RR	Railroad
PL	Pipelines		

conservation and management of the estuary to ensure the ecosystem's sustainability through the continuing pressure of development of the region. As part of the plan, the GBEP is coordinating the efforts of numerous 'partners' including local, State, and Federal entities; local businesses; private citizens; nonprofit business and environmental groups; and academic researchers, with the goal of facilitating the restoration of 15,000 acres by the year 2004. These groups are represented on the Galveston Bay Council which oversees these efforts. The Galveston Bay Foundation has expanded this goal to restore 24,000 acres in Galveston Bay by the year 2010 as part of a national effort (GBF, 1998).

A Wetlands Group (a subcommittee of the National Resource Users Group), sponsored by the GBEP, was formed to monitor and promote conservation and restoration of wetland habitat in the Galveston Bay system. There is some difficulty in the determination of the status of the national goal of "no net loss" of wetlands. The group is working with many agencies (e.g., the USACE and NMFS) and environmental groups to gather data on the trends and current status of wetlands in the system and to assist in monitoring ongoing activities. There continue to be difficulties in tracking wetland losses and to a lesser extent, gains.

Beneficial Use sites have been proposed as mitigation for various dredging projects in Galveston Bay by creating intertidal wetlands to support plant growth and wildlife use and to help mitigate resource impacts. For example, much of the dredged material from deepening of the Houston Ship Channel and from dredging activities proposed at Shoal Point would be used to create high and low marsh, without adversely affecting nearby marsh habitat. The sites are generally proposed within a 2.5-mile radius of the dredging area.

To date, only about 500 acres of wetlands are known to have been restored (GBEP, in press); however, several restoration projects are on-going and many more areas have been protected by inclusion in public and private preserves (e.g., FWS Anahuac and Brazoria National Wildlife Refuges, Galveston Island State Park, San Jacinto Battleground State Historical Park, The Nature Conservancy's Galveston Bay Coastal Prairie Preserve, Galveston Bay Foundation properties, and SCENIC GALVESTON, INC. properties). The Legacy Land Trust is working with many groups to continue this trend of protection by the use of conservation easements.

Marsh habitats in Swan Lake would be expanded through use of Shoal Point dredged material. Subsidence in the area has affected the intertidal wetlands at this site, and dredged material would be used to raise the grade and allow for vegetation establishment. The location of the proposed project on an existing DMPA, and the associated Beneficial Uses project (including wetlands restoration in Swan Lake) would not fragment wetland habitats and would result in a net gain in wetlands because the approximately 45 acres of mitigation in Swan Lake and other wetlands created by the Beneficial Uses identified in the proposed DMMP would more than offset the potential loss or negative impact to approximately 13 acres of jurisdictional wetlands on Shoal Point.

To a large extent, impacts to wetlands and protected species within the AOI would be avoided, minimized, or mitigated by compliance with existing Federal statutes that apply to private and government interests. The USACE (under Section 404 of the Clean Water Act) and the FWS (under the Endangered Species Act) have legislative mandates to reduce or avoid significant, adverse impacts to

protected resources on an individual as well as a cumulative basis. These regulations should minimize adverse effects on protected ecological resources as a cumulative consequence of continuing historic development patterns; however, the obvious trend is continued development in the region.

4.8.7.2 Essential Fish Habitat

Although benthic organisms in bay bottom habitat tend to recover quickly from the initial impacts of dredging, they would not recover fully and would remain subject to the impacts of maintenance dredging. Losses of bay bottom and water column are offset by the creation of marshes which are anticipated to be more productive and provide better habitat for fisheries. As discussed in Section 4.2.15, adverse effects of dredging activities on EFH and managed species are generally expected to be localized and temporary. Similar effects would be anticipated from other dredging projects in the region. Use of BMPs for controlling runoff and thereby limiting potential contamination of the open bay habitat, and spill prevention and control measures for minimizing impacts of accidental spills would be required for the proposed project as well as other development projects in the region and should result in minimal adverse impacts to the aquatic resources. Beneficial effects of dredging projects in the region would result from restoration and creation of intertidal marsh habitat in Beneficial Use sites. Creation of these marshes, which provide improved habitat for fisheries, offsets the loss of bay bottom required for placement of the Beneficial Use sites. As a result, the overall contribution of the proposed project to the cumulative effects of development in the region is expected to be beneficial to EFH and managed species because of the restoration and creation of marsh habitats, which are a key component of the life history stages of the aquatic species of concern.

4.8.8 Water Quality and Hydrology

EPA CAST results determined surface water use to be an average score. Surface water quality values showed a fairly high degree of vulnerability or impact, with a CAST ranking score of 4. Rainfall amount was high, with at least 50 inches per year, and average surface water flow was also considered fairly high, with a CAST ranking score of 4. Cumulative chemical releases into the water from the Toxic Release Inventory had a fairly low score of 2 (EPA, 2001e).

Various existing and planned developments in the area have a cumulative water quality impact on the receiving water bodies due to wastewater discharges and urban runoff. Surface water quality impacts of new development include point source and non-point source discharges. Point source discharges are regulated by the TPDES, which is administered by the TNRCC to protect the quality of the receiving water bodies. Runoff from developed sites is a major contributor of non-point source discharges. These discharges are regulated under the NPDES/TPDES stormwater programs for construction and industrial multisector activities.

Impervious cover increases as a result of development and, in turn, leads to higher runoff volume as well as higher peak runoff rates. According to GBEP (2001a), Newell found that one-fourth to one-third of the freshwater inflow to Galveston Bay came from stormwater runoff. A method based on the correlation of impervious cover to population (PBS&J, 2000) was used to estimate current and predicted areal extents of impervious cover. The data in Table 4.8.8-1 indicate that approximately 12 percent of the

TABLE 4.8.8-1

PROJECTED IMPERVIOUS COVER FOR HARRIS, GALVESTON, AND CHAMBERS COUNTIES

		Population			Impervious Cover					
County	Total Land Area (acres)	Year 2000	Projected for Year 2025	Projected Percent Increase	Estimate* for Year 2000 (acres)	Projected Estimate* for Year 2025 (acres)	Projected Increase (acres)	Projected Percent Increase	Estimate* for Year 2000 (% of Total Land Area)	Projected Estimate* for Year 2025 (% of Total Land Area)
Harris	1,106,560	1,246,076	1,739,534	40	186,911	260,930	74,019	40	17	24
Galveston	254,720	102,092	155,194	52	15,314	23,279	7,965	52	6	9
Chambers	383,360	8,837	13,757	56	1,326	2,064	738	56	0	1
Three-county area	1,744,640	1,357,005	1,908,485	41	203,551	286,273	82,722	41	12	16

* Population from Table 4.1.20-2.

Per capita estimate of impervious cover based on PBS&J (2000).

three-county land area (Harris, Galveston, and Chambers) is under impervious cover (17% of Harris County, 6% of Galveston County, and <1% of Chambers County). Projected numbers for the year 2025 show an overall increase in impervious cover to 16 percent (24% of Harris County, 9% of Galveston County, and 1% of Chambers County). This would mean an increase of 46 percent (almost 83,000 acres) over the current area under impervious cover. Higher runoff volume generally increases streambed scouring that would lead to increases in suspended sediments and associated constituents downstream. In accordance with stormwater regulations, the water quality impacts of runoff are generally mitigated by BMPs utilized to the extent practicable.

H-GAC has had an active water quality management program for over 20 years. This group coordinates with numerous entities to ensure appropriate monitoring and management of regional waters including Galveston Bay. H-GAC's Regional Water Quality Management Planning Program works with GBEP to implement the Galveston Bay Plan (Masterson, 2001). General water quality trends are discussed in Section 3.10.

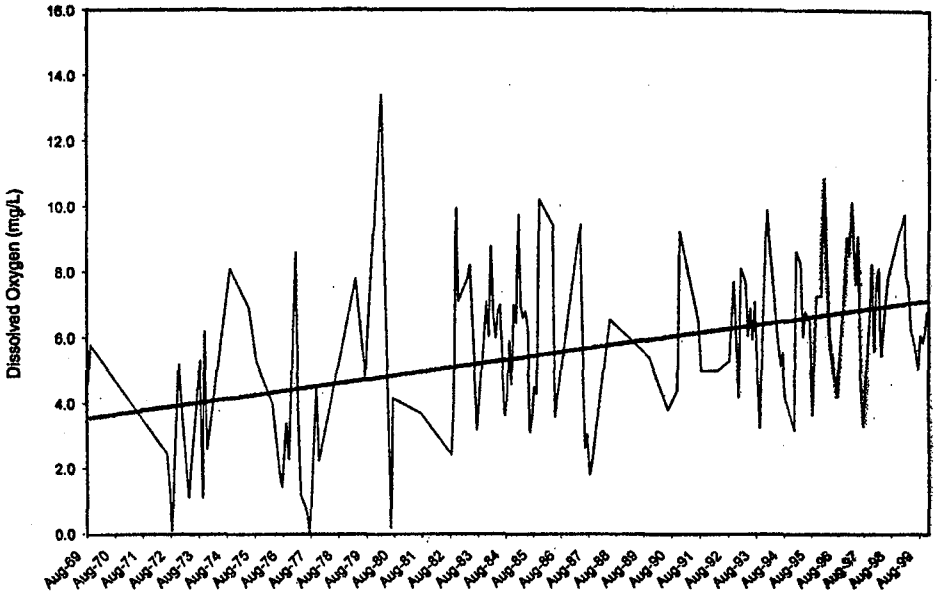
GBEP (2001a) reports that although historical water quality problems have been concentrated in the western urban tributaries, Galveston Bay has maintained good water quality overall. The trend of dissolved oxygen (Figure 4.8.8-1) indicates generally improved conditions. GBEP concludes that the current quality of bay waters is good, and where there are problems (associated with intense human activity, e.g., urban areas, points of surface runoff, waste discharges, and shipping) conditions are improving.

Locating the facility on an existing, leveed DMPA as opposed to natural lands would minimize impacts to natural groundwater and surface water systems. Water quality effects of the proposed project would result primarily from turbidity associated with dredging activities. The fact that most dredging would occur in existing channels minimizes these effects. There also could be concerns that the deepening of the Texas City Channel and dredging required for the turning basin and berthing areas could change circulation patterns and water quality, in particular, salinity. The Galveston Bay Freshwater Inflows Group (GBFIG) (with more than 30 stakeholders representing State agencies, local environmental groups, the navigation district, ports, utilities, water districts, commercial and sports fisheries, local industry, river authorities and agriculture) was formed to address the freshwater needs of the estuary. The 1997 Senate Bill 1 required the TWDB to create a statewide water plan with greater emphasis on regional planning. This resulted in the production of the Texas Water Availability Model which is used by the TWDB to assess the needs of the users of the waters of the various watersheds. GBFIG works with the TWDB to assess the fresh water needs of the estuary and ensure that the Trinity and San Jacinto river authorities recognize these needs and provide sufficient fresh water in the water budgets for the entire watersheds.

The GBEP (2001a) report notes that the trend for salinity in Galveston Bay has been to decline over the period of record. However, we might expect the deepening of the Houston and Galveston Channels to 45 feet to increase water exchange with the Gulf and raise salinity in Texas City area to some degree as was documented by the USACE (1995). As described in Section 4.2.10, deepening of the Texas City Channel would act to increase the circulation and salinity exchange with the Gulf by a small amount.

FIGURE 4.8.8-1

AVERAGE MONTHLY DISSOLVED OXYGEN (DO) IN GALVESTON BAY



Source: Criner and Johnican (in prep.)
From GBEP (2001b): Average Monthly Dissolved Oxygen (DO) in Galveston Bay.

As discussed in Section 3.10.2, the project vicinity has been subject to channel dredging and maintenance dredging since early in the twentieth century. While impacts on water quality and benthic habitat can be anticipated during dredging events, these impacts tend to be temporary and localized. Elutriate tests indicate that water quality concentrations are acceptable, and recolonization studies indicate that affected benthic habitat typically recovers over a period of several months. Dredging activities for other projects in the region can be expected to have similar temporary and localized effects on water quality and habitat. Based on the historic data available regarding effects of dredging activities, the proposed project is not expected to make a major contribution to cumulative water quality impacts. Use of dredged material from the proposed project to create Beneficial Use sites consisting of intertidal marsh habitat would result in positive cumulative effects for the region, which has experienced historic declines in marsh habitat.

4.8.9 Air Quality

EPA CAST results determined that cumulative chemical releases to the air from the Toxic Release Inventory ranked fairly high to high, with scores of 3 in the 2-mile buffer and 5 in the 4-mile buffer (EPA, 2001e).

As previously discussed, the project area for assessing cumulative effects is generally located within the Houston-Galveston Air Quality Control Region, also referred to as the HGA. This area includes Harris County and the seven surrounding counties of Montgomery, Liberty, Chambers, Galveston, Brazoria, Fort Bend, and Waller. Available monitoring data for several counties in the HGA for 1995 through 2000 were presented in Table 3.1.3-2 and are graphed on figures 4.8.9-1 through 4.8.9-10. Figure 4.8.9-11 is a graph of the HGA 1-hour ozone design values determined by the TNRCC for 1988 through 1997 (TNRCC, 2000). In general, the ozone design value is defined as the fourth highest concentration recorded within the past three years at a given site. For the period 1997 to 1999, the ozone design value for the HGA was determined to be 0.203 ppm (or 203 parts per billion) (H-GAC, 2000).

As shown on these figures, ozone is the only criteria pollutant for which the HGA fails to meet the NAAQS. An area will comply with the attainment of the 1-hour ozone standard when its three-year ozone design value is reduced to 0.12 ppm. The HGA has been classified as being in "Severe-17" nonattainment with the 1-hour NAAQS for ozone. Under current regulations, the HGA has until 2007 to attain the NAAQS for ozone.

The TNRCC has the responsibility for developing a plan for attaining the air quality standard in the HGA. This plan, which was submitted to and approved by the EPA, is called the SIP. The SIP describes how the area will reach attainment of the air quality standard for ozone. The SIP sets emissions budgets for point sources such as power plants and manufacturers, area wide sources such as dry cleaners and paint shops, off-road mobile sources such as boats and lawn mowers, and on-road sources such as cars, trucks, and motorcycles.

The existing 1-hour NAAQS for ozone will continue to apply to the HGA as it was not in attainment of that standard in July 1997 when the 8-hour standard was established. The recent SIP revisions adopted by the TNRCC on December 6, 2000, for the HGA proposed to implement emission

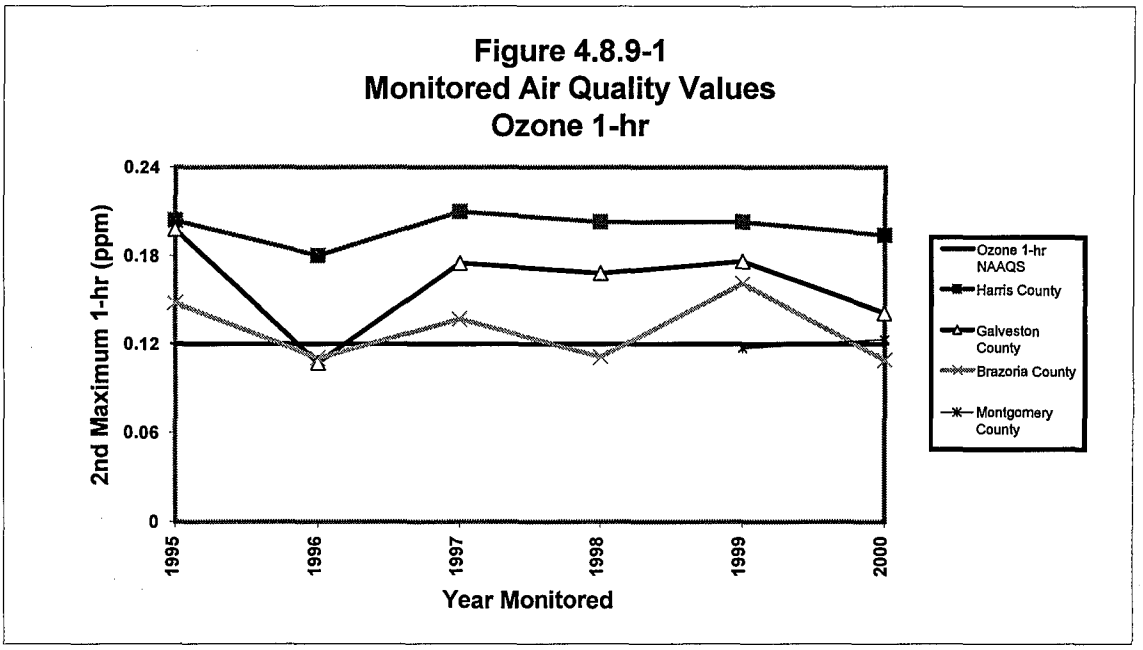


Figure 4.8.9-1
Monitored Air Quality Values
Ozone 1-hr
2nd Maximum 1-hr (ppm)
0.24
0.18
0.12
0.06
0
1995
1996
1997
1998
1999
2000
Year Monitored
Ozone 1-hr NAAQS
Harris County
Galveston County
Brazoria County
Montgomery County

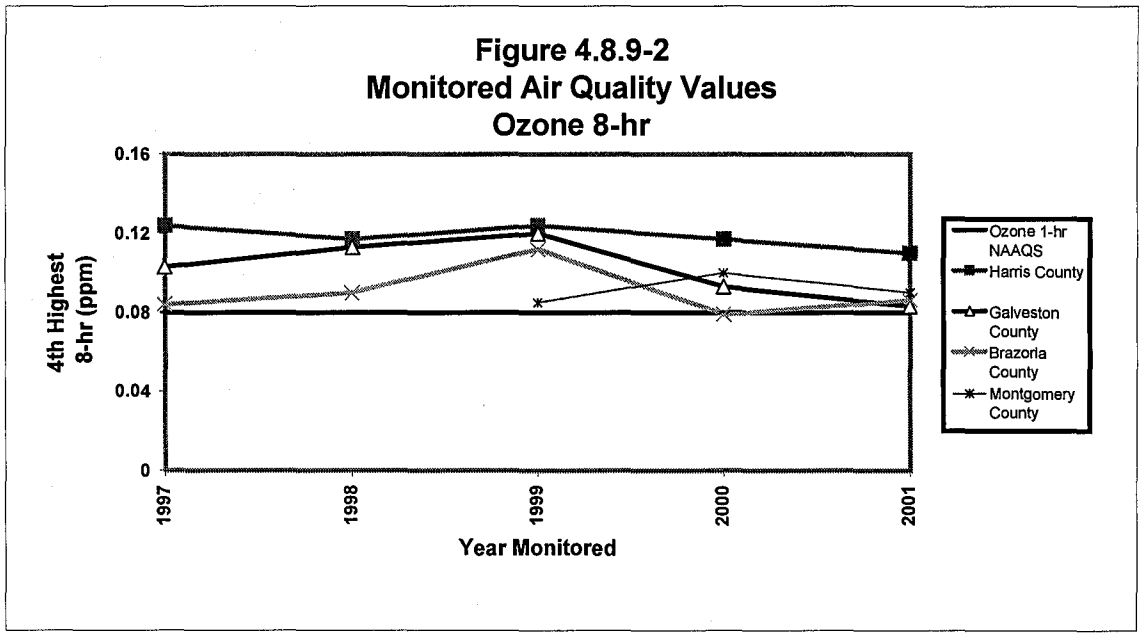


Figure 4.8.9-2
Monitored Air Quality Values
Ozone 8-hr
4th Highest 8-hr (ppm)
0.16
0.12
0.08
0.04
0
1997
1998
1999
2000
2001
Year Monitored
Ozone 1-hr NAAQS
Harris County
Galveston County
Brazoria County
Montgomery County

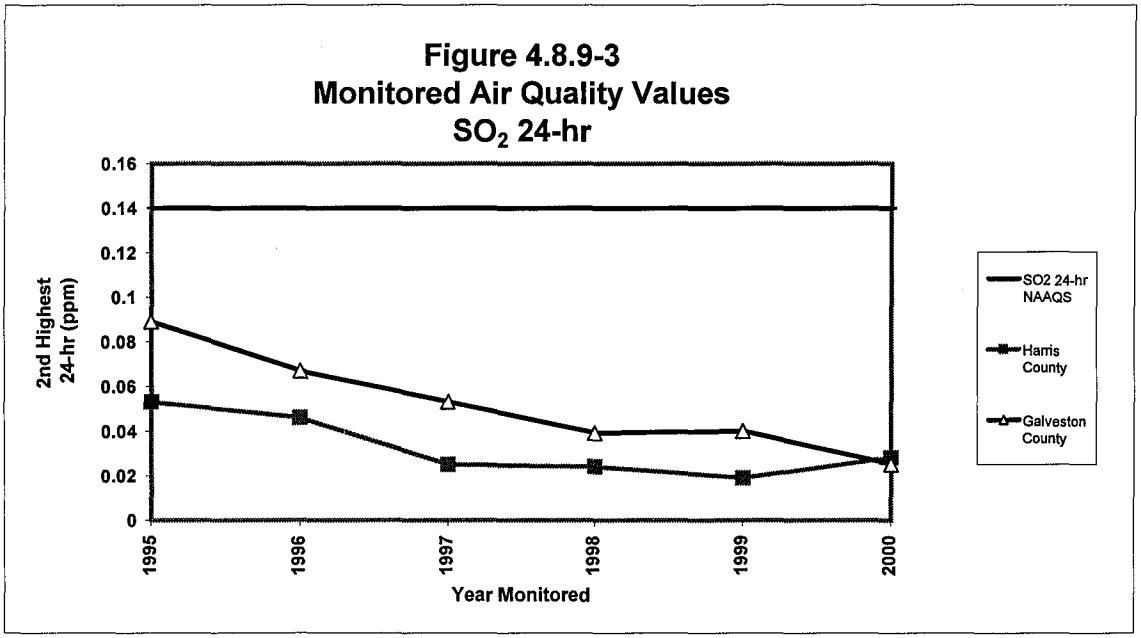


Figure 4.8.9-3
Monitored Air Quality Values
SO2 24-hr
2nd Highest 24-hr (ppm)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1995
1996
1997
1998
1999
2000
Year Monitored
SO2 24-hr NAAQS
Harris County
Galveston County

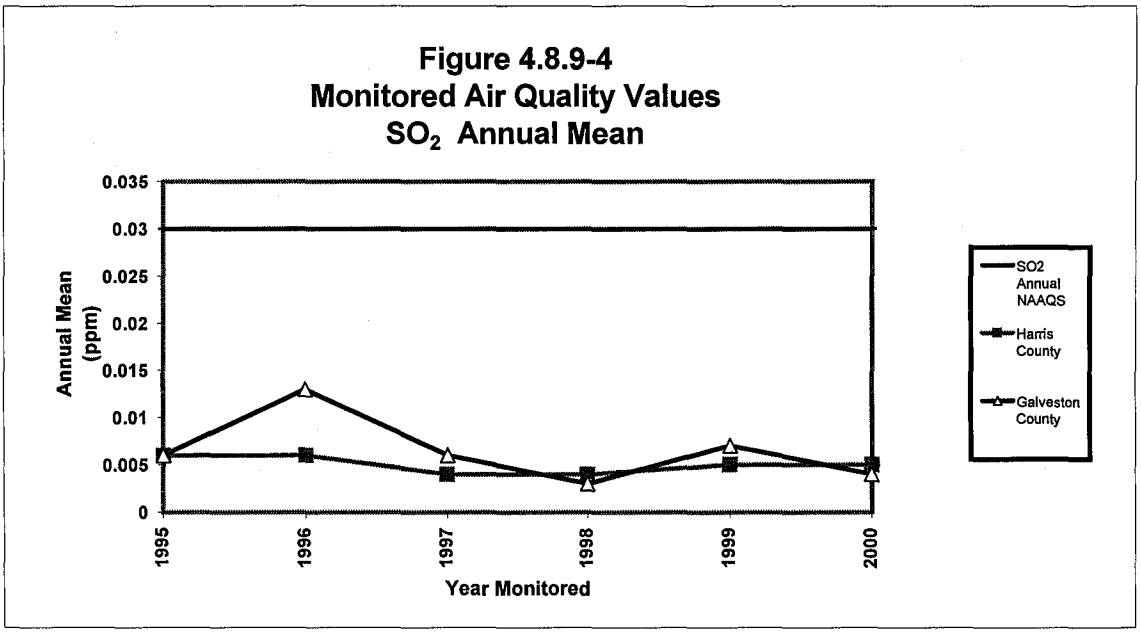


Figure 4.8.9-4
Monitored Air Quality Values
SO2 Annual Mean
Annual Mean (ppm)
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1995
1996
1997
1998
1999
2000
Year Monitored
SO2 Annual NAAQS
Harris County
Galveston County

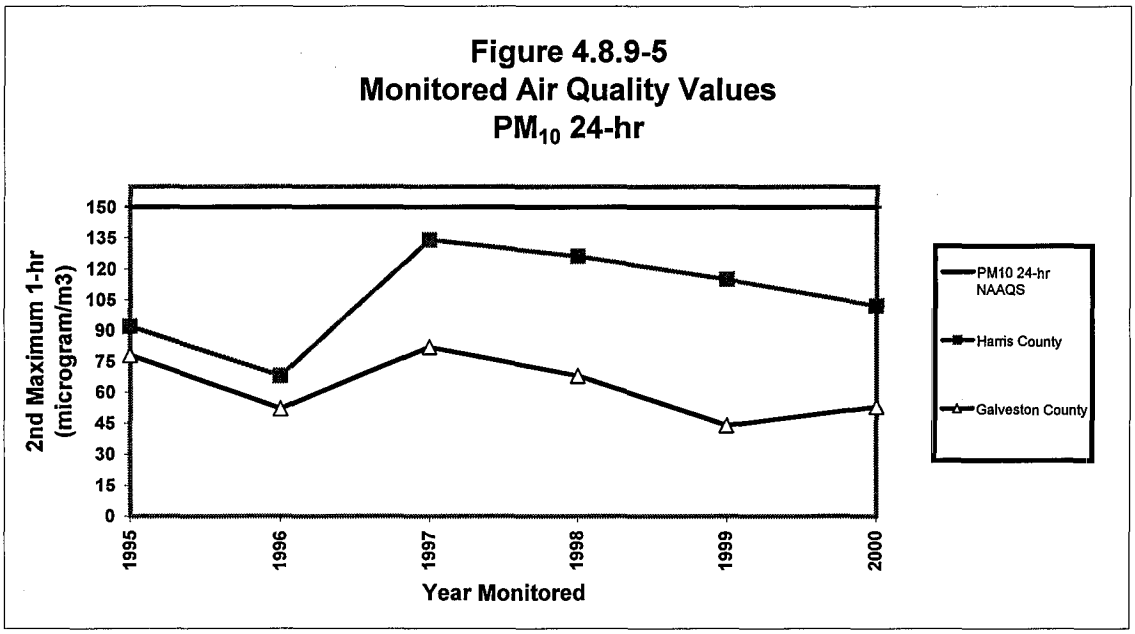


Figure 4.8.9-5
Monitored Air Quality Values
PM10 24-hr
2nd Maximum 1-hr (microgram/m3)
150
135
120
105
90
75
60
45
30
15
0
1995
1996
1997
1998
1999
2000
Year Monitored
PM10 24-hr NAAQS
Harris County
Galveston County

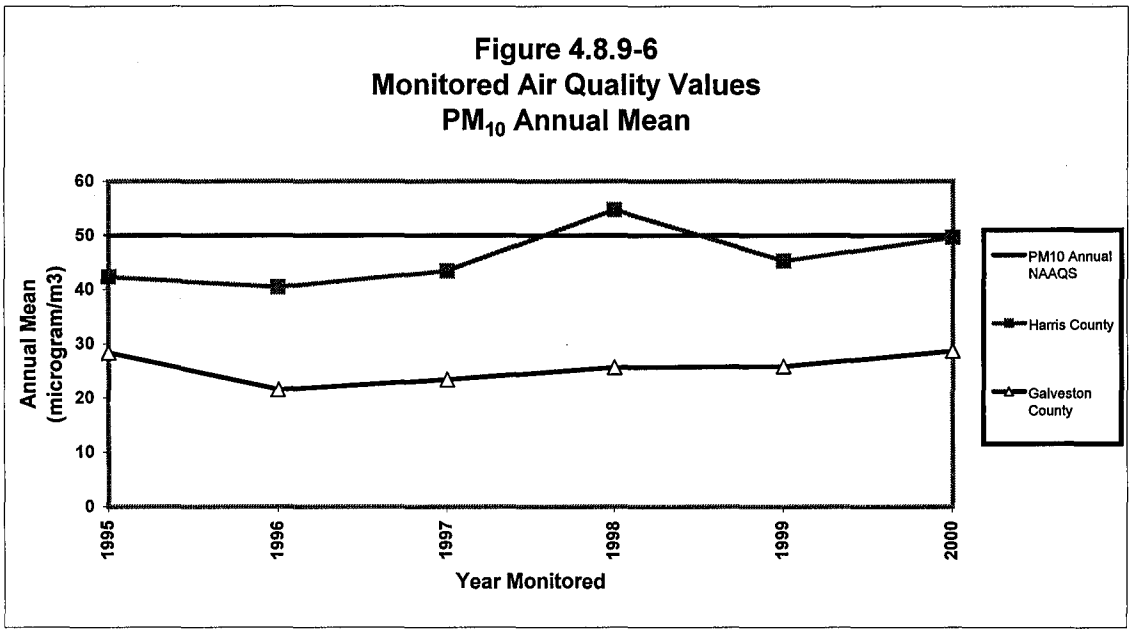


Figure 4.8.9-6
Monitored Air Quality Values
PM10 Annual Mean
Annual Mean (microgram/m3)
60
50
40
30
20
10
0
1995
1996
1997
1998
1999
2000
Year Monitored
PM10 Annual NAAQS
Harris County
Galveston County

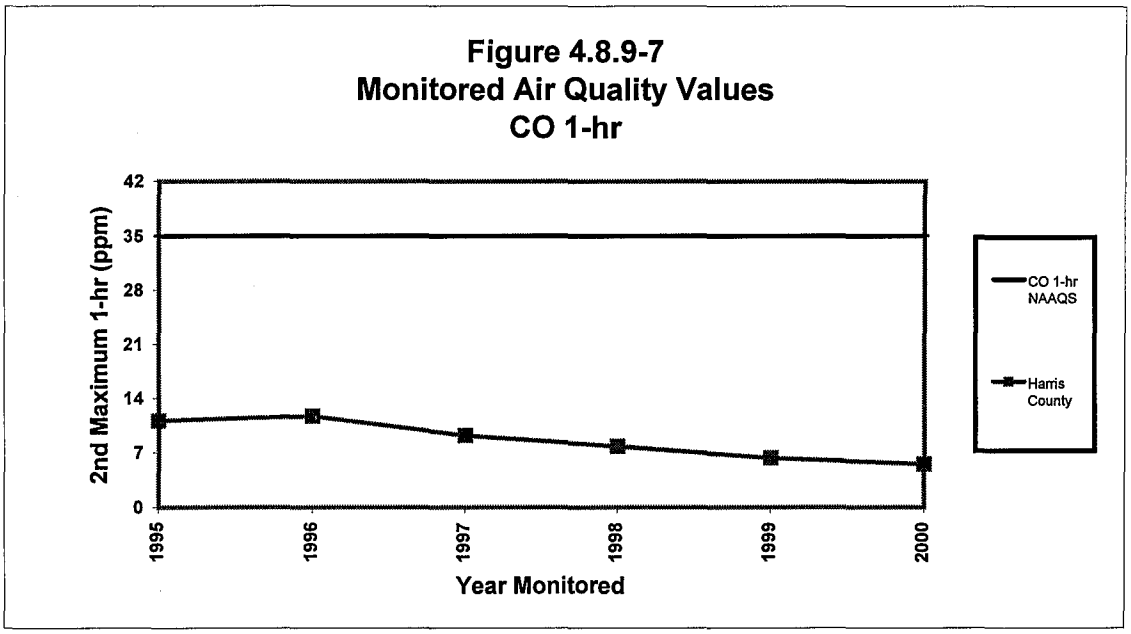


Figure 4.8.9-7
Monitored Air Quality Values
CO 1-hr
2nd Maximum 1-hr (ppm)
42
35
28
21
14
7
0
1995
1996
1997
1998
1999
2000
Year Monitored
CO 1-hr NAAQS
Harris County

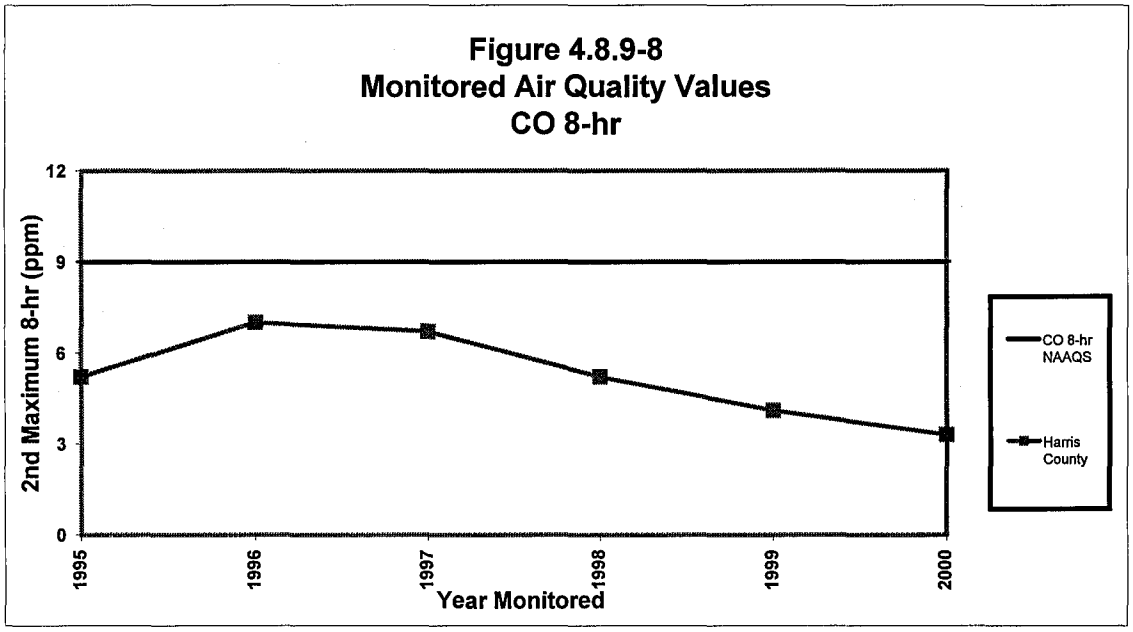


Figure 4.8.9-8
Monitored Air Quality Values
CO 8-hr
2nd Maximum 8-hr (ppm)
12
9
6
3
0
1995
1996
1997
1998
1999
2000
Year Monitored
CO 8-hr NAAQS
Harris County

Figure 4.8.9-9
Monitored Air Quality Values
NO_2 Annual Mean

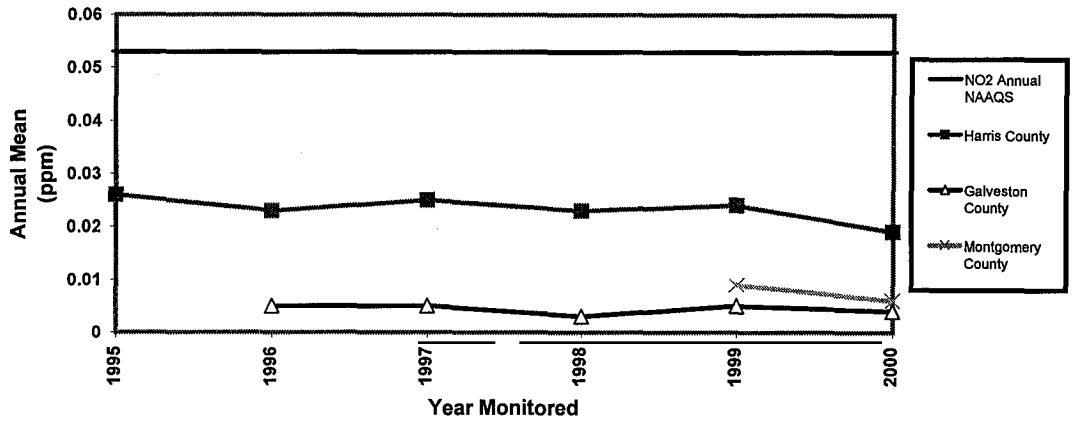


Figure 4.8.9-10
Monitored Air Quality Values
Pb Quarterly Mean

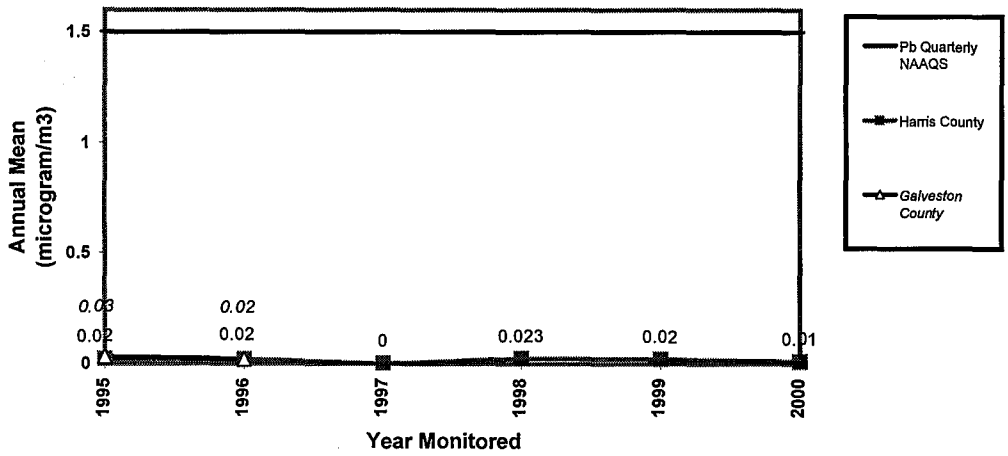
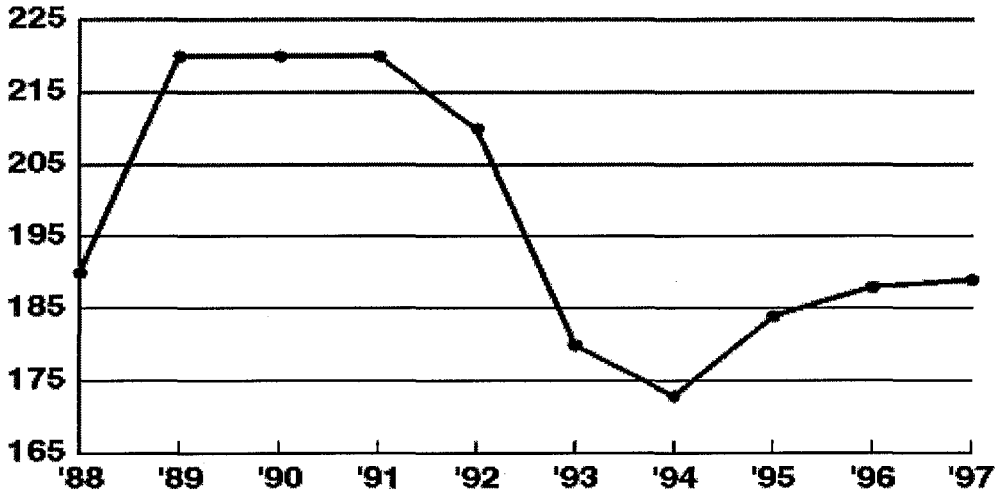


Figure 4.8.9-11
HGA 1-Hour
Ozone Design Value*
1988-1997



Source: TNRCC, 2001g.

*Measurements in parts per billion. EPA measure of compliance with NAAQS 1-hr standard of 125 parts per billion.

controls so as to demonstrate attainment with the 1-hour standard by the year 2007. The 1-hour standard will no longer apply to an area once the EPA determines that the area has reached the 1-hour standard (i.e., has demonstrated attainment). Once this area meets the 1-hour standard, the EPA will judge the area by the new, 8-hour standard which will be used to determine the air quality status of the area. TNRCC monitoring of ozone concentrations in this area over the previous 3 years (Figure 4.8.9-2) indicates levels above the 8-hour standard, as well as above the 1-hour standard. The controls proposed in the December 2000 SIP revisions are expected to significantly reduce emissions of ozone precursors and provide attainment with the 1-hour standard. If the resulting improvements do not also provide attainment with the 8-hour standard, then additional controls may be necessary.

The HGA is expected to experience growth in the regional population and economy, resulting in increased traffic and industrial capacity. The network of future roadways and subdivision streets resulting from cumulative effects, in addition to existing and planned industrial facilities within the AOI, would be expected to contribute to additional and varying amounts of air pollution emissions.

Even with increased growth in the area, historical ambient air monitoring data for the HGA indicates a long-term downward trend in ozone (H-GAC, 2000). This is generally the result of efforts made to reduce emissions from various sources of VOCs. Since being classified as nonattainment with the ozone standard, the HGA has implemented many new controls on emissions since 1990, which have significantly reduced emissions of VOCs and will further reduce emissions of NO_x in the area.

Limitations on the levels of certain pollutants are set by the NAAQS and the SIP. The SIP for the HGA includes enforceable commitments required by the EPA for reducing emissions of NO_x and VOC such that the area will attain the NAAQS for ozone. The SIP is a dynamic plan which can be constantly updated to account for changing conditions. New regulations and control strategies resulting from the HGA SIP impose emission control measures affecting various sources of air emissions including stationary sources, on-road mobile sources, non-road mobile sources, and area sources. In addition, reductions are also expected from expansion or improvement of high occupancy vehicle lanes, traffic flow management, park-and-ride lots, public transportation, and rideshare programs. Emissions reductions consider the need to offset a potential increase in emissions due to growth in the region resulting in increased traffic and industrial capacity.

In addition to the control of emissions to facilitate attainment of the ozone standard, the TNRCC also has regulations in place to control emissions of other pollutants, even though the NAAQS for these pollutants is being met. These regulations affect sources of particulate matter, SO_2, hazardous air pollutants, and other air emissions from industrial facilities. This is done through the implementation of State emission standards and by an elaborate permitting system which requires the implementation of emissions controls for the construction of new industrial facilities or modifications. These regulations are designed to provide for growth in a way that will continue attainment of the standards. In addition, within the HGA, industrial, community, and municipal groups are working cooperatively with the regulatory agencies to identify ways to continue to reduce emissions while allowing for growth in the area.

Possible cumulative impacts of reasonably foreseeable actions, in conjunction with the proposed container port, may result from projects related to transportation improvement, industrial

facilities, and navigation improvements. Specific factors inherent to these actions impacting air quality include emissions from construction activities, operations, and transportation. Construction activities would result in exhaust emissions from the combustion of fuel in construction equipment and emissions of dust from land disturbance. Emissions from industrial activities result from the operation of the facilities, including combustion emissions from fuel-burning equipment and fugitive emissions of PM and VOCs. Navigation related activities would result in emissions from the combustion of fuel in dredge and support vessels and the placement of dredged material.

Air quality impacts associated with the construction of planned transportation and industrial projects would result in a temporary impact on air quality. Emissions from these activities would be intermittent and of relatively short duration, generally ending when the construction activity ends. Although somewhat localized, emissions from the construction of transportation and navigation-related projects would be spread throughout the HGA as different project segments are completed. Emissions from the construction of industrial projects would be more localized, resulting from on-site construction equipment and worker vehicles. Emissions of NO_x and VOC for miscellaneous construction activities and transportation related activities are monitored and limited by the Texas SIP. In the development of the SIP, the TNRCC has established a construction emissions budget for NO_x and VOC that considers and allows for construction in the HGA due to growth. In addition, projects that are considered Federal actions must undergo an evaluation of conformity with the SIP (i.e., its emissions must be demonstrated to be included within the SIP emissions budget). As it is likely that the construction activities related to reasonably foreseeable actions and the proposed project are spatially separated by considerable distances, the potential short-term cumulative air quality impacts due to construction activities associated with the foreseeable and proposed projects would be limited and would not result in the deterioration of air quality to exceed applicable standards.

Emissions associated with the operation of industrial facilities and equipment are usually continuous and long-term, thus having a more continuous long-term impact on air quality. Stationary industrial sources are generally subject to the permitting requirements of the TNRCC and the EPA through the Texas SIP. The permitting process is designed to minimize emissions from a proposed facility using best available emissions control technology with consideration of technical feasibility and economic reasonableness. In addition, the permitting rules limit emissions of NO_x and VOC from new projects in the HGA by requiring even more stringent emissions control technology than projects in attainment areas or by requiring the purchase of retired emissions to offset the increase in new emissions. New or modified industrial facilities that would have significant emissions or emission increases of air contaminants other than NO_x and VOC (from activities related to operation) would have to comply with the Prevention of Significant Deterioration (PSD) of Air Quality regulations. The PSD rules limit the maximum allowable incremental increase in ambient concentrations above established baseline levels. Transportation improvements are generally made to improve traffic flow, effectively reducing long-term emissions resulting from traffic congestion and sporadic flow. Transportation improvement projects are also limited by SIP considerations and must conform to limitations within the SIP. Therefore, potential long-term cumulative air quality impacts due to reasonably foreseeable actions in combination with emissions from the proposed project would be limited and would not result in deterioration that would exceed applicable ambient air quality standards.

4.8.10 Hazardous Materials

As discussed in Section 4.2.9 and 4.2.10.4, the risk of contamination of soils, surface water, and groundwater as a result of construction or operation of the proposed facilities is relatively small. Several factors contribute to this conclusion, including the type of facility proposed (containerized cargo) and the available data from a similar facility at Barbours Cut; the controls in place for packaging, handling, storing, and transporting hazardous materials; and the BMPs and spill control measures to be implemented for the project. As a result, construction and operation of the proposed project are not expected to make a substantial contribution to cumulative effects of the use of hazardous materials on the environment in the region.

4.8.11 Present and Future Actions

Specific actions that may contribute to overall cumulative effects in the area are described in the following sections. Permitting activities by both the USACE and the GLO are presented in tables 4.8.7-1 and 4.8.7-2 and discussed in Ecological Resources (Section 4.8.7).

4.8.11.1 Transportation

TxDOT Projects

Several planned road and highway projects and studies will impact the AOI. These are described in Section 4.2.2 (Traffic) and include modifications to SH 146, SH 3 and IH 45. In addition to these proposed projects, TxDOT conducted a feasibility study into the proposed SH 87 Bolivar Crossing. Options considered in this study included construction of a causeway from Bolivar Peninsula to the mainland near Texas City via Pelican Island and possibly Galveston Island. The study was completed in July 2000. Additional ferry landings were recommended, but it was determined that additional study was needed before a Major Investment Study was undertaken for the proposed project (Guerra, 2001).

Grand Parkway

The Grand Parkway (SH 99) is a proposed four-lane, 170-mile circumferential scenic highway that would eventually traverse seven counties and encircle the greater Houston area. Factors evaluated during the continuing development of the various segments of the proposed facility include existing and future traffic demands, land acquisition, construction funding, and environmental impacts (GPA, 2001a).

Segments of the Grand Parkway that are most relevant to this cumulative effects assessment of a container port on Galveston Bay are as follows:

- Segment A from IH 45 to SH 146 (east of IH 45) – No studies are currently underway for Segment A (GPA, 2001b).
- Segment B from IH 45 to SH 6 (west of IH 45) – Preliminary engineering and environmental studies are underway. Galveston County has agreed to fund studies in the county. Brazoria County has not yet funded the segment in that county (GPA, 2001b).

- Segment I-2, from SH 146 to IH 10 near Baytown, Texas will be the second part of SH 99 constructed. The project design began in 1991. The Record of Decision (ROD) was signed in August 1998. The Grand Parkway Association is coordinating the Clean Water Act Section 404 permit with the USACE and trying to finalize ROW donations. Construction letting is scheduled for late 2001 (GPA, 2001b).

2022 Metropolitan Transportation Plan (MTP)

The 2022 Metropolitan Transportation Plan (MTP) includes proposals for specific transportation improvements in the Texas City area, as indicated in Table 4.2.2-5. The information presented in this table was obtained from H-GAC on June 25, 2001 (see original H-GAC spreadsheet in Appendix C). These proposals for intersection rebuilding, road expansions, new signal timings, and other improvements would be needed to accommodate the normal growth of the region and to accommodate traffic generated by the proposed container terminal.

Transportation Improvement Plan (TIP)

The Transportation Improvement Plan (TIP) is a staged, 3- to 5-year prioritized program of transportation projects in the metropolitan planning area. It is designed to be consistent with the Metropolitan Transportation Plan (MTP). This program is required for a locality to receive Federal transit and highway grants. The TIP also contains an annual or biennial element which lists all transportation project activities that will receive Federal funding for a given 1- or 2-year period. The Metropolitan Planning Organization (MPO) and State and transit operators are required to cooperatively develop the TIP (TxDOT, 2001b).

Burlington Northern and Santa Fe Railway Bayport Loop Buildout

San Jacinto Rail Limited plans to construct a 13-mile rail line from just south of Ellington Field to the Bayport Industrial District (just east of SH 146). The rail line would service petrochemical industries at the Industrial District. The predicted trip frequency is estimated to average only one train per day. The majority of shipments will be nonhazardous plastic pellets, although some shipments will include hazardous chemicals. Construction and operation of the rail line requires approval of the U.S Surface Transportation Board in coordination with Federal, State and local agencies. A petition was made to the Surface Transportation Board in August 2001 (BNSF, 2001).

4.8.11.2 Industrial

Port of Houston Authority (PHA) Bayport Container Terminal

The PHA submitted an application to the USACE in 1998 (revised 2002) to construct and operate a marine terminal complex on approximately 1,043 acres along the south side of the Bayport Ship Channel. The proposed project site is mostly within the extraterritorial jurisdiction of the City of Pasadena, approximately 30 miles southeast of downtown Houston. The Bayport container terminal and cruise ship facilities would consist of 756 acres for a container terminal complex, including wharves, container yards, gate facilities, intermodal yards, container freight stations, ancillary and support facilities, and industrial co-development areas. The terminal would also include 134 acres for a three-berth cruise terminal complex

and related co-development areas, 128 acres for a buffer area, and 28 acres of retention ponds not in the buffer zone.

The proposed facilities would ultimately include approximately 7,000 linear feet of new wharves and berths for container operations and approximately 3,500 feet of wharves and berths for cruise operations. The project would also include the dredging of a new 1,600-foot-diameter turning basin on the south side of the Bayport Channel, east of the proposed cruise terminals.

Development of the proposed terminal facilities would require improvement or new construction of 4.8 miles of roads. Trucks would have unimpeded access to the container terminal complex via new ramps connecting SH 146 to Port Road and a grade-separated gate entrance. A new rail track would be added from Strang Yard to the complex within existing rail right-of-way within or along SH 146. The new rail tracks would be added in a new southern corridor that would pass under a new grade separation at SH 146 near Red Bluff Road and then to the southern end of the intermodal terminal yard. Cruise terminal traffic would use a new road developed in this corridor to separate them from truck traffic. A total of 95 acres would be used for new or improved rights-of-way for roads and rail.

Cedar Crossing Industrial Park

Several tracts in Cedar Crossing, a 15,000-acre industrial park in the Baytown area, were purchased in May 2000 by an investment group led by Charles Iupe of Fidinam Capital. Bailey Steel Services also purchased 3 acres in Cedar Crossing to construct a steel distribution center (*Houston Chronicle*, 2000).

American Acryl Property

American Acryl acquired approximately 200 acres within the Pasadena Industrial District at Bayport (Port Road and Old Highway 146) for a proposed acrylic acid manufacturing facility. Site development is underway. Production is scheduled to begin early in 2002. When completed, the facility will have the capacity to manufacture 120,000 tpy of acrylic acid. The joint venture owners plan to independently utilize their shares of the acrylic acid production. The current construction project includes three main elements: 1) acrylic acid plant; 2) butyl acrylate plant; and 3) utilities. The production of acrylic acid and butyl acrylate involves reactors, columns and process tanks (American Acryl, 2001).

4.8.11.3 Navigation

Houston/Galveston Navigation Channels Project

A cumulative effect assessment was performed by Turner Collie & Braden (TCB) and Gahaban & Bryant Associates (GBA) (1995) to assess the combined effects of several authorized and planned Federal development projects in the Galveston Bay area. This study was prompted by the proposed enlargement of the Houston Ship Channel and the concerns by NMFS, EPA, TPWD, and FWS regarding potential environmental impacts associated with the project. An Interagency Coordination Team (ICT) joined to identify and resolve concerns. A subcommittee of the ICT, including the GBNEP, NMFS,

TPWD, USACE, and FWS was created as the Cumulative Impact Subcommittee. The findings and recommendations were incorporated into the Supplemental EIS for the Houston Ship Channel project.

A scope of work was agreed upon and included parameters to address ten past, present, and reasonably foreseeable future Federal projects viewed as pertinent to the bay's condition. Parameters that were included in the assessment included biological, physical, chemical, socioeconomic, and cultural attributes. The assessment addressed three scenarios that included: 1) continued maintenance dredging of the Houston Ship Channel as the WITHOUT PROJECT; 2) open-bay unconfined disposal (OPEN BAY) where new work and maintenance dredged material from the widening and deepening would be placed in subaqueous unconfined disposal cells and in upland confined and semiconfined disposal cells; and 3) a Beneficial Uses Group plan (BUG) in which new work and maintenance material from dredging would be used for construction of marshes, a bird island and shoreline stabilization, and upland confined disposal.

The WITHOUT PROJECT scenario resulted in a net negative impact baywide. The OPEN BAY scenario was assessed as resulting in a greater negative impact in Galveston Bay when compared with the WITHOUT PROJECT scenario. The BUG scenario, including associated construction of Beneficial Use sites, resulted in a net negative impact bay-wide in comparison with the two other options; however, the positive net benefit of marsh creation would reduce the negative impact of this scenario.

In summary, the results of the cumulative impact assessment conducted by TCB and GBA (1995) indicated that "continued maintenance dredging of the Houston and Galveston Channels in combination with other proposed projects reviewed will result in a negative impact to the Galveston Bay ecosystem." The study also indicated that the BUG scenario would have more positive effects than either the OPEN BAY or WITHOUT PROJECT scenarios.

Texas City "Y"– Modifications to Texas City Channel and GIWW Intersection

The Texas City Channel obliquely intersects the GIWW channel at Station 3282+00. At this junction, a 125-foot wide radial turning channel is provided west of the intersection to facilitate tows entering and exiting the two channels. The turning channel forms a "Y" shape and precludes pilots from having to make an abrupt sharp turn at the intersection. This channel has been all but abandoned by towboat pilots, however, because they favor navigating the deeper open water afforded by the Texas City Channel, even though this circuitous turn entails more distance and time. Pilots contend the turning channel is too narrow, often shoaled, and difficult to navigate during high winds or strong currents. Additionally, the south end of the channel intersects the north end of the Pelican Island mooring basin, complicating navigation when barges are parked at the basin. The immediate turn into the basin does not give pilots much leeway or time to set up for or complete a successful turn.

Gradual widening and turning of the eastbound approach of the GIWW channel to the Texas City Channel is proposed to open up the junction of the two channels. This widening would result in a triangular-shaped area at the junction that would give pilots the room required to facilitate turning. The depth of the widened area would be constructed and maintained to elevation –14 feet MLT. With the

improved intersection in place, there would no longer be a need for the existing turning channel. Consequently, the channel would be abandoned.

Construction costs assume the junction widening would be performed in late 2004, taking 3 months to complete. The cumulative cost of maintaining the improved intersection for 50 years is estimated to be $5,880,000, including contingencies amounting to $1,146,000. The average shoaling rate was determined to be 0.09 cubic yards/linear foot. From shoaling analysis, it is estimated that an average of 123,075 cubic yards of material would shoal in the improved area every 5 years. New work material excavated to improve the Texas City Channel junction would be used beneficially to create a marsh behind the spit at the south end of Pelican Island. The newly created marsh would be approximately 50 acres in size.

Texas City Channel Federal Project

When the EIS process for the Shoal Point Container Facility was begun, the Federal project to deepen the Texas City Channel was not active, at the request of the local sponsor. During the preparation of the EIS, this issue was re-evaluated and a request has been made to the USACE to initiate feasibility studies for deepening the Texas City Channel to 45 feet. Based on this, it appears likely that a Federal feasibility study will be carried out. A possible and reasonably foreseeable outcome of such a study is that a deepening would be justified. This expected outcome is based on previous feasibility study results showing that deepening was economically justified by a substantial margin even when the cost of a portion of the entrance channel deepening was included in the analysis. With the entrance channel dredging already performed, the economic justification would be substantially stronger.

4.8.12 Conclusions

The direct and indirect effects of the proposed action on affected resources, ecosystems, and human communities are described in Section 4.0 of this EIS and in the preceding subsections of this Cumulative Effects discussion. Adverse impacts on natural resources in the region have resulted from general trends in population growth and economic development. Such effects are expected to continue to occur as a result of development related to normal growth in the region, including specific projects such as those described in previous sections. These impacts, and impacts resulting from the proposed action, combine and interact to result in cumulative effects upon the AOI. Potentially adverse cumulative effects associated with past and continued future development of the AOI include loss of habitat, air and water quality impacts, and conversion of land uses. Beneficial effects of development in the region include new economic opportunities, housing alternatives, employment opportunities and recreational resources.

Additional housing, infrastructure, and commercial and public land uses required to serve the projected population would result in continued development and land use changes in the region. Extensive residential development is proposed in many of the communities in the AOI. Restaurants, retail shops, marinas, office complexes, business parks, and convenience stores are among the commercial developments currently being designed or constructed. As development occurs, the need for additional infrastructure and services (schools, transportation, utilities, fire, police, and emergency medical services) increases. Transportation improvement projects in the region include highway, road, bridge, or overpass

construction, reconstruction, widening, or upgrades to accommodate current and projected traffic in the area. Residential, commercial, office and industrial types of development would be accompanied by increased economic opportunity and area employment.

Development impacts associated with normal growth in the region are expected to result in conversion of wetland, riparian, and upland habitats and agricultural lands into commercial, residential or industrial land uses, as well as additional infrastructure and services as people continue to move into the area. Habitat fragmentation from infrastructure construction or changes in land use have disrupted and dispersed fish and wildlife populations. Both natural and artificial processes, including historical, human-induced subsidence and relative sea level rise as well as draining and filling wetlands for development have resulted in the conversion of wetland habitats to open water or upland habitat. However, some losses have been partly offset by gains in emergent wetlands that took place in transitional areas peripheral to wetlands (related to subsidence or water management programs). Although there have been significant losses to wetlands and other habitats since the 1950s and the continued urbanization and industrialization of the Houston-Galveston area will cause continued pressure on these habitats and the ecosystem, efforts to preserve, restore and create valuable habitat are underway that should ensure the ecosystem's sustainability despite continuing pressure of development of the region. Beneficial uses of dredged material in Galveston Bay should aid in this effort by creating intertidal wetlands to support plant growth, fisheries, and wildlife while mitigating resource impacts associated with new dredging projects as well as maintenance dredging activities. To a large extent, impacts to wetlands and protected species within the AOI would be avoided, minimized, or mitigated by compliance with existing Federal statutes that apply to private and government interests.

Although historical water quality problems have been concentrated in the western urban tributaries, Galveston Bay has maintained good water quality overall. Water quality effects of dredging activities throughout the AOI would result primarily from turbidity associated with dredging activities; however, these impacts tend to be temporary and localized. Various existing and planned developments in the area have a potential cumulative water quality impact on the receiving water bodies due to wastewater discharges and urban runoff. Use of BMPs for controlling runoff and thereby limiting potential contamination of the open bay habitat, and spill prevention and control measures for minimizing impacts of accidental spills should result in minimal adverse impacts to water quality and aquatic resources.

As the HGA continues to experience growth in the regional population and economy, the resulting increases in traffic and industrial capacity would be expected to contribute to additional and varying amounts of air pollution emissions. Within the Houston-Galveston Air Quality Control Region (the HGA), ozone is the only criteria pollutant for which the region fails to meet the NAAQS. Even with increased growth in the area, historical ambient air monitoring data for the HGA indicates a long-term downward trend in ozone (H-GAC, 2000). This is generally the result of efforts made to reduce emissions from various sources of VOCs. Under current regulations, the HGA has until 2007 to attain the NAAQS for ozone. The TNRCC has the responsibility for developing the SIP for attaining the air quality standard in the HGA. The SIP sets emissions budgets for point sources, area wide sources, off-road mobile sources, and on-road sources. The emission control measures proposed in the December 2000 SIP revisions are expected to significantly reduce emissions of ozone precursors and provide attainment. In addition, reductions are also expected from expansion or improvement of high occupancy vehicle lanes,

traffic flow management, park-and-ride lots, public transportation, and rideshare programs. Emissions reductions consider the need to offset a potential increase in emissions due to growth in the region resulting in increased traffic and industrial capacity.

In addition to the control of emissions to facilitate attainment of the ozone standard, the TNRCC also has regulations in place to control emissions of other pollutants, even though the NAAQS for these pollutants is being met. These regulations affect sources of particulate matter, SO_2, hazardous air pollutants, and other air emissions from industrial facilities and are designed to provide for growth in a way that will continue attainment of the standards.

Air emissions from the proposed action added to other past, present and reasonably foreseeable future actions would be addressed by the regulatory framework described above. The TNRCC and EPA are responsible for monitoring and tracking air quality levels and the identification of potential air quality exceedances. Adjustments will be made to the SIP, as appropriate, to achieve and maintain continued attainment of the standards. In addition, within the HGA, industrial, community, and municipal groups are working cooperatively with the regulatory agencies to identify ways to continue to reduce emissions while allowing for growth in the area.

In conclusion, the many projects occurring in the general vicinity of the proposed Shoal Point Container Terminal are part of the continued urbanization and industrialization of Harris, Chambers and Galveston counties. The potential cumulative effects of these projects accompany this trend and will affect environmental, social, and economic receptors. However, existing governmental regulations, in conjunction with the goals and coordination of community planning efforts, address the many and varied issues that influence the local and ecosystem-level conditions. The vision, goals and, ultimately, the coordination of the numerous stakeholder groups by local organizations, and the regulatory powers of State and Federal programs in addition to regulations such as the TCMP, the Clean Water Act, and the Clean Air Act, serve to safeguard these resources and prevent or minimize negative impacts that would threaten the general health and sustainability of the region.

SECTION 5

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5.0 LIST OF PREPARERS

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Topic/Area of Responsibility	Name/Degree	Title
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Navigation; Dredged Material Management Plan/Beneficial Uses; Surface Water Quality and Hydrology	Paul Jensen, P.E. Ph.D., Civil & Environmental Engineering; M.S., Physical Oceanography; B.S., Marine Transportation	Vice President, Project Director
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	Yu-Chun Su, Ph.D., CPESC Ph.D., M.S., B.S., Civil Engineering	Senior Engineer
	Adrienne Boer M.A., Environmental Mgmt.; B.A., Environmental Science	Water Resources Specialist
Air Quality	Ruben Velasquez, P.E. B.S., Chemical Engineering	Senior Engineer, Air Quality Specialist
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	Jason Miller B.S., Civil Engineering	Engineer II, Transportation
	Sofia M. Ojeda, EIT B.S., Civil Engineering	Engineering Staff
Geology; Soils; Groundwater Quality and Hydrology	Martin Romanak M.S., B.S., Geology	Geologist, Hydrologist
Hazardous Materials	Steve McVey B.S., Geology	Geologist, HAZMAT Specialist
Vegetation; Jurisdictional Waters of the U.S. (Sect. 10/404); Endangered and Threatened Plant Species; Alternatives Analysis; Cumulative Effects	Kathy Calnan M.S., Biology; B.A., Geology	Ecologist, Botanist
Wildlife and Habitat; Endangered and Threatened Wildlife Species	Derek Green B.S., Zoology	Biologist, Wildlife Specialist, Program Manager
	Eric M. Huebner B.A., Geography	Staff Ecologist
Aquatic Species and Habitat; Endangered and Threatened Aquatic Species	Lisa Vitale M.S., Biology; B.S., Marine Biology	Marine Biologist
Freshwater Aquatics	Andrew Labay M.S., B.S., Aquatic Biology	Biologist, Aquatics Specialist
Historical/Cultural Resources, Terrestrial	Meg Cruse B.A., Anthropology/History	Archaeologist
Historical/Cultural Resources, Marine	Bob Gearhart M.A., B.A., Anthropology	Archeologist; Magnetometer and Side-Scan Sonar Specialist

Topic/Area of Responsibility	Name/Degree	Title
PBS&J (cont'd):		
Land Use; Environmental Justice; Noise	Kathie Martel Goldsmith M.A., B.A., Geography	Environmental Planner
	Thomas Ademski B.S., Resource and Environmental Studies	Environmental Planner
Cumulative Effects	Patsy Turner B.S., Horticulture	Ecologist, Botanist
	Krista Copeland M.S., Environmental Science; B.S., Environmental Biology	Environmental Scientist
FEIS Coordinator	Angela Bulger M.S., Environmental Biology B.S., Systematics and Ecology	Ecologist
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	Matt Qualls B.S., Geography	CAD/GIS Specialist
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	Tom Church B.S., Geography	CAD/GIS Specialist
	David Kimmerling	CAD/Graphics Specialist
	Bob Bryant B.A., Sociology	Senior Word Processing Operator
	Cindy Miller	Senior Marketing Coordinator
Subcontractor:		
Socioeconomics/Land Use	Mickey Fishbeck M.S.C.R.P., Community & Regional Planning B.A., Latin American Studies;	Principal; Urban Planner Rimrock Consulting Company Austin, Texas

SECTION 6

COORDINATION/CONSULTATION

6.0 COORDINATION/CONSULTATION

6.1 SCOPING PROCESS

A Notice of Intent (NOI) to prepare a DEIS for the construction of a containerized cargo terminal on Shoal Point, adjacent to the Texas City Channel, Texas City, Galveston County, Texas, was issued by the USACE, on August 31, 2000 (see Appendix H-1). Federal, State and local agencies and the public were invited to identify issues that should be addressed in the DEIS. During the scoping period, the USACE received responses from two Federal agencies and one State agency, and many local companies and individuals. The main concerns of area residents were traffic congestion near the site and dredging impacts.

A meeting with the resource agencies was held on October 3, 2000, at the Charles Doyle Convention Center in Texas City, Texas, from 2:00 to 4:00 P.M. to provide a project description, present the EIS process/schedule, and open a discussion of issues and comments with the agency representatives. Invitations were sent to EPA, FWS, NOAA, NMFS, FHWA, USCG, TxDOT, TNRCC, TPWD, GLO, and THC (see example letter and invitation list in Appendix H-2).

On September 1, 2000, the USACE issued a Public Announcement (Appendix H-3) to provide notice of a public open house and scoping meeting for the project. The Public Announcement also provided notice that the deadline for mailing comments to the USACE was November 3, 2000. The Public Open House was held at the Charles Doyle Convention Center in Texas City, Texas, on October 3, 2000, from 5:00 to 7:00 P.M. The Open House agenda included a project description, a description of the EIS process/schedule and public involvement opportunities. Directly following the Open House was a Public Scoping Meeting held to provide additional information including an applicant presentation of the purpose and need for the project, a project description, history of the project, previous coordination, and a list of major issues. A court reporter was present to transcribe comments made by the public during the scoping meeting. The official transcript of the meeting is on file at the USACE, Galveston District office. Public comments received during the scoping process were incorporated into the work plan for the DEIS.

6.2 OPTIONAL PUBLIC MEETINGS

A stakeholders' meeting held on February 27, 2001, was designed to gather suggestions, information and concerns from Galveston Bay stakeholder groups that might have an interest in the potential Beneficial Uses of the dredged material from the proposed project. An invitation list was developed by the Dredged Material Management workgroup to represent potentially interested parties/organizations (see example letter and invitation list in Appendix H-4). After a brief history of the project, the sites suggested by the Dredged Material Management workgroup were briefly described and comments were invited from the attendees.

The USACE Galveston District held a Public Workshop on April 24, 2001, to provide an update to the public on the proposed project and the EIS process (see Public Announcement in Appendix H-5). The workshop was set up in an informal "Open House" format, with stations providing

information on several topics of interest: project description, alternatives analysis, land transportation, air quality, dredged material management, water transportation, and EIS process/schedule.

An Omega Bay Homeowners' Meeting was held on May 16, 2001, in Hitchcock, Texas. The project team invited homeowners to ask questions regarding the effects of the proposed project on the Omega Bay neighborhood. The majority of the public comments received by the USACE from Omega Bay residents were regarding truck traffic congestion on the frontage road at Exit 7 off IH 45.

6.3 AGENCY COORDINATION

To address the complex issues associated with the proposed project, the following Federal and State agencies were formally invited by the USACE to provide technical advice during the preparation of the EIS: NMFS, USCG, FWS, EPA, FHWA, TNRCC, GLO, and TxDOT. Written agency responses were received by the USACE from FWS, EPA, and TxDOT (see invitation letters and responses in Appendix H-6). In addition, the agencies responded by having their representatives attend the coordination meetings and offered their technical support, recommendations, reviews and comments.

Interagency work groups were formed to study the main issues related to the proposed terminal. Groups were formed to study issues related to air quality, land-based and marine traffic, dredged material management and alternative site locations. The following Federal, State and local agencies and groups were involved in the work groups: NMFS, NOAA, USCG, FWS, EPA, FHWA, TNRCC, TPWD, GLO, TxDOT, Galveston County Health Department, H-GAC, Galveston-Texas City Pilots, Port of Texas City, City of Texas City, and Audubon Society.

A TCMP consistency statement was signed by the applicant and sent to the USACE Galveston District office on June 23, 2000, as part of the Section 404/10 permit coordination (see Appendix H-7). It stated: "The proposed activity complies with Texas' approved coastal management program and will be conducted in a manner consistent with such program." By letter dated 12 September 2002 (see Appendix H-7), the Texas GLO informed the City of Texas City that the TCEQ (formerly TNRCC) will be responsible for determining the project's consistency with the goals and policies of the TCMP, and that this determination will accompany the Section 401 certification for the project.

As the third-party contractor for the EIS, PBS&J sent a letter to FWS to request information regarding endangered and threatened species of potential occurrence in the project vicinity. The request and response from FWS are included in Appendix H-8.

Coordination with EPA, TNRCC, and H-GAC regarding air quality issues has been ongoing throughout the EIS preparation process. At the request of EPA, TNRCC and H-GAC drafted letters relating to the SIP General Conformity Determination. The H-GAC letter (see Appendix H-9) discusses inclusion of the proposed project in the Regional Metropolitan Transportation Plan. The December 21, 2001, TNRCC letter (see Appendix H-9) presents the General Conformity budgets used in analyzing the impacts of the proposed project. The Mayor of the City of Texas City wrote a letter to the TNRCC to document the commitments the project sponsors have made with regard to emission controls (see letter in Appendix H-9). In response to comments received from EPA on the DEIS, the TNRCC prepared a letter to clarify that operating emissions from both the Shoal Point Container Terminal and the

Bayport Container Terminal projects are consistent with the HGA SIP and to confirm that secondary emissions resulting from growth in the region expected to occur as a result of the proposed container terminals are also accounted for in the HGA SIP (see letter in Appendix H-9). Based on the emission calculations provided to the TNRCC and the commitment letter provided by the City of Texas City, TNRCC provided their General Conformity Determination (see letter in Appendix H-9). The public notice regarding this determination was distributed in conjunction with this Final EIS.

An interim letter report providing a summary of the results of a cultural resources remote-sensing survey of the Shoal Point area is included in Appendix H-10.

Additional agency coordination that is in progress and will likely be completed during preparation of the Record of Decision includes coordination with the TNRCC regarding Clean Water Act Section 401 certification and consultation with NMFS regarding potential effects on EFH.

Correspondence and meeting minutes included in Appendix H-15 document the coordination that is in progress among the City of Texas City, Galveston County, the City of La Marque, and TxDOT with regard to an alternative truck route for truck traffic that is expected to use IH 45 to access the proposed container terminal.

6.4 EIS REVIEW PROCESS

The Notice of Availability of the DEIS was published in the Federal Register on January 4, 2002 (see Appendix H-13). This notice initiated a 45-day comment period during which comments were solicited from Federal, State, and local agencies, interest groups, and individuals. The comment period ended on February 19, 2002. Comments received during the comment period are presented in Appendix J-1 through J-3, along with responses to the comments that were prepared as a part of this FEIS.

On December 28, 2001, the USACE issued a Public Notice (see Appendix H-14) to announce the release of the DEIS, the Draft General Conformity Determination, and the revised permit application. The Public Notice also provided notification to the public of the comment period on the DEIS and the date and location of the Public Hearing on the DEIS. The Public Hearing was held on 29 January 2002 at the Charles Doyle Convention Center in Texas City, Texas. A public workshop preceded the hearing from 5:00 to 6:30 P.M., and the hearing commenced at 7:00 P.M. During the workshop, poster presentations were available for viewing, and project team members were present to discuss the DEIS with members of the public. Comments made by the public during the hearing were transcribed by a court reporter. The official hearing transcript is included in Appendix J-4, along with responses to the comments made during the hearing that were prepared as part of this FEIS.

The Notice of Availability of this FEIS in the Federal Register initiates a 30-day review period. Comments on the FEIS will be received by the USACE during this period. The USACE will consider all comments received during the review periods in making its decision on the Section 404/10 permit action. A Record of Decision will then be issued which will document the end of the NEPA process and the USACE's final permit decision.

SECTION 7

LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE FINAL STATEMENT ARE SENT

7.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE FINAL STATEMENT ARE SENT

The following agencies, organizations, and persons were sent copies of this EIS.

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National Marine Fisheries Service
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U.S. Coast Guard
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U.S. Coast Guard
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Houston-Galveston Area Council
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SECTION 8

BIBLIOGRAPHY

8.0 BIBLIOGRAPHY

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SECTION 9

GLOSSARY

9.0 GLOSSARY

The following definitions are for the convenience of those reading this Environmental Impact Statement and do not replace definitions in state, Federal, or local laws, regulations and ordinances.

aquifer – An underground bed or stratum of earth, gravel, or porous stone that contains water.

anthropogenic – Relating to, or resulting from, the influence of humans on nature (e.g., anthropogenic pollution).

aquitard – A fine-grained or confining layer having very low hydraulic conductivity.

arcuate – Curved or bowed.

bathymetry – The measurement of depths of water in oceans, seas and lakes and the information derived from such measurements.

benthos – Aquatic bottom dwelling organisms which include worms, leeches, snails, flatworms, burrowing mayflies, clams.

best management practice (BMP) – A practice or combination of practices determined to be the most practicable means of preventing or reducing, to a level compatible with environmental goals, the amount of pollution generated by nonpoint sources. BMPs are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility.

bioaccumulation – The accumulation of contaminants in the tissues of organisms through any route, including respiration, ingestion, or direct contact with contaminated water, sediment, or dredged material.

biomass – The mass of living material in a given area or volume of habitat.

brackish water – A mixture of fresh and salt water.

coastal zone – Coastal waters and adjacent lands that exert a measurable influence on the uses of the sea and its ecology.

carbon dioxide (CO_2) – A colorless, odorless, nonpoisonous gas that is a normal part of the ambient air. CO_2 is a product of fossil fuel combustion, and some researchers have theorized that excess CO_2 raises atmospheric temperatures.

chassis – Special trailer or undercarriage on which containers are moved over the road.

confined disposal – Placement of dredged material within diked nearshore or upland confined disposal facilities (CDFs) that enclose the disposal area above any adjacent water surface, isolating the dredged material from adjacent waters during placement. Confined disposal does not refer to subaqueous capping or contained aquatic disposal.

container – A box for transporting cargo, constructed with varying dimensions and to withstand transportation stresses.

contaminant – A chemical or biological substance in a form that can be incorporated into, onto, or be ingested by and that harms aquatic organisms, consumers of aquatic organisms, or users of the aquatic environment.

crestal graben – A block that has been downthrown along faults relative to rocks on either side.

crustacean – A group of aquatic animals characterized by jointed legs and a hard shell which is shed periodically, e.g., shrimp, crabs, crayfish, isopods, and amphipods.

demersal – At or near the bottom.

detritivores – Organisms that feed on detritus (fragments of plant or animal remains).

diapir – A dome or anticlinal fold in which a mobile core (e.g., salt) has broken through the overlying sedimentary strata.

dissolved solids – The total amount of dissolved material, organic and inorganic, contained in water or wastes. Excessive dissolved solids make water unpalatable for drinking and unsuitable for industrial uses.

dredged material – Material excavated from waters of the United States or ocean waters. The term dredged material refers to material which has been dredged from a water body, while the term sediment refers to material in a water body prior to the dredging process.

DWT – Deadweight tonnage; a ship's load, including the total weight of the cargo, fuel, and stores.

effluent – A discharge of pollutants into the environment, partially or completely treated or in its natural state. Generally used in regard to discharges into waters.

EIS – Environmental impact statement. A document prepared on the environmental impact of actions significantly affecting the quality of the human environment and used as a tool for decision-making.

epifauna – Benthic animals which crawl about on the sea bottom, or sit firmly attached to it.

evaporite – Sediments that are deposited from aqueous solution as a result of extensive or total evaporation.

ex-vessel value – The value of the actual fish harvest, factoring out fluctuating operational costs such as price of diesel fuel, etc.

FCL – Full container load; used to indicate that the load carried in a container equals one of the two operating maxima: weight or volume.

floodplain – The flat, low-lying portion of a stream valley subject to periodic inundation.

genus – A category of biological classification ranking between the family and the species, comprising structurally or phylogenetically (evolutionary relationship) related species and being designated by a Latin or latinized capitalized singular noun.

groundwater – The supply of freshwater under the earth's surface in an aquifer or soil that forms the natural reservoir for man's use.

habitat – The specific area or environment in which a particular type of plant or animal lives. An organism's habitat provides all of the basic requirements for the maintenance of life. Typical coastal habitats include beaches, marshes, rocky shores, bottom sediments, mudflats, and the water itself.

hydrogen sulfide (H_2S) – A malodorous gas made up of hydrogen and sulfur with the characteristic of odor of rotten eggs. It is emitted in the natural decomposition of organic matter and is also the natural accompaniment of advanced stages of eutrophication. H_2S is also a byproduct of refinery activity and the combustion of oil during power plant operations. In heavy concentrations, it can cause illness.

infauna – Animals which live within the sediment of the sea bottom.

inmigrant – One who moves into or comes to live in a region or community.

intertidal zone – The marine zone between the highest high tide point on a shoreline and the lowest tide point. The intertidal zone is sometimes subdivided into four separate habitats by height above tidal datum, typically numbered 1 to 4, land to sea.

isopod – A small, flattened crustacean belonging to the order Isopoda.

lagoon – A shallow body of seawater generally isolated from the ocean by a barrier island. Also the body of water enclosed within an atoll, or the water within a reverse estuary.

larva (pl. **larvae)** – An embryo that differs markedly in appearance from its parents and becomes self-sustaining before assuming the physical characteristics of its parents.

lead – A heavy metal that may be hazardous to human health if breathed or ingested.

mercury – A heavy metal, highly toxic of breathed or ingested. Mercury is residual in the environment, showing biological accumulation in all aquatic organisms, especially fish and shellfish. Chronic exposure to airborne mercury can have serious effects on the central nervous system.

nekton – Free-swimming organisms inhabiting the open water.

open-water disposal – Placement of dredged material in rivers, lakes, estuaries, or oceans via pipeline or surface release from hopper dredges or barges.

organism – Any living human, plant, or animal.

overfishing – Harvesting so many fish that there is not enough breeding stock left to replenish the species.

Panamax – Refers to the maximum dimensions of a vessel in order to transit the Panama Canal (maximum beam of 32.3 meters or 106 feet).

particulate matter – Very fine solid or liquid particles in the air or in an emission, including dust, fog, fumes, mist, smoke, and spray, etc.

PCB – Polychlorinated biphenyls, a group of organic compounds used in the manufacture of plastics. In the environment, PCBs exhibit many of the same characteristics as DDT and may, therefore, be confused with that pesticide. PCBs are highly toxic to aquatic life, they persist in the environment for long periods of time and are biologically accumulative.

"permitted" – Used by TNRCC personnel to mean 1) required to have a permit from the TNRCC or 2) having received such a permit through a process that includes a written application and a formal review by the agency.

phytoplankton – Plantlike, usually single-celled members (generally microscopic) of the plankton community.

planktivores – Organisms that feed on plankton.

plankton – Drifting or weakly swimming organisms suspended in water. Their horizontal position is to a large extent dependent on the mass flow of water rather than on their own swimming efforts.

planktivores – organisms that feed on plankton

planktonic – Floating in the water column.

Post-Panamax – Refers to vessels with maximum beam dimensions of 32.3 meters (106 feet) and greater (also see Panamax).

producers – Photosynthetic green plant or chemosynthetic bacteria, constituting the first feeding level in a food chain.

prograding – A seaward advance of the shoreline resulting from nearshore deposition of sediments.

Record of Decision – A comprehensive summary required by National Environmental Policy Act that discusses the factors leading to U.S. Army Corps of Engineers (USACE) decisions on regulatory and Civil Works matters and is signed by the USACE District Engineer after completion of appropriate environmental analysis and public involvement.

river basin – The 23 historically recognized drainage areas for the major rivers and coastal areas within the state of Texas.

runoff – The portion of rainfall, melted snow, or irrigation water that flows across ground surface and eventually is returned to streams. Runoff can pick up pollutants from the air or the land and carry them to receiving waters.

sediment – The layer of soil, sand, and minerals at the bottom of surface water that absorbs contaminants.

shoalgrass – Seagrass species (*Halodule beaudettei*); submerged perennial, restricted to shallow, saline coastal bays.

shrink-swell – Refers to clays or soils which alternately expand and contract in a semiarid climate where drying out is possible.

soil surcharge – The material used to consolidate poorly drained soils; consolidation of poorly drained soils.

Superfund – The common name used for the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

surface water – Water on the earth's surface exposed to the atmosphere as rivers, lakes, streams, and oceans.

SVOC – semivolatile organic compound.

swash – The rush of water onto the beach following the breaking of a wave.

throughput – The amount of cargo that reasonably can be expected to be processed, given the physical facilities available, the operating conditions present and the business conditions characteristic of the trade in which the terminal is engaged.

TNRCC – Texas Natural Resource Conservation Commission. On September 1, 1993, the Texas Air Control Board, Texas Water Commission, and parts of the Texas Department of Health merged and became the TNRCC.

toxic pollutant – Pollutants, or combinations of pollutants, including disease-causing agents, that after discharge and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will, on the basis of information available to the Administrator of the U.S. Environmental Protection Agency, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, or physical deformations in such organisms or their offspring.

TPDES – Texas Pollutant Discharge Elimination System. The major program for regulating municipal and industrial wastewater discharges through the permitting of wastewater treatment facilities. In 1998, TNRCC took over the administration of this program in Texas, formerly the NPDES, administered by the U.S. EPA.

transmissivity – The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient.

TRI – Toxics Release Inventory. A Federal inventory of approximately 650 harmful chemicals or classes of chemicals released to the environment or transferred off-site by specific industries in the U.S.

turbidity – An optical measure of the amount of material suspended in the water. Increasing the turbidity of the water decreases the amount of light that penetrates the water column. High levels of turbidity may be harmful to aquatic life.

weaving – The crossing of two or more traffic streams traveling in the same direction along a significant length of highway, without the aid of traffic control devices (except for guide signs).

wetlands – Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and that, under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated-soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (40 CFR Part 230), especially areas preserved for wildlife, zooplankton (planktonic animals that supply food for fish).

VOC – Volatile organic compounds. Secondary petrochemicals, including light alcohols, acetone, trichloroethylene, perchloroethylene, dichloroethylene, benzene, vinyl chloride, toluene, and methylene chloride, which are used as solvents, degreasers, paint thinners, and fuels. Because of their volatile nature, they readily evaporate into the air, increasing the potential exposure to humans. Due to their low water solubility, environmental persistence and widespread industrial use, they are commonly found in soil and groundwater.

zooplankton – Animal members of the plankton community.

SECTION 10

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