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FINAL REPORT FREEPORT HARBOR, TEXAS CHANNEL IMPROVEMENT PROJECT

COMMUNICATION

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THE FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT, BRAZORIA COUNTY, TEXAS FEASIBILITY REPORT AND ENVIRONMENTAL IMPACT STATEMENT

PART 2 OF 2

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VOLUME I

FINAL

ENVIRONMENTAL IMPACT STATEMENT

FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT BRAZORIA COUNTY, TEXAS

U.S. Army Corps of Engineers, Galveston District
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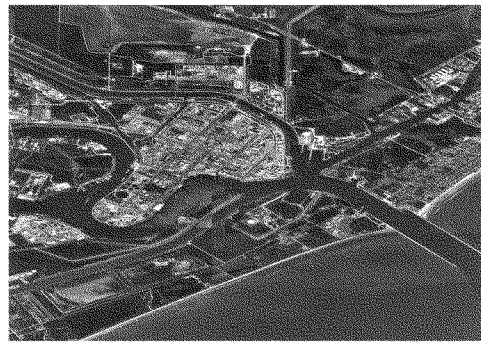
Galveston, Texas 77550



September 2012

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT BRAZORIA COUNTY, TEXAS

The U.S. Army Corps of Engineers, Galveston District (USACE), under the authority of Section 216 of the 1970 Flood Control Act, proposes to deepen and selectively widen the Freeport Channel system.

This Environmental Impact Statement (EIS) was prepared as required by the National Environmental Policy Act (NEPA) to present an evaluation of potential impacts of the proposed Freeport Harbor Channel Improvement Project. The proposed project includes deepening and selective widening of the Freeport Harbor Channel and associated turning basins (except Brazos Harbor), from the Outer Bar and Jetty channels, through the Lower Turning Basin up to the Brazosport and Upper turning basins, and upstream through the Stauffer Channel to the Stauffer Turning Basin. The EIS addresses the potential impacts of the proposed project on the human environment, as identified during the public interest review, including placement of dredged material. All factors that may be relevant to the proposed project were considered, including the following: dredged material management, air quality, shoreline erosion, economics, general environmental concerns, historic resources, protected species, navigation, recreation, water and sediment quality, energy needs, hazardous materials, and, in general, the welfare of the people. This EIS provides relevant information to the public on the potential impacts of the proposed project. Public and agency comments received during the Draft Environmental Impact Statement (DEIS) comment period are addressed in this EIS. The public and agency comments on the findings of the EIS will be addressed in the Record of Decision (ROD).

Comments on this EIS must be postmarked by:

October 9, 2012
Date

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ES.1 INTRODUCTION

The U.S. Army Corps of Engineers, Galveston District (USACE) joined in an agreement with the Brazos River Harbor Navigation District (now named Port Freeport) to conduct a feasibility study and prepare an Environmental Impact Statement (EIS) for proposed improvements to the Freeport Harbor Channel. The Freeport Harbor Channel Improvement Project (FHCIP) proposes to deepen and selectively widen the Freeport Harbor Channel and associated turning basins (except Brazos Harbor Turning Basin), up to and including the Stauffer Turning Basin to eliminate existing operational constraints. The USACE is the lead agency for this project, with no cooperating agencies. This EIS was prepared as required by the National Environmental Policy Act to present an evaluation of potential impacts associated with the proposed FHCIP.

ES.2 PURPOSE AND NEED

The purpose of the proposed project is to deepen and selectively widen the Freeport Harbor Channel to eliminate existing operational constraints, including one-way traffic, daylight-only operations for larger vessels, and restrictions when winds exceed 20 knots or crosscurrents exceed 0.5 knot. Maximum ship dimensions currently permitted by the Brazos Pilots Association (BPA) are 825 feet length overall, 145-foot maximum beam, and 42-foot draft. Currently, large crude carriers calling at the port remain offshore for lightering operations, where cargo is transferred to smaller crude tankers to enter Freeport Harbor Channel and deliver product. Current shipping projections suggest that crude imports are on the increase and will continue to increase in the future. Increases in imports will also increase the number of lightering operations, adding to shipping delays, congestion, and the risk of collision or spill.

The project need is to better facilitate the control and flow of ship traffic and reduce shipping costs. Currently, light-loading, one-way traffic, and daylight-only operation for larger vessels result in significantly higher costs to Port Freeport users. Port Freeport has decided to move forward with a permit project to widen the Freeport Harbor Channel Outer Bar and Jetty channels to 600 feet (Widening Project). As part of the permitted Widening Project, Port Freeport seeks Federal assumption of maintenance for channel improvements. Since the Widening Project is likely to be constructed prior to authorization of the FHCIP, it is expected that constraints associated with the 400-foot channel width would be reduced or eliminated. Deepening the channel will address other needs by allowing larger vessels to navigate the channel, reducing costs and delays associated with lightering and lightening operations. Port Freeport experienced strong tonnage growth over the past decade, with national statistics showing Port Freeport ranking 26th in 2008 in the Nation in terms of total tonnage, compared to 38th in the early 1990s. Although general cargo and containerized cargo are handled at Port Freeport, crude petroleum imports account for the majority of throughput. The proposed channel

improvement project would allow the economic benefits that will result from an improved channel to be realized.

ES.3 TIDAL DATUM CONVERSION

All elevations referred to in this report, unless specifically noted otherwise, are based on USACE Galveston District's local Mean Low Tide (MLT) datum. This project is a compilation of National Geodetic Vertical Datum of 1929 (NGVD 29) and the newer North American Vertical Datum of 1988 (NAVD 88). Final plates are shown in North American Datum (NAD 83, Texas State Plane Coordinate System, South Central Zone).

USACE has an established survey control network along the Freeport Harbor Channel. To comply with the guidance on referencing tidal datums using Mean Lower Low Water (MLLW), as required by current guidance, USACE took vertical survey measurements at tide gages and benchmarks to estimate the relative difference between MLT and MLLW datums along the Freeport Channel. The objective was to maintain an effective water depth of 55 feet while correctly referencing resulting water surface level in MLLW. At Freeport Channel, datum values for MLLW are +1 foot above MLT. However, this does not result in increased water depth, as the additional +1 foot of nominal depth is actually +1 foot above the normal surface water level. Therefore, the actual water depths are equivalent between a 55-foot MLT channel template and a 56-foot MLLW channel template. As the study and its documentation were completed using MLT, references to MLT have been maintained throughout this document. As the project moves to Preconstruction, Engineering, and Design phase, tidal data references will be documented as MLLW.

ES.4 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

Alternatives evaluated for the proposed project include different channel depth and width alternatives and alternatives for placement of the dredged material. Five alternatives were identified and suggested in the 2002 Galveston District Reconnaissance Report Section 905(b) Analysis. Formulation of alternative alignments and selection of dredged material placement areas (PAs) included an evaluation and analysis of historical and projected shoaling rates, erosion causes and rates, and general structural and nonstructural alternatives applicable for conditions specific to the project area. Channel widths and depths were determined by ship simulations based on information from the BPA and Engineer Research and Development Center and operational input from Port Freeport.

The existing Freeport Harbor Channel system begins approximately 5.7 miles seaward of the coastal jetty tips at the 47-foot depth contour in the Gulf of Mexico (Gulf), and continues upstream through the Freeport Harbor Outer Bar and Jetty channels, and winds westward for approximately 5.5 miles into Freeport to the Stauffer Channel Turning Basin. The Stauffer

Channel and Turning Basin was deauthorized in 1974. An analysis of jetty stability indicated that the maximum channel width should not exceed 600 feet. Thus, 500- and 600-foot channel widths were considered with depths ranging between 50 and 60 feet.

Incremental cost analysis and consideration of potential economic, environmental, and social impacts resulted in the identification of the National Economic Development (NED) Plan Alternative, which is referred to as the 60-x-540-foot project because the width of the Jetty Channel would be restricted to 540 feet. This alternative proposes to extend the Outer Bar Channel (Channel Extension) 3.2 miles farther into the Gulf at a depth of 62 feet (–63 MLLW) and a width of 600 feet, deepen the existing Outer Bar Channel to 62 feet (–63 MLLW) and the Jetty Channel to 60 feet (–61 MLLW), deepen the Lower Turning Basin and Main Channel through Station 132+66 (just above the Brazosport Turning Basin) to 60 feet (–61 MLLW) and widen the Brazosport Turning Basin to 1,200 feet, deepen the channel from Station 132+66 through the Upper Turning Basin to 50 feet (–51 MLLW), deepen and widen the Lower Stauffer Channel to 50 feet (–51 MLLW) by 300 feet, and dredge the Upper Stauffer Channel to 25 feet (–26 MLLW) deep by 200 feet wide in lieu of restoring its previously authorized dimensions of 30 feet (–31 MLLW) by 200 feet. Construction of the NED Alternative would generate approximately 20.4 million cubic yards (mcy) of dredged material. Maintenance of the deepened and widened channel is expected to generate a total of 190.5 mcy of maintenance dredged material over the 50-year evaluation period.

Port Freeport prefers the smaller and less costly 55-x-600-foot plan, referred to as the Locally Preferred Plan (LPP) Alternative. This alternative proposes to extend the Outer Bar Channel (Channel Extension) 1.3 miles further into the Gulf at a depth of 57 feet (–58 MLLW) and a width of 600 feet, deepen the existing Outer Bar Channel to 57 feet (–58 MLLW) and the Jetty Channel to 55 feet (–56 MLLW), deepen the Lower Turning Basin and Main Channel through Station 132+66 (just above the Brazosport Turning Basin) to 55 feet (–56 MLLW) and widen the Brazosport Turning Basin to 1,200 feet, deepen the channel from Station 132+66 through the Upper Turning Basin to 50 feet (–51 MLLW), deepen and widen the Lower Stauffer Channel to 50 feet (–51 MLLW) by 300 feet wide, and dredge the Upper Stauffer Channel to 25 feet (–26 MLLW) deep by 200 feet wide in lieu of restoring its previously authorized dimensions of 30 feet (–31 MLLW) by 200 feet. Construction of the LPP Alternative would generate approximately 14.4 mcy of new work dredged material. Maintenance of the deepened and widened channel would generate an anticipated 175.9 mcy of maintenance dredged material over the 50-year evaluation period. Although the benefits associated with this plan are slightly less, less dredged material is generated and this plan meets specific operational (business) objectives set forth by Port Freeport for specific competitive advantages; therefore, the USACE has selected the LPP Alternative as the Preferred Alternative for implementation.

New work material dredged from the Outer Bar and Jetty channels during construction would be placed in the existing New Work Ocean Dredged Material Disposal site (New Work ODMDS),

and the remainder of the new work material would be placed in existing upland confined PA 1 and proposed PAs 8 and 9. Material dredged from the Outer Bar and Jetty channels and the Lower Turning Basin during maintenance cycles would be placed in the existing Maintenance Material ODMDS (Maintenance ODMDS), and maintenance material from the remainder of the channel would be placed in PAs 1, 8, and 9.

In addition to the NED and LPP alternatives, two no action alternatives are evaluated in this EIS. A traditional No Action Alternative assumes that the present conditions associated with the project would continue into the future. For the FHCIP, however, two possible future conditions could occur. Port Freeport is pursuing widening to 600 feet but not deepening of the Outer Bay and Jetty channels (Widening Project) by permit, and it is assumed that channel widening will likely be completed prior to construction of the proposed Federal FHCIP. Therefore, the first Future Without-the-Project (FWOP) Alternative (FWOP-1) assumes that the Widening Project has been constructed and is part of the future condition. However, in the event Port Freeport does not construct the Widening Project, a second FWOP condition must be considered. The second FWOP Alternative (FWOP-2) was formulated to describe future project conditions if the permit action did not occur. In this discussion, FWOP-1 is used as the basis for comparing other project alternatives, while FWOP-2 is described only for scenario purposes and will not be carried forward as a basis for comparison.

ES.5 POTENTIAL ENVIRONMENTAL IMPACTS

The EIS addresses the potential impacts of the proposed project on human and environmental resources identified during the public interest review, including placement of dredged material. All factors that may be relevant to the proposed project were considered, including the following: dredged material management, air quality, shoreline erosion, economics, historic resources, protected species, recreation, water and sediment quality, energy needs, hazardous materials, and, in general, the welfare of the people. The following provides a brief description of potential impacts that were identified. Impacts between the NED and LPP alternatives were essentially equivalent, unless otherwise noted.

Environmental Setting

The existing Freeport Harbor Channel 45-Foot Project extends from deep water in the Gulf and continues landward into the inner channel reaches of Freeport Harbor. Freeport Harbor is located on the Old Brazos River Channel, which dead-ends farther upstream near State Highway 288, a major transportation corridor. The waterway is heavily developed with industrial and commercial properties, including petrochemical manufacturing, warehousing, and related businesses. The waterway serves as a major transportation corridor for waterborne commerce including tankers, freighters, tugs, barges, and offshore supply boats, as well as recreational vessels. The inner channel reaches are relatively low in biological productivity and are largely devoid of natural

habitats. Existing vegetation is sparsely distributed, and no significant or sensitive terrestrial or aquatic habitats exist within or along the project area.

Water and Sediment Quality

No water or sediment quality concerns were identified in a review of historic and current data. Potential impacts from ballast water releases would be slightly increased because channel improvements are likely to provide the opportunity for additional growth at Port Freeport resulting in increased ship traffic. Texas Commission on Environmental Quality (TCEQ) has concurred that there is reasonable certainty that the proposed project would not violate water quality standards and has provided water quality certification for the Preferred Alternative.

Air Quality

The Preferred Alternative is expected to increase air emissions in the Houston-Galveston-Brazoria Air Quality Control Region, which is currently classified as a severe nonattainment area for ozone. An analysis of estimated emissions associated with proposed channel improvements indicates that there may be short-term impacts on air quality in the immediate vicinity of the project area, but no long-term impacts are expected. However, the estimated project emissions of nitrous oxides (NO_X) are expected to exceed the conformity threshold of 25 tons per year (945 peak estimated tons per year for the NED Alternative and 883 peak estimated tons per year for the LPP Alternative). Pursuant to Section 176 of the Clean Air Act Amendments of 1990, a Draft General Conformity Determination has been filed and coordination initiated with TCEQ and the U.S. Environmental Protection Agency (EPA) to determine whether the proposed action is compliant with the State Implementation Plan (SIP). The Draft General Conformity Determination was noticed with the Draft Environmental Impact Statement in December 2010.

Based on the General Conformity Concurrence letter provided by TCEQ, USACE has prepared a Final General Conformity Determination (Appendix C) to document that emissions that would result from the proposed FHCIP are in conformity with the Texas SIP for the Houston-Galveston-Brazoria (HGB) nonattainment area. A Notice of Availability of this document was published in the newspaper of general circulation in Brazoria County concurrent with the EIS and was submitted to TCEQ, EPA, and the Brazoria County Health Department, the local air pollution control program.

The TCEQ and USACE's determination of conformity is based on the emissions information and project schedule proposed at the time. Once a final project schedule is completed, USACE will provide an update of the General Conformity documentation to TCEQ and EPA for review and concurrence that the updated emissions and schedule will still be conformant with the currently approved Houston-Galveston area SIP.

Noise

Noise impacts associated with the proposed action are expected to be short term and would be only slightly higher than those that occur during current maintenance dredging for the existing channel. Reauthorization of Stauffer Channel and Turning Basin would result in slightly elevated noise levels at sensitive receptors near the turning basin.

Geology, Mineral Resources, and Soils

Construction of PA 9 would convert approximately 250 acres of prime farmland to a Dredged Material Placement Area (DMPA). Additionally, approximately 132 acres of prime farmland is included in an area that would be preserved as part of the proposed mitigation. Because these areas would no longer be available for use as farmland in the future, preservation is considered an impact to prime farmland. The AD-1006 form was completed by the Natural Resources Conservation Service for both areas, and no additional coordination regarding these impacts is needed (Appendix A-4).

Nine petroleum pipelines were identified that cross Freeport Harbor Channel and proposed DMPAs. At this time, the Galveston District has determined that all pipelines are deep enough so that no pipeline relocations are needed.

Groundwater Hydrology

Potential impacts to groundwater could occur from accidental spill of petroleum products from equipment used during construction. Use of Best Management Practices during construction would minimize this potential. No impacts to water wells are expected because of the nature of the aquifer system and the difference in depth between the FHCIP depth (about 60 feet) and the shallowest well in the area (about 240 feet).

Hazardous, Toxic, and Radioactive Waste

The proximity of industrial facilities increases the potential for encountering hazardous material. A Hazardous, Toxic, and Radioactive Waste (HTRW) survey was conducted that included a thorough database review, review of historic aerial photography, a site visit, and interviews with local persons knowledgeable of the area. No known HTRW sites were identified in the project area footprint, and no active enforcement actions were under way at the time of assessment. The relatively impermeable nature of the new work material (clay) to contaminants, and previous sediment analyses indicate the probability of encountering contaminants at concentrations of concern during construction is unlikely to be an issue.

Vegetation and Wetlands

Construction of two new upland confined PAs, PAs 8 and 9, would convert approximately 418 acres of land, including 21 acres of forest and 39 acres of ephemeral wetlands, to a DMPA. Coordination with U.S. Fish and Wildlife Service (USFWS) and Texas Parks and Wildlife Department (TPWD) regarding these impacts has resulted in proposed mitigation that includes creation and maintenance of forested habitat and creation of wetland areas adjacent to impact areas.

Terrestrial and Aquatic Wildlife (Including Essential Fish Habitat)

No long-term impacts to terrestrial or aquatic species are expected. Temporary impacts may occur during construction from increased noise and turbidity. Benthic macroinvertebrate communities are likely to shift from the current composition to that of more-opportunistic species. Similar shifts in benthic community composition can be expected at the Maintenance ODMDS as now occurs. The benthic community at the New Work ODMDS is expected to recover over time following placement of the new work material. Impacts to Essential Fish Habitat are not expected to be significant.

Protected Species

Dredging activities could result in the incidental take of federally protected sea turtles that may occur in the project area. A Biological Assessment that incorporates the terms and conditions of the existing Gulf of Mexico Regional Biological Opinion dated November 19, 2003, has been prepared (Appendix I). Endangered Species Act Section 7 consultation will be required for this project. Impacts to other Endangered Species and piping plover critical habitat in the vicinity of the project area are not anticipated.

Cultural Resources

A thorough file review did not identify any National Register of Historic Places–listed or –eligible sites or State Archeological Landmarks within the project footprint. Research conducted for PAs 8 and 9 indicate potential Civil War remains in the vicinity of PA 9 that will be addressed under a Programmatic Agreement (PAg), negotiated with the Texas State Historic Preservation Officer (Appendix E). Compliance with the PAg places the project in compliance with Section 106 of the National Historic Preservation Act.

Land Use, Recreation, Aesthetics, and Socioeconomics

Minimal or no impacts to land use, recreation, aesthetics, or socioeconomics are expected to result from the proposed project. Reduced navigation restrictions and increased efficiency at the

port is likely to have a positive economic benefit in the local community, which could result in increased development in the area.

Storm Surge

The proposed channel improvements are not expected to result in increased storm surge elevations inside the jetties. Likewise, the proposed channel improvements are not expected to have a substantial effect on the level of protection offered by the current levee system.

The proposed FHCIP would have only minor impacts to adjacent shorelines for 3 to 4 miles from the jetties. These minor changes would not be expected to differ from natural variation currently seen along these shorelines.

Aircraft Wildlife-Strikes

A Memorandum of Agreement was executed among the Federal Aviation Administration, the U.S. Air Force, the U.S. Army, EPA, USFWS, and the U.S. Department of Agriculture to address the potential for aircraft-wildlife strikes throughout the United States, regarding Federal projects occurring within 5 miles of an airport. There are no airports located within 5 miles of the proposed project area. Therefore, the risk of aircraft-wildlife strikes is considered to be negligible, and no further coordination is required.

ES.6 MITIGATION

Mitigation refers to the avoidance, minimization, and rectification, reduction, or compensation of impacts resulting from implementation of an action. For the proposed FHCIP, the majority of potential project-related impacts were avoided. Thus, mitigation would be required only for impacts to forested and wetland habitats at the proposed new upland PAs.

Construction of two new upland PAs, PAs 8 and 9, would convert approximately 418 acres of land, including 21 acres (7.41 average annual habitat units [AAHUs]) of riparian forest and 39 acres (1.1 AAHUs) of ephemeral wetlands, to dredged material PAs. Coordination with USFWS and TPWD regarding these impacts has resulted in a proposed mitigation plan that includes creation and maintenance of riparian forest habitat (12 acres and 7.7 AAHUs) and creation of wetland areas (3 acres and 1.5 AAHUs) adjacent to the impact areas. These impacts and the proposed mitigation would be the same for both the NED and LPP alternatives (Appendix H). The mitigation monitoring and contingency plan is provided in Appendix H-2.

ES.7 COORDINATION AND PUBLIC INVOLVEMENT

Public involvement in the proposed project has occurred through public meetings and other outreach throughout the history of the project. The public, resource agencies, industry, local government, and other interested parties have been proactively informed about the project.

Public and agency concerns were identified at the public scoping meeting held January 15, 2004, at the Lake Jackson Civic Center, Lake Jackson, Texas. The purpose of the meeting was to inform stakeholders and interested parties about the proposed FHCIP, to outline the Corps Planning process, the proposed project schedule, and to solicit public comments. No oral comments were provided by Federal, State, or local resource agencies at the meeting, and the Galveston District received no subsequent written comments within the allotted comment period. In general, the public provided positive comments in support of the proposed project. However, one commenter expressed concerns regarding cumulative environmental impacts for the Gulf Coast region.

Two additional public information meetings were held in February 2006 and February 2008.

The DEIS was made available to all known Federal and state resource agencies as well as interested organizations and individuals on December 23, 2010. The comment period for the DEIS ended February 5, 2011. A public hearing was held during the comment period on January 13, 2011, in Freeport, Texas. A list of DEIS recipients is included in Section 13.4 of the EIS. Comments and corresponding responses from the DEIS comment period and public hearing have been addressed in this EIS.

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Acronyms and Abbreviations

°F	degrees Fahrenheit
AAHU	average annual habitat unit
AOU	American Ornithologists' Union
B/C	benefit to cost
BA	Biological Assessment
BEG	Bureau of Economic Geology
BEPA	Bald Eagle Protection Act
BMP	Best Management Practice
BO	Biological Opinion
BPA	Brazos Pilots Association
BRHND	Brazos River Harbor Navigation District
BU	beneficial use
BWM	ballast water management
CAA	Clean Air Act
CAER	Community Awareness and Emergency Response
CAR	Fish and Wildlife Coordination Act Report
C-CAP	Coastal Change Analysis Program
CCC	Coastal Coordination Council
CEPRA	Coastal Erosion Planning and Response Act
CEQ	President's Council on Environmental Quality
CERCLIS	Comprehensive Environmental Response Compensation and Liability Information System Database
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm	centimeters
cm/sec	centimeters per second
CO	carbon monoxide
CORRACT	RCRA Corrective Actions List
CR	County Road
CT	census tract
CWA	Clean Water Act
cy	cubic yards
dB	decibels
dBA	A-weighted sound level
DDE	dichlorodiphenyldichloroethylene, a breakdown of the pesticide DDT
DEIS	Draft Environmental Impact Statement
DERA	EPA Diesel Emission Reduction Program

DMPA	Dredged Material Placement Area
DO	dissolved oxygen
DOE	U.S. Department of Energy
EA	Environmental Assessment
EC	Engineering Circular
EFH	essential fish habitat
EH&A	Espey, Huston & Associates, Inc. (now PBS&J)
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
EOP	Environmental Operating Principles
EPA	U.S. Environmental Protection Agency
ER	Engineering Regulation
ERDC	Engineer Research and Development Center
ERL	effects range low
ERM	effects range medium
ERNS	Emergency Response Notification System
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCSA	Feasibility Cost-Sharing Agreement
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHCIP	Freeport Harbor Channel Improvement Project
FHWA	Federal Highway Administration
FM	Farm to Market Road
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act of 1981
FR	Feasibility Report
FS	Feasibility Study
Fugro	Fugro Consultants, L.P.
FWOP	Future Without-Project
GHG	Greenhouse Gas
GIS	Geographical Information System
GIWW	Gulf Intracoastal Waterway
GLO	Texas General Land Office
GMFMC	Gulf of Mexico Fisheries Management Council

gpm	gallon-per-minute
GRBO	Gulf Regional Biological Opinion
Gulf	Gulf of Mexico
HEP	Habitat Evaluation Procedure
HGB	Houston-Galveston-Brazoria
HHS	U.S. Department of Health and Human Services
HSI	habitat suitability index
HTRW	Hazardous, Toxic, and Radioactive Waste
IOP	Innocent Owner/Operator Program
IPCC	Intergovernmental Panel on Climate Change
ISD	Independent School District
L_{dn}	Day-Night Sound Level
LEP	Limited English Proficiency
L_{eq}	equivalent sound level
LFUN	Unauthorized and Unpermitted Landfill Sites
LNG	liquefied natural gas
LOA	length overall
LPP	Locally Preferred Plan
MBTA	Migratory Bird Treaty Act
mcy	million cubic yards
mcy/year	million cubic yards per year
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MLLW	Mean Lower Low Water
MLT	mean low tide
mm/year	millimeters per year
MMB	million barrels
MOA	Memorandum of Agreement
MPN/dL	Most Probable Number/deciliter
MPRSA	Marine Protection, Research, and Sanctuaries Act
msl	mean sea level
NAAQS	National Ambient Air Quality Standards
NBIC	National Ballast Information Clearinghouse
NCDC	National Climatic Data Center
NED	National Economic Development
NEPA	National Environmental Policy Act
NFRAP	no further remedial action planned
NFWL	National Fish and Wildlife Laboratory

NGL	natural gas liquid
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO	nitric oxide
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_X	nitrous oxides
NPL	National Priority List
NPS	National Park Service
NRC	National Research Council
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
O&M	operation and maintenance
O_3	ozone
ODMDS	Ocean Dredged Material Disposal Site
Oiltanking	Oiltanking Holdings Americas
OPA	Otherwise Protected Area
PA	placement area
PAg	Cultural Resource Programmatic Agreement
PAI	Prewitt and Associates, Inc.
Pb	lead
PCB	polychlorinated biphenyls
PED	Preconstruction, Engineering, and Design
PM_{10}	particulate matter with particle diameters of 10 microns or less
$PM_{2.5}$	particulate matter with diameters of 2.5 microns or less
ppm	parts per million
ppt	parts per thousand
RCRA	Resource Conservation and Recovery Act
RCRA TSD	RCRA Treatment, Storage, or Disposal List
RCRA-G	RCRA Generators and Violators List
RHA	River and Harbor Act
RIA	Regional Implementation Agreement
ROD	Record of Decision
RRC	Railroad Commission of Texas
RSLR	relative sea level rise
SAL	State Archeological Landmark

SAV	Submerged Aquatic Vegetation
SCS	Soil Conservation Service
SH	State Highway
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SMMP	Site Monitoring and Management Plan
SO_2	sulfur dioxide
SOC	species of concern
SP	solid phase
SPP	suspended particulate phase
SPR	Strategic Petroleum Reserve
SSA	sole source aquifer
SWQM	Surface Water Quality Monitoring
TAMU	Texas A&M University
TARL	Texas Archeological Research Laboratory
TCEQ	Texas Commission on Environmental Quality
TCMP	Texas Coastal Management Program
TCWC	Texas Colonial Waterbird Census
TDSHS	Texas Department of State Health Services
TelALL	TelALL Corporation
TERP	Texas Emissions Reduction Plan
THC	Texas Historical Commission
TOPS	Texas Offshore Oil Port System
TPWD	Texas Parks and Wildlife Department
tpy	tons per year
TSS	total suspended solids
TWC	Texas Workforce Commission
TWDB	Texas Water Development Board
TWQS	Texas Surface Water Quality Standards
TXAST	Texas aboveground storage tank database
TxDOT	Texas Department of Transportation
TXLF	City/County Solid Waste Landfill Listings
TXLUST	Texas leaking underground storage tank database
TXNDD	Texas Natural Diversity Database
TXSPILL	Texas Spills Incident Information System
TXSSF	State Superfund List
TXUST	Texas underground storage tank database
TXVCP	Texas Voluntary Cleanup Program

UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compounds
WMA	Wildlife Management Area
WQC	water quality discrete criteria
WRDA	Water Resources Development Act

1.0 NEED FOR AND OBJECTIVES OF ACTION

1.1 STUDY AUTHORITY AND PROJECT INFORMATION

1.1.1 Study Authority

The existing Freeport Harbor Project was authorized by the Rivers and Harbors Acts of May 1950 and July 1958, providing for an Entrance Channel (composed of the Outer Bar and Jetty channels) of 38-foot depth and 300-foot width from the Gulf of Mexico (Gulf) to inside the jetties, and for interior channels of 36-foot depth and 200-foot width up to and including the Upper Turning Basin. The relocation and deepening of the Jetty Channel to a 45-foot depth and 400-foot width and the Outer Bar Channel to a 47-foot depth and 400-foot width, with an extension of approximately 4.6 miles into the Gulf was authorized by Congress in 1978 with the passage of Section 101 of the Rivers and Harbors Act of 1970 (PL 91-611; House Document 289, 93rd Congress – 2nd Session, December 31, 1975) and by the president in 1974. The construction of this existing navigation project, referred to in this document as the Freeport Harbor Channel 45-Foot Project, was completed in 1993.

The Authority for proposed channel improvements to the existing navigation project is contained in Section 216 of the 1970 Flood Control Act.

1.1.2 Project Sponsors and Cooperating Agencies

The Brazos River Harbor Navigation District (now Port Freeport), the non-Federal sponsor of the existing project, requested consideration of additional channel improvements to alleviate navigation problems experienced at Port Freeport. Authority for a reconnaissance report (Section 905(b)) was included in the Water Resources Development Act of 1986 (WRDA 86), which was completed in 2002 by U.S. Army Corps of Engineers (USACE). The report documented Federal interest in a widening and deepening project with National Economic Development (NED) benefits in the form of transportation savings that could substantially exceed the cost of the project. Additionally, a general screening analysis was conducted to identify structural plans that would provide efficient navigation at the least cost while minimizing environmental impacts, and included a ship simulation study conducted at the U.S. Army Engineer Research and Development Center (ERDC) in Vicksburg, Mississippi. As a result, a feasibility study (FS) was initiated to determine whether a Federal navigation improvements project at Freeport Harbor was justified and to provide a decision document to Congress regarding authorizing construction and future maintenance of the recommended plan. On July 7, 2003, USACE and Port Freeport signed a Feasibility Cost-Sharing Agreement (FCSA) to conduct the FS, including an Environmental Impact Statement (EIS). The FS is being developed by USACE, Galveston District with the FS cost being equally shared by USACE and Port Freeport.

The USACE Galveston District Engineer is responsible for the overall management of this EIS. Port Freeport is the non-Federal sponsor for the study. The study is being coordinated with interested Federal, State, and local agencies and the public. There are no cooperating agencies for the Freeport Harbor Channel Improvement Project (FHCIP).

1.1.3 Project Location

The proposed project is located on the mid- to upper Texas coast in Brazoria County and encompasses the communities of Surfside, Quintana, Oyster Creek City, and the City of Freeport (Figure 1.1-1). Freeport Harbor Channel provides deepwater access from the Gulf of Mexico to Port Freeport. Specifically, the existing Freeport Channel system begins approximately 5.7 miles seaward of the coastal jetty tips at the 47-foot contour in the Gulf, continuing upstream through the Freeport Harbor Entrance Channel, and winding westward for approximately 5.5 miles into Freeport to the Stauffer Channel Turning Basin.

1.1.4 Project History and National Environmental Policy Act Compliance

The original project for Federal improvement at Freeport was authorized by the Rivers and Harbors Act of June 14, 1880, which provided for construction of jetties for controlling and improving the channel over the bar at the mouth of the Brazos River. The work was started in 1881 and continued until 1886 when operations were suspended for lack of funds. On April 25, 1899, in accordance with requirements of the Rivers and Harbors Act of March 3, 1899, the project was transferred to the United States. This constituted the initial authorization for the existing Freeport Channel system.

The Federal project known as Freeport Harbor, Texas, is an improvement of the original mouth of the Brazos River that provides for a deep-draft waterway from the Gulf of Mexico to the City of Freeport. A diversion dam about 7.5 miles above the original river mouth, and a diversion channel rerouting the Brazos River from the dam to an outlet in the Gulf about 6.5 miles southwest of the original mouth, now make the Freeport Channel system entirely tidal.

The Freeport Harbor waterway, as currently authorized, has an overall length of about 9.8 miles from deep water in the Gulf of Mexico to the Brazos Harbor Turning Basin. The Stauffer Channel was dredged originally by local interests to a depth of 25 feet over a bottom width of 300 feet, with a 500-foot square basin area. The Rivers and Harbors Act of 1935 incorporated the 1.4-mile-long channel and turning basin into the Federal project and authorized its deepening to 30 feet over a bottom width of 200 feet, and deepening the basin to 30 feet. Prior to deauthorization in 1974, available depths were adequate for existing traffic and the authorized 30-foot depth was not dredged. The project also provided for construction of a navigation lock in the diversion dam by local interests, when required in the interest of commerce and navigation. The lock has not been required and at present is classified as an inactive element of the project.

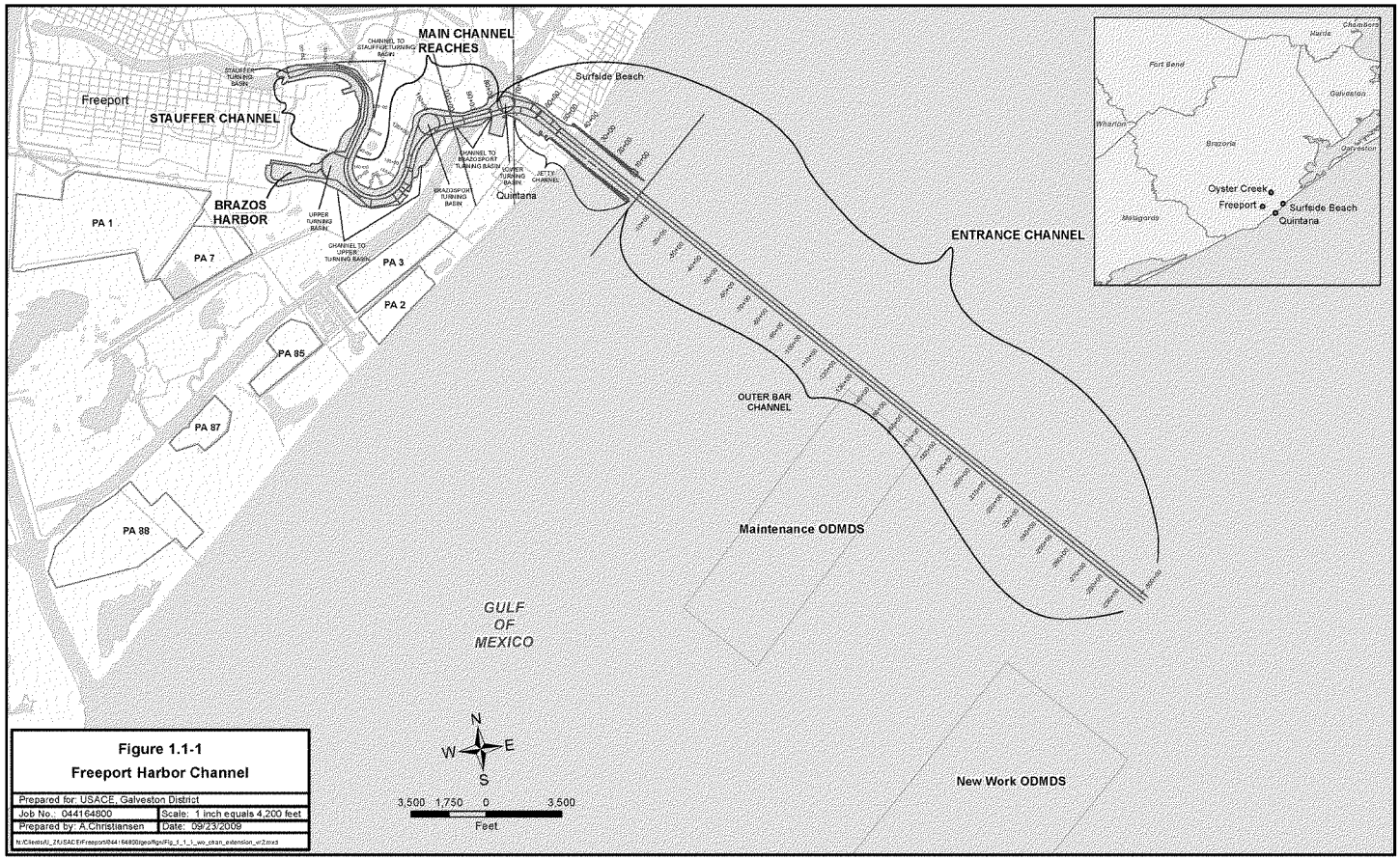

Figure 1.1-1
Freeport Harbor Channel

Prepared for: USACE, Galveston District	
Job No.: 044164800	Scale: 1 inch equals 4,200 feet
Prepared by: A.Christiansen	Date: 09/23/2009
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The Freeport Harbor Project was subsequently authorized by the Rivers and Harbors Acts of May 1950 and July 1958. The Acts provided for a deeper and wider Outer Bar Channel and interior channels up to the Upper Turning Basin. Greater depths, widths, and relocations of the Outer Bar and Jetty channels were authorized by Congress in 1970, and an EIS was prepared by USACE in 1978 for these actions. In 1978, Seaway Pipeline, Inc., under a Department of Army permit, widened the Outer Bar Channel to 400 feet and the Jetty Channel to 230 feet. The 45-foot channel was completed in 1993, including channel and turning basins dredging, relocation of the U.S. Coast Guard (USCG) station, construction of the 3,700-foot North Jetty, construction of public use facilities, rehabilitation of the South Jetty and addition of 500 feet to the North Jetty, and adjustments to a bend near the project's main turning basin, which was covered under a 1997 Record of Environmental Consideration.

Based on navigation problems associated with the existing 45-foot Project, USACE completed a Section 905(b) analysis (WRDA 86) reconnaissance report that confirmed the potential need for the channel improvements and documented Federal interest in a project. In July 2003, USACE and Port Freeport signed an FCSA, and efforts were initiated to prepare a Feasibility Report (FR) and EIS to identify and evaluate alternative plans, to determine whether channel improvements were justified, and to comply with the National Environmental Policy Act (NEPA).

In a separate action from the FR, Port Freeport undertook efforts to widen, but not deepen, the Outer Bar and Jetty channels at Freeport Harbor. As part of this action, Port Freeport applied to USACE for a Clean Water Act (CWA) Section 404(b)(1) permit and Rivers and Harbors Act Section 10 permit for dredge and fill and other construction activities related to widening portions of the Freeport Channel system. Permit Application No. 23752 was submitted to USACE on April 14, 2005. An EIS was coordinated and a Record of Decision (ROD) was signed by the Commander, USACE Galveston District on February 3, 2009. The Widening Project permit was issued on March 20, 2009. Construction of the Widening Project will begin once the Assistant Secretary of the Army – Civil Works (Secretary) approves Federal assumption of maintenance for the proposed improvements.

1.2 PURPOSE AND NEED

Vessel operations are currently constrained by the dimensions of the Freeport Harbor Channel. The maximum ship dimensions currently permitted by the Brazos Pilots Association (BPA) at Freeport Harbor are 825-foot length overall (LOA), 145-foot maximum beam, and 42-foot draft. The channel dimension constraints include (a) lightering and lightening, (b) LOA restrictions, (c) beam restrictions, (d) one-way traffic, and (e) daylight-only operation restrictions. These problems are discussed in more detail below.

- **Lightering and Lightening.** Since the completion of the 45-foot Project, the size of the vessels navigating the waterway has steadily increased so that many vessels currently have to be light-loaded to traverse the channel. The current channel depth

requires that large crude carriers remain offshore and transfer their cargo into smaller crude tankers for navigating the channel. This lightering operation takes place in the Gulf where two ships, the mother ship and the lightering ship, come together so that a cargo transfer can occur. Lightening operations are similar except that cargo is transferred to another ship so that both ships can enter port. Although these operations have occurred frequently in the past, the possibility for a collision, oil spill, fire, or other adverse environmental consequence is always present. Current projections indicate that crude imports will increase in the near future. As these imports increase, the number of lightering vessels and product carriers will also increase, adding to shipping delays, congestion, and the potential risk of collision or spill.

- **LOA Restrictions.** The length limitation of 825 feet is enforced because crosswinds and crosscurrents force tankers to "crab" at an angle through the Entrance Channel. Ships of greater length than 825 feet are not able to clear the jetties under adverse wind and current conditions. Waivers on ship length are granted on a case-by-case basis for ships as large as 900-foot LOA and 160-foot beam to transit the Freeport Harbor Channel, provided that winds are less than 20 knots and that there is no more than a 0.5 knot crosscurrent at the mouth of the jetties. About three to four ships per month are granted these waivers. Numerous requests have been submitted for ships in the 920- to 950-foot LOA range to transit the channel, and these requests have been denied. When denied access to Freeport Harbor, these ships normally divert to Corpus Christi or New Orleans.
- **Beam Restrictions.** The maximum beam permitted under normal operations of the existing project is 145 feet. Vessels with larger beams require waivers to enter the port.
- **One-Way Traffic Restriction.** Because of the 400-foot width of the Entrance and inside channels, one-way ship traffic is always in effect in the Freeport Harbor Channel. This can result in delays when ship schedules coincide.
- **Daylight-Only Operation Restriction.** Because of channel dimensions as well as the nature of the cargo, daylight-only operation is enforced on all vessels greater than 750-foot LOA or over 107-foot beam. This can result in waiting time of up to 12 hours, if ship arrival/departure occurs at dark.

Port Freeport requested that the terminus of the Federal project extend to include the Stauffer Channel. As part of the FS, optimization of the depth for the channel extension for the Lower Stauffer Channel was determined. Depth alternatives of 30, 40, and 50 feet were initially evaluated and resulted in a more focused evaluation of a smaller range of depths. Analyses were conducted to determine any competitive advantage that Port Freeport might potentially have over competing ports. For instance, there is considerable overlap between the Houston and Freeport population centers, and a Port Freeport container terminal has the potential of capturing associated savings. In addition, Port Freeport offers an advantage over existing facilities in Houston because terminal capacity in Houston is near capacity.

The purpose of the proposed project is to improve navigation efficiency by reducing the number of lightering and lightening operations by deepening the channel, and to eliminate operational constraints by improving the channel.

The project need is to eliminate operational constraints in order to allow vessels to avoid shipping delays, thereby reducing shipping costs and logistical problems.

As previously mentioned (Section 1.1.4), Port Freeport has moved forward with the Widening Project in an effort to address some of the needs of the port. Since the Widening Project is likely to be constructed prior to authorization of the FHCIP, it is expected that constraints associated with the 400-foot channel width would be reduced or eliminated. Federal deepening of the channel would address other needs by allowing larger vessels to navigate the channel, which would result in a reduction of costly delays from lightering and lightening and may reduce vessel trips. Therefore, the alternatives evaluated by the FS would need to provide sufficient depth to allow the projected fleet of ships to efficiently navigate Port Freeport, with significantly reduced lightering and lightening requirements.

Port Freeport has one of the largest petrochemical complexes in the world. The ship channel is lined with industry. Major petrochemical industries in the harbor include ConocoPhillips, Dow Chemical, and BASF. Located adjacent to the channel is Dow Chemical Company's Texas Division plant, which produces large quantities of basic industrial chemicals. ConocoPhillips has an oil terminal and large tank farm fronting the waterway, with pipeline connections to its refinery in Sweeny about 28 miles to the northwest. ConocoPhillips operates the Seaway Pipeline, which moves crude petroleum from Sweeny to Cushing, Oklahoma. There are also product pipelines from Sweeny and the Freeport region to Pasadena, Texas, on the Houston Ship Channel. Refined products are distributed throughout the Midwest and southeastern United States through pipelines, barge, and rail car from Freeport. A natural gas liquids (NGL) processing unit and olefins plants owned and operated by Chevron Phillips Chemical Company also are located at the Sweeny complex.

According to the U.S. Department of Energy's (DOE) Energy Information Administration (EIA), nearly 80 percent of the regional crude oil and product transfers move by pipeline from the U.S. Gulf Coast. The U.S. Gulf Coast leads the Nation in refinery capacity, with 41 percent of the Nation's crude oil distillation capacity. One-half of the Gulf Coast refinery capacity is in Texas, and the remainder is in Louisiana. Freeport's refinery capacity represents approximately 6 percent of the Texas capacity. The Gulf Coast is also the Nation's leading supplier of refined products. Products such as gasoline, heating oil, and diesel and jet fuel are transported from the Gulf Coast to the East Coast and the Midwest. Port Freeport terminals provide pipeline transmittal to underground storage facilities of the DOE's Strategic Petroleum Reserve (SPR) "Bryan Mound Site," near Freeport, Texas, to crude oil distribution hubs in Texas City and Jones Creek, Texas, as well as the noted connections to Houston and the Midwest.

Deep-draft petroleum and chemical import and export volumes for 2005–2007 increased over 100 percent from 1990–1992 levels. Port Freeport has facilities for a significant increase in crude petroleum imports. As such, more vessels can be expected to call at the port and a higher throughput-to-vessel-call ratio would reduce both the amount of lightering and the number of vessels passing through the Freeport Harbor Channel. Freeport's refined product import growth mirrors trends at other U.S. and Gulf Coast ports. Petroleum product imports primarily consist of lube oil and naphtha. It was determined, based on vessel size utilization trends, that a portion of petroleum products would benefit from channel depths over 50 feet.

Port Freeport's remaining cargo throughput primarily consists of banana imports, rice exports, and outbound coastwise chemical shipments. Most of the general cargo docks are located within the Brazos Harbor Turning Basin where the project depth is 36 feet.

Large bulk carriers are used in the import of limestone and building materials. The vessels used had vessel design drafts in the 40- to 44-foot range. Loaded drafts ranged from 35 to 39 feet. Total limestone imports for 2007 were 174 thousand tons. Limestone imports represented 24 percent of the 2005–2007 total general cargo tonnage.

Although Port Freeport handles general cargo and containerized cargo, crude petroleum imports account for the majority of throughput. As the imports increase, the number of lightering and lightening vessels and product carriers will also increase, adding to shipping delays, congestion, and potential risk of collision, unless the Freeport Harbor Channel is deepened. The proposed FHCIP entails deepening the channels at Freeport Harbor, which will provide opportunities for service ships to be more fully loaded and will also allow larger lightened tankers to transit within the channel at greater drafts. The results will be potential improvements to transportation savings in the form of reduced shipping costs, stemming from improved navigation efficiency by decreasing the number of lightering and lightening operations, which ultimately translates into economic benefits to the Nation.

1.3 EXISTING PROJECT

The existing 45-foot Project provides deepwater access from the Gulf to Port Freeport. The waterway extends from deep water in the Gulf, through a rock-protected Jetty Channel to the Lower Turning Basin. The waterway then turns in a westerly direction to, and including, a turning basin at Brazosport, and then curves southwesterly then northward through the Upper Turning Basin, passing Brazos Harbor and its turning basin to the west. The waterway then continues north and westerly through the Upper Turning Basin where it terminates at the Stauffer Turning Basin (see Figure 1.1-1).

The existing authorized depth for the Freeport Harbor Channel is 45 feet mean low tide (MLT). Project widths of the channel range from 400 feet at the Brazosport Turning Basin to 200 feet for the Brazos Harbor Channel. The Brazos Harbor Channel and Turning Basin are currently 36 feet

MLT. The Stauffer Channel measures 200 feet wide with a depth of 30 feet MLT. The tidal range for Freeport Harbor is typically 2 feet. Construction of the existing 45-foot Project was completed in 1998.

The project is geographically divided into four main segments: the Entrance Channel, Main Channel, Brazos Harbor, and the Stauffer Channel. Each segment is described as follows:

- **Entrance Channel** – This segment is bound by the Gulf and the Lower Turning Basin. It comprises the Outer Bar Channel, Jetty Channel, and a portion of the Lower Turning Basin. The Outer Bar Channel extends about 5.7 miles into the Gulf. The Jetty Channel extends 1.35 miles and stabilizes the original Brazos River mouth at Freeport.

- **Main Channel** – This approximately 2-mile segment extends west from the Lower Turning Basin through the Upper Turning Basin. Various petroleum and petrochemical facilities are located along the Main Channel.

- **Brazos Harbor** – This 0.6-mile segment is located to the west of the Upper Turning Basin and includes the Brazos Harbor Turning Basin. Brazos Harbor is not included in the channel portions proposed for improvements.

- **Stauffer Channel** – This approximately 1.4-mile segment extends from the Upper Turning Basin upstream through the Stauffer Turning Basin. This channel was authorized as a 30-foot by 200-foot channel but was deauthorized in 1974 under Section 12 of the WRDA (Public Law 93-251). Various commercial fisheries, marine businesses, and recreational facilities are located along the Stauffer Channel.

A detailed description of the 45-foot Project authorized dimensions is presented in Table 1.3-1, with USACE's channel stations (see Figure 1.3-1).

The depth and width of the existing channel system remains restrictive due to the size of the current world fleet. Beam-width restrictions continue to cause delays for larger ships wishing to enter Freeport's port facilities. Increased channel depths would reduce the requirement for lightering. Access to additional facilities would also allow Port Freeport to utilize facilities for future development. A project alleviating shipping delays for industry is needed.

1.4 PROBLEMS, NEEDS, AND PUBLIC CONCERNS

The environmental concerns identified during the reconnaissance study (USACE, 2002) included the following items:

- The potential for environmental harm as a result of shipping accidents is of concern.
- Sediment quality in Freeport Harbor was an issue raised at one of the public meetings; however, studies indicate that there are no sediment contamination issues.

Table 1.3-1
Freeport Harbor Channel
Currently Authorized Dimensions for Reaches and Basins

Channel Segment	Depth (feet)	Width (feet)	Length (miles)
Entrance Channel			
Outer Bar Channel	47	400	5.68
Jetty Channel	45	400	1.35
Lower Turning Basin	45	750	0.14
Main Channel			
Channel to Brazosport Turning Basin	45	400	0.50
Brazosport Turning Basin	45	1,000	0.19
Channel to Upper Turning Basin	45	350–375	1.08
Upper Turning Basin	45	1,200	0.23
Brazos Harbor			
Channel to Brazos Harbor[a]	36	200	0.51
Brazos Harbor Turning Basin	36	750	0.13
Stauffer Channel[b]			
Channel to Stauffer Turning Basin	30	200	1.34
Stauffer Turning Basin	30	500	0.09

[a]Channel to Brazos Harbor and Brazos Harbor Turning Basin will not be improved by the FHCIP.
[b]Stauffer Channel was deauthorized in 1974.

A Public Scoping Meeting was held on January 15, 2004, at the Lake Jackson Civic Center, Lake Jackson, Texas. The purpose of the meeting was to inform stakeholders and interested parties about the proposed FHCIP, to outline the planning and feasibility study processes, to present the proposed project schedule, and to solicit public comments/input. Solicitation of public comments was a primary objective of the scoping meeting to ensure that significant issues were addressed as required by NEPA. Generally, the public provided positive comments in support of the proposed project. However, one commenter expressed concerns regarding potential cumulative environmental impacts from navigation improvement projects for the Texas Gulf Coast, and asserted that the environmental community would probably oppose deepening the channel beyond 50 feet.

No oral comments were provided by Federal or State resource agencies at the meeting, and USACE received no subsequent written comments within the allotted comment period. A summary of information from the scoping meeting is provided in Appendix A-1.

1.5 PLANNING OBJECTIVES

The primary objective of Federal navigation activities is to contribute to the Nation's economy while protecting the Nation's environmental resources in accordance with existing laws,

regulations, and executive orders (EOs). The planning objectives of this Federal navigation project include improvement in the efficiency of the deep-draft navigation system and maintenance or enhancement of the quality of the area's coastal and estuarine resources. Economic efficiency would result from the passage of ships into and out of Freeport Harbor that previously had to remain offshore and transfer cargo into smaller crude tankers for product delivery. Economic benefits could also be realized through decreased vessel delays, as the preponderance of benefits are derived from increases in transportation efficiency and lower vessel operating costs.

1.6 OTHER PLANNING CONSIDERATIONS

1.6.1 Environmental Operating Principles

As a reemphasis of the USACE's commitment to the environment and to ensure effective participation in sound environmental stewardship, a formalized set of "Environmental Operating Principles," containing seven principles, was promulgated and promoted throughout USACE to inform and guide its corporate program execution and project development decision-making process. The purpose of the USACE Environmental Operating Principles (EOP) is to illuminate the ways in which the USACE's missions are to be integrated with natural resources laws, values, and sound environmental practices, in order to focus on achieving greater synergy between environmental sustainability and implementation of the full spectrum of USACE activities, including planning, design and construction, operations and maintenance, regulatory, research and development, acquisition, real estate, and support for others (USACE, 2003). The seven EOPs are summarized as follows:

1. Strive to achieve environmental sustainability. An environment maintained in a healthy, diverse, and sustainable condition is necessary to support life.
2. Recognize the interdependence of life and the physical environment. Proactively consider environmental consequences of USACE programs and act accordingly in all appropriate circumstances.
3. Seek balance and synergy among human development activities and natural systems by designing economic and environmental solutions that support and reinforce one another.
4. Continue to accept corporate responsibility and accountability under the law for activities and decisions under our control that impact human health and welfare and the continued viability of natural systems.
5. Seek ways and means to assess and mitigate cumulative impacts to the environment; bring systems approaches to the full life cycle of our processes and work.
6. Build and share an integrated scientific, economic, and social knowledge base that supports a greater understanding of the environment and impacts of our work.

7. Respect the views of individuals and groups interested in USACE activities, listen to them actively, and learn from their perspective in the search to find innovative win-win solutions to the Nation's problems that also protect and enhance the environment.

These principles have been integrated into the earliest stages of the FHCIP's plan formulation and study development process.

1.6.2 USACE Campaign Plan

In August 2006, as a result of lessons learned from hurricanes Katrina and Rita, the USACE Chief of Engineers initiated the "Actions for Change" in an effort to transform USACE planning, design, construction, and operation and maintenance principles and decision-making processes. This program has been further developed into a Campaign Plan. USACE is moving forward with this Campaign Plan to transform the way business is done. The USACE Campaign Plan is available on the internet at http://www.usace.army.mil/about/campaignplan/Pages/Home.aspx.

The successful achievement of the goals and objectives contained in this Campaign Plan are dependent on actions implemented by the entire USACE team. The Campaign Plan includes four goals for USACE. These goals are:

Goal 1: Ready for all Contingencies – Deliver USACE support to combat, stability, and disaster operations through forward deployed and reachback capabilities.

Goal 2: Engineering Sustainable Water Resources – Deliver enduring and essential water resource solutions through collaboration with partners and stakeholders.

Goal 3: Delivering Effective, Resilient, Sustainable Solutions – Deliver innovative, resilient, sustainable solutions to the Armed Forces and the Nation.

Goal 4: Recruit and Retain Strong Teams – Build and cultivate a competent, disciplined, and resilient team equipped to deliver high-quality solutions.

Goals 1 and 4 do not apply directly to the USACE planning process and are not discussed in detail. Goals 2 and 3 pertain to water resources planning and directly to the FHCIP. These goals are described in more detail below.

1.6.2.1 Goal 2: Engineering Sustainable Water Resources

With Goal 2, USACE focuses on comprehensive, sustainable, and integrated solutions to the Nation's water resources challenges through collaboration with stakeholders. This goal refers to not only developing and delivering comprehensive and lasting solutions but also ensuring that these solutions are long lasting, integrated, and holistic to respond to today's and future challenges.

1.6.2.2 Goal 3: Delivering Effective, Resilient, Sustainable Solutions

Goal 3 emphasizes that USACE will provide innovative, resilient, and sustainable infrastructure solutions for the Nation today and in the future. USACE is the Nation's premier public service engineering and construction organization and can provide infrastructure support to serve both the military and national civilian arenas. This effort will improve resilience and lifecycle investment in critical infrastructure, deliver reliable infrastructure using a risk-informed asset management strategy, and develop and apply innovative approaches to delivering quality infrastructure.

2.0 ALTERNATIVES

2.1 INTRODUCTION

For the development of the proposed FHCIP, several alternatives were identified in the 2002 USACE, Galveston District Section 905(b) Analysis Reconnaissance Report. Five alternatives were analyzed during this initial stage. The FR, which this EIS accompanies, includes detailed analyses of a broader range of improvements and their effectiveness at improving efficiency by allowing the use of larger, more-efficient vessels and reducing delays. Details of the Alternatives Analysis are provided in the FR. Only a brief summary is included below.

Formulation of alternative alignments and dredged material placement areas (DMPAs) included an evaluation and analysis of historical and projected shoaling rates, erosion causes and rates, and general structural and nonstructural alternatives applicable for conditions specific to the project area. Operational concerns of the BPA were also considered. Channel widths and depths were determined by ship simulations based on information from BPA and ERDC. Non-Federal sponsor requests were also evaluated.

An economic evaluation of project modifications to Freeport Harbor was conducted by calculating project benefits based on reductions in transportation costs. Various combinations of widening and deepening alternatives were initially evaluated and screened for more-detailed consideration. Following initial analysis and evaluation, more-detailed cost/benefit analyses were performed on selected alternatives.

An evaluation of jetty stability performed for the FHCIP (Fugro Consultants, L.P. [Fugro], 2005) indicated that at 60-foot depth, relocation of the inshore jetties would be required for widths 550 feet or greater. Incremental benefit-to-cost analyses of the proposed channel configurations took into consideration the cost of jetty relocation. Cross-sectional channel dimensions for Jetty Channel stability can be seen in Appendix K, Figure 2 (Freeport Harbor Jetty Channel Cross Section: Jetty Stability Analysis). Based on the results of those analyses, it was determined that 540 feet was the maximum bottom width that could be constructed between the jetties that would maintain stability and the standard 3-foot horizontal to 1-foot vertical channel side slope. Therefore, the most economical channel width at maximum 60-foot depth was 540 feet, which would allow larger ships to enter the channel without the associated costs of jetty relocation.

2.2 PRELIMINARY SCREENING

The objective of the alternatives screening process is to identify a plan that best meets the purpose and need defined for the project by analysis of a full range of alternatives, including both structural and nonstructural possibilities. Table 2.2-1 lists all project alternatives considered.

Table 2.2-1
Initial Project Alternative Plans

Initial Screening Alternative	Selected Alternative #
1-No Action	Alternative 1; FWOP-2
2a-Widening – 500 foot	
2b-Widening – 600 foot	Alternative 2; FWOP-1; Widening Project
3a-Deepen – 50 foot	Alternative 3
3b-Deepen – 55 foot	Alternative 4
3c-Deepen – 60 foot	Alternative 5
4a-Deepen/Widen – 50x500	
4b-Deepen/Widen – 50x600	
4c-Deepen/Widen – 55x500	
4d-Deepen/Widen – 55x600	
4e-Deepen/Widen – 60x500	
4f-Deepen/Widen – 60x600	
5a-Deepen Brazos Harbor Channel – 40 foot	
5b-Deepen Brazos Harbor Channel – 42 foot	
5c-Deepen Brazos Harbor Channel – 45 foot	
6a-Deepen/Widen Brazos Harbor Channel – 40x300	
6b-Deepen/Widen Brazos Harbor Channel – 42x300	
6c-Deepen/Widen Brazos Harbor Channel – 45x300	
7-Reauthorization of Stauffer Channel to 30 foot	Alternative 6
8a-Deepen Lower Stauffer Channel – 36 foot	
8b-Deepen Lower Stauffer Channel – 40 foot	
8c-Deepen Lower Stauffer Channel – 42 foot	
8d-Deepen Lower Stauffer Channel – 45 foot	
8e-Deepen Lower Stauffer Channel – 50 foot	
9-Widen Lower Stauffer Channel – 300 foot	Alternative 7
10a-Deepen/Widen Lower Stauffer Channel – 36x300	
10b-Deepen/Widen Lower Stauffer Channel – 40x300	Alternative 8
10c-Deepen/Widen Lower Stauffer Channel – 42x300	
10d-Deepen/Widen Lower Stauffer Channel – 45x300	
10e-Deepen/Widen Lower Stauffer Channel – 50x300	Alternative 9
11-Redredge Upper 3,400 feet of Stauffer Channel to 30 foot	

As required by NEPA, each alternative carried forward is traditionally compared to a No Action or Future Without-Project Alternative. Because of the port's Widening Project, however, we have two possible Future Without-Project conditions: one where the Widening Project is constructed before the Federal CIP, or one where Port Freeport's Widening Project is not built before the Federal FHCIP. Our assumption is that the Widening Project will be built, but we must consider both possible futures. If Port Freeport constructs the Widening Project, the Future Without-Project condition for the Federal project would be an existing widened Entrance Channel. This is identified as Future Without-Project 1 (FWOP-1), or Alternative 2 in Table 2.2-1. If the port does not widen the channel, the Federal construction project would then include widening the Entrance Channel as proposed by the permit, and would also deepen it. This alternative is the equivalent of the traditional No Action Alternative (Alternative 1 in Table 2.2-1), but is referred to as Future Without-Project 2, or FWOP-2. Because FWOP-1 is the most likely future, it is the alternative against which all Federal project alternatives are compared, rather than the traditional No Action, or FWOP-2, Alternative. A brief discussion of project area impacts should no construction occur, or under the traditional No Action condition, is presented in the FWOP-2 description, below.

2.2.1 No Action (FWOP-2)

The No Action, or FWOP-2, Alternative is the existing 45-foot Project. The 45-foot Project depth would be maintained throughout the Freeport Harbor Entrance Channel. The Main Channel, turning basins and Stauffer Channel dimensions would remain as described in Section 1.3 and Table 1.3-1. Maintenance material would continue to be placed in the existing Maintenance ocean dredged material disposal site (ODMDS) for the Entrance Channel, and in placement area (PA) 1 for the channels inshore of the Jetty Channel. The Widening Project would not be built.

The future condition should neither the Widening Project nor Federal CIP be built assumes that current project conditions would continue. Future development of the Freeport area would occur without these projects, but would occur faster if they were constructed (Section 4.15). Impacts from naturally occurring relative sea level rise (RSLR) would occur, but would result in minimal impacts to habitats or facilities (Appendix L). Possible takes of threatened and endangered sea turtles would continue to occur as a result of maintenance dredging of the existing project. Port development would be constrained by channel depth and width limitations.

2.2.1.1 FWOP-2, with the Proposed FHCIP

In a future where the Widening Project is not constructed but a Federal FHCIP is, the proposed Federal project would both widen (up to 600 feet) and deepen (by as much as 60 feet) the Entrance Channel, claiming project benefits for both widening and deepening, and increasing Federal project impacts as a result of Federal widening.

Under this scenario, the proposed Federal project could generate up to 15.3 million cubic yards (mcy) of new work dredged material of which 300,000 cubic yards (cy) of silty/sand material would likely be used beneficially by placing it on Quintana Beach in front of the Seaway upland PA. The remainder of the material would be placed in the existing New Work ODMDS. Maintenance of these improved reaches would generate up to 120 mcy of material over the 50-year evaluation period.

In upland areas, channel widening would remove 1.9 acres of habitat consisting of 1.65 acres of herbaceous/grassland, 0.25 acre of beach, and 1,000 square feet (0.023 acre) of shrub/scrub wetland. In the vicinity of the high-tide line, 2 acres of sand-covered, estuarine (tidal) mudflats would be removed. The flats, which are exposed at low tide, are underlain with Beaumont clay and the sand cover is ephemeral, shifting with strong currents. Because of this and wave disturbance from ships passing through the Jetty Channel and the periodic strong currents in the channel, impacts at these locations are not considered significant. All of these areas are located along the north (Surfside) side of the Jetty Channel between Surfside Jetty Park and the USCG Station. Minor and temporary effects on water quality and benthic organisms would occur.

Noise levels in the widening area would be temporarily elevated and minor short-term impacts on air quality would occur. Nitrous oxide (NO_X) emissions for the project would exceed the conformity threshold requiring a General Conformity Determination.

With respect to threatened or endangered species, sea turtle takes could occur as a result of new work and maintenance dredging associated with widening and deepening. The beach and sandy flats that would be removed from the Jetty Channel shoreline could be used for foraging by piping plover, which are known to occur in the area; however, no impact to designated piping plover critical habitat would occur. Endangered Species Act (ESA) Section 7 consultation would be required to address potential impacts to endangered species from Federal widening.

2.2.2 Port Freeport Widening Project (FWOP-1)

FWOP-1 assumes that construction of the Widening Project would occur before Federal construction of the FHCIP. Under FWOP-1, all channels and turning basins would be maintained at the currently authorized depth of 45 feet, with construction of the permitted 600-foot widening of the Entrance Channel. As the most probable project future, FWOP-1 is the condition against which all proposed project alternatives are evaluated, rather than the No Action Alternative (FWOP-2).

2.2.3 Nonstructural Alternatives

Nonstructural alternatives would include restrictions such as one-way traffic, lightering and lightening, and an alternative mode of commodity transport. One nonstructural opportunity available is the continued use of beam width restrictions within the channel. Current pilot rule restrictions prevent two ships from passing in the channel. These rules are agreed upon by the

shipping industry, supported by USCG, and administered by BPA. This measure would only maintain current operations, with its increased costs and delays. Another nonstructural measure is use of lightering and lightening vessels. This is another practice already in use and would offer no additional benefits.

The proposed Texas Offshore Oil Port System (TOPS) was evaluated as an alternative mode of commodity transport. TOPS was originally proposed as a joint venture among three firms, but two of those firms announced in 2009 that they were withdrawing from the project. The remaining partner, Oiltanking Holdings Americas (Oiltanking) announced at that time that it intended to continue with the project. However, Oiltanking submitted a letter to the Maritime Administration on April 12, 2010, requesting to withdraw their application for a deepwater port license for the TOPS project (U.S. Department of Transportation, 2012).

In a general discussion with industry, a representative noted that offshore oil terminal projects surface periodically, but the cost of these alternatives keeps them from moving beyond the initial planning stage. TOPS included no plans for connections to either the Seaway or ConocoPhillips docks. It was a proposed offshore terminal project that would provide feedstock to Texas City, Houston, and Port Arthur. Freeport's Seaway dock also serves Texas City and Houston. Additionally, TOPS would not provide connections to Cushing, Oklahoma, which the Freeport refineries serve. The terminal operating on the Freeport Channel and those in Port Arthur have noted that TOPS would serve as an addition to and complement the existing method of importing crude petroleum and was not intended as a substitute for existing modes of shipment. TOPS would reduce the volume of Freeport crude oil transported by vessels by an unknown amount. Because of this, an economic sensitivity analysis was performed to determine if a structural alternative would still be the NED alternative. The result of this sensitivity analyses showed that the 60-foot channel depth continues to produce the highest net excess benefits among the array of depth alternatives.

Therefore, nonstructural alternatives were not considered feasible or did not fully address the problems.

2.2.4 Screening Process for Structural Alternatives

A general screening process was first used to determine which structural alternative plan would result in the objective of providing reliable and efficient navigation at the least cost while minimizing environmental impacts. The non-Federal sponsor initially expressed a desire for a channel 600 feet wide and 60 feet deep. Constraints to widening were identified in the Jetty Channel and in the channel reach between the Brazosport Turning Basin and the Upper Turning Basin. Multiple alternative plans were evaluated for more-detailed consideration. The initial array of alternatives is listed in Table 2.2-1. These initial screening alternative plans included:

- No Action Plan (1).

- Widening of the Outer Bar and Jetty channels only with no deepening (2).
- Deepening to 50, 55, or 60 feet from the Gulf of Mexico to the Upper Turning Basin, with and without widening, and with widening to 500 and 600 feet only through the Jetty Channel (3 and 4).
- Deepening to 40, 42, or 45 feet the Brazos Harbor Channel and Turning Basin, without widening and with widening to 300 feet (5 and 6).
- Reauthorization of Stauffer Channel to 30 feet (7)
- Deepening the lower (3,700-foot) reach of the Stauffer Channel to 36, 40, 42, 45, and 50 feet without widening and with widening to 300 feet (8–10).
- Dredging the upper (remaining 3,400 feet) reach of the Stauffer Channel to its previously authorized 30-foot depth (11).

The initial array was also screened regarding environmental considerations. To assist with screening of the initial project alternatives for potential positive or negative environmental impacts, particular emphasis was placed on the following environmental considerations:

- Protection and preservation of the existing fish and wildlife resources, estuaries, wetland habitats, and water quality, and where practicable, beneficially using dredged material to create and/or protect habitat;
- Consideration in the project design of the least disruptive construction techniques and methods;
- Mitigation for project-related unavoidable impacts by minimizing, rectifying, reducing or eliminating, compensating, replacing, or substituting resources;
- Preservation of significant historical and archeological resources through avoidance of impacts to these resources; and,
- Consideration of socioeconomic effects.

Based on the problems and opportunities identified by the non-Federal sponsor and the public comments received at the public scoping meeting, a variety of alternative plans was identified to address one or more of the planning objectives. Screening of alternative plans focused on whether deepening and widening would be cost effective. The following criteria were used to evaluate and screen the alternative plans:

Dredging Quantities	Minimize Environmental Impacts
Cultural Resource Concerns	Real Estate Issues
Construction Costs	Project Benefits
Sponsor's Preferences	Safety Issues
Public Acceptance	

Preliminary benefits and costs developed for these alternative plans were used to reduce the number of alternative plans considered during more-detailed evaluation. Mitigation was

considered to be the same for all alternatives during the screening of alternative plans. Cost factors such as levee construction, dredging, and pipeline relocation/removal, engineering design, and construction management were included in this cost analysis. Although no ecological benefits and mitigation costs were calculated, all alternatives were reviewed for potential effects to the environment in a nonquantitative manner. Costs for operation and maintenance for each of the alternatives were not included in the initial evaluation but were considered in the later screening process. Costs were developed for all of the alternative plans; however, benefits were determined only for traffic associated with terminals on the authorized channel. Benefits for the Stauffer Channel were not calculated for the initial screening.

The channel was divided into its basic reaches, Outer Bar, Jetty, Lower Turning Basin, Channel to Brazosport Turning Basin, Brazosport Turning Basin, Channel to Upper Turning Basin, Upper Turning Basin, Brazos Harbor Channel and Turning Basin, and Stauffer Channel. The various depth and width options were applied to these reaches. In the Channel to Upper Turning Basin reach, there was some width restriction due to docks on both sides of the channel.

Dredged material from the Outer Bar and Jetty channels reach would be placed in ODMDSs by hopper dredges. There are two existing ODMDSs associated with the existing 45-foot Project, the New Work ODMDS and the Maintenance ODMDS. Dredged material from the inshore channel reaches would be placed in confined upland PAs by hydraulic pipeline dredging. There are several existing PAs in the vicinity of the channel; however, new PAs would be needed for new work and maintenance material. Port Freeport owns large tracts of land in the area available for use as PAs.

Initial analysis of the Brazos Harbor Channel and Turning Basin, used for general cargo and not used by large, deep-draft vessels, showed that deepening and widening were not justified. No increase in ship size is projected for the users of this area. The 36-foot-deep channel intersects with the Main Channel near Station 170+00, just above ConocoPhillips's petroleum docks. Brazos Harbor Turning Basin vessel traffic primarily consists of refrigerated container vessels delivering bananas and general cargo vessels shipping rice. The configuration of the access area and turning basin limits future expansion opportunities due to the high density of docks and landside facilities. The water and landside limitations of the general cargo reaches prompted development of the adjacent Velasco property for the construction of the new container terminal. The Brazos Harbor Channel was dropped from detailed plan formulation.

2.3 SECONDARY SCREENING

Nine project alternatives including FWOP-2 were identified for further evaluation. Evaluation included performing a more-detailed economic analysis to establish the benefit-to-cost ratio and net excess benefits for each alternative identified in Section 2.3, below. Both the NED Plan and the Locally Preferred Plan (LPP) were identified as a result of this detailed economic analysis.

The NED Plan consists of deepening the channel to 60 feet at a width of 540 feet, and the LPP entails deepening the channel to 55 feet at a width of 600 feet. Both plans include widening and dredging the Lower and Upper Stauffer channels. The nine alternatives that were carried forward for detailed analysis are described below.

2.3.1 Alternatives Considered for Detailed Analysis

The final array of alternatives considered included:

Alternative 1: No Action; FWOP-2; the existing project, described above.

Main Channel

Alternative 2: FWOP-1; widen the Outer Bar and Jetty channels to 600 feet.

Alternative 3: Deepen to 50 feet from the Gulf of Mexico to the Upper Turning Basin and widen to 600 feet through the Jetty Channel.

Alternative 4: Deepen to 55 feet from the Gulf of Mexico to the Upper Turning Basin and widen to 600 feet through the Jetty Channel.

Alternative 5: Deepen to 60 feet from the Gulf of Mexico to the Upper Turning Basin and widen to 600 feet through the Jetty Channel.

Stauffer Channel

Alternative 6: Dredge Stauffer Channel to its previously authorized dimensions of 30 feet deep by 200 feet wide.

Alternative 7: Widen the lower 3,700 feet of the Stauffer Channel to 300 feet and reestablish its previously authorized depth of 30 feet, with the upper 3,400 feet of the Stauffer Channel dredged to its previously authorized dimensions of 30 feet deep and 200 feet wide.

Alternative 8: Widen the lower 3,700 feet of the Stauffer Channel to a 300-foot width and deepen it to 40 feet, with the upper 3,400 feet of the Stauffer Channel dredged to previously authorized dimensions of 30 feet deep and 200 feet wide.

Alternative 9: Widen the lower 3,700 feet of the Stauffer Channel to a 300-foot width and deepen it to 50 feet, with the upper 3,400 feet of the Stauffer Channel dredged to its previously authorized dimensions of 30 feet deep and 200 feet wide.

Detailed analyses of benefits and costs were conducted for a 50-year period of analysis for all the above alternatives, combining various channel widths and depths with the different Stauffer Channel configurations.

2.3.2 Environmental Considerations

Eight channel improvement alternatives were proposed for analysis. All were variations of deepening and/or widening of various reaches or the entire length of the authorized ship channel, as well as an extension of the existing Outer Bar Channel with deepening and widening. The

proposed depths for the existing channel ranged from 47 to 60 feet plus advance maintenance and overdepth dredging. Proposed widening would increase the existing project from 400 feet up to 600 feet along most of its length. With two exceptions, none of the alternatives would impact wetlands or upland areas, and all dredging will be confined to open water. However, initial channel widening (from 400 to 600 feet) would be accomplished by the non-Federal sponsor under a permit, ahead of proposed Federal channel improvements. The permit widening would remove approximately 1.9 acres of upland area located near the Jetty Channel just east of the USCG Station on the north (Surfside Beach) side of the channel. Proposed Federal channel improvements (deepening and selective widening) would follow the permit project, producing no additional impacts in the Jetty Channel portion of the permit project area. Alternatives 3 through 9 would impact benthic organisms that would recover rapidly after construction.

During plan formulation, the Federal project considered potential beneficial uses identified by the permit Widening Project such as beach renourishment and marsh restoration using new work dredged material from inland portions of the ship channel. While soil borings indicated some sandy material, no concentrated sand lenses were identified, and the high percentage of clay could not be used for beach nourishment. Marsh restoration was also precluded because of the presence of oysters at two of the three sites considered for restoration. The third potential site was cost prohibitive because of pump distance. New work and maintenance material from the offshore reaches of the ship channel would be placed in existing New Work and Maintenance ODMDSs located along the Outer Bar Channel for all alternatives considered. The U.S. Environmental Protection Agency (EPA) has concurred in the use of the existing ODMDSs for proposed new construction and continued project maintenance.

Both new work and maintenance material removed from inland reaches of the ship channel would be placed in existing PA 1 and two proposed new upland PAs, 8 (168 acres) and 9 (250 acres) (see Figure 2.5-1). The proposed PAs are currently used as pasture for cattle grazing. Construction of the two new upland PAs would impact approximately 21 acres of riparian forest and 39 acres of ephemeral wetlands. Coordination with U.S. Fish and Wildlife Service (USFWS) and Texas Parks and Wildlife Department (TPWD) regarding these impacts has resulted in proposed mitigation that includes creation and maintenance of riparian forest habitat and wetlands.

A terrestrial cultural resource investigation of proposed PAs 8 and 9 located a possible Civil War gun emplacement that will require avoidance or further investigation if avoidance of the site is not possible. Additional cultural resource investigations will be conducted and coordinated under an executed Programmatic Agreement (PAg) pursuant to 36 Code of Federal Regulations (CFR) 800.

A Hazardous, Toxic, and Radioactive Waste (HTRW) assessment was conducted for the project area, including proposed PAs 8 and 9. While several sources of HTRW were identified at upland

industries that line the banks of the Freeport Harbor Channel, no active enforcement actions were under way, and no HTRW sites were located within the project area footprint. Previous sediment quality analyses also revealed no contaminant concerns. Therefore, it is unlikely that contaminants will be encountered during construction activities.

Based on environmental screening considerations, it was determined that the initial alternatives under consideration presented no environmental constraints that would result in adverse impacts to the human or natural environment, to include fish and wildlife resources, wetlands, cultural resources, and socioeconomics. According to Table 2.3-1, impacts to benthic organisms from channel dredging and ODMDS placement activities represent the largest areal impacts regarding proposed project improvements. Additional information associated with potential environmental impacts from the alternatives is also found in this matrix.

2.3.3 Results of Detailed Analysis

Per ton transportation cost savings for channel depth alternatives of 50 to 60 feet at project widths of 500 to 600 feet were compared with the existing 45-foot channel depth costs. Some were only briefly examined and are not included here (see FR for more detail). The increased channel depths would provide improved access to the crude petroleum and petroleum product docks; thus, benefit calculations were limited to petroleum. The analysis included crude petroleum imports transportation savings, petroleum product import and export tonnage transportation savings, and total annual costs. Based on the average annual benefits over a 50-year period of analysis at a 4.0 percent discount rate, the benefit/cost ratios and average annual net excess benefits were computed for various depth increments beginning at the Outer Bar Channel up to the Upper Turning Basin, and for the Stauffer Channel. These increments were derived from the nine alternatives, above.

As detailed plan formulation began, the alternatives were reevaluated. In reevaluation of the Jetty Channel area, it was determined that in order to provide adequate stability of the rock jetties, the bottom width for a 60-foot-deep channel would have to be reduced. It was determined that 540 feet was the maximum bottom width that could be constructed between the jetties and maintain the standard 3-foot horizontal to 1-foot vertical channel side slope. Economic evaluation of the Stauffer Channel indicated that benefits were maximized at a depth of 25 feet in the Upper Channel reach. Thus, the alternative plans were modified accordingly.

After the conclusion of the preliminary screening, detailed plan formulation focused on the refinement of two alternatives determined to be the most feasible: 60-x-540-foot and 55-x-600-foot channel improvements, both of which are described in greater detail below. The FWOP-1 Alternative was also carried forward into detailed analysis to provide for comparison with proposed Federal action alternatives. All nonstructural alternatives were eliminated.

Table 2.3-1
Alternatives Screening Matrix – Potential Impacts to Evaluated Resources

ALTERNATIVES	1	2	3	4	5	6	7	8	9	NED Plan	LPP
	No Action	**Entrance & Jetty Channel 600' Width**	**Main Channel 50' Depth**	**Main Channel 55' Depth**	**Main Channel 60' Depth**	**Stauffer Ch Authorized Dimensions 30' Depth**	**Stauffer Channel Widened and 30' Depth**	**Stauffer Channel Widened and 40' Depth**	**Stauffer Channel Widened and 50' Depth**	**Alternatives 5 and 8**	**Alternatives 4 and 9**
EVALUATION CRITERIA											
Construction Dredging Volumes	None	3.1 mcy	15.8 mcy	15.7 mcy	21.8 mcy	4.7 mcy	1.0 mcy	1.4 mcy	1.6 mcy	23.2 mcy	17.3 mcy
Maintenance Dredging Volumes (50-year plan)	112 mcy	161 mcy	171.4 mcy	175.8 mcy	190.4 mcy	0.08 mcy	0.08 mcy	0.08 mcy	0.08 mcy	190.5 mcy	175.9 mcy
Construction Air Quality (NO_X emissions)	None	Approximately 430 tons, conformity determination required	Less than NED	Less than NED	Less than NED	Less than NED	Less than NED	Less than NED	Less than NED	Approximately 3,522 tons, conformity determination required	Approximately 2,620 tons, conformity determination required
Noise (dBA)	3–6 dBA over ambient	12–23 dBA over ambient during construction	Less than NED	Less than NED	Less than NED	Less than NED	Less than NED	Less than NED	Less than NED	12 to 23 dBA over ambient	Same as NED
Salinity	No change	No change	Minor increase	Minor increase	Minor increase	Minor increase	Minor increase	Minor increase	Minor increase	Minor increase	Minor increase
Essential Fish Habitat	No change	Less turbidity than NED	Less turbidity than NED	Less turbidity than NED	Less turbidity than NED	Less turbidity than NED	Less turbidity than NED	Less turbidity than NED	Less turbidity than NED	Temporary turbidity during construction	Less turbidity than NED
Benthic Habitat (acres of impact)	1,291 acres Maintenance ODMDS	1,291 acres Maintenance ODMDS 2,236 New Work ODMDS	1,291 acres Maintenance ODMDS 2,236 New Work ODMDS	1,291 acres Maintenance ODMDS 2,236 New Work ODMDS	1,291 acres Maintenance ODMDS 2,236 New Work ODMDS	None	None	None	None	1,291 acres Maintenance ODMDS 2,236 New Work ODMDS	1,291 acres Maintenance ODMDS 2,236 New Work ODMDS
Threatened and Endangered Species	Chance of turtle takes	Chance of turtle takes	Chance of turtle takes	Chance of turtle takes	Chance of turtle takes	Minimal chance of turtle takes	Minimal chance of turtle takes	Minimal chance of turtle takes	Minimal chance of turtle takes	Greater chance of turtle takes	Less chance of turtle takes
Terrestrial Wildlife Habitat (acres of impact)	None	Less than 2 acres of impact along channel	418 acres, PAs 8 and 9	418 acres, PAs 8 and 9	418 acres, PAs 8 and 9	418 acres, PAs 8 and 9	418 acres, PAs 8 and 9	418 acres, PAs 8 and 9	418 acres, PAs 8 and 9	418 acres, PAs 8 and 9	418 acres, PAs 8 and 9
Wetlands (acres and AAHUs)	None	0.48 acres; AAHUs not reported	39.5 acres 1.1 AAHUs	39.5 acres 1.1 AAHUs	39.5 acres 1.1 AAHUs	39.5 acres 1.1 AAHUs	39.5 acres 1.1 AAHUs	39.5 acres 1.1 AAHUs	39.5 acres 1.1 AAHUs	39.5 acres 1.1 AAHUs	39.5 acres 1.1 AAHUs
Riparian Forest (acres and AAHUs)	None	None	21 acres 7.46 AAHUs	21 acres 7.46 AAHUs	21 acres 7.46 AAHUs	21 acres 7.46 AAHUs	21 acres 7.46 AAHUs	21 acres 7.46 AAHUs	21 acres 7.46 AAHUs	21 acres 7.46 AAHUs	21 acres 7.46 AAHUs
Prime Farmlands (acres)	None	None	250 acres in PA 9	250 acres in PA 9	250 acres in PA 9	250 acres in PA 9	250 acres in PA 9	250 acres in PA 9	250 acres in PA 9	250 acres in PA 9	250 acres in PA 9
Socioeconomics	Potentially increased delays and economic loss as ship sizes increase	Short-term increase in construction employment; potential for economic growth	Short-term increase in construction employment; potential for economic growth	Short-term increase in construction employment; potential for economic growth	Short-term increase in construction employment; potential for economic growth	Short-term increase in construction employment; potential for economic growth	Short-term increase in construction employment; potential for economic growth	Short-term increase in construction employment; potential for economic growth	Short-term increase in construction employment; potential for economic growth	Short-term increase in construction employment; potential for economic growth	Short-term increase in construction employment; potential for economic growth

dBA = A-weighted sound level; AAHU = average annual habitat unit

Detailed engineering analysis focused on development of hydrology and hydraulic analysis, channel layout, engineering quantities, geotechnical analysis, operations and maintenance, and cost estimating.

2.4 EVALUATION OF SCREENED ALTERNATIVES

The following subsections provide descriptions of the alternatives carried forward for further analysis and comparison. The alternatives include the FWOP-1, NED (alternatives 5 and 8, above, slightly modified to account for jetty stability and depth of the Upper Reach of the Stauffer Channel), and LPP (alternatives 4 and 9, above, slightly modified for depth of the Upper Reach of the Stauffer Channel). Detailed project dimensions for the FWOP-2 were previously displayed in Table 1.3-1.

2.4.1 FWOP-1 Alternative, Widening Project

The Widening Project would be maintained at the authorized depth of 45 feet and permitted width of up to 600 feet for the Entrance Channel. The Jetty Channel from Channel Station 63+46 would be gradually widened, at the authorized depth, from 400 feet to 550 feet up to Channel Station 43+00. From that station to Channel Station 38+00, the channel width would be between 550 feet and 600 feet. The remainder of the Jetty Channel and the entire Outer Bar Channel (to approximately Channel Station –300+00) would be approximately 600 feet wide. The remainder of the Freeport Harbor Main Channel, turning basins, and Stauffer Channel would remain as described in Section 1.3 and Table 1.3-1. Construction of the Widening Project would result in approximately 3.2 mcy of new work dredged material consisting of approximately 2.9 mcy of clay/silt material and about 300,000 cy of silty/sand material. The 2.9 mcy of clay/silt material would be placed in the existing New Work ODMDS. The 300,000 cy of silty/sand material would be placed on Quintana Beach in front of the Seaway PA.

Construction of the Widening Project is expected to impact approximately 3.9 acres along the north (Surfside) side of the Jetty Channel between Surfside Jetty Park and the USCG Station. This area would be dredged as part of the widening of the Jetty Channel. Removal of this land area would result in the loss of shrub/scrub upland vegetation, beach, and tidal mud flats.

Maintenance material would continue to be removed and placed in the existing Maintenance ODMDS currently used for the Jetty and Outer Bar channels, and in PA 1 for the channels inshore of the Jetty Channel. None of the maintenance dredged material would be used beneficially because it is not suitable for beach nourishment and there are no economically justified marsh creation sites within reasonable pumping distance of the project.

2.4.2 NED Alternative

Channel configuration details of the NED Plan (NED Alternative) are summarized in Table 2.4-1. Several cross sections showing channel dimensions for the NED Alternative can be seen on Figures K1–7, located in Appendix K, and the proposed NED Alternative channel footprint, compared to the 45-foot Project (existing channel), can be seen on Figure 2.4-1.

Table 2.4-1
Freeport Harbor Channel
Proposed NED Plan Dimensions for Reaches and Basins

Channel Section	Required Depth (feet)	Width (feet)	New Work Quantity (cy)[a,b]
Future Channel Extension (Sta –300+00 to Stat –470+00)	62	600	2,670,000
Outer Bar Channel (Sta 0+00 to Sta –300+00)	62	600	11,100,000
Jetty Channel (Sta 0+00 to Sta 71+52)	60	540	4,187,000
Lower Turning Basin (Sta 71+52 to Sta 78+52)	60	750	318,000
Channel to Brazosport and New 1,200-foot Turning Basin (Sta 78+52 to Sta 115+00)	60	existing[c]	2,316,000
Channel from Brazosport Turning Basin (Sta 115+00 to Sta 132+66)	60	existing[c]	547,000
Channel to Upper Turning Basin and Upper Turning Basin (Sta 132+66 to Sta 184+20)	50	existing[c,d]	490,000
Stauffer Channel – Lower Reach (Sta 184+20 to Sta 222+00)	50	300	1,340,000
Stauffer Channel – Upper Reach and Turning Basin (Sta 222+00 to Sta 260+00)	25	200[e]	427,000

[a] Includes Advance Maintenance
[b] Includes Allowable Overdepth
[c] Channel width varies from 350 to 400 feet
[d] Upper Turning Basin is 1,200 feet
[e] Stauffer Turning Basin is 500 feet

In general, the NED Alternative is referred to as the 60- by 540-foot project because the width of the Jetty Channel would be restricted to 540 feet. This alternative proposes to extend the Outer Bar Channel 3.2 miles farther into the Gulf at a depth of 62 feet and a width of 600 feet, deepen the existing Outer Bar Channel to 62 feet and the Jetty Channel to 60 feet, deepen the Lower Turning Basin and Main Channel through Station 132+66 (just above the Brazosport Turning Basin) to 60 feet and widen the Brazosport Turning Basin to 1,200 feet, deepen the channel from Station 132+66 through the Upper Turning Basin to 50 feet, deepen and widen the Lower Stauffer Channel to 50 feet by 300 feet, and dredge the Upper Stauffer Channel to 25 feet deep by 200 feet wide in lieu of restoring its previous dimensions of 30 feet by 200 feet. The above depths are authorized depths and do not include 2 feet of advanced maintenance or allowable overdepth dredging. Material dredged from the Entrance Channel during construction

Legend

- LPP Proposed Channel*
- NED Proposed Channel*
- Existing Channel

N W E S

0 1,500 3,000 6,000 Feet

Note: *Created using plan drawings provided by USACE 03/02/2010

Figure 2.4-1
NED & LPP Proposed Channels

Freeport Harbor Channel Improvement Project

Prepared for: USACE	
Job No.: 044190100	Scale: 1 inch equals 3,000 feet
Prepared by: 15490	Date: 03/09/2010
File: N:/Clients/U_Z/USACE/Projects/Freeport/044190100/projects/Figures/2_5_2.mxd	

would be placed in the New Work ODMDS, and the remainder of the new work material would be placed in PAs 1, 8, and 9. Construction would generate approximately 20.4 mcy of new work dredged material (including advance maintenance and allowable overdepth), of which 15 mcy would be placed in the New Work ODMDS and 2.1 mcy and 3.3 mcy would be placed in PAs 8 and 9, respectively. Maintenance of the improved channel is calculated to generate a total of 190.5 mcy of material over the 50-year evaluation period. Of this, 3.5 mcy would be placed in the Maintenance ODMDS on an estimated 1-year cycle, and 0.04 mcy, 0.12 mcy, and 0.19 mcy would be placed in PAs 1, 8, and 9, respectively, on a 3-year cycle. Maintenance material dredged from the Entrance and Lower Turning Basin channels would be placed in the Maintenance ODMDS, and material from the remainder of the channels would be placed in PAs 1, 8, and 9.

2.4.3 LPP Alternative, Preferred Alternative

An analysis of channel configuration plans identified the 60-x-540-foot alternative, or NED Plan, as the plan with the most net benefits; however, the port prefers the smaller and less costly 55-x-600-foot plan, or the LPP Alternative. Although the benefits associated with this plan are slightly less, the amount of new work dredged material is smaller, and at the request of Port Freeport, USACE has selected the LPP Alternative as the Preferred Alternative for implementation. Channel dimensions for the LPP Alternative compared to the Widening Project can be seen on Figures K1–7, located in Appendix K, and the proposed LPP Alternative channel footprint, compared to the 45-foot Project (existing channel), can be seen on Figure 2.4-1.

The LPP Alternative proposes to extend the Outer Bar Channel (Channel Extension) 1.3 miles farther into the Gulf at a depth of 57 feet (–58 Mean Lower Low Water [MLLW]) and a width of 600 feet, deepen the existing Outer Bar Channel to 57 feet (–58 MLLW) and the Jetty Channel to 55 feet (–56 MLLW), deepen the Lower Turning Basin and Main Channel through Station 132+66 (just above the Brazosport Turning Basin) to 55 feet (–56 MLLW) and widen the Brazosport Turning Basin to 1,200 feet, deepen the channel from Station 132+66 through the Upper Turning Basin to 50 feet (–51 MLLW), deepen and widen the Lower Stauffer Channel to 50 feet (–51 MLLW) by 300 feet wide, and dredge the Upper Stauffer Channel to 25 feet (–26 MLLW) deep by 200 feet wide in lieu of restoring its previously authorized dimensions of 30 feet (–31 MLLW) by 200 feet. The above depths are authorized depths and do not include 2 feet of advanced maintenance or allowable overdepth dredging. Proposed channel dimensions for the Preferred Alternative can be found in Table 2.4-2. Material dredged from the Entrance Channel during construction would be placed in the New Work ODMDS, and the remainder of the new work material would be placed in PAs 1, 8, and 9. Construction of the LPP Alternative would generate approximately 17.3 mcy of new work dredged material (including advance maintenance and allowable overdepth), of which 12.7 mcy would be placed in the New Work ODMDS, and 1.9 and 2.7 mcy would be placed in PAs 8 and 9, respectively.

Table 2.4-2
Freeport Harbor Channel
Proposed Dimensions for Preferred Alternative Reaches and Basins

Channel Section	Required Depth (feet)	Width (feet)	New Work Quantity (cy)[a,b]
Future Channel Extension (Sta –300+00 to Stat -370+00)	57	600	795,000
Outer Bar Channel (Sta 0+00 to Sta –300+00)	57	600	8,290,000
Jetty Channel (Sta 0+00 to Sta 71+52.58)	55	600	3,648,000
Lower Turning Basin (Sta 71+52 to Sta 78+52)	55	750	208,000
Channel to Brazosport and New 1,200-foot Turning Basin (Sta 78+52 to Sta 115+00)	55	existing[c]	1,716,000
Channel from Brazosport Turning Basin (Sta 115+00 to Sta 132+66)	55	existing[c]	391,000
Channel to Upper Turning Basin and Upper Turning Basin (Sta 132+66 to Sta 184+20)	50	existing[c,d]	490,000
Stauffer Channel – Lower Reach (Sta 184+20 to Sta 222+00)	50	300	1,387,000
Stauffer Channel – Upper Reach and Turning Basin (Sta 222+00 to Sta 260+00)	25	200[e]	427,000

[a] Includes advanced maintenance

[b] Includes allowable overdepth

[c] Channel width varies from 350 to 400 feet

[d] Upper Turning Basin is 1,200 feet

[e] Stauffer Turning Basin is 500 feet

Material dredged from the Entrance and Lower Turning Basin channels during maintenance cycles would be placed in the Maintenance ODMDS, and material from the remainder of the channel would be placed in PAs 1, 8, and 9. Maintenance of the deepened and widened channel would generate a total of 175.9 mcy of maintenance dredged material over the 50-year evaluation period. Of this, as with the NED Alternative, 3.2 mcy would be placed in the Maintenance ODMDS on an estimated 1-year cycle, and 0.4 mcy, 0.12 mcy, and 0.19 mcy would be placed in PAs 1, 8, and 9, respectively, on a 3-year cycle.

2.5 DREDGED MATERIAL PLACEMENT ALTERNATIVES

Although not part of the initial screening, various alternatives for placement of dredged material were also considered. For the NED Alternative, a maximum of 20.4 mcy of new work material and 190.5 mcy of maintenance material over the 50-year period of economic evaluation are expected to be produced by the proposed project. Placement alternatives considered included expansion of existing upland PAs, creating new upland PAs, and use of existing ODMDSs. Tables 2.5-1 and 2.5-2 below contain summaries of new work and maintenance volumes, distribution to placement areas, and maintenance dredging cycles.

Table 2.5-1
Freeport Harbor Deepening and Widening – Summary of New Work Dredging

Alternative	Channel Reaches	Channel Reach Stationing To	Channel Reach Stationing From	Required Quantity (cy)	Overdepth Quantity (cy)	Total Quantity (cy)	Dredging Stationing & Placement Site Designation To	Dredging Stationing & Placement Site Designation From	Dredging Stationing & Placement Site Designation Site	Quantity Breakdown to Placement Sites (cy)
NED	Future Channel Extension	–470+00	–300+00	2,000,000	670,000	2,670,000	–470+00	–300+00	ODMDS 1	14,957,454
	Outer Bar Channel	–300+00	00+00	7,800,000	1,300,000	9,100,000	–300+00	00+00		
	Jetty Channel	00+00	71+52	2,900,000	287,000	3,187,000	00+00	71+52		
	Lower Turn Basin	71+52	78+52	280,000	38,000	318,000	71+52	78+52	PA 8	2,087,559
	Ch to Brazosport & New 1,200-foot Brazosport TB*	78+52	115+00	2,200,000	116,000	2,316,000	78+52	106+40		
							106+40	115+00	PA 9	3,396,987
	Ch from Brazosport TB	115+00	132+66	513,000	34,000	547,000	115+00	132+66		
	Ch to Upper TB & Upper TB	132+66	184+20	380,000	110,000	490,000	132+66	184+20		
	Stauffer Channel, Lower Stauffer TB	184+20	222+00	1,340,000	47,000	1,113,000	184+20	222+00		
	Stauffer Channel, Upper Staffer & TB	222+00	260+00	390,000	37,000	427,000	222+00	260+00		
	Total			**17,803,000**	**2,639,000**	**20,442,000**				
LPP	Future Channel Extension	–370+00	–300+00	500,000	295,000	795,000	–470+00	–300+00	ODMDS 1	9,733,297
	Outer Bar Channel	–300+00	00+00	4,990,000	1,300,000	6,290,000	–300+00	00+00		
	Jetty Channel	00+00	71+52	2,345,000	303,000	2,648,000	00+00	71+52		
	Lower Turn Basin	71+52	78+52	170,000	38,000	208,000	71+52	78+52	PA 8	1,853,144
	Ch to Brazosport & New 1,200-foot Brazosport TB	78+52	115+00	1,600,000	116,000	1,716,000	78+52	113+50		
							113+50	115+00	PA 9	2,765,559
	Ch from Brazosport TB	115+00	132+66	357,000	34,000	391,000	115+00	132+66		
	Ch to Upper TB & Upper TB	132+66	184+20	380,000	110,000	490,000	132+66	184+20		
	Stauffer Channel, Lower Stauffer TB	184+20	222+00	1,340,000	47,000	1,387,000	184+20	222+00		
	Stauffer Channel, Upper Staffer & TB	222+00	260+00	390,000	37,000	427,000	222+00	260+00		
	Total			**12,072,000**	**2,280,000**	**14,352,000**				**14,352,000**

*TB = Turning Basin.

Table 2.5-2
Freeport Harbor Deepening and Widening – Summary of Maintenance Dredging and Placement Area Parameters

Alternative	Channel Reaches	Channel Reach Stationing To	Channel Reach Stationing From	Annual Shoaling Rate From Channel Reaches (cy)	Dredging Stationing & Placement Site Designation To	Dredging Stationing & Placement Site Designation From	Dredging Stationing & Placement Site Designation Site	Approx. Size of Placement Site (Acres)	Approx. Existing Levee Elevation (feet in MLT)	1st Construction Levee Elev. (feet in MLT)	Shaped NW Levee Elev. (feet in MLT)	50-Year Levee Elev. (feet in MLT)	Annual Shoaling Rate to Placement Site (cy)	Years Per Cycle	Dredge Quantity Per Cycle (cy)	Total Number of Cycles	Total 50-Year Maintenance Dredging Quantity (cy)
NED	NED Extension	–450+00	–300+00	1,044,448	–450+00	–300+00	ODMDS 1A	1,291	NA	NA	NA	NA	3,472,580	1	3,472,580	50	173,628,985
	Outer Bar Channel	–300+00	00+00	2,088,897	–300+00	00+00											
	Jetty Channel	00+00	71+52	316,289	00+00	71+52											
	Lower Turning Basin	71+52	78+52	22,946	71+52	78+52											
	Ch to Brazosport & Brazosport TB*	78+52	115+52	142,181	78+52	90+20	PA 1	320	29.0	31.5	31.5	33.5	44,883	3	134,649	16	2,154,384
					90+20	115+52	PA 8	168	NA	23.0	33.5	33.5	119,183	3	357,550	16	5,720,805
	Ch to Upper TB	115+52	132+66	57,889	115+52	122+00	PA 9	254	NA	23.0	33.5	33.5	177,700	3	533,101	16	8,529,620
					122+00	132+66											
	Ch to UP TB & UP TB	132+66	184+20	141,697	132+66	184+20											
	Lower Stauffer TB	184+20	222+00	4,826	184+20	222+00							9,826	12	117,912	4	471,648
	Upper Staffer TB	222+00	260+00	5,000	222+00	260+00											
	Total			**3,824,173**									**3,824,173**				**190,505,443**
LPP	LPP Extension	–450+00	–300+00	873,159	–450+00	–300+00	ODMDS 1A	1,291	NA	NA	NA	NA	3,188,339	1	3,188,339	50	159,416,960
	Outer Bar Channel	–300+00	00+00	1,969,531	–300+00	00+00											
	Jetty Channel	00+00	71+52	324,554	00+00	71+52											
	Lower Turning Basin	71+52	78+52	21,095	71+52	78+52											
	Ch to Brazosport & Brazosport TB	78+52	115+52	132,400	78+52	89+10	PA 1	320	29.0	31.5	31.5	33.5	37,859	3	113,577	16	1,817,240
					89+10	115+52	PA 8	168	NA	21.5	33.0	33.0	119,008	3	357,025	16	5,712,400
	Ch to Upper TB	115+52	132+66	53,220	115+52	123+40	PA 9	254	NA	21.5	33.0	33.0	170,450	3	511,350	16	8,181,594
					123+40	132+66											
	Ch to UP TB & UP TB	132+66	184+20	141,697	132+66	184+20											
	Lower Stauffer TB	184+20	222+00	11,507	184+20	222+00							16,907	12	202,884	4	811,536
	Upper Staffer TB	222+00	260+00	5,400	222+00	260+00											
	Total			**3,532,564**									**3,532,564**				**175,939,729**

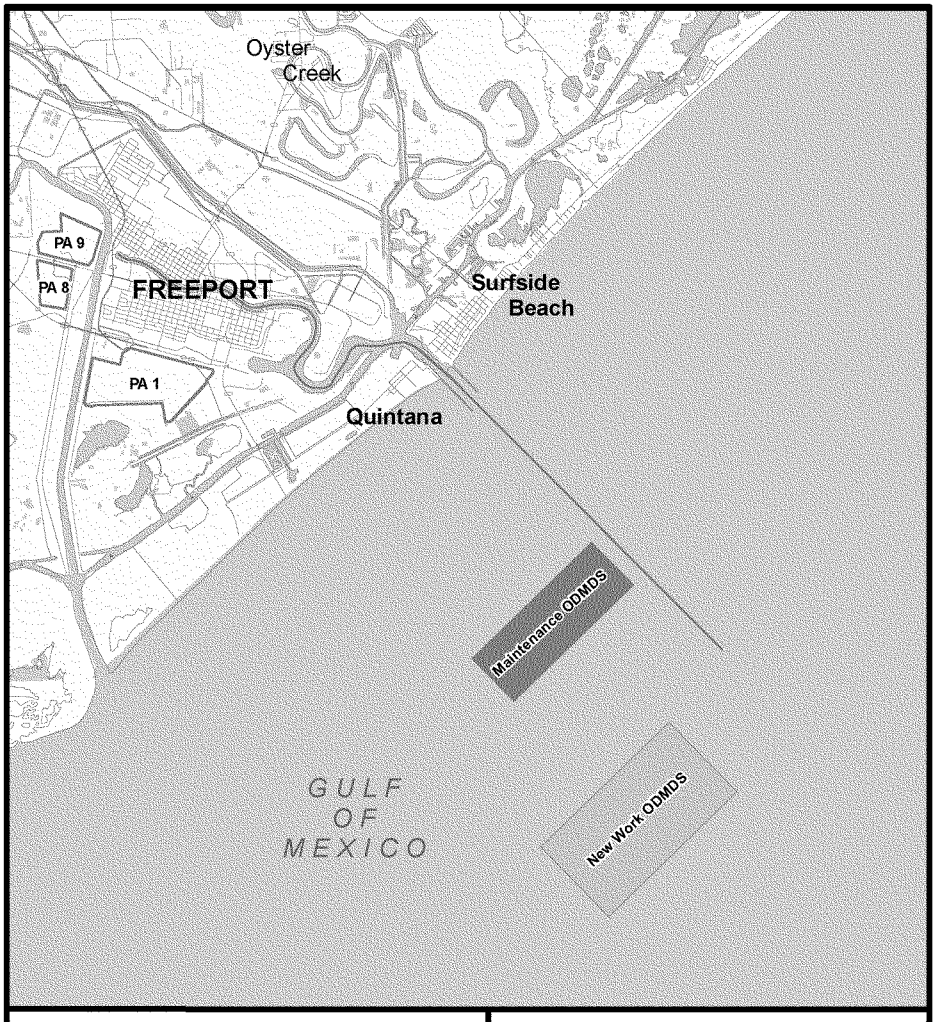
*TB = Turning Basin.

During plan formulation, the Federal project considered potential beneficial uses identified by the Widening Project such as beach nourishment and marsh restoration for new work dredged material. While soil borings in the project area indicated some sandy material, no concentrated lenses were identified, and the high percentage of clay material present would not be compatible with existing sandy beach soils in terms of nourishment efforts. The potential for marsh restoration was also precluded because sensitive resources (oysters) and recreational use existed at two of the three sites considered for proposed restoration activities; moreover, restoration activities at the remaining site considered would be cost prohibitive due to rehandling of dredging equipment, dredging time, and dredging conditions.

Each of the following dredged material disposal plans includes a different mix of possible placement alternatives.

Gulf Placement Plan – Two EPA-designated dispersive ODMDSs exist south of Freeport in the Gulf of Mexico (Figure 2.5-1). The ODMDS closest to shore was originally designated to receive maintenance dredged material and is referred to as the Maintenance ODMDS, while the ODMDS farthest from shore was originally designated to receive new work (construction) material from the 45-foot Project and is referred to as the New Work ODMDS. Coordination with EPA under Section 102 of the Marine Protection, Research, and Sanctuaries Act (MPRSA) of 1972 (Ocean Dumping Act) resulted in their concurrence to utilize the existing Maintenance and New Work ODMDSs in similar capacity for the FHCIP. Surveys were conducted to establish the condition of the present ODMDS sites, and it has been determined that they are of sufficient size to accommodate placement activities for the proposed project (Appendix B). New work dredged material removed from the Entrance Channel seaward would be placed in the New Work ODMDS, while maintenance material from the Lower Turning Basin and Entrance Channel would be placed in the Maintenance ODMDS. EPA concurrence in the use of these sites precluded the need to identify and designate new ODMDS sites, which would have increased project impacts.

Upland Placement Plan – Several existing PAs are located in the proposed project area (see Figure 1.1-1). The 45-foot Project currently uses PA 1, a 330-acre site, which retains some capacity but cannot be expanded, for placement of maintenance material. It is proposed to use PA 1 for placement of maintenance material for the Main and Stauffer channels for the FHCIP. PAs 2 and 3 are designated for Gulf Intracoastal Waterway (GIWW) maintenance material placement and are not available for FHCIP use. Given estimated quantities, approximately 418 additional upland acres would be needed for placement in order to handle new work material from the Main and Stauffer channels and maintenance material from the Lower Turning Basin. Several tracts of land owned by Port Freeport were considered for upland PA development for the FHCIP. Two potential new PAs, 8 (168 acres) and 9 (250 acres), were identified on port land west of the Brazos River Diversion Channel and northwest of PA 1 (see Figure 2.5-1).



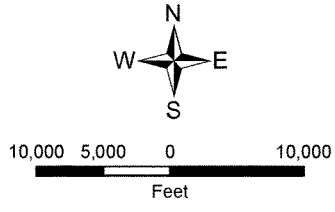


Figure 2.5-1

Freeport Harbor Channel Improvement Project

Dredged Material Placement Area Alternatives

Prepared for: USACE, Galveston District	
Job No.: 044190100	Scale: 1:120,000
Prepared by: A. Christiansen	Date: 03/24/2008
File: N:/Clients/U_Z/USACE/Projects/Freeport/044190100/projects/fig_2_4_1.mxd	

2.6 COMPARISON OF REASONABLE ALTERNATIVES

The following provides a comparison of potential impacts resulting from the two action alternatives, the NED and LPP, and FWOP-1 (Widening Project). In general, NED and LPP impacts are quite similar, with NED impacts slightly greater, as might be expected. The primary impact of FWOP-1 would be an increase in the amount of maintenance dredged material placed in the Maintenance ODMDS by approximately 1 mcy per year (USACE, 2008a). The NED Alternative would result in the placement of approximately 20.4 mcy of new work dredged material during construction, while the LPP Alternative would result in the placement of approximately 17.3 mcy. Maintenance dredged material over the 50-year project would be 190.5 and 175.9 mcy for the NED and LPP, respectively.

NO_X emissions are expected to exceed the threshold for General Conformity for both NED and LPP, but would be higher for the NED Alternative (approximately 437 tons per year [tpy] NO_X) than for the LPP Alternative (approximately 333 tpy NO_X). The anticipated increase in air emissions associated with an increase in the amount of dredged material during maintenance cycles would be the same for both alternatives. Noise impacts during dredging operations would be about 3 to 6 dBA (A-weighted sound level) higher at the nearest noise receptors than what is experienced during current maintenance dredging for both alternatives. The NED Alternative would result in average annual net excess benefits of approximately $42.6 million with a benefit cost ratio of 2.3, while the LPP Alternative would yield $22.6 million in average annual net excess benefits with a benefit cost ratio of 1.9. Under FWOP-1, if the trend to larger ships continues, more delays for commercial vessels can be expected, resulting in the potential loss of economic benefit for the region. Both action alternatives could result in potential lethal and nonlethal takes of sea turtles during construction and maintenance dredging.

Construction of two new upland confined PAs, PAs 8 and 9, required for both action alternatives, would convert approximately 418 acres of land, including 21 acres of riparian forest and 39 acres of ephemeral wetlands, to DMPAs. The impacts and the proposed mitigation would be the same for both alternatives.

Both alternatives have the potential to result in similar economic development in the study area. Essentially, there are only minor different potential impacts related to implementation of either of the action alternatives. Although long-term impacts for both projects are expected to be roughly equivalent, construction-related impacts are slightly less for the LPP Alternative, except for air emissions, which are reduced by about 27 percent. Thus, the LPP Alternative has been identified as the environmentally preferable alternative. Table 2.6-1 below provides a comparison of alternative plans for channel improvements.

Table 2.6-1
Freeport Harbor Channel and Stauffer Modification
NED and LPP Economic Summary
Average Annual Values at 4.0% and $1,000s

	NED Plan			
	Freeport Channel 60/50 feet	Stauffer Modification		Totals
		Lower Reach 50 feet	Upper Reach 25 feet	
First Cost of Construction	$374,522	$12,664	$4,090	$391,276
Interest During Construction	$28,477	$149	$6	$28,632
Total Investment	$402,999	$12,813	$4,096	$419,909
Average Annual Cost	$18,760	$596	$191	$19,547
Average Annual O&M	$11,258	$1,024	$42	$12,324
Total Annual Cost	$30,018	$1,620	$233	$31,871
Average Annual Benefits	$65,270	$7,784	$1,419	$74,474
Net Excess Benefits	$35,253	$6,164	$1,186	$42,603
B/C Ratios	2.2	4.8	6.1	**2.3**
	LPP			
	Freeport Channel 55/50 feet	Stauffer Modification		Totals
		Lower Reach 50 feet	Upper Reach 25 feet	
First Cost of Construction	$274,988	$11,840	$3,823	$290,651
Interest During Construction	$19,156	$139	$6	$19,301
Total Investment	$294,144	$11,979	$3,829	$309,952
Average Annual Cost	$13,692	$558	$178	$14,428
Average Annual O&M	$9,569	$1,024	$42	$10,635
Total Annual Cost	$23,261	$1,581	$221	$25,063
Average Annual Benefits	$38,442	$7,784	$1,419	$47,646
Net Excess Benefits	$15,181	$6,203	$1,199	$22,583
B/C Ratios	1.7	4.9	6.4	**1.9**

2.6.1 Identification of the Preferred Alternative

The identification of the Preferred Alternative was based on economic, engineering, and environmental factors and local preferences. Costs were estimated for all the alternatives and compared to the benefits. Based on the ship simulation studies, the Brazosport Turning Basin was set at 1,200 feet. No work was proposed for the Brazos Harbor Channel and Turning Basin. Included in the costs are dredging, PA levee construction, and operation and maintenance (O&M) costs for the 50-year period of analysis. Ecosystem mitigation requirements and costs were determined. During detailed plan formulation, the non-Federal sponsor expressed their preference for a channel deepening and widening project slightly different than the plan resulting from the NED analysis.

The Preferred Alternative addresses the problems and opportunities identified during the study and satisfies the planning objectives of increasing navigation efficiency along the Freeport Harbor Channel while maintaining the coastal and estuarine resources within the project area. This Preferred Alternative is the LPP, the plan preferred by the non-Federal sponsor. The Preferred Alternative calls for a 57- to 55-foot-deep by 600-foot-wide Outer Bar and Jetty Channel (57-foot-deep Outer Bar Channel/55-foot-deep Jetty Channel) and 55-foot Main Channel. The LPP is recommended in lieu of the NED Plan. The LPP is less costly than the NED Plan for the Entrance and Main channels, and the net excess benefits are less. The Preferred Alternatives for the Lower and Upper Stauffer channels are the same as the NED Plan.

Table 2.6-1 presents the economic summaries for the NED and the LPP. Incremental analysis of the NED components showed that the highest net excess benefits are for the 60/50-foot depth alternative for all of the Freeport channels through the Lower Stauffer Channel. The maximum net excess benefits for the Upper Stauffer Channel maximized at 25 feet. The overall benefit to cost (B/C) ratio for the Preferred Alternative (LPP) is 1.9.

2.6.2 Sensitivity of Project Alternatives to Relative Sea Level Rise

Sea level rise can affect coastal communities and habitats in a variety of different ways, including submerging low-lying lands, eroding beaches, converting wetlands to open water, intensifying coastal flooding, and increasing the salinity of estuaries and freshwater aquifers. It is caused by a number of natural and human-induced factors and can vary by region. Some impacts of sea level rise can already be observed along the U.S. coast. The primary causes of global sea level rise are the expansion of ocean water due to warming and the melting of glaciers and ice sheets. Locally, sea level rise is also influenced by changes to the geology of coastal land.

RSLR consists of two components: global (eustatic) sea level rise and local subsidence. The uncertainty inherent in the rates of eustatic sea level rise is evident in the variability of the different modeled rates given for the National Research Council (NRC, 1987) projections and the Intergovernmental Panel on Climate Change (IPCC, 2007). A similar degree of uncertainty exists with the rate of local subsidence.

Recent USACE guidance (Engineering Circular [EC] 1165-2-211, July 2009) provides direction for incorporating the direct and indirect physical effects of projected future sea level change in managing, planning, engineering, designing, constructing, operating, and maintaining USACE projects and systems of projects. Recent climate research by IPCC predicts continued or accelerated global warming for the twenty-first century and possibly beyond, which will cause a continued or accelerated rise in global mean sea level (msl). Impacts to coastal and estuarine zones caused by sea level change must be considered in all phases of Civil Works programs.

In order to meet the requirements of EC 1165-2-211, the sensitivity of project alternatives to potential changes in sea level must be evaluated (Table 2.6-2). The range of RSLR was

determined using both tide gage and basal peat data for the local subsidence component of RSLR. Tide gage data reflect the effects of recent historical subsidence.

Table 2.6-2
Comparison of Alternative Plans – Potential Impacts to Evaluated Resources

	No Action (FWOP-2)	Widening Project (FWOP-1)	NED Alternative	LPP Alternative (Preferred Alternative)
Construction Dredging Volumes	None	3.1 mcy	20.4 mcy	14.4 mcy
Maintenance Dredging Volumes (50-year plan)	112 mcy	161 mcy	190.5 mcy	175.9 mcy
Construction Air Quality (NO_X emissions)	None	Approximately 430 tons, conformity determination required	Approximately 3,522 tons, conformity determination required	Approximately 2,620 tons, conformity determination required
Noise (dBA)	3–6 dBA over ambient	12–23 dBA over ambient during construction	12 to 23 dBA over ambient	Same as NED
Salinity	No change	No change	Minor increase	Minor increase
Essential Fish Habitat	No change	Less turbidity than NED	Temporary turbidity during construction	Less turbidity than NED
Benthic Habitat (acres of impact)	1,291 acres Maintenance ODMDS	1,291 acres Maintenance ODMDS 2,236 New Work ODMDS	1,291 acres Maintenance ODMDS 2,236 New Work ODMDS	1,291 acres Maintenance ODMDS 2,236 New Work ODMDS
Threatened and Endangered Species	Chance of turtle takes	Chance of turtle takes	Greater chance of turtle takes	Less chance of turtle takes
Terrestrial Wildlife Habitat (acres of impact)	None	Less than 2 acres of impact along channel	418 acres, PAs 8 and 9	418 acres, PAs 8 and 9
Wetlands (acres and AAHUs)	None	0.48 acre; AAHUs not reported	39.5 acres 1.1 AAHUs	39.5 acres 1.1 AAHUs
Riparian Forest (acres and AAHUs)	None	None	21 acres 7.46 AAHUs	21 acres 7.46 AAHUs
Prime Farmlands (acres)	None	None	250 acres in PA 9	250 acres in PA 9
Socioeconomics	Potentially increased delays and economic loss as ship sizes increase	Short-term increase in construction employment; potential for economic growth	Short-term increase in construction employment; potential for economic growth	Short-term increase in construction employment; potential for economic growth

The recent historic rate of local RSLR extracted from the National Oceanic and Atmospheric Administration (NOAA) tide gage at Freeport, Texas, is 0.0143 foot/year, for the 52-year period between 1954 and 2006 (NOAA, 2006). This study assumes a historic eustatic sea level rise rate equal to the globally averaged rate given for the Modified NRC curves (= 1.7 millimeters per year [mm/year], or 0.0056 foot/year) (NRC, 1987). Subtracting the historic eustatic rate from the local historic RSLR tide gage rate yields an estimated observed subsidence rate of 2.65 mm/year (0.0087 foot/year) for the Freeport area.

To date, however, there is no scientific consensus concerning the projection of future subsidence rates in the Texas and Louisiana coastal region. The relative influence of historic anthropogenic activities in this area (e.g., oil and gas withdrawal) is difficult to quantify. If these activities contributed significantly to recent observations of subsidence, then significant reductions or cessation of these activities may result in rapid deceleration of subsidence rates, returning them to long-term average rates.

Several studies of basal peat layers have been conducted in the Texas and Louisiana coastal region to determine estimates of the long-term average rates of subsidence for the northwest Gulf Coast. These rates are generally on the order to 0.5 mm/year (0.0016 foot/year) (Törnqvist et al., 2006). This rate is significantly lower than the observed tide gage rates. Therefore, if historic anthropogenic activities are largely responsible for the accelerated rates observed in the tide records, then projected rates would be expected to decelerate rapidly over the next several decades.

Deriving RSLR estimates using both basal peat and tide gage data, possible RSLR rates were estimated for a 50-year period of analysis (the period from 2012 to 2062) to range from 0.36 to 2.40 feet. Possible low (historic), intermediate, and high RSLR rates are given for subsidence values that correspond to both the observed tide gage values (rapid subsidence), and the observed basal peat values (moderate subsidence), and are as follows:

- 0.71 foot, Low (216 mm/year), based on tide gage subsidence rates
- 0.36 foot, Low (110 mm/year), based on basal peat subsidence rates
- 1.11 feet, Intermediate (338 mm/year), based on tide gage subsidence rates
- 0.76 foot, Intermediate (232 mm/year), based on basal peat subsidence rates
- 2.40 feet, High (732 mm/year), based on tide gage subsidence rates
- 2.04 feet, High (662 mm/year), based on basal peat subsidence rates

RSLR rates for the project area are discussed in greater detail in Appendix L (Relative Sea Level Rise) of this EIS.

The most apparent potential for RSLR impacts in the Freeport Harbor project area includes impacts on wetlands and other sensitive low-lying areas due to higher water levels, impacts on vessel navigation due to changes in current velocities in the area, and impacts on surge levels. These potential impacts are examined in Section 4, Environmental Consequences.

2.6.3 Tidal Datum Conversion

USACE regulations and Headquarter (HQ) guidance on tidal datum stress the necessity of converting local datum, such as MLT to MLLW. The predominant reasons for conversion to MLLW are the need for consistency throughout the ports of the U.S., continuity of NOAA and

USCG navigation charts, and the avoidance of misconceptions within the shipping and dredging industries with regard to channel depths. USACE has an established survey control network along the Freeport Harbor Channel. To comply with the guidance on referencing tidal datums using MLLW, USACE took vertical survey measurements at tide gages and benchmarks to estimate the relative difference between MLT and MLLW datums along the Freeport Channel. The objective was to maintain an effective water depth of 55 feet while correctly referencing resulting water surface level in MLLW. At Freeport Channel, datum values for MLLW are +1 foot above MLT. However, this does not result in increased water depth, as the additional +1 foot of nominal depth is actually +1 foot above the normal surface water level. Therefore, the actual water depths are equivalent between a 55-foot MLT channel template and a 56-foot MLLW channel template. As the study and its documentation were completed using MLT, references to MLT have been maintained throughout this document. As the project moves to PED phase, tidal data references will be documented as MLLW.

3.0 AFFECTED ENVIRONMENT

To facilitate the description of existing resources and potential impacts from the proposed FHCIP, a study area and project area have been defined. The study area encompasses a much larger area that could potentially be impacted by the proposed FHCIP, while the project area encompasses a smaller area, more immediate to the proposed project construction footprint.

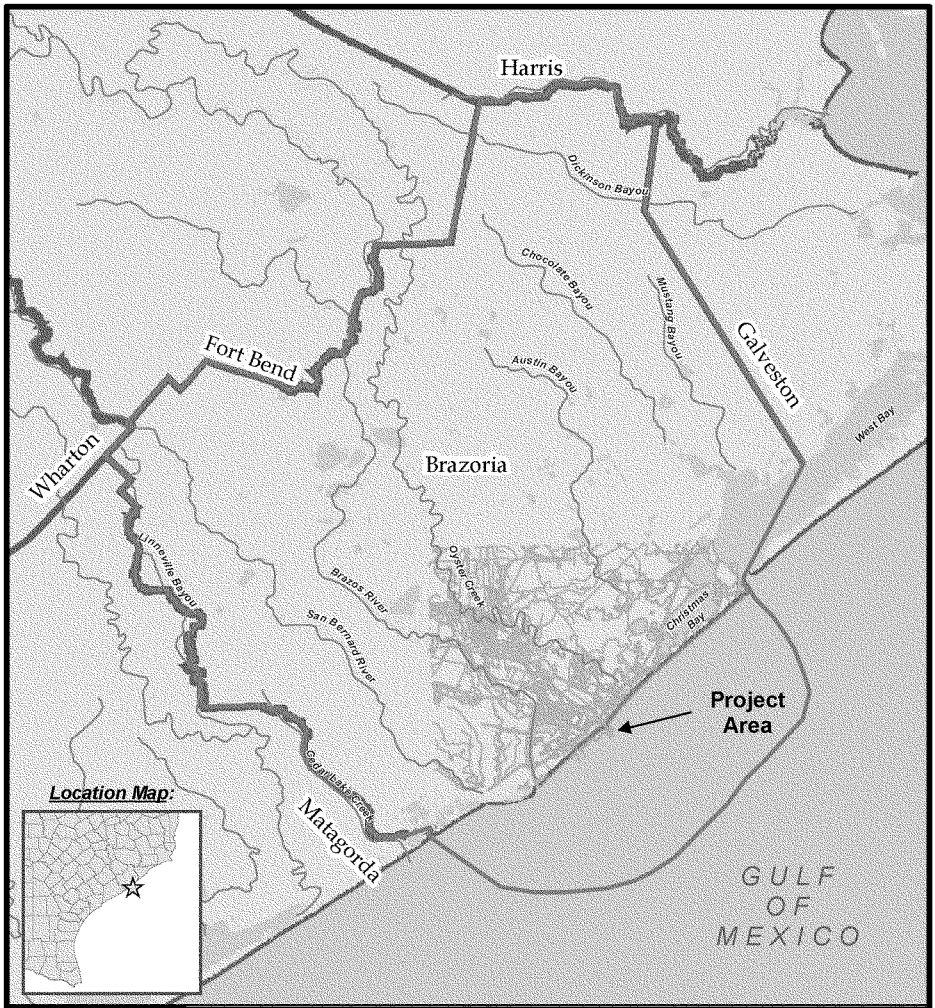
The study area and project area are part of the Texan Biotic Province (Province), an ecological region that is rich in species diversity and composition. While the study area is more similar to the larger Province, much of the project area is significantly degraded in terms of biological resources, largely due to a long history of industrial, commercial, and human settlement activities. More-detailed descriptions of the study and project areas along with the natural systems and human components are discussed below.

3.1 STUDY AREA DESCRIPTION

Because availability of information for specific resource categories varies, definition of the study area was driven by the smallest unit of available information or regulatory consideration for certain resources. Information regarding protected (threatened and endangered) species and wildlife species is available at the county level but is not available for more-specific geographic areas. For other resources, such as socioeconomics and land use, information is available in units varying from the entire United States, Texas, Brazoria County, and local communities, to transects within local communities. When discussing water quality issues, the study area may be defined as the approximate 70-square-mile Freeport Harbor Channel watershed. Thus, study area definitions tend to be resource specific. However, for general description purposes, the study area has been defined as Brazoria County plus a 10-mile radius into the Gulf to account for marine species that could occur within the project vicinity (Figure 3.1-1). For other resources, where the study area may be more specific, a description of the study area is provided at the beginning of that section.

3.2 PROJECT AREA DESCRIPTION

The project area is defined as the footprint of the construction area within the channel, the existing New Work and Maintenance ODMDSs, the three upland PAs 1, 8, and 9, plus a 1-mile buffer around these features (Figure 3.2-1). The project area takes into consideration areas of potential direct impact and areas potentially affected by immediate indirect or secondary impacts. Included in the project area are all or portions of the cities of Freeport, Surfside Beach, and Quintana.



Legend

Freeport Harbor CIP Area

Study Area

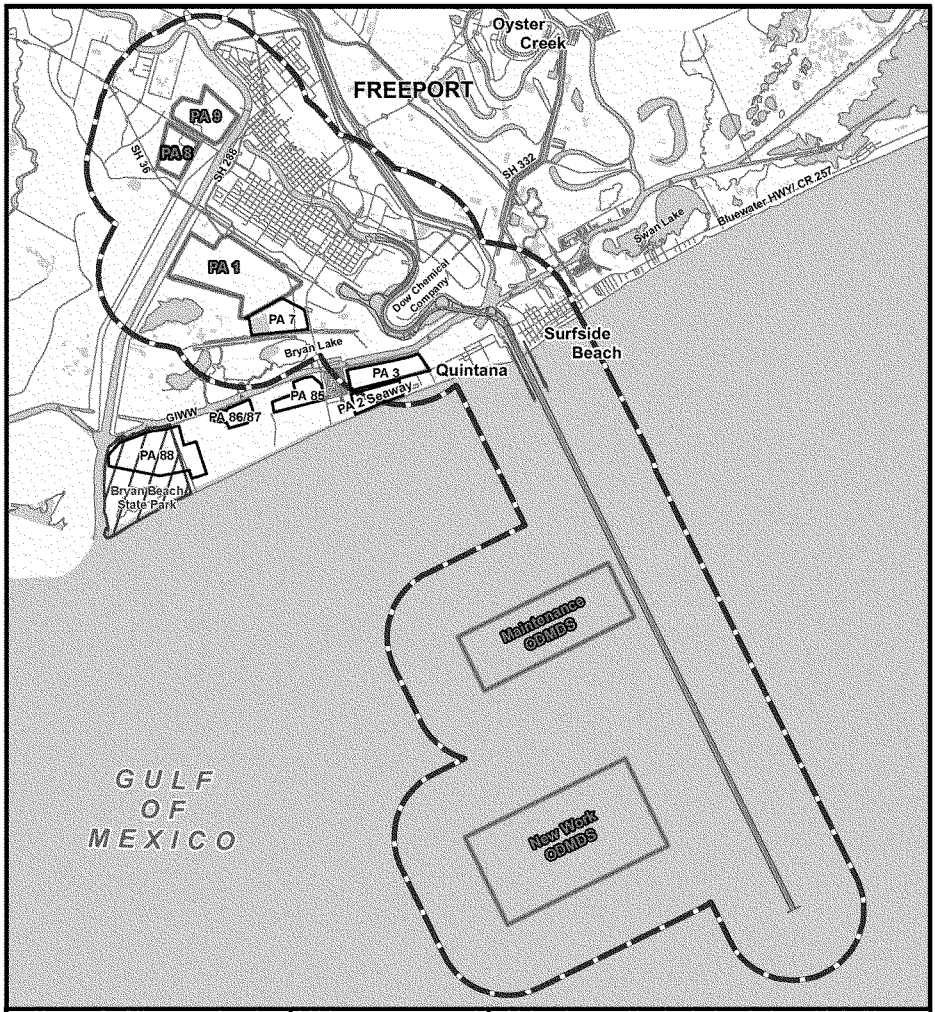
N W E S

10 5 0 10 Miles

Figure 3.1-1

Freeport Harbor Channel Improvement Project Study Area

Prepared for: USACE Galveston	
Job No.: 044190100	
Prepared by: A.Christiansen	Date: 03/14/2008
File: N:/Clients/U_Z/USACE/Projects/Freeport/044190100/projects/Fig_3_0_2_vr2.mxd	



Legend

- Channel Centerline
- Dredged Material Placement Areas
- Bryan Beach State Park
- Project Area
- Placement Areas

0 0.45 0.9 1.8
Miles

Figure 3.2-1

Freeport Harbor Channel Improvement Project Area

Prepared for: USACE Galveston	
Job No.: 044190100	
Prepared by: A.Christiansen	Date: 03/24/2008

File: N:/Clients/U_Z/USACE/Projects/Freeport/044190100/projects/Figures/Fig_3_0_1_vr2.mxd

In general, the landward portion of the project area encompasses areas dominated by industrial, commercial, and residential development with some recreation areas, as well as scattered agricultural land and some marshes, all of which are centered around the Freeport Harbor Channel. Prior to the diversion of the Brazos River, the channel was the mouth of the Brazos River. Currently, the Freeport Harbor Channel extends south into the Gulf with no associated bay or estuary, and dead-ends to the north just before reaching State Highway (SH) 288 after passing through the City of Freeport. The community of Surfside Beach is located immediately northeast of the Freeport Harbor Jetty Channel, and Quintana is located immediately to the southwest. Both communities are small beachfront residential areas along public-access beaches. Surfside Beach has been affected by erosion, with homes currently being removed from the beach in efforts to proceed with beach nourishment and shoreline stabilization projects. Quintana is located adjacent to the Seaway upland confined DMPA and the Freeport liquefied natural gas (LNG) facility. Just past that facility, the GIWW crosses Freeport Harbor Channel. From that point, industrial complexes, such as Dow Chemical Company and ConocoPhillips facilities, line the banks of the channel until the transition into the City of Freeport. Inland from the channel, areas that are not developed are generally either converted into upland DMPAs or are marshes or lakes that are used for fishing and other recreational uses, or agricultural land used for livestock or crop production. The majority of marsh habitat found in the project area does not have a direct hydrological connection to the Freeport Harbor Channel.

The natural environment within the project footprint is highly fragmented due to human disturbance and is largely devoid of natural habitats. Upland areas along the channel banks contain broadly scattered grasses, sparse stands of shrub vegetation including non-native invasive salt cedar (*Tamarisk* sp.) and big leaf sumpweed (*Iva* sp.), as well as small fringes of giant reed (*Phragmites communis*). Within the project footprint, there is no submerged aquatic vegetation (SAV), beach or dune habitat, estuarine wetlands or estuarine tidal flats, forested wetlands, or no freshwater flats. However, ephemeral wetlands (39 acres) located on overgrazed pasture and riparian forest (21 acres) can be found within the project footprint at the proposed site of upland PA 9. These resources would be converted into a DMPA, but project mitigation of wetlands and riparian forest would be provided.

Farther upland, the grasslands that may occur within the project area include pasture dominated by introduced species including bermudagrass (*Cynodon dactylon*) and bahiagrass (*Paspalum notatum*). Remnants of the original coastal prairie, with common species including little bluestem (*Schizachyrium scoparium),* brownseed paspalum (*Paspalum plicatulum*), indiangrass (*Sorghastrum nutans*), rosettegrass (*Panicum oligosanthes*), and thin paspalum (*Paspalum setaceum*) may occur within the project area as only a small percentage of the upland grassland. Most prairie remnants support a mix of non-native pasture grasses in addition to some native species.

3.3 ENVIRONMENTAL SETTING

3.3.1 Climate

The climate of the study area is predominantly marine, with periods of modified continental influence during the colder months when cold fronts from the northwest sometimes reach the coast. Because of its coastal location and relatively low latitude, cold fronts that reach the area seldom have severe temperatures.

Climate normals for Brazoria County were taken from the National Climatic Data Center (NCDC) public database. Climatology data have been recorded since 1946 at three weather stations located in Alvin, Angleton, and Freeport, Texas. Monthly normal temperatures and precipitation, as recorded at these three weather stations for the period of 1971 to 2000, are provided in Table 3.3-1.

Table 3.3-1
Monthly Normals of Temperature and Precipitation (1971–2000)
Brazoria County

	Temperature									Precipitation		
	Alvin			Angleton			Freeport			Alvin	Angleton	Freeport
	Avg Daily Max	Avg Daily Min	Avg Daily	Avg Daily Max	Avg Daily Min	Avg Daily	Avg Daily Max	Avg Daily Min	Avg Daily	Avg	Avg	Avg
Month	°F	°F	°F	°F	°F	°F	°F	°F	°F	inches	inches	inches
January	62.2	43.1	52.7	62.8	43.7	53.3	62.6	45.4	54.0	4.76	4.76	4.29
February	65.7	46.1	55.9	65.9	46.9	56.4	65.4	47.9	56.7	2.91	3.50	2.84
March	72.0	53.0	62.5	72.1	53.6	62.9	71.5	54.7	63.1	3.11	3.76	2.87
April	77.3	59.6	68.5	77.5	59.6	68.6	76.5	61.4	69.0	3.22	3.74	2.82
May	83.6	67.3	75.5	83.8	67.3	75.6	82.6	69.2	75.9	4.92	5.20	4.02
June	88.8	72.5	80.7	89.1	72.7	80.9	87.8	75.1	81.5	5.35	6.44	4.65
July	91.2	74.2	82.7	91.8	74.2	83.0	90.2	77.2	83.7	4.78	4.24	4.74
August	91.6	73.8	82.7	91.9	73.7	82.8	90.2	76.5	83.4	3.84	4.83	4.18
September	87.7	69.6	78.7	88.1	69.8	79.0	86.7	72.2	79.5	7.12	7.49	7.80
October	80.8	60.4	70.6	81.2	60.3	70.8	80.2	63.5	71.9	3.93	4.25	4.52
November	72.2	52.1	62.2	72.4	52.0	62.2	72.0	54.1	63.1	4.43	4.86	4.42
December	64.7	45.1	54.9	65.1	45.2	55.2	65.0	47.4	56.2	3.36	4.17	3.51
Annual	78.2	59.7	69.0	78.5	59.9	69.2	77.6	62.1	69.8	51.73	57.24	50.6

Source: NCDC (2006a)

Mean daily temperatures range from about 55 degrees Fahrenheit (°F) in December and January to above 80°F in the summer months. Minimum temperatures fall as low as 43°F, and maximum temperatures rise as high as 92°F.

Monthly rainfall is evenly distributed throughout the year. Average annual precipitation is about 52 inches, 57 inches, and 51 inches for Alvin, Angleton, and Freeport, respectively. Monthly precipitation averages range from about 2.82 to 7.80 inches.

Freeze occurrence data were also extracted from the NCDC database for the three monitoring stations in Brazoria County. Table 3.3-2 shows probable dates of the first freeze in fall and the last freeze in spring.

Table 3.3-2
Freeze Dates in Spring and Fall (1971–2000)
Brazoria County

	Freeze Dates (Below 32°F)		
Probability	**Alvin**	**Angleton**	**Freeport**
Last Freeze in Spring			
10	Mar 20	Mar 26	Mar 03
50	Feb 15	Feb 15	Jan 31
90	Jan 10	Jan 04	-
First Freeze in Fall			
10	Jan 01	Dec 29	-
50	Dec 09	Dec 05	Dec 28
90	Nov 19	Nov 13	Nov 28

Source: NCDC (2006b)

Snowfall is rare. In 95 percent of the winters, there is no measurable snowfall. In 5 percent, the snowfall, usually of short duration, is no more than 4 inches. The heaviest 1-day snowfall on record was more than 2 inches.

The average humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 90 percent. The sun shines 60 percent of the time possible in summer and in winter. The prevailing winds are from the south and southeast. Average windspeed, 10 miles per hour, is highest in March (Soil Conservation Service [SCS], 1981).

On average, Port Freeport is affected by a tropical storm or hurricane every 3.34 years and is directly hit by a hurricane (within 40 miles) every 11.42 years (Hurricanecity, 2008). An investigation of tropical storms in the Freeport area was conducted by the Texas Engineering Experiment Station at Texas A&M University (TAMU) to determine the degree of risk of flooding for the Freeport area that is protected by the levee system (Edge et al., 2006). The study was based on numerical simulations of tidal elevations and storm surges for tropical storm events that have historically impacted the area. Simulation models were used to produce multiple life-cycle simulations of tide and storm surge activity for 35 locations within the Freeport area. Based on study results, the maximum storm surge plus tide value was calculated to be 17.9 feet for the 200-year storm and 13.1 feet for the 100-year storm, both in Oyster Creek. None of the storm-

surge-plus-tide values were greater than the current height of the levee system. The study also addressed runup of wind-generated waves at five locations along the levee. The highest expected value for the maximum wave elevation was calculated to be 21.7 feet above msl for a 200-year storm and 16.1 feet for a 100-year event. The maximum storm runup waves were in excess of 26.2 feet; however, those were associated with events greater than the 200-year event (Edge et al., 2006). Thus it is reasonable to expect that the existing levee system would provide protection for up to a 200-year storm event.

3.3.2 Geology

The study area is situated near the seaward margin of the west Gulf Coastal Plain Physiographic Province. Regionally, the area is characterized by a nearly continuous series of marginal marine embayments separated from the Gulf by a system of barrier islands and peninsulas (Lankford and Rehkemper, 1969). Coastline features are typically the result of several active, geologic processes including longshore drift, beach wash, wind deflation and deposition, tidal currents and waves, delta outbuilding, and river point bar and flood deposits. The coastal zone is underlain by sedimentary deposits that originated in ancient but similar coastal systems (McGowen et al., 1976).

The coastal plain near the Gulf is located within the Gulf Coast geosyncline, a major center of sediment deposition since the middle to late Jurassic Period. More than 30,000 feet of Jurassic- to Pleistocene-aged sedimentary deposits dip and thicken toward the Gulf. During part of the Mesozoic Era (late Triassic to Jurassic), the seas in the area were isolated and water inflow was restricted, resulting in the deposition of evaporate sediments dominated by salt (Wermund et al., 1989). After salt deposition, the region was overlain primarily by prograding sands and muds. Interspersed throughout these layers are salt domes that have migrated upwards through the underlying strata to within a few thousand feet of the land surface. In addition, the regional dip is bisected by belts of arcuate growth faults that are typically downthrown to the Gulf, or by faults in the proximity of salt domes.

The study area is characterized as Quaternary (Recent and Holocene) Alluvium containing thick deposits of clay, silt, sand, and gravel (Barnes, 1982, 1987), overlying the Pleistocene Beaumont Formation. These formations consist mainly of stream channel, point bar, natural levee, and backswamp deposits associated with former and current river channels and bayous. The Alluvium outcrops in a belt approximately 70 to 90 miles wide paralleling the Texas coastline. The underlying Beaumont Formation is estimated to be less than 1,000 feet thick and consists mostly of clay, silt, sand, and gravel.

Construction and maintenance of the GIWW, irrigation and drainage canals, and access channels has resulted in extensive channelization and associated disposal of dredged material in the area (McGowen et al., 1976). The project area is further characterized by recent fill and subaqueous

dredged material deposits located on the landward and seaward sides of the barrier beach (Quintana and Surfside) associated with the construction of the Freeport Harbor Channel for the City of Freeport's chemical-processing complex. Material composition at these locations is dictated by the origin of the material; however, dredging and disposal typically make the material less coherent and more permeable. Typically, fill and dredged material consists of mixed mud, silt, sand, shell, and reworked dredged material. Reworked dredged material from the Jetty Channel may be sandy and moderately sorted with high to very high permeability and low water-holding capacity. Maintenance material from the remainder of the channels is fine silt.

The 1929 diversion of the Brazos River resulted in shoreline erosion in the Surfside area and the deposition of a new delta at the mouth of the relocated Brazos (McGowen et al., 1976). Sediment distributions within the new fluviatile-deltaic system consist primarily of sand, silt, and mud. Beyond the delta front is an area of prodelta muds. The sand-mud boundary lies between 2.0 to 2.9 miles offshore from the present Brazos River delta. Muddy sands also occur adjacent to DMPAs, in the shallow bay margin next to the mainland shore, and at the edge of wind tidal flats. Muddy sand distribution is not controlled by depth; rather, it is related to hurricane washovers, dredging activities, and reworking of relict sediment (McGowen and Morton, 1979).

Along the Texas coastal zone, subsurface faults are relatively common, and a number of these have been activated as a result of subsidence in the Freeport area. Most surface faults are related to long-trending coastal fault systems extending upwards from thousands of feet below surface and/or to faults associated with salt domes (Brown et al., 1974). Coastal zone faults form primarily by natural geologic processes, including deposition and differential sediment compaction, upward movement of salt deposits to form diapirs, gulfward creep of coastal landmass, and warping of landmass due to regional tectonics. There are two types of faults that occur in the region, growth and salt dome. Growth faults form by subsurface slumping, creep, and consolidation of sediments during deposition. These faults are confined to Cenozoic-aged sediments and are typically parallel to the Gulf Coast, with lengths exceeding 6 miles. Salt dome faults occur in radial and crestal graben-type patterns over and around the dome top, revealing linear surface traces that are somewhat curved with numerous intersections. These faults are typically localized (<3 miles long) and numerous.

Subsidence occurs as sudden sinking or gradual downward settling of land with little or no horizontal motion, caused by surface faults and intensified and/or accelerated by subsurface mining or the pumping of oil or groundwater. Subsidence is the major manifestation of surface faulting throughout the Texas Gulf Coast, and typically occurs on the downthrown side of the fault. In addition, the extraction of groundwater, oil and gas, and salt brine in the Freeport area (and subsequent active faulting) has caused land subsidence on the order of 1.5 to 2 feet in the area vicinity. However, subsidence has been observed to lessen and diminish altogether as groundwater, oil, and gas pumping has decreased or ceased (Holzer and Gabrysch, 1982; Verbeek and Clanton, 1981).

Several geotechnical studies have been conducted within the project area over the past 40 years that included numerous cores. However, most of these cores were taken for past projects and did not extend to potential project depths. Additionally, since these cores are of virgin sediments, change in those sediments should not be expected over a few decades. The most recent study of sediments (virgin and dredged) located in the immediate vicinity of the Freeport Harbor Channel was conducted by Fugro (2005) between January 28, 2005, and February 3, 2005, for the permit Widening Project, and has been used for preparation of this EIS. According to the Fugro report, a total of seven soil borings were drilled in the Jetty Channel. Geotechnical information from this report is discussed in Section 3.5.

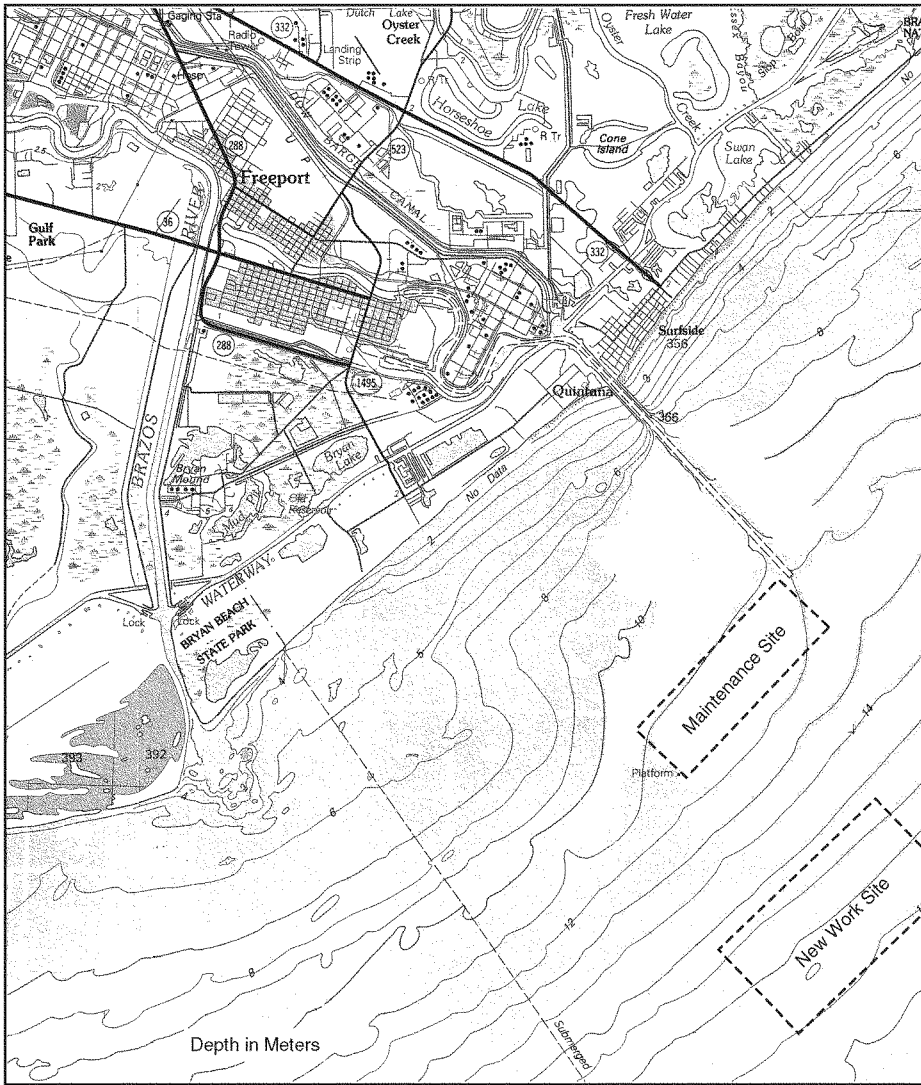
3.3.3 Physiography and Bathymetry

The primary physiographic environments of the study area include fluvial deltaic systems, barrier island strandplain systems, and aeolian (wind) systems. The Coastal Zone within the study area is underlain by sedimentary deposits that originated in ancient, but similar, physiographic environments. These ancient sediments were deposited by the same natural processes that are currently active in shaping the present coastline such as longshore drift, beach wash, wind deflation and deposition, tidal currents, wind-generated waves and currents, delta outbuilding, and river point bar and flood deposition (McGowen et al., 1976).

The study area is characterized by interconnected natural waterways, the GIWW, and other navigable channels. The surface topography of the project area is mainly flat to gently rolling and slopes to the southeast toward the Gulf. The diverted Brazos River drains areas to the west of the study area and discharges into the Gulf, forming a delta west of the project area. A few short, low-gradient streams drain directly into the GIWW, navigation channels, and scattered lakes. Most common among coastal features are beach ridges, open sand beaches, dunes, mudflats, marshes, and deltas. A topographic map for the study area is presented on Figure 3.3-1.

The Brazos River is a fine-grained meanderbelt system characterized by frequent cutoff and abandoned channel courses, relatively high mud load, and narrow to broad floodplains. Natural ponds, lakes, holding ponds, and artificial reservoirs are present on the floodplains of the Brazos River (McGowen et al., 1976). Dredged material has been placed along most of the turning basins, channels, and canals in the project area.

The portion of the Gulf within the project area is confined to the shallow Gulf shelf area and is largely devoid of significant physiographic features. The shelf slopes uniformly in the project area at a rate of approximately 5:10,000 feet, except within approximately 3,000 feet of the coastline where the slope is steeper, about 5:1,000 feet. The turning basins and GIWW are relatively low-energy environments protected on the seaward side by beach ridges and open sand



north

0 1 2 miles

Base Map: USGS 1:100,000 Quadrangle; Freeport, Texas

Figure 3.3-1

TOPOGRAPHIC MAP
OF PORT FREEPORT, TEXAS

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beaches. The Freeport Harbor Channel is a moderate- to high-energy environment partially protected by two (north-south) man-made rock jetties. These jetties extend into the Gulf approximately 0.5 mile from the shoreline.

The bathymetry of the project area has been partially modified by channel dredging and subsequent formation of ODMDS. Channel depths in the Outer Bar and Jetty channels are currently maintained to –47 feet MLT. The existing channel is approximately 5.2 miles in length and has a bottom width of approximately 400 feet. The bathymetry of the project area is presented on Figure 3.3-1.

3.3.4 Water Exchange and Inflows

There are two principal types of water exchange in the Freeport Harbor system: bidirectional (tidal exchange with the Gulf) and unidirectional (flows from rainfall runoff and wastewater that enter the harbor and flow to the Gulf). Of the two, the tidal exchange is by far the greatest volume. When the Brazos River was diverted in 1929, most freshwater inflow into the Freeport Harbor Channel system was lost, with the exception of rainfall, sheet flow, and wastewater. Tidal influence in the Gulf is dominated by the 12.4-hour semidiurnal and the 24.8-hour diurnal lunar tides and the 13.6-day cycle in the magnitude of the declination of the moon (Ward, 1977). Tidal waters in Freeport Harbor have a total surface area (measured from navigation chart 11321) of approximately 2,550 acres. If the tidal range (elevation difference between low and high water) was 1.5 feet, the volume of water that would need to enter or leave the Jetty Channel would be 166.5 million cubic feet. If this took place during semidiurnal tides (6.2 hours for a flood or ebb tide), the average tidal flow would be 7,460 cubic feet per second (cfs). The cross-sectional area of the Jetty Channel is approximately 33,000 square feet, so the average tidal current velocity through the channel is about 0.2 foot/second.

Freshwater inflows from the approximately 70-square-mile watershed are much smaller than the tidal flows. There is no flow measurement in this watershed, but the nearby U.S. Geological Survey (USGS) Chocolate Bayou gage near Alvin (08078000) can provide an estimate and has a drainage area of 87.7 square miles. The average flow from 1959 to 2001 was 118 cfs. Adjusting for the watershed area gives a projected average freshwater flow at the Jetty Channel of 94 cfs, which is much smaller than the average semidiurnal tidal flow of 7,460 cfs.

Frontal passages can cause more-rapid changes in water levels and exchanges with the Gulf. As a front approaches from the north, onshore airflow increases, forcing water from the Gulf into the harbor. With frontal passage, the wind direction shifts, forcing water from the harbor into the Gulf. The effect is heightened because the front pushes water away from the coast, causing more water to flow Gulfward.

Storm surges associated with hurricanes can be severe. For example, the storm surge during Hurricane Claudette in July 2003 was observed to be around 5.8 feet above msl at the tide gage

at Freeport Harbor (Edge et al., 2006), and the surge from Hurricane Carla in late September 1961 was calculated to be almost 11 feet msl.

3.3.5 Shoreline Changes in Project Area

The shorelines of both Surfside Beach and Quintana have changed substantially over the last 150 years. This area has been studied extensively, and a number of contributing causes have been identified in the literature. Most of the Texas shoreline is now in retreat because of RSLR and a reduced supply of sand from the Mississippi and Atchafalaya River systems and from Texas rivers because of the construction of reservoirs. The 1929 Brazos River diversion also removed an important sand source from area beaches. The greatest rate of shoreline change occurs with severe storms, including:

- Hurricane Carla 1961
- Hurricane Alicia 1983
- Tropical Storm Francis 1998
- Tropical Storm Allison 2001
- Hurricane Rita 2005

Other major factors are RSLR that results in shoreline regression and aeolian erosion of sand aggravated by beach vehicle traffic. Finally, there has been the interception of sand from the longshore system by the navigation channel and jetties. The navigation channel in the relatively shallow coastal waters affects the propagation of waves approaching the coast, and this has an effect on the longshore transport of sand. The jetties act as groins to block longshore sediment movement, but some material gets around the jetties and must be periodically dredged from the Outer Bar and Jetty channels.

Morton (1997) and Gibeaut et al. (2000) have summarized shoreline change information in the project area. Figure 3.3-2 presents data, extracted from Morton (1997), of shoreline positions along transect locations in the Surfside/Quintana area. Figure 3.3-3 is a plot of the shoreline positions for representative years taken from the Morton (1997) transects. All of the shoreline positions are shifted to start with the 1996 position as seen on the shoreline of an aerial photograph from that year. In 1852, the shoreline was well inland from its position today. Between 1852 and 1930, the shoreline at Freeport shows strong accretion. At that point, the shoreline was over a mile into what is now the Gulf. However, transects farther west show little change. Following the 1929 relocation of the river, the shoreline at stations 21 and 22, near the new river mouth, advanced substantially, while the area around the Freeport jetties retreated rapidly. Between 1958 and 1996, the shoreline has retreated over the entire area.

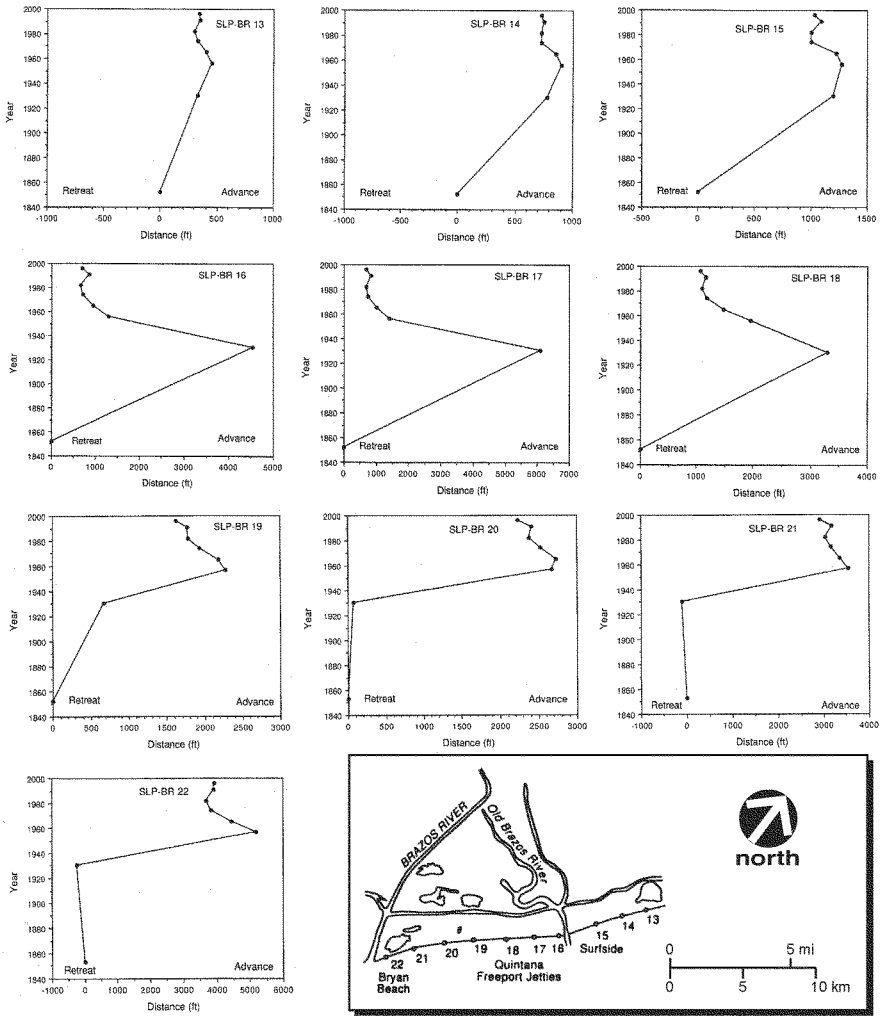

Figure 3.3-2

SHORELINE CHANGES
IN PROJECT AREA
1852-1996

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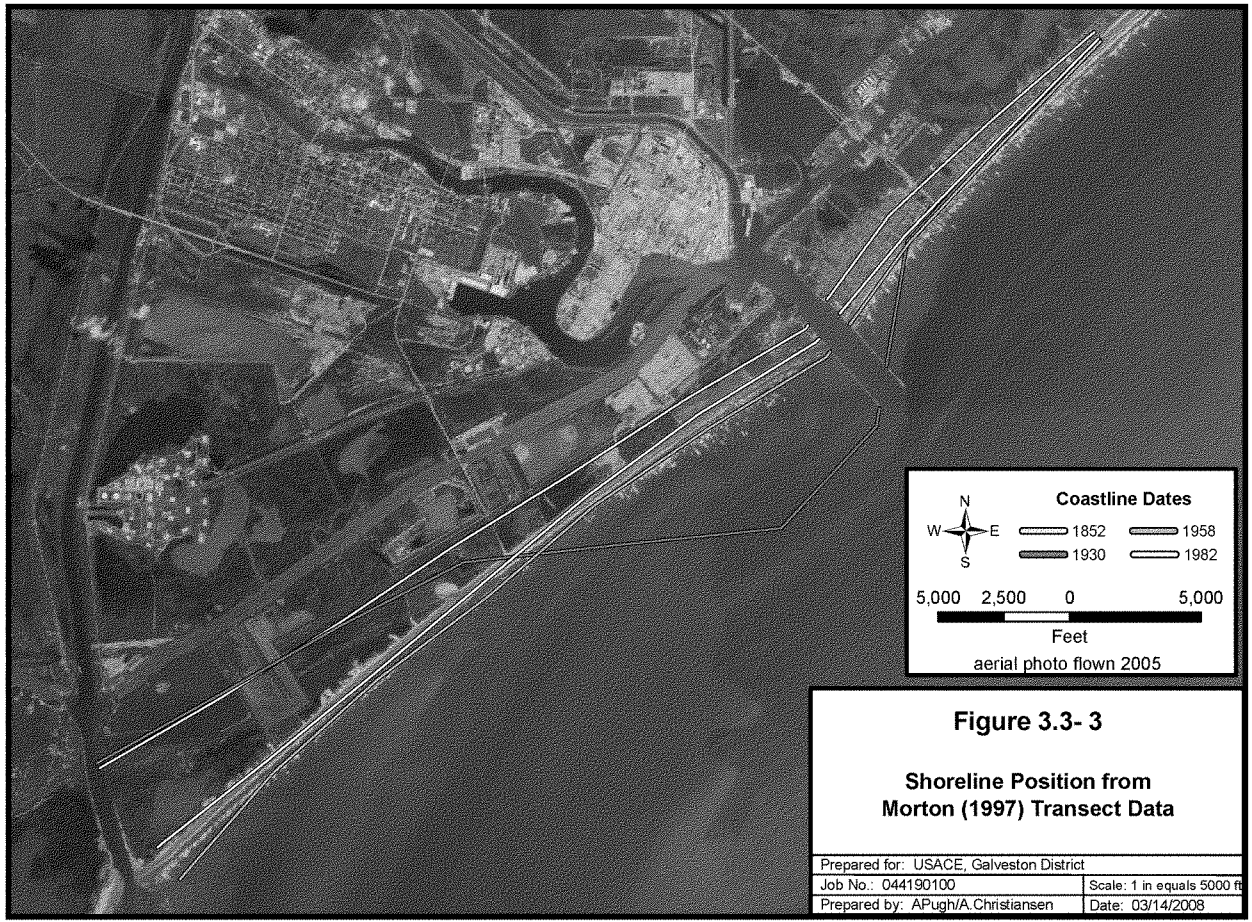


Figure 3.3- 3

Shoreline Position from Morton (1997) Transect Data

Prepared for: USACE, Galveston District	
Job No.: 044190100	Scale: 1 in equals 5000 ft
Prepared by: APugh/A.Christiansen	Date: 03/14/2008

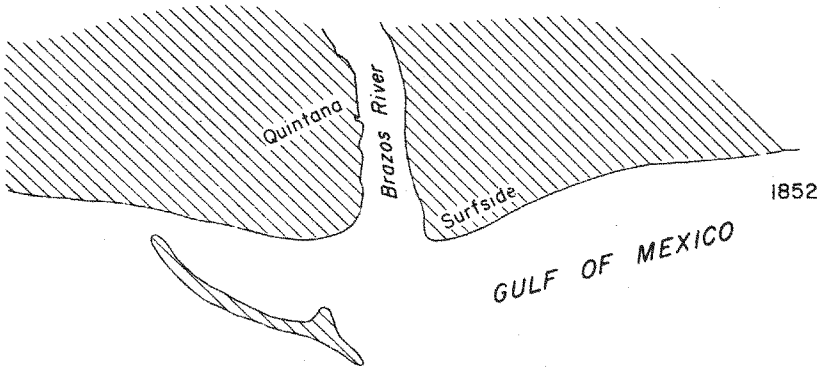
File: N:/Clients/U_Z/USACE/Projects/Freeport/044190100/projects/fig_3_1_3_vr2.mxd

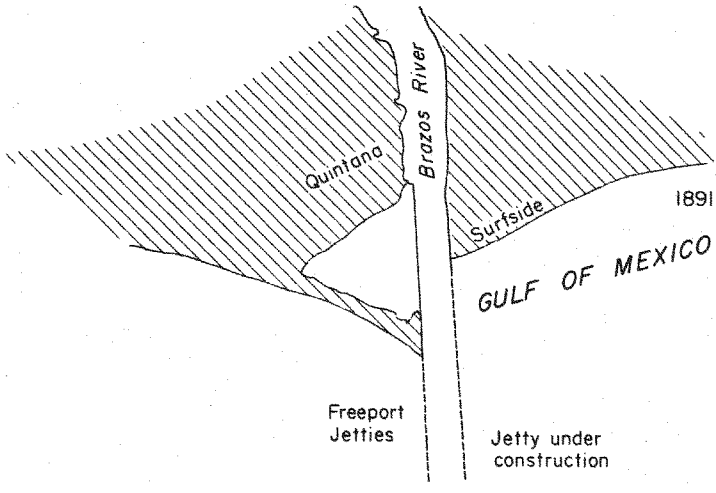
The shoreline accretion or advance near Freeport between 1852 and 1930 was due to a combination of the deposition of sand supplied by the river and the effect of the jetties (built between 1889 and 1896) (Morton and Pieper, 1975). An intermediate point in the shoreline advance can be seen on Figure 3.3-4, taken from Morton and Pieper (1975). It shows the shoreline at the Brazos River mouth advancing substantially between 1852 and 1891. Note that the jetty construction began in 1889 and probably had no effect on the shoreline by 1891.

As seen on Figure 3.3-2, since 1930 (and the 1929 river relocation) the Surfside stations (13, 14, and 15) have been relatively stable or slowly retreating and the Quintana stations (16, 17, and 18) have been retreating more rapidly. This difference appears to reflect the effect of the Freeport jetties acting as groins to block the normal longshore sediment transport towards the southwest. Near the relocated Brazos River mouth (transects 19–22), the shoreline advanced noticeably between 1930 and 1958. During this period, the Brazos River was supplying most of its full sand load. By 1958, reservoir development on the Brazos River has substantially reduced the sand supply, and since that time the shoreline has been retreating.

A major factor in coastal erosion is the amount of sand supplied to the system. The Brazos River is one of the few that still terminates in the Gulf and historically carried a substantial amount of the sand that advanced the beaches in the area. Mathewson and Minter (1976) analyzed the effect of reservoir development in the Brazos River basin and found a major reduction in the amount of beach sand supplied since reservoir development started in the 1920s. The first reservoir, Mineral Wells, started impoundment in 1920. By 1969, 29 reservoirs had been constructed on the Brazos River. The mechanisms identified and quantified in the study include trapping of sand by reservoirs (95 percent trapping efficiency for sand is employed) and reduction of peak river flow rates that perform most of the sand transport in the river. The total Brazos River watershed is 44,640 square miles, but only 35,400 square miles were contributing in 1975 (Mathewson and Minter, 1976). The watershed not affected by major reservoirs in 1975 was noted to be only 10,934 square miles, or about 30 percent of the contributing watershed. The contributing watershed is smaller today. Additional reservoirs completed since the Mathewson and Minter study include Lake Limestone, 1978; Lake Granger and Lake Georgetown, 1980; Lake Aquilla, 1983; and Lake Alan Henry, 1994.

In addition to sand trapping in over 70 percent of the watershed, reservoirs have also reduced peak flood discharges that are important in conveying sand in the river to the coast. The reduction in peak flood discharge was found to be larger in the upper basin (52 percent reduction at Waco) than in the lower basin (30 percent at Richmond). Mathewson and Minter (1976) estimated that about 76 percent of the sand that historically reached the coast was not reaching it in 1975. Their calculations indicate that prior to reservoir development the river transported 101 billion cubic feet of sand or 3.75 million cubic yards per year (mcy/year), and that the transport rate in the early 1970s was 1.14 mcy/year. This is a reduction in sand supply to the coast of about 2.6 mcy/year. This sand would have been supplied during short periods of high





0 2000
scale in feet

Figure 3.3-4

SHORELINE AT
FREEPORT 1852 AND 1891
(MORTON & PIEPER, 1975)

L:\projects\hc1\USACE\Galv\441901 - Freeport Federal Impacts EIS\Background - Freeport Fed\cad\figure3_1-4.ai

river flow, and be distributed both east and west of the river, but predominantly to the west because of the prevailing orientation of onshore winds and longshore drift.

Efforts to offset shoreline erosion with beach nourishment have been carried out under the Texas Coastal Erosion Planning and Response Act (CEPRA). These have involved both trucking in at least 950 cy of sand in one project and bringing sand from a DMPA near Baytown by barge for dune rehabilitation (Newby, 2006). A major limitation of beach nourishment in the area is the limited availability and expense of a suitable sand supply. Nourishing the beach with sand brought by truck or barge from a substantial distance is expensive. In the early 1990s, approximately 300,000 cy of silty sand from the 45-foot Project was placed on the Surfside Beach (Rodino and Moseley, 2005). Currently, beaches on both sides of the Freeport jetties are severely eroded, with the current average rate of shoreline retreat 9 to 10 feet per year (Bureau of Economic Geology [BEG], 2007). Erosion on the Quintana Beach side is threatening the stability of the Seaway upland confined PA, and erosion of Surfside Beach is threatening beachfront homes.

3.4 WATER QUALITY

3.4.1 Salinity and Other Conventional Water Quality Parameters

The Texas Commission on Environmental Quality (TCEQ) has designated the old Brazos River Channel Tidal (Freeport Harbor) as Segment 1111. This essentially covers Freeport Harbor. The designated uses for Segment 1111 are contact recreation (swimming) and high-quality aquatic habitat.

TCEQ monitors this station quarterly. Table 3.4-1 summarizes results for the last 5 years for several key parameters. With little watershed area and freshwater inflow, the average salinity at the station is almost the same as the coastal waters. The minimum salinity is over 18 parts per thousand (ppt) and the average is over 26 ppt. Gulf salinity at Freeport ranges from 32 to 35 ppt. Dissolved oxygen (DO) concentrations average 7.2 milligrams per liter (mg/L), and all are well above the criterion for high-quality aquatic life use of 4 mg/L. *Enterococci* concentrations are all well below the criterion of 35 Most Probable Number/deciliter (MPN/dL), indicating that the waters of Freeport Harbor support the contact recreation use. There is one TCEQ station in the Gulf (Segment 2501) at the end of the South Jetty (17519), but there was only one sample at this station since 2003. The results of that sample were similar to those presented in Table 3.4-1.

During maintenance dredging operations, dredged material is discharged into an upland confined PA and the Maintenance ODMDS. Material excavated from the Entrance and Jetty channels is deposited at the Maintenance ODMDS, and these placement activities may affect DO concentrations in the water column (Brown and Clark, 1968; Hopkins, 1972; May, 1973; Pearce, 1972; Wakeman, 1974; Windom, 1972). May (1973) found that although the water column DO

Table 3.4-1
Summary of Surface Measurements at Station 11498, Old Brazos River Channel
Midway Between Mouth and Terminus

Parameter	aux	Unit	Start date	End date	Num of data	Average	Minimum	Maximum	Std Dev	Criterion
Dissolved Oxygen	00300	mg/L	3/29/2000	1/3/2006	24	7.2	4.9	10.8	1.4	4.0
Salinity	00480	ppt	3/29/2000	1/3/2006	24	26.7	18.4	33.7	4.0	
Enterococci [1]	31701	MPN/dL	3/13/2001	1/3/2006	20	7.8	<1	20	5.7	35

Source: TCEQ Surface Water Quality Monitoring (SWQM) database, http://www.tceq.state.tx.us/compliance/monitoring/crp/data/samplequery.html
[1] For data below reporting limit, half reporting limit used in calculating average and standard deviation.

did not change, there was a temporary decrease in DO at the water/sediment interface in the areas of mud flow. He also found little apparent difference in the immediate oxygen demand between recently deposited sediments from dredged material placement and other sediments. May (1973), Jones and Lee (1978), Peddicord (1979), and Lee (1976) agree that high total oxygen demand, as measured in the laboratory, does not necessarily lead to oxygen depletion upon placement since only a small part of the oxygen demand is exerted at placement and the only open-water placement at Freeport during maintenance activities would be offshore in 35 to 40 feet of water.

Maintenance dredging and placement of dredged materials during maintenance operations also increases turbidity in the water column, which has been shown to reduce primary production in laboratory studies (Sherk, 1971). Field studies, however, have shown essentially no biological impacts from turbidity (May, 1973; Odum and Wilson, 1962), probably because both coastal and estuarine animals are accustomed to large variance in turbidity from a variety of sources, e.g., storms, tidal fluctuations, currents (Clarke and Wilber, 2000).

3.4.2 Water and Elutriate Chemistry

Since EPA is hesitant about relying on data more than 5 years old, only data collected within 5 years of the beginning of the preparation of this EIS (i.e., data from 2002 to the present were analyzed to determine the water quality of the project area) (Table 3.4-2). However, Table 3.4-3 summarizes the detected constituents, by year, from the USACE database since 1987. There were no collections in 2002 and 2003, so data from 2004, 2005, 2006, and 2008 are included in Table 3.4-2. Since Table 3.4-2 only presents the constituents that were detected, Table 3.4-4 provides the complete list of contaminants of concern, for which all samples are tested. This list was compiled jointly by EPA Region VI and Galveston District and is incorporated in the Regional Implementation Agreement (RIA) (EPA/USACE, 2003). The data presented are from samples of maintenance material from the Outer Bar Channel, the Jetty Channel, the Lower Turning Basin, and the Channel to Brazosport Turning Basin. Since the material from the channel landward from the Jetty Channel is maintained less frequently, those materials are sampled less frequently, and the Brazosport Turning Basin, the Channel to Upper Turning Basin, and the Upper Turning Basin have not been sampled since 1998/1999. Also included below is a discussion of elutriate samples, which provide information on those constituents that are dissolved into the water column during hydraulic dredging and placement (see Table 3.4-2). Since the elutriate represents the dissolved concentrations that would be expected in the water column, they are compared to the Texas Surface Water Quality Standards (TWQS) provided by TCEQ (2000) for the protection of aquatic life and EPA water quality discrete criteria (WQC) (EPA, 2008). Since the values are from grab samples, not long-term composites or averages, and are from a marine environment, the acute marine TWQS and WQC are used for comparison. Sediment data are also included in Table 3.4-2 since the elutriate is a measure of the release of

Table 3.4-2

Detected Parameters
Freeport Harbor Channel

						FH-EC-04-01			FH-EC-04-02			FH-EC-04-03			FH-EC-04-03 DUP			FH-EC-04-REF		
					Station: Date: Channel Station:	4/29/2004 60+00			4/29/2004 --45+00			4/29/2004 --150+00			4/29/2004 --150+00			4/29/2004		
Parameter	Liquid Media Unit	Solid Media Unit	WQC	TWQS	ERL	Water	Elutriate	Sediment	Water	Elutriate	Sediment	Water	Elutriate	Sediment	Water	Elutriate	Sediment	Water	Elutriate	Sediment
Sand		%						7.5			10.7			1.1			0.9			12.9
Silt		%						28.0			65.5			68.0			63.6			28.2
Clay		%						64.5			23.8			30.9			35.5			58.9
D50		mm						0.00			0.01			0.01			0.01			0.00
Percent Solids		%						40.2			42.6			35.4			33.5			47.2
Antimony	µg/L	mg/kg	N/A	N/A	N/A	<3.00	<3.00	<2.5	<3.00	<3.00	<2.5	<3.00	<3.00	<2.5	<3.00	<3.00	<2.5			<2.5
Arsenic	µg/L	mg/kg	69	149	8.2	1.83	2.58	6.75	1.32	2.47	7.12	1.30	1.45	**8.63**	1.80	1.07	**9.15**			6.93
Beryllium	µg/L	mg/kg	N/A	N/A	N/A	<0.2	<0.2	<1.00	<0.2	<0.2	<1.00	<0.2	<0.2	<1.00	<0.2	<0.2	<1.00			<1.00
Cadmium	µg/L	mg/kg	40	45.4	1.20	<1.00	<1.00	<0.10	<1.00	<1.00	<0.10	<1.00	<1.00	<0.10	<1.00	<1.00	<0.10			0.13
Chromium	µg/L	mg/kg	1,100	1,090	81.0	<1.00	<1.00	18.8	<1.00	<1.00	14.9	<1.00	<1.00	19.3	<1.00	<1.00	20.5			19.6
Copper	µg/L	mg/kg	4.8	13.5	34.0	<1.00	<1.00	11.3	<1.00	<1.00	8.55	<1.00	<1.00	11.2	<1.00	<1.00	11.8			12.2
Lead	µg/L	mg/kg	210	133	46.7	<1.00	<1.00	17.9	<1.00	<1.00	17.8	<1.00	<1.00	22.5	<1.00	<1.00	23.7			17.6
Mercury	µg/L	mg/kg	1.8	2.1	0.15	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20			<0.20
Nickel	µg/L	mg/kg	74	118	20.9	<1.00	<1.00	17.3	<1.00	<1.00	14.9	<1.00	<1.00	18.6	<1.00	<1.00	19.3			18.8
Selenium	µg/L	mg/kg	290	564	N/A	<2.00	<2.00	<0.50	<2.00	<2.00	<0.50	<2.00	<2.00	<0.50	<2.00	<2.00	<0.50			<0.50
Silver	µg/L	mg/kg	1.9	2.0	1.00	<1.00	<1.00	<0.20	<1.00	<1.00	<0.20	<1.00	<1.00	<0.20	<1.00	<1.00	<0.20			<0.20
Thallium	µg/L	mg/kg	N/A	N/A	N/A	<1.00	<1.00	0.27	<1.00	<1.00	0.21	<1.00	<1.00	0.28	<1.00	<1.00	0.27			0.21
Zinc	µg/L	mg/kg	90	92.7	150	8.39	9.70	28.6	4.61	8.72	27.3	12.2	8.61	31.0	2.83	8.04	34.1			25.4
Bis(2-ethylhexyl) phthalate	µg/L	µg/kg	N/A	N/A	N/A	<3.00	<3.00	<50.0	<3.00	<3.00	<50.0	<3.00	<3.00	<50.0	<3.00	<3.00	<50.0			<50.0
TOC	mg/L	%	N/A	N/A	N/A	4.32	8.34	7800	3.07	5.33	7800	3.33	3.98	11300	3.71	3.95	11500			10300
Ammonia	mg/L	mg/kg	Var	N/A	N/A	0.05	1.17	99.9	0.03	1.25	88.6	0.03	0.55	83.5	0.03	0.72	82.8			71.0

Table 3.4-2 (Continued)

					Station:	FH-EC-05-01			FH-EC-05-02			FH-EC-05-02 DUP			FH-EC-05-03			FH-EC-05-REF		
					Date:	6/29/2005			6/29/2005			6/29/2005			6/29/2005			6/29/2005		
					Channel Station:	60+00			–45+00			–45+00			–150+00					
Parameter	Liquid Media Unit	Solid Media Unit	WQC	TWQS	ERL	Water	Elutriate	Sediment	Water	Elutriate	Sediment	Water	Elutriate	Sediment	Water	Elutriate	Sediment	Water	Elutriate	Sediment
Sand		%						4.0			16.7			14.5			1.0			7.5
Silt		%						19.1			41.5			47.8			70.2			5.7
Clay		%						76.9			41.8			37.7			28.8			86.8
D50		mm						0.00			0.01			0.01			0.01			0.00
Percent Solids		%						41.4			45.8			43.1			33.7			47.4
Antimony	µg/L	mg/kg	N/A	N/A	N/A	<3.00	<3.00	<2.5	<3.00	<3.00	<2.5	<3.00	<3.00	<2.5	<3.00	<3.00	<2.5			<2.5
Arsenic	µg/L	mg/kg	69	149	8.2	2.25	3.84	7.26	2.26	4.08	6.19	2.34	3.78	6.47	2.42	3.10	**8.61**			7.53
Beryllium	µg/L	mg/kg	N/A	N/A	N/A	<0.2	<0.2	<1.00	<0.2	<0.2	<1.00	<0.2	<0.2	<1.00	<0.2	<0.2	<1.00			<1.00
Cadmium	µg/L	mg/kg	40	45.4	1.20	<1.00	<1.00	<0.10	<1.00	<1.00	<0.10	<1.00	<1.00	<0.10	<1.00	<1.00	<0.10			0.2
Chromium	µg/L	mg/kg	1,100	1,090	81.0	<1.00	<1.00	23.5	<1.00	<1.00	18.7	<1.00	<1.00	18.7	<1.00	<1.00	23.6			23.8
Copper	µg/L	mg/kg	4.8	13.5	34.0	<1.00	<1.00	14.0	<1.00	<1.00	10.4	<1.00	<1.00	10.3	<1.00	<1.00	13.9			15.4
Lead	µg/L	mg/kg	210	133	46.7	<1.00	<1.00	18.5	<1.00	<1.00	15.2	<1.00	1.27	16.1	<1.00	1.19	21.7			16.8
Mercury	µg/L	mg/kg	1.8	2.1	0.15	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20			<0.20
Nickel	µg/L	mg/kg	74	118	20.9	<1.00	6.06	19.2	<1.00	3.89	15.8	<1.00	4.34	16.0	<1.00	4.35	19.9			20.8
Selenium	µg/L	mg/kg	290	564	N/A	2.26	<2.00	<0.50	2.24	<2.00	<0.50	2.26	<2.00	<0.50	2.21	<2.00	<0.50			<0.50
Silver	µg/L	mg/kg	1.9	2.0	1.00	<1.00	<1.00	<0.20	<1.00	<1.00	<0.20	<1.00	<1.00	<0.20	<1.00	<1.00	<0.20			<0.20
Thallium	µg/L	mg/kg	N/A	N/A	N/A	<1.00	<1.00	1.09	<1.00	<1.00	0.50	<1.00	<1.00	0.28	<1.00	<1.00	0.53			0.38
Zinc	µg/L	mg/kg	90	92.7	150	<1.00	5.03	19.6	<1.00	1.89	17.1	<1.00	2.40	17.4	<1.00	2.29	24.1			17.9
Bis(2-ethylhexyl) phthalate	µg/L	µg/kg	N/A	N/A	N/A	<3.00	<3.00	<50.0	<3.00	<3.00	<50.0	<3.00	<3.00	<50.0	<3.00	<3.00	<50.0			<50.0
TOC	mg/L	%	N/A	N/A	N/A	2.80	3.37	14800	3.25	4.29	15300	1.87	5.49	12900	2.28	4.13	18900			13300
Ammonia	mg/L	mg/kg	Var	N/A	N/A	0.15	0.87	17.2	0.11	0.74	7.7	0.19	1.07	21.2	0.16	0.98	20.6			12.2

Table 3.4-2 (Continued)

					Station:	F-06-01B			F-06-01A			F-06-01			FH-06-01			FH-06-01 DUP		
					Date:	8/22/2006			8/22/2006			8/22/2006			8/22/2006			8/22/2006		
					Channel Station:	95+00			85+00			75+00			50+00			50+00		
Parameter	**Liquid Media Unit**	**Solid Media Unit**	**WQC**	**TWQS**	**ERL**	**Water**	**Elutriate**	**Sediment**	**Water**	**Elutriate**	**Sediment**	**Water**	**Elutriate**	**Sediment**	**Water**	**Elutriate**	**Sediment**	**Water**	**Elutriate**	**Sediment**
Sand		%						1.8			4.2			1.8			1.8			1.8
Silt		%						40.6			35.6			40.6			40.6			40.6
Clay		%						57.6			60.2			57.6			57.6			57.6
D50		mm						0.00			0.00			0.00			0.00			0.00
Percent Solids		%						41.0			40.8			41.0			41.0			41.0
Antimony	µg/L	mg/kg	N/A	N/A	N/A	<3.00	<3.00	<2.5	<3.00	<3.00	<2.5	<3.00	<3.00	<2.5	<3.00	<3.00	<2.5	<3.00	<3.00	<2.5
Arsenic	µg/L	mg/kg	69	149	8.2	4.19	5.59	7.81	4.29	7.92	8.13	4.10	6.30	7.82	4.09	5.87	7.08	3.52	6.13	7.35
Beryllium	µg/L	mg/kg	N/A	N/A	N/A	<0.2	<0.2	<1.00	<0.2	<0.2	<1.00	<0.2	<0.2	<1.00	<0.2	<0.2	<1.00	<0.2	<0.2	<1.00
Cadmium	µg/L	mg/kg	40	45.4	1.20	0.04	0.29	<0.10	<1.00	0.47	<0.10	0.98	1.07	<0.10	0.27	0.82	<0.10	0.86	0.59	0.16
Chromium	µg/L	mg/kg	1,100	1,090	81.0	1.08	1.08	9.25	<1.00	<1.00	8.11	<1.00	1.28	8.41	<1.00	<1.00	6.84	<1.00	<1.00	6.78
Copper	µg/L	mg/kg	4.8	13.5	34.0	1.89	2.21	12.1	1.57	2.16	10.6	1.43	1.91	10.7	1.36	1.66	8.57	1.43	2.18	8.02
Lead	µg/L	mg/kg	210	133	46.7	<1.00	<1.00	15.1	<1.00	0.18	14.9	1.15	<1.00	16.0	<1.00	<1.00	14.0	0.84	<1.00	14.2
Mercury	µg/L	mg/kg	1.8	2.1	0.15	1.05	0.31	<0.20	1.19	0.26	<0.20	0.82	0.21	<0.20	1.20	0.11	<0.20	0.95	0.22	<0.20
Nickel	µg/L	mg/kg	74	118	20.9	<1.00	<1.00	4.56	<1.00	<1.00	3.97	<1.00	<1.00	4.13	<1.00	<1.00	3.67	<1.00	<1.00	3.43
Selenium	µg/L	mg/kg	290	564	N/A	1.92	1.50	0.44	1.28	2.31	0.64	1.54	3.78	0.66	1.33	5.09	0.65	1.09	5.46	0.76
Silver	µg/L	mg/kg	1.9	2.0	1.00	<1.00	<1.00	<0.20	<1.00	<1.00	<0.20	<1.00	<1.00	<0.20	<1.00	<1.00	<0.20	<1.00	<1.00	<0.20
Thallium	µg/L	mg/kg	N/A	N/A	N/A	<1.00	<1.00	0.34	<1.00	<1.00	0.34	1.68	<1.00	0.25	<1.00	<1.00	<1.00	0.71	<1.00	<1.00
Zinc	µg/L	mg/kg	90	92.7	150	<1.00	41.1	14.8	<1.00	5.82	14.1	<1.00	40.2	13.4	<1.00	13.5	12.9	<1.00	79.8	12.1
Bis(2-ethylhexyl) phthalate	µg/L	µg/kg	N/A	N/A	N/A	<3.00	<3.00	207	<3.00	<3.00	145	<3.00	<3.00	180	<3.00	<3.00	209	<3.00	<3.00	185
TOC	mg/L	%	N/A	N/A	N/A	5.60	7.05	0.98	5.16	5.02	0.91	3.14	5.52	1.06	4.11	5.25	1.15	4.31	5.55	0.90
Ammonia	mg/L	mg/kg	1.7	N/A	N/A	0.06	0.25	254	0.08	0.23	319	0.05	0.49	283	0.08	0.52	222	0.07	0.38	259

Table 3.4-2 (Continued)

					Station:	FH-06-02			FH-06-04			FH-06-06			FH-06-REF			FH-06-PA1		
					Date:	8/22/2006			8/22/2006			8/22/2006			8/22/2006			8/22/2006		
					Channel Station:	0+00			–100+00			–200+00								
Parameter	**Liquid Media Unit**	**Solid Media Unit**	**WQC**	**TWQS**	**ERL**	**Water**	**Elutriate**	**Sediment**	**Water**	**Elutriate**	**Sediment**	**Water**	**Elutriate**	**Sediment**	**Water**	**Elutriate**	**Sediment**	**Water**	**Elutriate**	**Sediment**
Sand		%						1.8			4.2			1.1			4.0			23.7
Silt		%						40.6			40.1			37.3			31.5			56.1
Clay		%						57.6			55.7			61.6			64.5			20.2
D50		mm						0.00			0.00			0.00			0.00			0.00
Percent Solids		%						41.0			44.4			39.1			46.0			68.3
Antimony	µg/L	mg/kg	N/A	N/A	N/A	<3.00	<3.00	<2.5	<3.00	<3.00	<2.5	<3.00	<3.00	<2.5	<3.00	<3.00	<2.5	<3.00	<3.00	<2.5
Arsenic	µg/L	mg/kg	69	149	8.2	3.74	7.96	**8.57**	3.49	6.03	**8.62**	3.68	4.77	**9.45**	3.65	5.51	**8.90**	3.57	3.87	4.51
Beryllium	µg/L	mg/kg	N/A	N/A	N/A	<0.2	<0.2	<1.00	<0.2	<0.2	<1.00	<0.2	<0.2	<1.00	<0.2	<0.2	<1.00	<0.2	<0.2	<1.00
Cadmium	µg/L	mg/kg	40	45.4	1.20	0.67	0.74	<0.10	0.32	0.40	<0.10	0.78	0.26	<0.10	0.49	0.42	<0.10	0.54	0.68	<0.10
Chromium	µg/L	mg/kg	1,100	1,090	81.0	<1.00	<1.00	7.69	<1.00	<1.00	6.80	<1.00	1.28	8.14	<1.00	<1.00	8.25	<1.00	<1.00	3.24
Copper	µg/L	mg/kg	4.8	13.5	34.0	1.11	0.94	8.54	1.07	1.38	7.65	1.61	1.79	10.1	1.52	1.66	10.2	1.07	1.03	3.02
Lead	µg/L	mg/kg	210	133	46.7	<1.00	<1.00	17.3	<1.00	<1.00	16.4	<1.00	<1.00	20.7	<1.00	<1.00	17.8	<1.00	<1.00	8.48
Mercury	µg/L	mg/kg	1.8	2.1	0.15	0.99	0.10	<0.20	0.66	0.32	<0.20	0.91	0.38	<0.20	0.58	0.23	<0.20	0.50	0.28	<0.20
Nickel	µg/L	mg/kg	74	118	20.9	<1.00	<1.00	3.95	<1.00	<1.00	3.08	<1.00	<1.00	3.89	<1.00	<1.00	3.73	<1.00	<1.00	1.77
Selenium	µg/L	mg/kg	290	564	N/A	1.09	4.50	0.72	1.26	6.31	0.50	0.91	7.63	0.61	1.24	6.98	0.69	0.86	8.20	0.32
Silver	µg/L	mg/kg	1.9	2.0	1.00	<1.00	<1.00	<0.20	<1.00	<1.00	<0.20	<1.00	<1.00	<0.20	<1.00	<1.00	<0.20	<1.00	<1.00	<0.20
Thallium	µg/L	mg/kg	N/A	N/A	N/A	<1.00	<1.00	<1.00	<1.00	<1.00	<0.20	0.76	<1.00	<0.20	<1.00	<1.00	<0.20	<1.00	<1.00	<0.20
Zinc	µg/L	mg/kg	90	92.7	150	<1.00	<1.00	12.9	<1.00	13.30	11.7	<1.00	<1.00	15.7	<1.00	<1.00	11.6	<1.00	<1.00	7.68
Bis(2-ethylhexyl) phthalate	µg/L	µg/kg	N/A	N/A	N/A	<3.00	<3.00	227	<3.00	<3.00	183	<3.00	<3.00	247	<3.00	<3.00	172	<3.00	<3.00	127
TOC	mg/L	%	N/A	N/A	N/A	2.48	4.96	1.04	1.62	4.25	0.81	1.86	3.82	0.87	2.17	4.84	0.61	2.38	3.54	0.50
Ammonia	mg/L	mg/kg	1.7	N/A	N/A	0.06	0.53	206	0.06	0.44	227	0.05	0.43	226	0.05	0.52	276	0.05	0.49	183

Table 3.4-2 (Concluded)

					Station:	F-08-01			F-08-02			F-08-03			F-08-04		
					Date:	6/5/2008			6/6/2008			6/6/2008			6/6/2008		
					Channel Station:	75+00			112+00			125+00			175+00		
Parameter	**Liquid Media Unit**	**Solid Media Unit**	**WQC**	**TWQS**	**ERL**	**Water**	**Elutriate**	**Sediment**	**Water**	**Elutriate**	**Sediment**	**Water**	**Elutriate**	**Sediment**	**Water**	**Elutriate**	**Sediment**
Sand		%						2.7			0.7			2.8			1.0
Silt		%						26.1			26.2			26.6			14.8
Clay		%						71.2			73.1			70.6			84.2
D50		mm						0.00			0.00			0.00			0.00
Percent Solids		%						34.9			35.5			36.6			35.9
Antimony	µg/L	mg/kg	N/A	N/A	N/A	<3.00	<3.00	<2.5	<3.00	<3.00	<2.5	<3.00	<3.00	<2.5	0.71	0.44	<2.5
Arsenic	µg/L	mg/kg	69	149	8.2	2.63	3.20	7.23	2.02	5.87	5.78	2.61	3.19	**8.35**	2.55	5.78	5.94
Beryllium	µg/L	mg/kg	N/A	N/A	N/A	<0.2	<0.2	1.23	<0.2	<0.2	0.90	<0.2	<0.2	1.20	<0.2	<0.2	1.06
Cadmium	µg/L	mg/kg	40	45.4	1.20	<1.00	<1.00	0.17	<1.00	<1.00	<0.10	<1.00	<1.00	0.19	<1.00	<1.00	<0.10
Chromium	µg/L	mg/kg	1,100	1,090	81.0	2.90	<1.00	27.8	<1.00	<1.00	22.5	0.49	<1.00	34.4	<1.00	<1.00	27.6
Copper	µg/L	mg/kg	4.8	13.5	34.0	1.08	1.28	13.2	1.14	1.05	12.7	1.60	1.88	18.5	1.08	1.03	17.5
Lead	µg/L	mg/kg	210	133	46.7	<1.00	<1.00	15.2	<1.00	<1.00	13.0	<1.00	<1.00	21.1	<1.00	<1.00	16.2
Mercury	µg/L	mg/kg	1.8	2.1	0.15	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Nickel	µg/L	mg/kg	74	118	20.9	<1.00	<1.00	12.9	<1.00	<1.00	4.62	<1.00	<1.00	6.85	<1.00	<1.00	5.64
Selenium	µg/L	mg/kg	290	564	N/A	0.69	1.90	0.14	1.04	0.76	0.14	1.60	1.40	0.14	1.03	1.50	0.17
Silver	µg/L	mg/kg	1.9	2.0	1.00	<1.00	<1.00	0.72	<1.00	<1.00	0.08	<1.00	<1.00	0.25	<1.00	<1.00	0.08
Thallium	µg/L	mg/kg	N/A	N/A	N/A	<1.00	<1.00	0.29	<1.00	<1.00	0.20	<1.00	<1.00	0.33	<1.00	<1.00	0.25
Zinc	µg/L	mg/kg	90	92.7	150	8.48	3.64	62.6	0.96	8.31	50.8	2.18	2.45	79.2	0.61	17.00	72.3
Bis(2-ethylhexyl) phthalate	µg/L	µg/kg	N/A	N/A	N/A	<3.00	<3.00	<50.0	<3.00	<3.00	<50.0	<3.00	<3.00	<50.0	<3.00	<3.00	<50.0
TOC	mg/L	%	N/A	N/A	N/A	2.68	3.15	1.03	3.23	3.76	0.90	2.82	4.06	0.71	2.85	4.08	0.95
Ammonia	mg/L	mg/kg	1.7	N/A	N/A	0.38	1.83	293	0.34	1.54	268	0.22	1.65	271	0.33	1.76	254

Chromium = CrIII and Total Cr

Var = varies based on pH, salinity, and temperatures

N/A means that no applicable value exists.

WQC = EPA Acute, Marine Water Quality Criterion; TWQS = Texas Acute, Marine Water Quality Standard; ERL = Effects Range Low.

µg/L = micrograms per liter

mg/kg = milligrams per kilogram

mm = millimeter

Table 3.4-3
Constituents Detected in Water and Elutriate Samples by Year*

	Year																									
	1987		1988		1989		1993		1995		1997		1998		1999		2000		2004		2005		2006		2008	
Parameter	**W**	**E**	**W**	**E**	**W**	**E**	**W**	**E**	**W**	**E**	**W**	**E**	**W**	**E**	**W**	**E**	**W**	**E**	**W**	**E**	**W**	**E**	**W**	**E**	**W**	**E**
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A							X	X
Arsenic												X	X	X	X	X			X	X	X	X	X	X	X	X
Barium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	X	X	X	X	X	X	X	X	X	X	N/A	N/A	N/A	N/A	NA	N/A	N/A	N/A
Cadmium			X	X					X	X	X		X	X	X		X	X					X	X		
Chromium								X			X		X	X									X	X	X	
Copper	X	X									X	X	X	X			X	X					X	X	X	X
Lead	X	X										X			X							X	X	X		
Mercury											X												X	X		
Nickel			X	X							X	X		X	X	X						X				
Selenium												X									X		X	X	X	X
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A					X			
Zinc	X	X	X	X			X	X			X	X	X	X	X	X	X	X	X	X		X		X	X	X
TOC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	X	X					X	X	X	X	X	X	X	X
Ammonia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	X	X		X	X	X	X		X	X	X	X	X	X	X	X

* Channel Stations Only, PA and Reference samples are not included.

W = water, E = elutriate, N/A = analysis not conducted for that constituent.

Table 3.4-4

Parameters Determined by Chemical Analysis

METALS	
Antimony	Lead
Arsenic	Mercury
Beryllium	Nickel
Cadmium	Selenium
Chromium, Total	Silver
Chromium, Trivalent	Thallium
Chromium, Hexavalent	Zinc
Copper	
PESTICIDES AND PCBs	
Aldrin	Dieldrin
Alpha-BHC	Endosulfan I
Beta-BHC	Endosulfan II
Gamma-BHC (Lindane)	Endosulfan sulfate
Delta-BHC	Endrin
Chlordane	Endrin aldehyde
Alpha-Chlordane	Heptachlor
Gamma- Chlordane	Heptachlor epoxide
4,4'-DDD	Toxaphene
4,4'-DDE	Total PCBs
4,4'-DDT	
SEMIVOLATILES	
Acenaphthene	Dimethyl phthalate
Acenaphthylene	Di-n-butyl phthalate
Anthracene	2,4-Dinitrotoluene
Benzidine	2,6-Dinitrotoluene
Benzo(a)anthracene	Di-n-octyl phthalate
Benzo(a)pyrene	1,2-Diphenylhydrazine
Benzo(ghi)perylene	Fluoranthene
Benzo(b&k)fluoranthene	Fluorene
Bis(2-chloroethyloxy)methane	Hexachlorobenzene
Bis(2-chloroethyl)ether	Hexachlorobutadiene
Bis(2-chloroisoproply)ether	Hexachlorocyclopentadiene
Bis(2-ethylhexyl)phthalate	Hexachloroethane
4-Bromophenyl phenyl ether	Indeno(123-CD)pyrene
Butyl benzyl phthalate	Isophorone
4-chloro-3-methylphenol	2-Methyl-4,6-dinitrophenol
2-Chloronapthalene	Naphthalene
2-Chlorophenol	Nitrobenzene
4-Chlorophenyl phenyl ether	2-Nitrophenol
Chrysene	4-Nitrophenol
Dibenzo(ah)anthracene	N-nitrosodimethylamine
1,2-Dichlorobenzene	N-nitrosodi-n-propylamine
1,3-Dichlorobenzene	N-nitrosodiphenylamine
1,4-Dichlorobenzene	Phenanthrene
3,3'-Dichlorobenzidine	Phenol
2,4-Dichlorophenol	Pentachlorophenol
2,4-Dinitrophenol	Pryene
Diethyl phthalate	1,2,4-Trichlorobenzene
2,4-Dimethylphenol	2,4,6-Trichlorophenol
CONVENTIONAL PARAMETERS	
Ammonia	
Cyanide	Total Petroleum Hydrocarbons
Total Organic Carbon	% Solids*

* sediment only

constituents from the sediment into the water column and it may be informative to be able to compare elutriate results to sediment results. Also provided in Table 3.4-2, and other tables in this section, are the USACE channel stations, which can be compared to Figure 1.3-1 to determine station locations. Table 3.4-2 shows that, of the metals, beryllium and silver were not detected in water or elutriate samples. Of the 22 samples collected for water and elutriate testing in 2004, 2005, 2006, and 2008, antimony was found in only one water and one elutriate sample in 2008; thallium was found in only three water samples in 2006; nickel was found in four elutriate samples in 2005; chromium was found in one water and three elutriate samples in 2006 and two water samples in 2008; and lead was found in two elutriate samples in 2005 and two water samples and an elutriate sample in 2006. Copper and mercury were found in no samples in 2004 and 2005 but were found in all samples in 2006. Cadmium was not found in 2004 or 2005 but was found in all elutriates and all but one water sample in 2006. Selenium was also found in all 2006 and 2008 samples, and in all water samples in 2005. Zinc was in water samples only in 2004 and 2008 but was found in all elutriate samples in 2004, 2005, and 2008, and 6 of 10 elutriate samples in 2006. Arsenic was the only metal found in all water and elutriate samples in 2004, 2005, 2006, and 2008. Total Organic Carbon and ammonia were also found in all samples for all 4 years and bis(2-ethylhexyl)phthalate, while found in the sediments in 2006, was not detected in any water or elutriate sample. Table 3.4-3 shows the years in which the various constituents in Table 3.4-2 were detected in channel stations, and includes all years for which there are data. While PA and reference area samples are included in Table 3.4-2, they are not indicative of water quality in the project area and are not included in Table 3.4-3.

Only two definite trends are demonstrated by the data in Table 3.4-2. When detected, water concentrations of mercury are always higher than the elutriate concentrations, and ammonia is always higher in the elutriates. Selenium is generally quite a bit higher in the elutriates than in the water samples. Arsenic, copper, and zinc concentrations are generally, but not always, higher in the elutriate samples than in the water samples, but the differences are small.

None of the water or elutriate samples exceeded applicable WQC or TWQS, so there are no indications of water or elutriate problems in the Jetty and Outer Bar channels.

Additionally, water, elutriate, and sediment chemical analyses were conducted on new work samples from the Main (Inner) Channel by USACE in 1971, 1975, and 1976 (USACE, 1978), but the water and elutriate results are not reported here. Water samples were not filtered, as is required now, and water and elutriate concentrations were reported in mg/L (e.g., lead concentrations of 0.001 mg/L), indicating a high detection limit and accuracy that was insufficient for comparison to WQC and TWQS. However, after analysis of the data, including monitoring in both the channel and the Maintenance ODMDS during and after dredging and placement, the conclusion of USACE (1978), with concurrence of the other State and Federal resource agencies, was that there were no significant causes for concern relative to the construction material elutriates. Sediment data are discussed in Section 3.5.1.

Following EPA designation of the Maintenance and New Work ODMDSs (see Figure 1.3-1) in 1988 (EPA, 1989), USACE undertook extensive monitoring of the New Work ODMDS (Espey, Huston & Associates, Inc. [EH&A] now PBS&J, 1994). Testing included water, sediment, and elutriate chemistry and benthic community analyses. In general, the testing determined no significant impacts attributable to dredged material placement, either in the chemical analyses or benthic community structure and assemblages (EH&A, 1994).

3.4.3 Bioassays

One set of suspended particulate phase (SPP), or unfiltered elutriate, bioassays was conducted on samples collected from the Outer Bar and Jetty channels (PBS&J, 2004a) since 2002 (see Section 3.4.2), although before that time, numerous SPP bioassays were conducted and indicated no toxicity. The results of these tests are presented in Table 3.4-5. Results indicate that in all tests survival of organisms exposed to the SPP sediments from the Outer Bar and Jetty channels was above 90 percent. So, no 96-hour LC_{50} (that concentration of a substance that is lethal to 50 percent of test organisms after a continuous exposure time of 96 hours) could be calculated. Furthermore, there were no tests in which the survival in the Dilution Water Control was greater than survival in the channel treatments. Thus, pursuant to the RIA, no statistical analyses are required and the Limiting Permissible Concentration for the SPP is met. Therefore, these data indicate that no acute toxicity to water column organisms could be expected from dredging the Outer Bar and Jetty channels or placement of channel sediments.

3.4.4 Ballast Water

Ballast water is loaded on empty ships to provide weight and stability while traveling from one port to the next. There are thousands of marine species that can be carried from port to port in ballast water, which may ultimately result in the introduction of non-native or invasive aquatic species from foreign ports (Global Ballast Water Management Programme, 2006). Ballast water is the largest single vector for nonindigenous species transfer in the U.S. (EPA, 2001). EPA has compiled a list of invasive species that have been unintentionally introduced in Texas, although not necessarily through ballast water alone (EPA, 2001). TPWD has identified the invasive species that pose the greatest threat in Texas (Table 3.4-6). Over half of these are considered current management priorities by TPWD.

USCG, under the provisions of the National Invasive Species Act of 1996, has implemented mandatory ballast water management (BWM) protocols. All vessels, foreign and domestic, equipped with ballast water tanks that operate within U.S. waters are required to comply with the 33 CFR Part 151 management protocol. This includes conducting ballast water exchange at a minimum of 200 miles offshore and submitting a ballast water exchange report to the National Ballast Information Clearinghouse (NBIC) to ensure compliance with the management requirements (USCG, 2006).

Table 3.4-5
The Number and Percentages of Surviving Organisms
Suspended Particulate Phase Bioassays
100% Test Solution
May 2004

		Number of Survivors							
	Replicate	**Dilution Control**	**Reference Control**	**Dilution Control**	**FH-EC-01 60+00**	**Dilution Control**	**FH-EC-02 –45+00**	**Dilution Control**	**FH-EC-03 –150+00**
A. bahia	1	10	10	10	10	10	10	10	10
juveniles	2	10	10	10	10	10	10	10	10
10/replicate	3	10	10	10	10	10	10	9	10
	4	10	10	10	10	10	10	10	10
	5	10	10	10	10	10	10	10	10
	Average	10.0	10.0	10.0	10.0	10.0	10.0	9.8	10.0
	(%)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	98.0%	100.0%
A. bahia	1	10	10	10	10	10	10	10	10
adults	2	10	9	10	10	10	10	10	10
10/replicate	3	10	10	10	10	10	9	10	10
	4	10	10	10	10	10	10	10	10
	5	10	9	10	10	10	10	10	10
	Average	10.0	9.6	10.0	10.0	10.0	9.8	10.0	10.0
	(%)	100.0%	96.0%	100.0%	100.0%	100.0%	98.0%	100.0%	100.0%
M. beryllina	1	10	10	10	10	10	10	10	10
10/replicate	2	6	10	6	10	6	9	6	10
	3	10	10	10	10	10	10	10	10
	4	10	10	10	10	10	9	10	10
	5	10	10	10	9	10	10	10	9
	Average	9.2	10.0	9.2	9.8	9.2	9.6	9.2	9.8
	(%)	92.0%	100.0%	92.0%	98.0%	92.0%	96.0%	92.0%	98.0%

Table 3.4-6
Current and Potential Management Priorities of Invasive Aquatic Species in Texas

Scientific Name	Common Name	Texas
Shrimp Viruses		
Taura Syndrome Virus	shrimp virus	ü
White Spot Syndrome Virus	shrimp virus	ü
Coelenterates		
Phyllorhiza punctata	spotted jellyfish	P
Roundworms (phylum Nematoda)		
Anguillicola crassus	eel parasite	P
Mollusks		
Corbicula fluminea	Asian clam	P
Crassostrea gigas	Japanese (or Pacific giant) oyster	ü
Dreissena polymorpha	zebra mussel	P
Perna perna	brown mussel	P
Pomacea canalicula	channeled applesnail	ü
Crustaceans		
Carcinus maenas	green crab	P
Charybdis helleri	marine swimming crab	P
Eriocheri sinensis	Chinese mittencrab	P
Fishes		
Cichlasoma cyanoguttatum	Rio Grande cichlid	ü
Ctenopharyngodon idella	grass carp	ü
Hypophthalmichthys molitrix	silver carp	P
Hypophthalmichthys nobilis	bighead carp	P
Mylopharyngodon piceus	black carp	P
Oreochromis aureus	blue tilapia	ü
Oreochromis mossambicua	Mozambique tilapia	ü
Mammals		
Myocastor coypus	nutria	ü
Algae		
Aureoumbra lagunensis	brown tide algae	ü*
Vascular Plants		
Alternanthera philoxeroides	alligatorweed	ü
Eichhornia crassipes	water hyacinth	ü
Hydrilla verticillata	hydrilla	ü
Ipomoea aquatica	waterspinach	P
Lythrum salicaria	purple loosestrife	P
Panicum repens	torpedograss	ü
Pistia stratiotes	waterlettuce	ü
Salvinia minima	common salvinia	ü
Salvinia molesta	giant salvinia	ü
Semi-Aquatic Vascular Plants		
Pueraria montana	kudzu	P
Sapium sebiferum	Chinese tallow tree	ü

P = Potential TPWD management priority for Texas.
ü = Current TPWD management priority for Texas.
*Cryptogenic (a species whose status as indigenous or nonindigenous remains unresolved)

Source: EPA (2001).

According to the NBIC (2006) ballast water reporting database, between 2004 and 2006, 217 ballast water exchange reports were submitted for Freeport Harbor. Of these, 14 represented treated and 8 represented untreated discharges that occurred at Freeport. Treated discharges consisted of either flow-through (pumping seawater in to displace the tank contents) or empty/refill of ballast tanks.

3.5 SEDIMENT QUALITY

3.5.1 Surficial Sediments

There has been only one recent study that evaluated construction material, as part of the jetty stability analysis, which is pertinent to the project (PBS&J, 2005a). Soil samples were collected by Fugro (2005) to determine whether the soils presented a contamination "cause for concern." Contaminants of concern are presented in Table 3.4-4. There are no sediment or soil quality criteria with which to compare concentrations in soils; however, several different guidelines are used to look for a cause for concern in sediment samples. One of these guidelines is the effects range low (ERL), which has been used in the past to examine both soils and sediments destined for beneficial use (BU) or ocean disposal in the Gulf.

It should be noted that while ERLs are used for comparative purposes, they were developed by assembling a large group of sediment data sets, comprising samples for which there was both bulk sediment chemistry and exhibition of toxicity. For each chemical in the data set, the concentrations were ranked in ascending order, and the ERL was calculated as the lower 10th percentile of the concentrations. However, this approach demonstrates no cause and effect from the chemicals in the data set, since the fact that a chemical was detected does not demonstrate that it was responsible for any of the toxicity exhibited by the sediment. Not surprisingly, when ERLs derived from sets of data from different areas are compared, the results are inconsistent (USACE, 1998). For example, when the ERLs of a number of chemicals were compared using a northern California data set versus a southern California data set, the ERLs differed by a range from only a factor of three for total polychlorinated biphenyls (PCBs) to a factor of 2,689 for p,p'dichlorodiphenyldichloroethylene, a breakdown product of the pesticide DDT (DDE). Since the ERLs are not based on cause and effect data, they exhibit low predictive ability and give a high number of false positives (USACE, 1998). Also used, on occasion, are the Effects Range Medium (ERM), similar to the ERLs but representing the median range of concentrations, and thus, higher concentrations. The ERLs (and the one ERM) used here are those presented in the NOAA 1999 Screening Quick Reference Tables (Buchman, 1999).

Data for detected compounds are presented in Table 3.5-1: a total of 10 samples taken from six borings (Figure 3.5-1). While seven borings were taken, as indicated on Figure 3.5-1, only six of these were submitted for chemical analysis. Arsenic, beryllium, total chromium, copper, lead, manganese, nickel, and zinc were detected in all samples. Thallium was detected in 6 of 10 samples, mercury in 2 samples.

Organic compound analyses were conducted including organic halides, volatile organic compounds (VOCs), semivolatile organic compounds, pesticides, and PCBs. Of these, fluoranthene was detected in only one sample.

There were six exceedances of ERLs, all by nickel, ranging from 23.8 milligrams per kilogram (mg/kg) (114 percent of the ERL) to 35.3 mg/kg (170 percent of the ERL). To determine whether these nickel levels are of concern, recent (since 2002) sediment zinc concentration and percent survival in solid phase (SP) bioassays of Entrance Channel sediment samples along the Texas coast were examined. This yielded 26 data points from six bioassays (PBS&J, 2004a, 2004b, 2004c, 2005b, 2007, 2008). Both average percent survival and lowest percent survival (indicating the most sensitive species) were compared to the nickel concentration in the bioassayed sediments. Correlation was poor. Using a linear equation, the Pearson r-value was 0.151 ($R^2 = 0.023$) for the average percent survival and 0.342 ($R^2 = 0.117$) for the lowest percent survival. The r-value was positive in both cases, indicating higher survival with increasing nickel concentration within the range of nickel concentrations found in the sediments. However, higher R^2 values were obtained for polynomial equations, with second- to fourth-order equations yielding R^2 values of 0.154 to 0.156 for nickel concentrations versus lowest percent survival and 0.050 to 0.052 for average percent survival. All polynomial equations indicated that, for the data available and ignoring all other potential contributing factors, an hormetic effect was demonstrated with an optimum nickel concentration of around 15 mg/kg, with percent survival declining at higher and lower nickel concentrations. Using a second-order polynomial equation, the concentration of nickel required to reduce survival to 50 percent is 41 mg/kg for the lowest percent survival curve and 76 mg/kg for the average percent survival curve. While these data demonstrate no more cause and effect relation than the ERL, they do indicate that the range of nickel concentrations determined for the soils is unlikely to cause significant toxicity to sensitive benthic organisms during bioassays conducted according to procedures provided in EPA/USACE (1991).

There would appear to be no significant cause for concern relative to placing these soils in the Gulf or using them beneficially because of the following reasons.

1. As noted above, there is no cause and effect built into the development of an ERL, so there is no way to determine whether nickel was the causative factor in the data that led to the nickel ERL;
2. toxicity data predict that nickel concentrations in the same range as the ERL did not cause toxicity;
3. the concentrations are less than a factor of two of the ERL;
4. the concentrations are below the ERM concentration (51.6 mg/kg) and well below the Apparent Effects Threshold values, of which 110.0 mg/kg (for echinoderm larvae) is the lowest value (Buchman, 1999);

Table 3.5-1
Concentrations of Detected Constituents in Soils (dry weight)
Freeport Harbor Channel Improvement Project

Date Sampled: February 2005

Parameter	Units	NOAA ERL*	B-1,E,26' 0211038	B-2,E-1,24' 0211039	B-2,E-2,46' 0211040	B-3,E-1,26' 0211041	B-3,E-2,35' 0211042	B-4,E-1,35' 0211043	B-4,E-2,40' 0211044	B-5,E-1,34' 0211045	B-5,E-2,59' 0211046	B-6,E-2,32-34' 0211047
Arsenic	mg/kg	8.2	2.7	2.4	1.4	0.700	8.2	2.0	4.1	0.600	2.0	1.6
Beryllium	mg/kg	N/A	1.15	1.18	1.46	0.274	1.46	0.743	1.16	0.142	0.983	0.433
Chromium, Total	mg/kg	81.0	28.1	46.0	59.9	7.8	46.8	15.3	23.2	4.1	20.2	9.9
Copper	mg/kg	34.0	25.8	19.1	19.9	3.6	26.1	10.1	19.5	1.6	12.2	4.6
Lead	mg/kg	46.7	14.9	27.6	29.9	5.1	39.9	7.0	15.6	2.8	10.7	6.8
Manganese	mg/kg	N/A	257.7	184.7	214.1	130.2	723.2	157.2	489.6	85.2	290.1	311.9
Mercury	mg/kg	0.150	< 0.00794	< 0.00664	< 0.00663	< 0.00613	< 0.00647	< 0.00597	< 0.00647	< 0.00602	0.0111	0.0129
Nickel	mg/kg	20.9	**30.2**	**26.8**	**33.3**	6.0	**35.3**	17.6	**29.8**	3.3	**23.8**	10.6
Thallium	mg/kg	N/A	0.294	0.284	0.340	< 0.190	0.324	< 0.195	0.285	< 0.176	0.214	< 0.193
Zinc	mg/kg	150	61.7	63.1	73.5	38.0	64.5	34.8	58.9	10.5	50.4	40.6
Fluoranthene	ug/kg	600	< 635	< 531	< 265	534	< 259	< 239	< 259	< 241	< 237	< 259
Percent Solids	%	N/A	63.0	75.3	75.4	81.5	77.3	83.8	77.3	83.0	84.5	77.1

ERL = Effects Range Low for Marine Sediments. There are no ERLs for soils.
Bold indicates exceedance of an ERL.

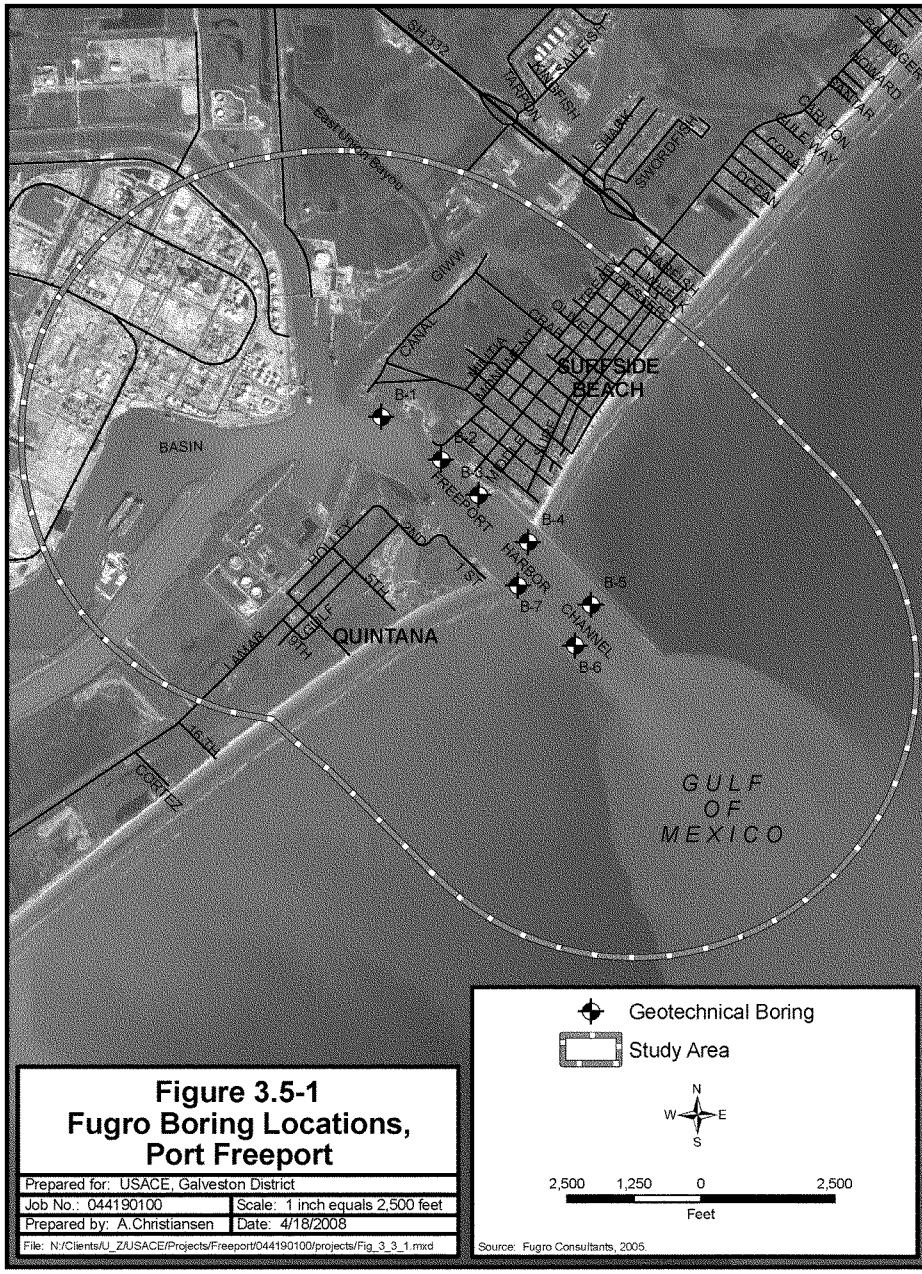


Figure 3.5-1
Fugro Boring Locations, Port Freeport

Prepared for: USACE, Galveston District	
Job No.: 044190100	Scale: 1 inch equals 2,500 feet
Prepared by: A.Christiansen	Date: 4/18/2008
File: N:/Clients/U_Z/USACE/Projects/Freeport/044190100/projects/Fig_3_3_1.mxd	

5. there are no Action Levels established by the Food and Drug Administration for poisonous or deleterious substances in human food and animal feed (which includes fish and shellfish) for nickel; and
6. no other ERLs were exceeded.

Data for construction material taken by USACE in 1975 and 1976 for core samples collected from the downstream edge of the Stauffer Channel (Station C2), the Channel to Upper Turning Basin (Station C3), the Channel to Brazosport Turning Basin (Station C4), and the upstream end of Jetty Channel (Station C9) are presented in Table 3.5-2 and compared to the ERLs. It should be noted that techniques and detection limits were not as stringent in the 1970s as they are today and that collection devices and techniques were not as "clean" as they are at present. However, these data are presently the only data available for the construction material from the Main (Inner) Channel.

As an examination of Table 3.5-2 will show, the ERL for arsenic was slightly exceeded in 1976, but not in 1975 at Station C3. The cadmium ERL was exceeded in 1975 at stations C2 and C9. However, 1976 values were a fraction of the 1975 values, and none exceeded the cadmium ERL. Additionally, Station C9 is very near Fugro boring Station B-2 (Fugro, 2005; PBS&J, 2005a), and cadmium was not detected in the samples from Station B-2. The nickel ERL was exceeded at Station C3 in 1975 and 1976 and at Station C4 in 1976. However, the discussion above concerning the nickel ERL applies to these data as well. Therefore, these data provide a preliminary assurance that no cause for concern is indicated for the construction material from the inner portions of the Freeport Ship Channel, including the Stauffer Channel. However, during the Preconstruction, Engineering, and Design (PED) phase of the project, USACE plans additional sampling of construction material from both the Stauffer Channel and from the extension of the Outer Bar Channel.

USACE conducted monitoring of the ocean placement of construction material from dredging of the Outer Bar and Jetty channels for the 45-foot Project (USACE, 1978). No water column, sediment, or benthos problems were noted.

3.5.2 Maintenance Material

3.5.2.1 Chemistry

Only data since 2002 are presented and analyzed for this EIS (see Section 3.4.2) to determine the sediment quality of the project area. The data presented here are from bulk sediment analyses, which tend to show considerable variation, even within duplicates. The data from reference and PA sites are not included in this analysis because those sediments will not be part of the maintenance material from the improved channel. Like the construction material discussed above, the sediment data are compared to ERLs.

Table 3.5-2
Concentrations of Detected Constituents in Soils (dry weight)
Freeport Harbor Channel Improvement Project

Parameter	Units	NOAA ERL*	C2 3/10/75 ~190+00	C3 3/12/75 ~130+00	C4 4/3/75 ~100+00	C9 3/5/75 ~60+00	C2 5/21/76 ~190+00	C3 5/21/76 ~130+00	C4 5/21/76 ~100+00	C9 6/15/76 ~60+00
Arsenic	mg/kg	8.2	5.8	< 1.0	4.2	2.9	2.3	**9.1**	7.7	3.9
Cadmium	mg/kg	1.2	**3.0**	< 1.0	< 1.0	**4.0**	0.31	0.79	0.49	0.69
Chromium, Total	mg/kg	81.0	N/A	N/A	N/A	N/A	14	16	23	10
Copper	mg/kg	34.0	12	3.0	7.0	8.0	5.6	13	9.3	8.6
Lead	mg/kg	46.7	27	10	18	34	12	20	19	12
Mercury	mg/kg	0.150	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	mg/kg	20.9	20	**50**	14	17	11	**25**	**22**	15
Selenium	mg/kg	N/A	N/A	N/A	N/A	N/A	0.23	0.23	< 0.10	< 0.10
Zinc	mg/kg	150	56	22	40	38	18	40	51	26
Percent Solids	%	N/A	81.4	79.2	75.7	83.4	80	74	73	75

ERL = Effects Range Low for Marine Sediments.
Bold indicates exceedance of an ERL.

The sediment chemistry data are presented in Table 3.4-2 for the same time period and the same stations as for the water and elutriate samples. PA stations and Reference station data are included in Table 3.4-2 for comparison purposes. Exceedances of ERLs are bolded in Table 3.4-2. Table 3.5-3 shows the years in which the various constituents in Table 3.4-4 were detected, but only in channel station sediments.

In 2004, the ERL for arsenic was slightly exceeded (8.63 and 9.15 mg/kg versus the ERL of 8.2 mg/kg) at one Entrance Channel station and its duplicate. There was one exceedance of the arsenic ERL in 2005 (8.61 mg/kg versus 8.2 mg/kg) at an Entrance Channel station. The arsenic ERL was exceeded in 2006 at three stations in the Entrance Channel (8.57 mg/kg–9.45 mg/kg) and also at the Reference Station (8.90 mg/kg) versus an ERL of 8.2 mg/kg. In 2008, there was one exceedance at a station in the Main Channel (8.35 mg/kg). Because of the lack of cause and effect in the generation of the ERL, this is not necessarily indicative of a cause for concern. As noted in Section 3.4.3, water column bioassays prepared with these sediments indicated no toxicity. The following sections deal with benthic bioassays and bioaccumulation studies with these sediments.

3.5.2.2 Bioassays

Table 3.5-4 presents the data for SP, or whole mud, bioassays with Outer Bar and Jetty Channel sediments conducted for the EPA or USACE from 2003, 2004, and 2005 (Battelle, 2004; PBS&J, 2004a, 2005b). These bioassays were conducted according to protocols in EPA/USACE (1991) and the RIA. Only data since 2002 are presented here (see Section 3.4.2), but numerous SP bioassays were conducted prior to 2002 with no exhibition of toxicity.

Survival in the SP bioassays conducted with the amphipod *Leptocheirus plumulosus* on samples collected in April 2004 was acceptable, and survival in the Reference Control was not at least 10 percent greater than survival in the treatments. However, survival of the opossum shrimp, *Americamysis bahia*, was poor, especially in the Reference Control. While the tests theoretically passed the requirements of the RIA, the results were not typical, and the SP bioassays with *A. bahia* were repeated in 2005. As can be seen from Table 3.5-4, survival was good for all test groups. Survival was also nearly equal in all tests, confirming the conclusions drawn from the SP bioassay with the April 2004 samples that there is no indication of a cause for concern from the ocean placement of the maintenance material from Outer Bar and Jetty channels.

Solid phase bioassays using the amphipod *Ampelisca abdita* were also conducted for EPA in 2003 (Battelle, 2004). The data reported in Battelle (2004) are also included in Table 3.5-4. These bioassays were on composite sediment samples from the four quadrants of the Maintenance ODMDS, from a reference area roughly 2 miles up-current from the Maintenance ODMDS, from an area roughly 750 feet down-current of the down-current edge of the Maintenance ODMDS, and two laboratory controls. Survival ranged from 77 to 89 percent.

Table 3.5-3
Constituents Detected in Sediment Samples by Year*

Parameter	1987	1988	1989	1993	1995	Jan-97	Sep-97	Mar-98	Jul-98	1999	2000	2004	2005	2006	2008
Arsenic	X	X					X	X	X	X	X	X	X	X	X
Barium	N/A	N/A	N/A	N/A	X	X	X	X	X	X	X	N/A	N/A	N/A	N/A
Beryllium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A				X
Cadmium				X	X			X						X	X
Chromium	X	X	X	X	X	X		X	X	X	X	X	X	X	X
Copper	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Lead	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mercury					X		X		X	X	X				
Nickel	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Selenium					X						X			X	X
Silver	N/A	N/A	N/A	N/A				X			X				
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	X	X	X	X
Zinc	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bis(2-ethylhexyl) phthalate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			X	
TOC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	X	X	X	X	X	X	X	X
Total PCB					X										
Ammonia	N/A	N/A	N/A	N/A	N/A	X	X	N/A	X	X	X	X	X	X	X

* Channel Stations Only, PA and Reference samples are not included.

Table 3.5-4
The Number and Percentages of Surviving Organisms
10-Day Solid Phase Bioassays
Freeport Harbor Jetty and Entrance Channels

2004

	Replicate (n=5)	Number of Survivors				
		True Control	Reference Control	FH-EC-01 60+00	FH-EC-02 –45+00	FH-EC-03 –150+00
10-DAY	1	20	19	19	20	20
L. plumulosis	2	20	15	18	12	19
20/replicate	3	20	19	19	20	20
	4	20	19	18	9	18
	5	20	15	15	16	8
	Average	20.0	17.4	17.8	15.4	17.0
	(%)	100.0%	87.0%	89.0%	77.0%	85.0%
A. bahia	1	20	6	19	18	20
20/replicate	2	20	16	20	15	17
	3	18	3	19	19	10
	4	19	0	18	7	17
	5	18	12	15	8	15
	Average	19.0	7.4	18.2	13.4	15.8
	(%)	95.0%	37.0%	91.0%	67.0%	79.0%
Total Organisms	1	40	25	38	38	40
30/replicate	2	40	31	38	27	36
	3	38	22	38	39	30
	4	39	19	36	16	35
	5	38	27	30	24	23
	Average	39.0	24.8	36.0	28.8	32.8
	(%)	97.5%	62.0%	90.0%	72.0%	82.0%

2005

	Replicate (n=5)	Number of Survivors				
		True Control	Reference Control	FH-EC-05-01 60+00	FH-EC-05-02 –45+00	FH-EC-05-03 –150+00
10-DAY	1	19	15	17	18	17
A. bahia	2	19	18	17	13	20
20/replicate	3	19	18	15	17	17
	4	20	20	17	20	20
	5	19	18	20	18	19
	Average	19.2	17.8	17.2	17.2	18.6
	(%)	96.0%	89.0%	86.0%	86.0%	93.0%

Table 3.5-4 (Concluded)
Freeport ODMDS

2003

		Number of Survivors			
	Replicate (n=5)	**True Control**	**Reference**	**Q1 NW Quadrant**	**Q2 NE Quadrant**
10-DAY	A	15	17	15	17
A. abdita	B	19	17	18	13
20/replicate	C	17	18	13	18
	D	17	18	17	19
	E	18	17	14	18
	Average	17.2	17.4	15.4	17.0
	(%)	86.0%	87.0%	77.0%	85.0%
		Number of Survivors			
	Replicate (n=5)	**Q3 SE Quadrant**	**Q4 SW Quadrant**	**Down Current**	**LA-5 Control**
10-DAY	A	17	18	16	16
A. abdita	B	16	18	17	16
20/replicate	C	17	16	20	13
	D	19	18	18	18
	E	16	19	18	18
	Average	17.0	17.8	17.8	16.2
	(%)	85.0%	89.0%	89.0%	81.0%

There were no tests in which survival in the Reference Control was greater than survival in the treatments and the difference exceeded 10 percent, requiring statistical analysis.

3.5.2.3 Bioaccumulation Studies

Bioaccumulation studies were also conducted on samples of the maintenance material for USACE (PBS&J, 2004a) and from the Battelle (2004) stations previously noted for the SP bioassays (Table 3.5-5).

Although these data are the only ones included in this EIS (see Section 3.4.3), bioaccumulation studies were conducted numerous times prior to 2002 with similar results. In 2004, the organic chemical bis(2-ethylhexyl)phthalate was found above detection limits in test organism tissues. Of the metals, arsenic, chromium, copper, lead, nickel, selenium, and zinc were found in tissue samples above detection limits. Concentrations of none of the constituents in tissues of *N. virens* or *M. mercenaria* exposed to test sediments were significantly higher than the respective concentrations in Reference Control organisms (PBS&J, 2004a).

The Battelle bioaccumulation studies, using *M. nasuta*, were on the composite sediment samples from the four quadrants of the Maintenance ODMDS, the reference area, the down-current station, and three laboratory controls. Samples were also taken from clams that were not tested (archive samples). In general, all of the values were approximately the same for individual constituents, although the archive tissue tended to have the highest numerical values. "There were no environmentally noteworthy elevations of" metals or organic compounds "in tissues exposed to sediments from the active discharge quadrants (Q1 and Q2), the inactive quadrants (Q3 and Q4), the Down Current site, or the Reference site" (Battelle, 2004).

3.6 AIR QUALITY

The following sections discuss the applicable regulatory framework and existing ambient air quality within the study area. Due to the regional nature of air quality, although the project occurs only in Brazoria County, the air quality study area analysis consists of the Houston-Galveston-Brazoria (HGB) Consolidated Metropolitan Statistical Area. The air quality analysis study area consists of this larger area because it is the unit at which EPA evaluates air quality.

3.6.1 Regulatory Context

3.6.1.1 National Ambient Air Quality Standards

The Clean Air Act (CAA), which was last amended in 1990, regulates air emissions from area, stationary, and mobile sources. The CAA requires 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

Table 3.5-5
Average Concentrations of Detected Compounds
in Tissue Samples of
Freeport Harbor Entrance Channel

***N. virens* 2004**

Parameter	STATION				
	True Control	Reference Control	FH-EC-01 60+00	FH-EC-02 -45+00	FH-EC-03 -150+00
Metals (mg/kg)					
Arsenic	3.41	2.39	2.39	2.38	2.50
Chromium	0.13	0.08	0.10	0.10	0.10
Copper	1.28	1.23	1.36	1.25	1.30
Lead	0.11	0.11	0.12	0.11	0.13
Mercury	0.03	0.03	0.03	0.03	0.02
Nickel	0.32	0.28	0.27	0.24	0.26
Selenium	0.26	0.25	0.25	0.23	0.24
Zinc	12.80	9.13	10.40	13.00	8.90
Bis (2-ethylhexyl) phthalate	67.50	73.00	76.60	85.10	100.00

***M. mercenaria* 2004**

Parameter	STATION				
	True Control	Reference Control	FH-EC-01 60+00	FH-EC-02 -45+00	FH-EC-03 -150+00
Metals (mg/kg)					
Arsenic	1.99	1.98	1.51	2.03	1.89
Chromium	0.12	0.09	0.09	0.05	0.08
Copper	1.09	0.98	1.00	1.14	1.20
Nickel	0.39	0.41	0.32	0.37	0.42
Selenium	0.18	0.20	0.15	0.18	0.15
Silver	0.08	0.07	0.07	0.08	0.08
Thallium	0.09	0.10	0.10	0.10	0.10
Zinc	9.19	9.05	8.51	9.27	8.79
Bis (2-ethylhexyl) phthalate	61.60	65.70	58.70	76.10	74.00

Table 3.5-5 (Concluded)

***M. nasuta* 2003**

Parameter	STATION				
	Control A	Control B	Control C	Reference	Archive
Metals (mg/kg)					
Arsenic	1.83	2.15	2.20	1.77	1.73
Cadmium	0.02	0.03	0.03	0.02	0.03
Chromium	0.17	0.43	0.41	0.20	0.08
Copper	0.90	1.25	1.22	0.95	1.65
Lead	0.11	0.13	0.16	0.18	0.12
Nickel	0.32	0.49	0.64	0.39	0.32
Selenium	0.15	0.12	0.17	nd	0.17
Silver	0.02	0.02	0.03	0.02	0.03
Zinc	6.07	6.95	9.02	6.73	9.60
Low Molecular Wt PAH	0.94	1.34	1.34	0.62	2.84
High Molecular Wt PAH	1.49	1.50	2.41	1.00	6.59
Total PAH	2.43	2.84	3.75	1.62	9.43
Total DDT	0.08	0.12	0.22	0.06	0.09

Parameter	STATION				
	Q1 NW Quadrant	Q2 NE Quadrant	Q3 SE Quadrant	Q4 SW Quadrant	Down Current
Metals (mg/kg)					
Arsenic	1.94	1.87	2.19	2.03	2.13
Cadmium	0.02	0.02	0.02	0.02	0.04
Chromium	0.18	0.25	0.30	0.24	0.23
Copper	1.19	1.22	1.09	1.14	1.24
Lead	0.20	0.20	0.28	0.19	0.22
Nickel	0.30	0.36	0.46	0.38	0.40
Selenium	0.17	0.24	0.14	0.17	0.14
Silver	0.03	0.02	0.03	0.02	0.03
Zinc	6.90	7.10	8.62	7.33	8.41
Low Molecular Wt PAH	2.27	0.99	0.87	0.70	0.72
High Molecular Wt PAH	2.35	1.53	1.57	1.52	1.64
Total PAH	4.62	2.52	2.44	2.22	2.36
Total DDT	0.10	0.11	0.09	0.10	0.11

define the maximum levels of air quality that 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 that 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 these established standards on a continuing basis.

EPA has set NAAQS for seven principal pollutants, called "criteria" pollutants. They are carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), lead (Pb), inhalable particulate matter with an aerodynamic diameter less than or equal to a nominal 10 microns (PM_{10}), fine particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 microns ($PM_{2.5}$), and sulfur dioxide (SO_2). The NAAQS are further defined in 40 CFR Part 50.

CO is a colorless and practically odorless gas primarily formed when carbon in fuels is not burned completely. 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 nitrous 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 are 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 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. O_3 contributes to the formation of photochemical smog.

Pb is a heavy metal that 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. 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 CAA also requires the results of the ambient air quality monitoring data be used by EPA to assign a designation to each area of the U.S. regarding compliance with the NAAQS. 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.

Under the CAA, individual states were required to develop a State Implementation Plan (SIP) to define the strategies for assessing and maintaining the NAAQS. TCEQ has the responsibility for developing the SIP with approval by EPA. For areas that are in nonattainment with the NAAQS, the SIP describes how the area will reach attainment of the air quality standards. The SIP sets emissions budgets for point sources such as power plants and manufacturers, areawide 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 project area is in the HGB Intrastate Air Quality Control Region (EPA, 2007a). The HGB is in attainment or unclassified with the NAAQS for all criteria pollutants except ozone. It is classified as a "severe" nonattainment area with respect to the 1-hour and the 8-hour NAAQS for ozone. Under the "severe" attainment designation, the HGB has a deadline of June 15, 2019, for attainment of the 8-hour ozone standard. The 1-hour attainment reclassification is still pending (*Federal Register* Vol. 73, No. 191).

The topography and meteorology of the study area should not seriously restrict dispersion of airborne pollutants. However, ground-level ozone is typically formed during periods of high solar radiation, low wind speeds, and elevated temperatures. There is a significant amount of variability year to year in regional 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 HGB area, as in many other coastal communities, a "sea breeze-land breeze" effect is caused by temperature differences between the land and the Gulf. This effect moves air from the land out over the Gulf during the night, and moves it back in as temperatures rise the following day, i.e., recirculating polluted air. During the years when there are high numbers of sunny days combined with either stagnant wind conditions or winds that blow out into the Gulf in the

morning and then back onto land in the afternoon, the eight-county area sees higher ozone levels. Varying wind patterns and time required for ozone to form can also result in high concentrations of ozone at locations remote from pollution sources.

3.6.1.2 Conformity of Federal Actions

As required by the CAA, 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.

The CAA prohibits Federal agencies from funding, permitting, constructing, 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.

Because the project is located in the HGB severe nonattainment area for ozone, if the total emissions from the project are equal to or greater than 25 tpy of VOC or 25 tpy of NO_X, then USACE must issue a General Conformity Determination stating how the project conforms or will conform with the SIP for that pollutant, prior to approval for the project. However, even if the emissions of NO_X or VOCs are below these levels, a conformity determination may also be 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).

Because project emissions are expected to exceed 25 tpy for NO_X, a draft General Conformity Determination was prepared by USACE (Appendix C). The determination takes into account estimated project emissions and whether or not those emissions conform to the SIP. The General Conformity Determination was submitted to EPA and TCEQ for review concurrent with the Draft Environmental Impact Statement (DEIS) in December 2010. The results of this coordination are reported in EIS Section 4.4.

3.6.1.3 Greenhouse Gas Emissions and Climate Change

Air emissions from the project will result from the operation of dredges, tugboats, and land-side construction equipment powered by internal combustion engines that produce exhaust emissions. Emissions from this equipment will result in an increase in Greenhouse Gas (GHG) emissions that could contribute to global climate change. To date, specific thresholds to evaluate adverse

impacts pertaining to GHG emissions have not been established by local decision-making agencies, the State, or the Federal government. The Council on Environmental Quality (CEQ) has published "Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions," February 10, 2010. The Draft Guidance suggests that the impacts of projects directly emitting GHGs in excess of 25,000 metric tons or more of carbon dioxide (CO_2)-equivalent (CO_2e) GHG emissions on an annual basis be considered in a qualitative and quantitative manner. However, the guidance stresses that, given the nature of GHGs and their persistence in the atmosphere, climate change impacts should be considered on a cumulative level. Appendix N presents a project-level analysis of GHG emissions.

3.6.2 Air Quality Baseline Condition

Ambient air quality in the project area is directly related to emissions from man-made sources such as from stationary sources (stacks, vents, etc.); emissions from mobile sources such as vehicles, ships, trains, etc.; chemical reactions in the atmosphere such as the formation of ozone; and natural sources such as trees, fires, and wind-blown dust. Since all of these sources must be considered in an assessment of air quality, EPA has identified air emissions inventories and ambient air monitoring as key methods for assessing air quality.

3.6.2.1 Existing Air Emissions Inventory

Baseline emissions were determined using data from EPA's emissions inventory database (EPA, 2009). Table 3.6-1 is a summary of emissions for Brazoria County for 2002, the most recent data available from EPA's database. For comparison, the total emissions inventory for the HGB air quality region is also provided. The emissions information for each pollutant is broken out by category: area source, point source, highway, and off-highway emissions. These data provide a base from which to compare the proposed project emissions.

3.6.2.2 Existing Air-monitoring Data

Air pollutants within and near the project area are measured by numerous air-monitoring stations. Most of the stations in the region measure the concentrations of criteria air pollutants, as well as temperature, wind velocity, wind direction, and other meteorological parameters. The monitors operate continuously and are routinely calibrated and maintained to assure quality data. Current monitoring data are available for CO, NO_2, O_3, SO_2, $PM_{2.5}$, PM_{10}, and Pb. Monitoring for other criteria pollutants has either been discontinued or data are not available.

Review of available monitoring data for the HGB for the years 1997–2007 (EPA, 2007c) shows a decreasing trend over the years for CO, $PM_{2.5}$, and SO_2. Monitored values for ozone also appear to be declining, probably as a result of increased regulations to meet the NAAQS for ozone. Concentrations of PM_{10} appear to have increased over the years. Monitored values for NO_2 and Pb show little variability over the past few years.

Table 3.6-1
Summary of 2002 Air Emissions Inventory for Brazoria County Compared to the HGB by Source Category (tpy)

Source Category	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC
Brazoria County						
Area	7,355	2,114	38,241	4,581	1,441	4,655
Point	5,974	20,851	898	826	4,705	6,111
Highway Vehicle	29,211	4,183	115	80	137	2,349
Off-Highway Vehicles	17,277	16,980	1,109	1,028	4,911	2,727
Total	59,817	44,128	40,363	6,515	11,194	15,842
HGB						
Area	57,739	20,587	301,949	38,726	22,219	82,371
Point	54,451	111,280	12,635	11,008	106,166	47,441
Highway Vehicle	615,263	96,492	2,647	1,830	3,143	49,826
Off-Highway Vehicles	374,240	128,993	8,123	7,591	20,490	34,490
Total	1,101,693	357,353	325,353	59,155	152,017	214,128
Brazoria County as a Percent of HGB Emission Source Categories, %						
Area	12.7	10.3	12.7	11.8	6.5	5.7
Point	11.0	18.7	7.1	7.5	4.4	12.9
Highway Vehicle	4.7	4.3	4.3	4.4	4.4	4.7
Off-Highway Vehicles	4.6	13.2	13.7	13.5	24.0	7.9
Total	5.4	12.3	12.4	11.0	7.4	7.4

Source: EPA (2009)

A "design value" is used by EPA to determine the correct designation of an ozone nonattainment area. Air quality data are collected at each monitoring site in the HGB nonattainment area and used to calculate the design value. For compliance with the ozone 1-hour and 8-hour standards, NAAQS will be met (i.e., the site is said to be in attainment) when the design value is less than or equal to 0.12 parts per million (ppm) and 0.08 ppm, respectively. Both the 1-hour and 8-hour ozone monitored values have decreased over the past 18 years. The 2009 1-hour ozone design value was 0.127 ppm, representing a 42 percent decrease from the value for 1991 of 0.220 ppm. The 2009 8-hour ozone design value was 0.084 ppm, a 29 percent decrease from the 1991 value of 0.119 ppm (TCEQ, 2010a).

As previously noted, a General Conformity Determination has been prepared by USACE (see Appendix C). Coordination with EPA and TCEQ was conducted to ensure the project is compliant with the SIP.

3.7 NOISE

3.7.1 Fundamentals and Terminology

The magnitude of noise is usually described by its sound pressure. Since the range of sound pressure varies greatly, a logarithmic scale is used to relate sound pressures to some common reference level, usually in decibels (dB). Sound pressures described in decibels are called sound pressure levels and are often defined in terms of frequency-weighted scales (A, B, C, or D).

The A-weighted scale is used almost exclusively in environmental noise measurements because it places most emphasis on the frequency range detected by the human ear (1,000–6,000 hertz). Sound levels measured using A-weighting are often expressed as dBA. Throughout this section, references are made to dBA, which means an A-weighted decibel level. Common sound/noise levels that an individual may encounter daily are listed in Table 3.7-1. Noise levels associated with the dredging equipment that may be used for this project are also included in this table for reference.

In accordance with standard practice, noise levels in this document are discussed in terms of the equivalent sound level (L_{eq}) and the day-night sound level (L_{dn}). Typical noise environments consist of numerous noise sources that vary and fluctuate over time. L_{eq} provides a way to describe the average sound level, in decibels, for any given time period under consideration. L_{dn} is the 24-hour average sound level obtained after the addition of a 10 dB penalty for sound levels that occur during nighttime hours (10:00 P.M. to 7:00 A.M.) in order to account for heightened sensitivity to noise during that period. Federal agencies, including EPA, Department of Defense, and Department of Housing and Urban Development, have adopted this descriptor in assessing environmental impacts. Regulatory agencies generally recognize an L_{dn} of 55 dBA as a goal for the outdoor noise environment in residential areas. Studies have found that outdoor noise environments across the United States range from approximately 40 L_{dn} in rural residential areas, to nearly 60 L_{dn} in older urban residential areas, to as much as 90 L_{dn} in congested urban settings (EPA, 1974).

Sound pressure levels of two separate sources are not directly additive. Therefore, as shown in Table 3.7-2, if a sound of 60 dBA is added to another sound of 60 dBA, the resulting noise level is 63 dBA, not 120 dBA. For example, if the noise level of a hopper dredge is measured at 85 dBA at 50 feet, and the noise level of a tug boat is measured at 82 dBA at 50 feet, the combined noise level of both would be approximately 87 dBA at 50 feet.

Table 3.7-1
Hearing: Sounds that Bombard Us Daily

Decibels		
140 130	Shotgun blast, jet 100 feet away at takeoff Motor test chamber	Pain Human ear pain threshold
120 110	Firecrackers Severe thunder, pneumatic jackhammer Hockey crowd Amplified rock music	Uncomfortably loud
100 90	Textile loom Subway train, elevated train, farm tractor Power lawn mower, newspaper press Heavy city traffic, noisy factory	Loud
80 70	**Large tug boat at 50 feet**[1] **Hopper Dredge at 160 feet away**[2] **Bulldozer at 50 feet away**[3] Diesel truck 40 mph 50 feet away Crowded restaurant, garbage disposal **Small tug boat at 50 feet away**[4] Average factory, vacuum cleaner Passenger car 50 mph 50 feet away	Moderately loud
60 50	Quiet typewriter Singing birds, window air conditioner Quiet automobile Normal conversation, average office	Quiet
40	Household refrigerator Quiet office	Very quiet
30 20 10	Average home Dripping faucet Whisper 5 feet away Light rainfall, rustle of leaves Whisper	Average person's threshold of hearing Just audible
0		Threshold for acute hearing

Source: Olishifski and Harford (1975)
[1]Geier & Geier Consulting (1997)
[2]Assumed same as large tug
[3]FHWA (2006)
[4]Epsilon Associates (2006)

Table 3.7-2
Decibel Addition

Difference Between Two Sources	For Example	Add To Higher Level	Resultant Sound Level
0 dB	60 and 60 dB	3 dB	63 dB
1 dB	60 and 61 dB		64 dB
2 dB	60 and 62 dB	2 dB	64 dB
3 dB	60 and 63 dB		65 dB
4–9 dB	60 and 65 dB	1 dB	66 dB
10 dB or more	60 and 70 dB	0 dB	70 dB

Source: Texas Department of Transportation (TxDOT, 1996)

3.7.2 Affected Environment for Noise

Noise-sensitive receivers are facilities or areas where excessive noise may disrupt normal activity, cause annoyance, or cause loss of business. Land uses such as residential, religious, educational, recreational, and medical facilities are more sensitive to increased noise levels than are commercial and industrial land uses. Although the vast majority of land use along the ship channel is dominated by commercial and industrial uses, noise-sensitive receivers are concentrated in the communities of Quintana, Surfside Beach, and Freeport. Although portions of the Freeport Harbor Channel are dominated by industrial development, single-family residences, RV parks, and recreational areas also occur on both sides of the channel.

The existing noise environment of these communities is affected by a number of sources, most of which are transportation related (i.e., barges, railway, roadway, etc.). Waterborne transportation includes barges, commercial vessels, sport and recreation boats, and current maintenance dredging of the ship channel. Heavy industrial facilities such as the Dow Chemical plant also contribute to the existing noise environment within these communities. Hourly L_{eq} noise levels measured at noise-sensitive receivers within Quintana were found to range from approximately 49 dBA L_{eq} to approximately 61 dBA L_{eq}. The calculated L_{dn} for the same receivers ranged from a high of 65.1 dBA to a low of 60.9 dBA (HFP Acoustical Consultants, Inc., 2002). Although the measurements were taken approximately 0.5 mile from the channel, they provide a point of reference for the existing noise levels within the area. It is assumed that noise levels adjacent to the channel could be slightly higher due to the waterborne traffic. For evaluation purposes, existing noise levels were assumed to be 55 dBA L_{eq} (the average of ambient levels recorded within Quintana). This level is more appropriate due to the increased activity in the channel's vicinity, and is also the goal for the outdoor noise environment in residential areas as set by numerous agencies.

The majority of mechanical dredging equipment on a hopper dredge is housed below the vessel's deck; therefore, noise levels associated with the equipment are comparable to tug boats. Table 3.7-3 summarizes dredging-related noise levels produced by equipment type.

Table 3.7-3
Typical Noise Levels of Dredge and Construction Equipment

Equipment	Noise Level (dBA)
Cutterhead dredge (at 160 feet)	79[1]
Hopper dredge (at 50 feet)	87[2]
Large tug boat (at 50 feet)	87[3]
Small tug boat	72[3]
Bulldozer (at 50 feet)	82[4]
Bucket crane (at 50 feet)	82[4]

[1] Geier & Geier Consulting (1997)
[2] Assumed same as large tug
[3] Epsilon Associates (2006)
[4] FHWA (2006)

Maintenance dredging currently occurs on the Freeport Harbor Channel approximately every 10 months and generally includes use of a hopper dredge and tending boats. The nearest noise-sensitive receivers affected by existing channel maintenance activities are located within Surfside Beach. The Surfside Beach Jetty Park is located approximately 220 feet from the channel centerline, and the nearest residences at Surfside Beach are located approximately 880 feet from the channel centerline. Worst-case noise levels related to maintenance dredging operations were calculated to be approximately 75 dBA at the Surfside Beach Jetty Park and 63 dBA at Surfside Beach's nearest residences. Maintenance dredging, therefore, may temporarily increase noise levels by approximately 20 dBA at the Surfside Beach Jetty Park and 8 dBA at the nearest Surfside Beach residences.

3.8 ENERGY AND MINERAL RESOURCES

Abundant natural resources, including oil and gas, sulfur, salt, shell, clay, sand, magnesium, and bromine occur within the study area; the most important being oil and gas (McGowen et al., 1976). The presence and historical exploitation of these natural resources in the Freeport area have contributed to the maritime industry. Oil, natural gas, and NGLs are major contributors to the current area economy. Major nonagricultural land use of the Freeport area is either directly or indirectly related to oil and gas production.

Sulfur is not commonly used by individual consumers but rather in the manufacture of a variety of products including sulfuric acid. Salt domes are numerous in the region and provide an abundant supply of high-grade sodium chloride. The bulk of Texas salt production comes from the Texas coastal zone. The nearest brine-production site is located at the Bryan Mound facility, which is the former site of a sulfur mine that produced 5 million tons of sulfur between 1918 and 1935.

Associated with the massive salt domes is the underground storage of crude oil. The oil is stored in the cavities created in the salt domes, and the liquid hydrocarbons stored in the Texas coast in this manner account for a significant portion of the total liquid hydrocarbon storage in the U.S. The nearest commercial storage facility is also located at the Bryan Mound facility located adjacent to PA 1.

Within the study area, shell naturally occurs as discrete reefs and banks mixed with bottom sand and mud in the shallow bays. The physical and chemical properties of shell make it suitable for use as aggregate and road base and for the production of lime, cement, and chemicals. Historical shell production has depleted oyster reefs within the bays in the general region, and oyster shell is no longer commercially mined.

Sand deposits in the area have the potential for industry or specialty uses such as foundry sands, glass sands, and chemical silica. Common clays are used in the manufacture of brick and tile. Gypsum, used mainly as a construction raw material, occurs in the caprock deposits of the region but, unlike salt and sulfur, is not easily mined and significant production is unlikely. Magnesium compounds and magnesium metal are produced from magnesium chloride, which is extracted from sea water in the Freeport-Velasco area. Historically the area has been the largest producer of magnesium metal in the U.S. Similarly, bromine is extracted from sea water in the Freeport area (McGowen et al., 1976).

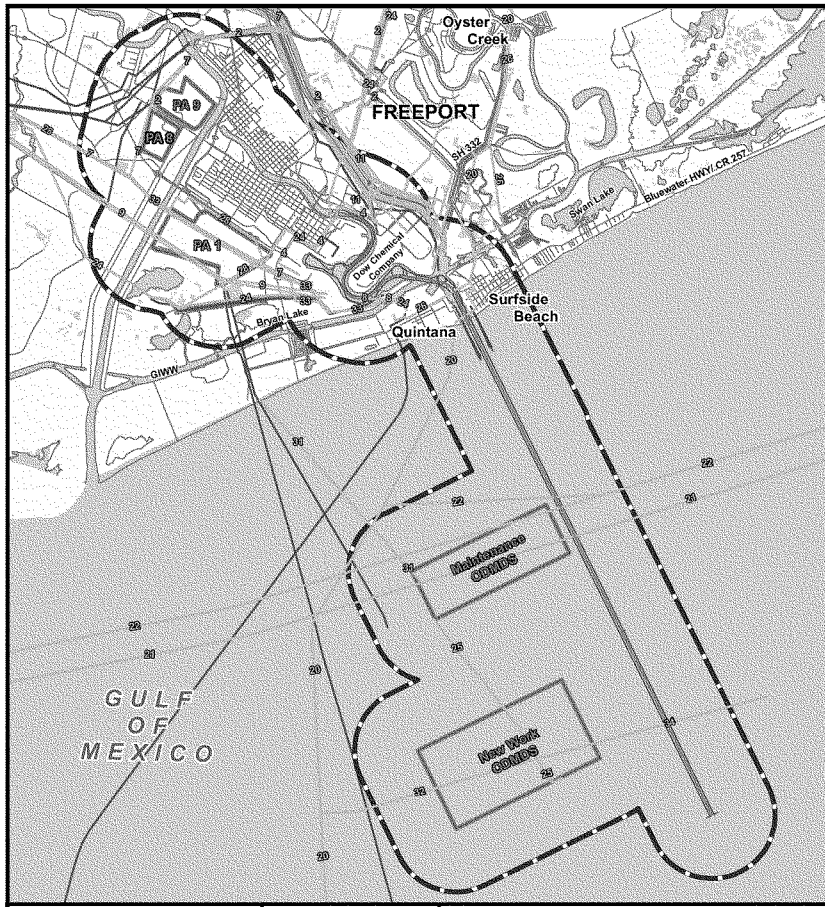
Atkins obtained and reviewed the oil/gas well-bore and pipeline electronic database maintained by the Railroad Commission of Texas (RRC). The results of the oil/gas well review indicate that there are a total of three permitted well sites located within the project area. These well sites include one permitted drilling location and two dry holes (Table 3.8-1).

Table 3.8-1
Summary of Oil and Gas Wells within a 1-mile Radius of the Project

API No.	Longitude	Latitude	Status
42-039-31442-00	–95.32816	28.93214	Dry Hole
42-039-32574-00	–95.34556	28.94892	Permitted Location
42-039-32395-00	–95.38498	28.96022	Dry Hole

Given the highly developed nature of the project area, further exploration for oil and gas is unlikely. However, private enterprise and government facilities in the project area will continue to play a major role in the petroleum industry.

Numerous pipelines were identified within the project area (Figure 3.8-1). According to the RRC pipeline database, a total of eight active pipelines cross the Freeport Ship Channel (Table 3.8-2), six cross PAs 1, 8, and 9 (Table 3.8-3), and five lay beneath the ODMDSs (Table 3.8-4). While the RRC pipeline database is the most comprehensive account of pipelines in the State of Texas, this database may not include every existing pipeline.



Legend

- Pipelines which intersect Project Components
- Pipelines which do not intersect Project Components
- Channel Centerline
- Project Area
- Dredged Material Placement Areas

N W E S

0 0.5 1 2
Miles

Figure 3.8-1

Freeport Harbor Channel Improvement Project Area Petroleum Pipelines

Prepared for: USACE Galveston	
Job No.: 044190100	
Prepared by: A.Christiansen	Date: 03/11/2008

File: N:/Clients/U_Z/USACE/Projects/Freeport/044190100/projects/Figures/Fig_3_6_1.mxd

Table 3.8-2
Summary of Petroleum Pipelines Crossing Freeport Harbor Channel

Operator	System Name	Diameter (inches)	Commodity	T4 Permit No.	Map Id No.
Enbridge Offshore PLS	Galveston Island Gathering System	16	Natural gas	04099	20
Freeport LNG	Freeport LNG	42	Natural gas	07100	26
Dow Chemical Co.	SPO Liquid	4.5	Product	07040	11
ExxonMobil Pipeline Co	Diana Hoover Onshore Crude	24	Crude oil	06461	24
ConocoPhillips Co.	Freeport to Freeport 2 Terminal	30	Crude oil	04057	8
BASF Corporation	Brazoria County	4.5	Anhydrous ammonia	04969	4
Enterprise Products	Seagull	24	Natural gas	02878	21, 22
Tri-C Resources	Tract 306L	6.6	Natural gas	06846	34

Table 3.8-3
Summary of Petroleum Pipelines Crossing PA 1, PA 8, and PA 9

Operator	System Name	Diameter (inches)	Commodity	T4 Permit No.	Map Id No.
Air Liquide	Oxy Choc-Freeport-Phillips	12.75	Hydrogen gas	05467	2
ConocoPhillips Co.	Sweeney-Freeport 1 Terminal	8.63	Benzene	04052	7
ConocoPhillips Co.	Sweeney-Freeport 1 Terminal	24	Crude oil	04057	9
ExxonMobil Pipeline Co	Diana Hoover Onshore Crude	40	Crude oil	06461	24
Houston Pipeline Co.	1089-000	10.75	Natural gas	00749	28
TEPPCO Crude Pipeline	Seaway	42	Crude oil	05161	33

Table 3.8-4
Summary of Petroleum Pipelines Crossing ODMDSs

Operator	System Name	Diameter (inches)	Commodity	T4 Permit No.	Map Id No.
Enterprise Products	Seagull Pipeline	24	Natural gas	02878	21, 22
Flash Gas & Oil SW	Galveston 310-L to Brazos 386	3.5	Natural gas (inactive)	02698	25
Mobil Oil Corp.	Brazos Block 386 Field	8.63	Natural gas (inactive)	00896	31
Seneca Resources Corp	Galveston 310-L	6.63	Natural gas	05251	32
Tri-C Resources, Inc.	Tract 360L	6.63	Natural gas	06846	34

3.9 SOILS

Mapping by the SCS (1981) shows a total of six soil series located at existing PA 1 and proposed PAs 8 and 9.

PA 1 is underlain by Surfside clay (west and southeast) and Velasco clay (northeast). The Surfside clay is a nearly level saline soil that occurs in marshes. The surface layer is mildly alkaline, saline, very dark gray clay about 14 inches thick. The next layer, to a depth of 32 inches, is mildly alkaline, saline, dark gray clay. This soil is poorly drained and rarely flooded. Surface runoff and permeability are very slow. The water table is above a depth of about 2 feet during the winter. The potential for urban use is low. The primary restrictive features are wetness, clayey texture, high shrink-swell potential, salinity, and susceptibility to flooding (SCS, 1981). Velasco clay is a nearly level saline soil that occurs in marshes. This soil is a moderately alkaline, saline clay to a depth of about 65 inches. From the surface to about 8 inches it is dark reddish brown, from 8 to 30 inches it is dark brown, and from 30 to 65 inches it is mottled with reds, browns, and grays. This soil is very poorly drained and frequently flooded. Surface runoff and permeability are very slow. The water table is within 20 inches of the surface throughout most of the year. The soil is used as rangeland and wildlife habitat. The main restrictive features are wetness, salinity, clayey texture, and susceptibility to flooding (SCS, 1981).

The PA 8 area consists primarily of Velasco clay with very minor amounts of Surfside clay in the extreme south. These soils are described above.

The PA 9 area is composed primarily of Brazoria clay, with lesser amounts of Clemville silty clay loam (northeast), Norwood silt loam (east), and Pledger clay (south).

Brazoria clay (0–1 percent slopes) is a nearly level nonsaline soil. It is dark reddish brown, calcareous, moderately alkaline clay to a depth of more than 60 inches. This soil is poorly drained and rarely flooded. Surface runoff is slow and permeability very slow. The water table is at a depth of 1 to 3 feet during winter. This soil is used mainly as pastureland and in some areas as cropland. The restrictive features are the wetness, high shrink-swell potential, and susceptibility to flooding (SCS, 1981).

Clemville silty clay loam is a nearly level nonsaline soil. This soil is moderately alkaline, calcareous silty clay loam to a depth of 30 inches. To a depth of 60 inches, it is reddish brown calcareous, moderately alkaline silty clay that grades to clay in the lower part. This soil is well drained and rarely flooded. Surface runoff and permeability are slow. This soil is used mainly for cropland. The potential for urban use is medium because of the hazard of flooding (SCS, 1981).

Norwood silt loam (0–1 percent slopes) is a nearly level nonsaline soil that occurs on levees situated along bayous and rivers. This soil is reddish brown silt loam to a depth of about 48 inches. From 48 to 54 inches it is yellowish red very fine sandy loam, and from 54 to

64 inches it is reddish brown silt loam. The soil is well drained and rarely flooded. Surface runoff is slow and permeability is moderate. This soil is used mainly as cropland and pastureland. Potential urban use is low due to possibility of flooding (SCS, 1981).

Pledger clay is a nearly level nonsaline soil that has a surface layer of mildly alkaline black clay about 26 inches thick. The subsoil to a depth of 50 inches is moderately alkaline, calcareous, reddish brown silty clay. This soil is poorly drained and rarely flooded. Surface runoff is slow and permeability is very slow. This soil is used mainly as pastureland and in some areas as cropland. It has a perched water table above a depth of 2 feet in winter. The main restrictive features are wetness, clayey texture, high shrink-swell potential, and susceptibility to flooding (SCS, 1981).

Additionally, the soil map indicates the general area surrounding the Freeport area consists of the Surfside-Velasco association (SCS, 1981). This soil association unit is about 60 percent Surfside soils, 11 percent Velasco soils, and 29 percent soils of minor extent.

The Surfside soils are nearly level, poorly drained, saline, clayey soils. The surface layer is very dark to dark gray clay from 14 to 32 inches thick. Below, to a depth of 72 inches, is dark reddish brown saline clay. The Velasco soils are on broad, nearly level flats that are at elevations lower than the Surfside soils. The surface layer is a dark reddish brown to dark brown saline clay from 8 to 30 inches thick. The underlying layer to a depth of 65 inches is gray, mottled, saline clay. Of minor extent in the Surfside-Velasco association are Asa, Ijam, Harris, Pledger, and Veston soils. The soils of this association are used as rangeland and wildlife habitat. Wetness and salinity preclude their use for pastureland and cropland. The potential for urban use is low, the most restrictive features being wetness, clayey texture, high shrink-swell potential, and the susceptibility to flooding (SCS, 1981).

3.9.1 Prime and Unique Farmland

Prime farmland soils are defined by the Secretary of Agriculture in 7 CFR Part 657 (*Federal Register* Vol. 43, No. 21) as those soils that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. The soil quality, growing season, and moisture supply are available to economically produce sustained high yield of crops when treated and managed, including water management, according to acceptable farming methods. Some soils are considered prime farmland in their native state, and others are considered prime farmland only if they are drained or watered well enough to grow the main crops in the area. There are no designated "unique farmlands" in the State of Texas (Brown, 2002).

Soil Survey Geographic Database information acquired from the Natural Resources Conservation Service (NRCS) indicates that the soils located in PA 9 are considered prime farmlands (NRCS, 2007). The total estimated acreage of prime farmland located within PA 9 is

approximately 250 acres. Figure 3.9-1 presents prime farmland soils located within PA 9. No prime farmland soils are located within PA 8. NRCS has been notified of impacts to prime farmland from construction of PA 9 and mitigation areas. Coordination with NRCS has been completed for prime farmland soils (Appendix A-4).

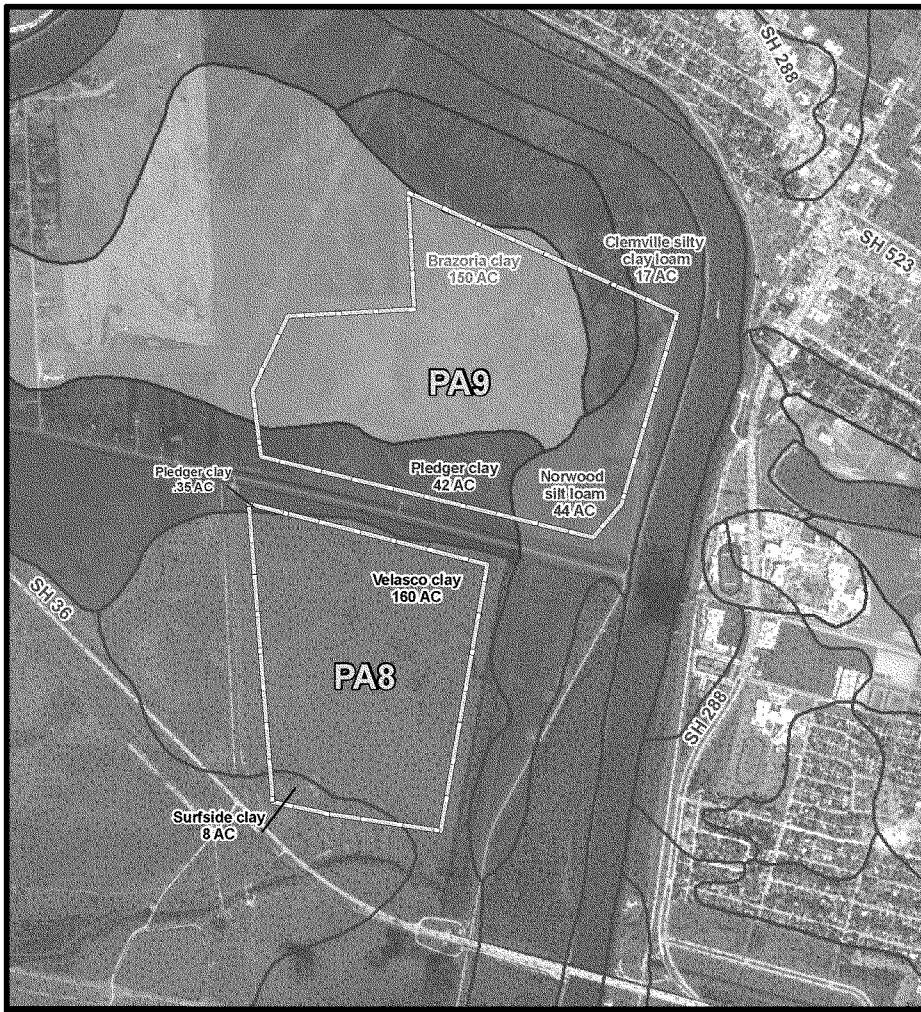
3.10 GROUNDWATER HYDROLOGY

In the study area, the Gulf Coast Aquifer system is the principal source of groundwater for public, agricultural, and industrial needs. Within the aquifer system, the Chicot Aquifer is the uppermost aquifer, and all public and private water-supply wells in the area are supplied by this aquifer (Texas Water Development Board [TWDB], 2007). The Evangeline Aquifer underlies the Chicot Aquifer. The Evangeline Aquifer is noted for its abundance of good-quality groundwater and is considered one of the most prolific aquifers in the Texas Coastal Plain (Baker, 1979) but is not used in the Freeport area. The Chicot and Evangeline aquifers are commonly used hydrogeologic-unit designations for subdivisions of the upper, mostly sandy part of the deposits; and the lower permeable zones make up the Jasper Aquifer.

The lithology of the Gulf Coast aquifer system consists of sand, silt, and clay, reflecting three depositional environments: continental (alluvial plain), transitional (delta, lagoon, and beach), and marine (continental shelf). These deposits thicken as they dip toward the Gulf, resulting in a wedge-shaped configuration of the hydrologic units. Numerous retreats and advances of ancient shorelines have resulted in a complex, overlapping mixture of sand, silt, and clay. These complex deposits have been divided into seven units (five permeable zones and two confining units) based on permeability differences, water depths, and vertical differences in hydraulic head.

As noted above, the Chicot Aquifer is the uppermost water-bearing unit in the Gulf Coast Aquifer system. The Chicot-Evangeline boundary runs approximately parallel to the coast, and forms an outcrop about 90 miles inland from Freeport (Baker, 1979). All public, industrial, and private water supply wells in the Freeport area draw from the Chicot Aquifer. According to 1999 estimated water-use data for Brazoria County, approximately 203 million gallons of groundwater and surface water were withdrawn per day for municipal, manufacturing, irrigation, mining, and livestock uses (TWDB, 2007).

Groundwater recharge into the aquifers occurs primarily by precipitation onto outcropped areas and downward leakage from overlying saturated (perched) layers and/or aquifers. Regional groundwater flow in the aquifers is generally in a southeastward direction from outcrop areas towards areas of natural discharge (Wesselman, 1971). Superimposed upon this natural discharge regime is artificial discharge from groundwater pumping.



NRCS Soil Types within Placement Areas:

Prime Farmland Areas:

- Brazoria clay, 0 to 1% slopes
- Clemville silty clay loam
- Norwood silt loam, 0 to 1% slopes
- Pledger clay
- Asa silt loam

- Placement Areas
- Non-Prime Farmland Areas

N W E S

0 500 1,000 1,500 2,000
Feet

Figure 3.9-1
Prime Farmland Areas
Freeport Harbor
Channel Improvement Project

Prepared for: USACE Galveston	
Job No.: 441901.00	Scale: 1inch equals 1,500 feet
Prepared by: A.Christiansen	Date: 03/14/2008

File: N:/Clients/U_Z/USACE/Projects/Freeport/044190100/projects/fig_3-7-1_vr3.mxd

Significant changes in groundwater elevation have occurred in the Freeport area over the last 60 years. Water levels dropped nearly 100 feet during the 1940s and 1950s, but began to recover as the rate of groundwater pumping in the area leveled off (Texas Water Commission, 1963). Depth to groundwater in USGS- and TWDB-monitored wells remained greater than 70 feet throughout most of the Freeport area through the 1980s (TWDB, 2007; USGS, 2007).

Current water levels in the Chicot Aquifer in most of southern Brazoria County have remained relatively constant since the late 1970s, with water-level elevations of 30 to 50 feet below msl (Coplin and Lanning-Rush, 2002). However, none of the wells monitored for these surveys are located in the Freeport area, which had typically seen the most dramatic fluctuations in water level in southern Brazoria County (Texas Water Commission, 1963).

A sole source aquifer (SSA) is an aquifer that has been designated by EPA as the sole or principal source of drinking water for an area. As such, a designated SSA receives special protection. The program for protecting SSAs was established by the Safe Drinking Water Act of 1974. EPA designates an aquifer as a sole source based upon a petition from an individual, company, association, or government entity. EPA has not designated any SSAs within the study area (EPA, 2007b).

Records from the TWDB indicate there are approximately 17 water wells located within 0.5 mile of the Freeport Harbor Channel. Figure 3.10-1 presents the approximate water well locations within 0.5 mile from the Freeport Harbor Channel according to the TWDB database (TWDB, 2007). (Note: data is not guaranteed by TWDB to be 100 percent accurate). Typically, all nearby water wells are screened in the Chicot Aquifer and range from 241 to 1,130 feet in total depth (Table 3.10-1).

Two active public supply wells are located within 0.30 mile of the ship channel. The town of Surfside has a public supply well located approximately 0.30 mile northeast of the ship channel, and the City of Freeport has a public supply well located approximately 0.15 mile south of the Stauffer Turning Basin. The depth of these wells is 249 and 300 feet (see Table 3.10-1). A third (unused) public supply well for Quintana is located less than 0.10 mile due southwest of the ship channel (8106522). This well was reportedly drilled in 1895 and is 650 feet deep. A private water well is located approximately 0.2 mile west of the Jetty Channel and is 250 feet deep.

There are approximately 10 industrial wells owned by Dow Chemical within 0.25 mile east of the Freeport Harbor Channel between the Brazosport and Upper turning basins. These wells range in depth from 241 to 1,130 feet.

Table 3.10-1
Summary of Water Wells within 0.5 mile of Freeport Harbor Channel

State Well Number/Map Id No.	Owner	Water Use	Well Depth (feet)
8106405	City of Freeport	Public	249
8106423	B.H. Gardner Constructors	Industrial	248
8106501	Dow Chemical	Industrial	273
8106504	Ortloff Corporation	Industrial	266
8106506	Dow Chemical	Industrial	254
8106507	Dow Chemical	Industrial	241
8106508	Dow Chemical	Industrial	265
8106509	Dow Chemical	Industrial	273
8106510	Dow Chemical	Industrial	252
8106512	City of Surfside	Public	300
8106513	C.L. Ray	Private	250
8106514	Dow Chemical	Industrial	1,130
8106516	Dow Chemical	Industrial	269
8106517	Dow Chemical	Industrial	1,130
8106519	Dow Chemical	Industrial	263
8106521	U.S. Army	Industrial/unused	258
8106522	City of Quintana	Public/unused	650

3.11 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

The following provides a summary of an HTRW data review for the project area. This HTRW assessment was conducted in general accordance with procedures described in the Department of the Army, USACE document Engineering Regulation (ER) 1165-2-132, Water Resource Policies and Authorities–Hazardous, Toxic, and Radioactive Waste (HTRW) Guidance for Civil Works Projects. The objective of this preliminary assessment is to identify "the existence of, and potential for, HTRW contamination on lands in the project area, or external contamination which could impact, or be impacted by a project." The findings and recommendations presented in this HTRW assessment are based on information derived from a review of historic aerial photographs, interviews with persons knowledgeable of the area, a review of regulatory agency databases, and a site visit. More-detailed information regarding this HTRW assessment can be found in Appendix D-1.

Groundwater wells

Project Area

N
W E
S

0 1,150 2,300

Feet

Figure 3.10-1

Freeport Harbor Channel Improvement Project Water Well Locations

Prepared for: USACE	
Job No.: 044190100	Scale: 1 inch equals 2,300 feet
Prepared by: A.Christiansen	Date: 3/19/2008

File: N:/Clients/U_Z/USACE/Projects/Freeport/044190100/projects/Figures/Fig_3_8_1.mxd

3.11.1 Aerial Photographic Review

Aerial photographs of the project area were obtained to examine the historic usage of the current Freeport Harbor Channel system including Port Freeport and the former Brazos River Channel. The photographs depict the project area as it appeared in 1944, 1965, 1975, 1987, 1995, and 2004 (Appendix D-2). The aerial photographs were obtained from the USGS, the Agricultural Stabilization Conservation Service, and TxDOT.

The earliest aerial photography available of the area was taken in 1944. These aerial photographs indicate that development immediately adjacent to the project area is limited to a large industrial facility located on the east bank of a narrow bend of the Brazos River. This facility is identified as the first process areas of the Dow Chemical facility. Along the west bank of the waterway, a small area containing several large, open-top aboveground storage tanks is visible (Phillips). The remaining areas adjacent to the waterway are mostly undeveloped, with some unimproved roads providing limited access. Large tracts of land adjacent to the GIWW appear to be used as PAs for dredged material. The tracts of land proposed for proposed PAs 8 and 9 are undeveloped marshland, possibly used for agriculture.

The 1965 and 1975 photographs depict the continued growth of the Dow facility, the dredging of the Brazos Harbor Turning Basin and construction of new warehouses, the installation of additional storage tanks at the Phillips tank farm along the west shore of the waterway, and a new bridge crossing the Old Brazos River at Farm to Market Road (FM) 1495. The 1987 photograph indicates the addition of facilities and land-use changes in the project area. The most notable changes occurred along the shoreline of the waterway, including the construction of a facility at Quintana consisting of a small tank farm and a berthing dock, the construction of a berthing facility on the peninsula between the GIWW and the Old Brazos River, the construction of additional process and storage facilities adjacent to Dow east of the channel, additional storage capacity at the Phillips tank farm, and new docking facilities along the west bank of the Old Brazos River west of Dow. The 1995 photograph indicates that the project area, adjacent properties, and surrounding properties remain basically unchanged from the 1987 photograph. The drilling platform known as Zeus is visible at its mooring in the Entrance Channel. The tract of land identified as PA 1 was converted to an upland PA.

The most recent aerial photograph was taken in 2004, and the project area and surrounding properties are basically unchanged from the previous photograph. Portions of the original Dow facility appear to have been dismantled and are vacant. A canal is visible across the length of PA 1, while the tracts of proposed PAs 8 and 9 remain undeveloped agricultural land. No other visible changes are detectable in the photograph.

3.11.2 Interviews

PBS&J conducted interviews with staff of the TCEQ Region 12 office in May 2006 regarding potential sources of contamination to the project area (Appendix D-3). PBS&J contacted Aron Athavaley, site investigator, regarding his knowledge of HTRW contamination on lands in the project area, or external contamination that could impact the project. Mr. Athavaley informed PBS&J that, while there are facilities with ongoing corrective action activities in upland areas along the banks of the waterway, there are no active enforcement actions under way. When PBS&J inquired of any direct sources of contamination to the project, he noted the potential for off-site migration of impacted groundwater to discharge into the waterway. These impacts have been documented by groundwater monitor wells along the Dow facility.

3.11.3 Regulatory Agency Database Review

PBS&J retained the services of TelALL Corporation (TelALL) to conduct the regulatory agency database information search. The scope of the regulatory information search included the following databases: the National Priority List (NPL); the State Superfund List (TXSSF); Comprehensive Environmental Response, Compensation and Liability Information System Database (CERCLIS) including the No Further Remedial Action Planned (NFRAP) database; Resource Conservation and Recovery Act (RCRA) Generators and Violators List (RCRA-G); RCRA Corrective Actions List (CORRACT); RCRA Treatment, Storage, or Disposal List (RCRA TSD); Texas Underground and Aboveground Storage Tank Database (TXUST and TXAST); Leaking Underground Storage Tank Listings (TXLUST); Texas Voluntary Cleanup Program (TXVCP); Innocent Owner/Operator Program (IOP); City/County Solid Waste Landfill listings (TXLF); Unauthorized and Unpermitted Landfill Sites (LFUN); Emergency Response Notification System (ERNS) database; and Texas Spills Incident Information System (TXSPILL) database.

PBS&J performed a review and evaluation of the available public information relating to the site. The review consisted of summarizing the regulatory agency database information acquired by TelALL. A site reconnaissance was conducted in March 2008 to verify the location of sites referenced in the regulatory database search and to locate any additional unreported hazardous materials sites. The site locations were provided by TelALL and are approximate, since they are based on street address information included in the databases. A map illustrating the locations of these registered sites is included in Appendix D-2.

3.11.4 Regulatory Agency Database Results

During the various database searches, a total of 1,066 listings were identified along upland areas of the Freeport Channel system. These listings were located primarily at the heavily concentrated industrial and petrochemical facility complexes that line the banks and upland areas of the waterway. No known sites or sources of contamination were identified within the project area

footprint. Several of these listings were associated with the same facility or property (e.g., a facility/property that contains multiple petroleum storage tanks and is the site of several reported spills or emergency response actions). The 1,066 database listings were associated with a total of 201 facilities or properties within the project area. On the basis of the results of the regulatory database searches, the following sites were identified:

- Three CERCLIS sites;
- Six NFRAP sites;
- Five CORRACT sites;
- Nine RCRA generators sites;
- One RCRA treatment, storage, and disposal site;
- One hundred twenty-six petroleum storage tanks at 30 sites;
- Nineteen leaking underground storage tank sites;
- Five hundred forty-five reported emergency response actions; and
- Four hundred five reported spills.

No NPL, State Superfund, Voluntary Cleanup, or City/County solid waste landfill sites were located within the project area. The regulatory agency databases searched include sites that are onshore and are not typically available for the offshore portion of the project. A summary description of regulated sites and spill incidents is included in Appendix D-1, and TelALL Summary Reports are included in Appendix D-4.

3.11.5 Site Reconnaissance

A visual inspection of the project area was conducted by PBS&J personnel on March 18–19, 2008, by boat and automobile. Port Freeport provided an escorted tour of the project area using Port Security personnel and a Port Security boat. The remaining component of the site reconnaissance was conducted by accessing the project area by public roadways. The site inspection was intended to identify indicators of areas of potential hazardous waste and confirm mapped locations of sites identified through the various regulatory agency reviews. Photography of the project area was restricted; however, photographs allowed during the site reconnaissance have been included in Appendix D-5.

The site reconnaissance conducted by boat began at the Stauffer Turning Basin, which defines the northern extent of the project area (Site Photograph No. 1, Appendix D-5). A sign indicating the presence of underground gas or petroleum pipelines was observed within the turning basin (Site Photograph No. 2, Appendix D-5). The properties along the western shore of this northern segment of the Old Brazos River include small private businesses, which provide boat maintenance including wet and dry docks and refueling. One of these businesses operates several

registered aboveground storage tanks used apparently for retail fuel sales. These tanks were reported in the regulatory agency database report. The tanks appeared to be located within secondary containment. The property along the entire eastern shore from the water lock to the GIWW is owned and operated by Dow. This facility has the greatest number of records reported in the regulatory agency database report for releases of regulated substances. Land use adjacent to the shore includes a railroad spur, a surface impoundment, a freshwater canal, and existing and former process areas. An earthen levee constructed along the shore separates the waterway from the adjacent railroad spur and process areas at the Dow facility.

Adjacent to Port Freeport, along the western shore, is a facility that stores anhydrous ammonia. The facility has a ship dock and a large pressurized storage vessel. ConocoPhillips operates the adjacent facility, which is a tank farm containing over 19 registered aboveground storage tanks. The tanks appear to be within secondary containment. Another feature encountered during the site reconnaissance was the abandoned drilling platform known as Zeus, which was a potential source of contaminants to the project area. However, the platform has since been removed from the project area, following the site visit. A pipeline marker was observed near the USCG Station indicating one or more underground pipelines crossing the Freeport ship channel (Site Photograph No. 6). Another pipeline marker was observed near the mouth of the Entrance Channel. The site reconnaissance conducted by boat concluded at the mouth of the jetty.

The areas designated as PAs are characterized as undeveloped land. PA 1 has been used as a PA and as a result remains undeveloped with several large unvegetated areas containing dredged material. Proposed PAs 8 and 9 are accessible by county roadway and appear to be primarily overgrazed grasslands with some wooded areas.

The results of the site reconnaissance confirmed mapped locations of upland facilities with hazardous materials, along the banks of the waterway, as identified through the various regulatory agency reviews. No new sites were identified.

3.12 VEGETATION INCLUDING WETLANDS

The study area is located within the Upper Coast division (Hatch et al., 1999) of the Gulf Coast Prairies and Marshes Vegetational Region (Gould, 1975). This region is a nearly level plain less than 250 feet in elevation, covering approximately 10 million acres (Hatch et al., 1990). The Gulf Prairies include the coastal plain that extends approximately 30 to 80 miles inland. The Gulf Marshes are located in a narrow strip of lowlands that are adjacent to the coast and barrier islands (Hatch et al., 1999). Unlike most of the major river systems in Texas, there is no bay or estuary associated with the Freeport project area. McGowen et al. (1976) present a detailed history of the geological development of the area that caused this condition. Additionally, there is no active delta or direct inflow from the river into the Freeport Harbor Channel area because

the Brazos River was diverted in 1929, relocating the mouth of the river approximately 6 miles to the southwest.

The vegetation communities of the Freeport area, with particular attention to the wetlands, have been mapped and described in several studies (Bezanson, 2001; Houston-Galveston Area Council, 2002; McGowen et al., 1976; TPWD, 1999; USFWS, 1992a; White et al., 1988, 2004, 2005). However, the Freeport Harbor Channel is commonly the eastern or western boundary of these studies, which focus either on the Galveston Bay System to the northeast or the Matagorda Bay System to the southwest, so that in these reports, the acreage values and trends for plant community types in the Freeport area tend to be overshadowed by the values and trends in the other estuaries.

An important ecosystem that occurs within the study area is the Columbia Bottomlands, which is located in the floodplains of the Brazos, San Bernard, and Colorado rivers (Figure 3.12-1). The Columbia Bottomlands area supports uplands and wetlands including marshes, forested wetlands, small scattered prairies, and bottomland hardwood forests (The Nature Conservancy, 2002, 2004). Once contiguous along the rivers and bayou corridors, remaining bottomland hardwood forests compose only one-quarter of their historic cover due to fragmentation by human activities (The Nature Conservancy, 2004). The forests of the Columbia Bottomlands primarily occur north of the Freeport Harbor Channel, outside of the likely influence of project activities.

A vegetation map (Figure 3.12-2) was produced with Geographical Information System (GIS) data from NOAA's Coastal Change Analysis Program (C-CAP), specifically for the Freeport Harbor Channel project area. C-CAP is a nationally standardized database of land cover and land change information for the coastal regions of the U.S. Figure 3.12-2 is based on 2005 satellite (Landsat Thematic Mapper and/or Landsat Enhanced Thematic Mapper) imagery. The acreage values (calculated from the C-CAP data) for vegetation categories within the FHCIP project area appear in Table 3.12-1. More information, including the Gulf Coast GIS data file (NOAA, 2006) that was used to produce Figure 3.12-2, is available online (www.csc.noaa.gov/crs/lca/ccap.html). The C-CAP dataset was used to provide baseline vegetation information because it provided more information on upland and wetland communities, unlike the National Wetland Inventory (NWI) (USFWS, 1992a) which mapped all uplands as a single category. As a reminder, it should be noted that with regard to acres of vegetation provided in Section 3.12, the project area includes the footprint of the construction area within the channel, the existing New Work and Maintenance ODMDSs, the three upland PAs (PA 1, PA 8, and PA 9), plus a 1-mile buffer area around these features. The project area and footprint occurring offshore contain no vegetation due to tidal and wave disturbances and water depths that preclude SAV establishment. Vegetation occurring within the project footprint was categorized using a combination of field verifications, C-CAP, and review of 2004 infrared aerial imagery and 2005 and 2008 true color aerial imagery. These combined resources were used for project footprint vegetation assessments

due to inaccuracies of C-CAP data at finer spatial scales. C-CAP data are more accurate at larger spatial scales and coarser-grained spatial analysis and may overestimate vegetation types at the project area and footprint spatial scale.

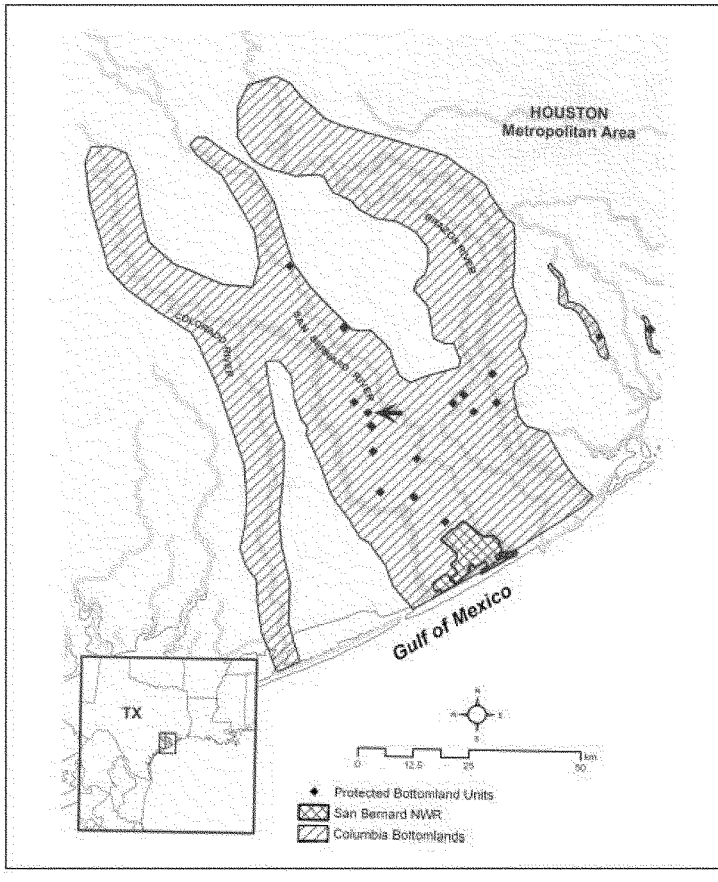


Figure 3.12-1
Approximate Historic Extent of the Columbia Bottomlands Ecosystem (Rosen et al. 2008)

Vegetation Including Wetlands of Project Area*:

- High Intensity Developed
- Medium Intensity Developed
- Low Intensity Developed
- Cultivated
- Pasture/Hay
- Grassland
- Deciduous Forest
- Evergreen Forest
- Unconsolidated Shore
- Bare Land
- Mixed Forest
- Scrub/Shrub
- Palustrine Forested Wetland
- Palustrine Scrub/Shrub Wetland**
- Palustrine Emergent Wetland**
- Estuarine Forested Wetland
- Developed Open Space
- Estuarine Scrub/Shrub Wetland
- Estuarine Emergent Wetland
- Water
- Palustrine Aquatic Bed
- Estuarine Aquatic Bed

Project Features:

- Placement Areas
- Project Area

*Source: NOAA C-CAP 2006. **Note: Features not consistent with NWI (FWS, 1992) map.

Figure 3.12-2
Freeport Harbor Channel Improvement Project Area

Vegetation Including Wetlands Based on 2005 NOAA Imagery

Prepared for: USACE Galveston	
Job No.: 044190100	Scale: 1 inch equals 7,500 feet
Prepared by: A.Christiansen	Date: 03/14/2008
File:N:/Clients/U_Z/USACE/Projects/Freeport/044190100/projects/Figures/3_10_1.mxd	

3.12.1 Uplands

The mouth of the Freeport Harbor Channel is in a relatively upland area of the Texas coast line. Wetlands are more extensive 10 miles to the southwest (Brazos River Delta and the San Bernard National Wildlife Refuge [NWR]) and 5 miles to the northeast (Christmas Bay, Drum Bay, and part of the Brazoria NWR). Uplands include developed areas, dunes and relict beach ridges, grasslands, and woodlands. There are approximately 4,792 acres of developed land, 89 acres of beaches and dunes, 80 acres of upland forest, 98 acres of upland shrub/scrub, and 725 acres of upland grassland/pastures in the project area according to C-CAP data (Table 3.12-1; NOAA, 2006).

Sand dunes help absorb the impacts of storm surges and high waves and also serve to slow the intrusion of water inland. In addition, dunes store sand that helps deter shoreline erosion and replenishes eroded beaches after storms. Within the project area, these habitats are impacted by development and shoreline erosion. In the vicinity of Freeport Harbor Channel, the shoreline is eroding at a rate of 9 to 10 feet/year (BEG, 2007; ERDC, 2007). Typical plant species of the primary dunes in the broader study area include sea oats (*Uniola paniculata*), bitter Panicum (*Panicum amarum*), Gulf croton (*Croton punctatus*), beach morning glory (*Ipomea pes-caprae*), and fiddleleaf morning glory (*Ipomea stolonifera*). Secondary dune species include marshhay cordgrass (*Spartina patens*), seashore dropseed (*Sporobolus virginicus*), seacoast bluestem (*Schizachyrium littorale*), seashore saltgrass (*Distichlis spicata*), pennywort (*Hydrocotyle bonariensis*), and partridge pea (*Chamaecrista fasciculata*). The secondary dune community, which is located in the hummocky area leeward of the higher and drier primary dunes, is often a wetland community or considered a transitional community between upland and wetland. There are approximately 89 acres of beach in the project area according to C-CAP data (see Table 3.12-1; NOAA, 2006). No beach or dune habitat occurs within the project footprint.

Diamond and Smeins (1987) describe forest and woodlands that occur in the Upper Coastal Prairie, including Coastal Live Oak/Post Oak (*Quercus virginiana/Q. stellata*) Forest, Water Oak (*Quercus nigra*)/Coastal Live Oaks Forest, and Mesquite-Huisache (*Prosopis glandulosa-Acacia farnesiana*) Shrublands. The typical forest and shrub/scrub vegetation within the project area could include a diverse range of native and non-native tree and brush species such as sugar hackberry (*Celtis laevigata*), cedar elm (*Ulmus crassifolia*), Chinese tallow (*Sapium sabiferum*), toothache tree (*Zanthoxylum fracineum*), pecan trees (*Carya illinoinensis*), red mulberry (*Morus rubra* L.), honey locust (*Gleditsia aquatica*), gum bumelia (*Sideroxylon lanuginosum*), Jerusalem tree (*Parkinsonia aculeata*), chinaberry (*Melia azedarach*), yaupon holly (*Ilex vomitoria*), palmetto (*Serenoa repens*), green briar (*Smilax* sp.), McCartney's rose (*Rosa bracteata*), peppervine (*Ampelopsis brevipedunculata*), trumpet creeper (*Campsis radicans*), poison ivy (*Toxicodendron radicans*), dewberry (*Rubus eubatus*), blackberry (*Rubus* sp.), native chili peppers (*Capsicum annum L.*), sumpweed (*Iva* sp.), *Baccharis* spp., turk's cap (*Malvaviscus arboreus*), and frogfruit (*Phyla lour*).

Table 3.12-1
Vegetation/Land Cover within Project Area[a] and Project Footprint

NOAA C-CAP Land Cover Categories	Project Area (Acres) (C-CAP Data)	Project Footprint (Acres) (Field-Verified Data)	Location of Footprint Impacts
Vegetation – Uplands			
Deciduous Forest	66	21	PA 9
Evergreen Forest	7	0	
Mixed Forest	7	0	
Shrub/Scrub	98	0	
Grassland	725	358	PAs 8 and 9
	963	***379***	
Bare Land (Gulf shore – beach/dune)	***89***	***0***	
Vegetation – Wetlands			
Estuarine[b]			
Estuarine Aquatic Bed	174	0	
Estuarine Emergent Wetland	1,957	0	
Estuarine Forested Wetland	0	0	
	2,131	***0***	
Palustrine[b]			
Palustrine Aquatic Bed	3	0	
Palustrine Emergent Wetland	3,020	39	PAs 8 and 9
Palustrine Forested Wetland	248	0	
Palustrine Shrub/Scrub Wetland	1,106	0	
	4,377	***39***	
Unconsolidated Shore (includes sand/mud flats)	***946***	***0***	
Developed Lands			
High Intensity Developed	1,106	0	
Low Intensity Developed	1,449	0	
Medium Intensity Developed	1,437	0	
Developed Open Space	800	0	
	4,792	***0***	
Water			
Marine Water (Gulf of Mexico)	24,193	0	
non-Marine Water (channels and other interior waters)	1,395	0	
	25,587	***0***	
Agricultural/Cultivated (not including pasture/hay)	***1***	***0***	
TOTAL – Project Area and Footprint	**38,826**	**418**	

[a]Project Area includes project footprint, exclusive of mitigation areas, with a 1-mile buffer; although part of the project footprint, the mitigation areas are not included in the calculations for the above table.
[b]Overestimate of wetland acreages are likely since C-CAP data are produced on spatial scales much greater than the project area. Field verifications have confirmed overestimation of wetlands by C-CAP data at some LPP project impact locations.

The upland grasslands that may occur within the project area include pasture lands, dominated by introduced species including bermudagrass (*Cynodon dactylon*) and bahaigrass (*Paspalum notatum*). Remnants of the original coastal prairie, with common species including little bluestem (*Schizachyrium scoparium),* brownseed paspalum (*Paspalum plicatulum*), indiangrass (*Sorghastrum nutans*), rosettegrass (*Panicum oligosanthes*), and thin paspalum (*Paspalum setaceum*) are likely to occur within the project area as only a small percentage of the upland grassland. Most are likely to support a mix of introduced pasture grasses in addition to some native species.

According to field verification results, within the project footprint, upland vegetation includes 21 acres of deciduous upland forest and 365 acres of grassland (includes 358 acres of grazed coastal grassland). Some of the 21 acres of upland deciduous forest include riparian forested areas adjacent to the Brazos River, which is the location proposed for construction of PA 9. Within PA 9's footprint, the forest consists of second-growth woods and is contiguous with a larger woodland to the north. It is a mixed-species woodlot, approximately 40 years in age, somewhat open with a grazed understory. The forest consists of a range of native and non-native tree and brush species similar to that described above.

3.12.2 Wetlands

The following provides a description of the wetland vegetation types found within the project area based on C-CAP data. The vegetation described within the project footprint, and immediately adjacent areas, is based on a combination of some field verifications, review of aerial imagery, and C-CAP data.

3.12.2.1 Estuarine Habitats

Coastal wetlands (saline to freshwater) are distinct areas between terrestrial and aquatic systems where the water table is at or near the surface, or the land is covered by shallow water with emergent vegetation. They are important natural resources that provide essential habitat for fish, shellfish, and other wildlife. Coastal wetlands also serve to filter and process agricultural and urban runoff and buffer coastal areas against storm and wave damage.

According to White et al. (2005), the condition and distribution of wetland types can be affected by changes in depth and frequency of inundation as well as salinity. RSLR is also of concern to coastal wetlands. ERDC (2009) reports that the historic rate of local RSLR (i.e., a combination of eustatic or worldwide sea level rise and local subsidence) in the Freeport area was 0.0143 foot/year for the 52-year period between 1954 and 2006. According to ERDC, the observed subsidence rate is 0.0087 foot/year for the Freeport area. This apparent change in RSLR could have been associated with man-made or anthropogenic activities such as oil extraction and groundwater withdrawal, which may have increased subsidence, exacerbating local sea levels. Descriptions of the wetland plant communities (including aquatic vegetation)

that occur in the project area appear in the following paragraphs. There are no estuarine wetland habitats in the project footprint, and none will be impacted by the proposed project.

*3.12.2.1.1 Estuarine Submerged Aquatic Vegetation (*Estuarine Aquatic Bed*)*

Seagrasses, which are SAV, are considered to be critical coastal nursery habitat for estuarine fisheries and wildlife. They also serve as a food source for fish, waterfowl, and turtles. They contribute organic matter to the nutrient cycle and stabilize coastal sedimentation and erosion processes (TPWD, 1999). The estuarine SAV species may include shoalgrass (*Halodule wrightii*) and widgeongrass (*Ruppia maritima*).

According to C-CAP, there are approximately 174 acres of SAV (equivalent to C-CAP's category, Estuarine Aquatic Bed) in the project area (see Table 3.12-1; NOAA, 2006); however, these are primarily located in estuarine marshes that are indirectly connected to the Freeport Harbor Channel via the GIWW, or, in some cases, within leveed areas. C-CAP maps some narrow patchy areas of SAV along the channel shoreline. However, based on some field verifications and review aerial interpretation, there is no SAV in the project footprint and immediately adjacent areas, and none will be impacted by the proposed project.

*3.12.2.1.2 Estuarine Marshes – Salt/Brackish (*Estuarine Emergent Wetlands*)*

The dominant species in the frequently inundated low salt marshes is smooth cordgrass (*Spartina alterniflora*) and, secondarily, seashore saltgrass. These are often interspersed with low brackish marshes dominated by saltmarsh bulrush (*Bolboschoenus robustus*) and glasswort (*Salicornia virginicus*). Commonly, the low salt marsh is adjacent to open-water areas, with the low brackish marsh adjacent to the low salt marsh. At slightly higher elevations (and less frequently inundated) are the high salt/brackish marshes. Common species in the high marshes include sea ox-eye daisy (*Borrichia frutescens*), saltwort (*Batis maritima*), and shoregrass (*Monanthochloe littoralis*). According to C-CAP data, there are approximately 1,957 acres of estuarine emergent wetlands in the project area (see Table 3.12-1; NOAA, 2006). There are no saltwater or brackish estuarine wetland habitats in the project footprint, and none will be impacted by the proposed project.

3.12.2.1.3 Estuarine Shrub/Scrub Wetlands – Salt/Brackish

The estuarine intertidal shrub/scrub category describes coastal wetlands dominated by woody vegetation and periodically flooded by tidal waters. Examples of estuarine intertidal shrub/scrub species in the study area include big leaf sumpweed (*Iva frutescens*), the exotic invasive tamarisk (*Tamarix* spp.), and bushy sea-ox-eye. C-CAP does not map any estuarine shrub/scrub wetlands within the project area (see Table 3.12-1; NOAA, 2006); however, some areas were observed during field visits in the surrounding marshes (not adjacent to the Freeport Harbor Channel). So the actual cover by estuarine shrub/scrub may be underestimated by C-CAP. There are no

saltwater or brackish estuarine shrub/scrub wetland habitats in, or immediately adjacent to, the project footprint, and none will be impacted by the proposed project.

3.12.2.1.4 Estuarine Tidal Flats (Unconsolidated Shore)

This community type includes coastal wetlands periodically flooded by tidal waters and with less than 30 percent areal coverage by vegetation. This category includes sandbars, mud flats, and other nonvegetated or sparsely vegetated habitats called salt flats. Sparse vegetation of salt flats may include glasswort, saltwort, and shoregrass. These tidal flats serve as valuable feeding grounds for coastal shorebirds, including the threatened piping plover, fish, and invertebrates. Although C-CAP data (NOAA, 2006) maps 946 acres of tidal flats within the project area, C-CAP data do not differentiate between estuarine and palustrine 'unconsolidated shore' (including flats). Also, although there are small flats displayed (see Figure 3.12-2) on the shoreline of the channel that would be considered estuarine, based on field verifications and review of aerial imagery, these areas are considered overestimates and errors of C-CAP data. As previously mentioned, C-CAP data are more accurate at larger spatial scales and coarser-grained spatial analysis, and may overestimate vegetation or habitat types at the project footprint spatial scale. Because the C-CAP acreage for 'unconsolidated shore' includes both estuarine and palustrine areas, including areas within levees, overall acreages within the project area are likely greatly overestimated. Within the project footprint, no estuarine tidal flats occur.

3.12.2.2 Freshwater Habitats

3.12.2.2.1 Freshwater Aquatic Vegetation – Submerged and Floating (Palustrine Aquatic Bed)

Common submerged and floating freshwater aquatic species may include the invasive exotic species water hyacinth (*Eichornia crassipes*) and water lettuce (*Pistia stratiotes*), or the native frogbit (*Linobium spongia*). Other species may include widgeongrass, as well as other strictly fresh-intermediate species like Sago pondweed (*Potamogeton pectinatus*), cabomba (*Cabomba caroliniana*), and mermaid weed (*Proserpinica palustris*). Only 3 acres of palustrine aquatic beds are mapped by C-CAP (see Table 3.12-1; NOAA, 2006) within the project area. No submerged or floating freshwater aquatic vegetation occurs within the project footprint and none will be impacted by the project.

3.12.2.2.2 Freshwater Marshes (Palustrine Emergent Wetland)

The estuarine system extends landward to the point where salinity is less than 0.5 ppt (during average annual low flow) (Cowardin et al., 1979). Most of the freshwater marshes are located more inland than the estuarine marshes; however, some do occur in swales near the Gulf shoreline. Common species include spikerush (*Eleocharis* sp.), flat-sedge (*Cyperus* spp.), rushes (*Juncus* spp.), smartweed (*Polygonum* sp.), coastal water-hyssop (*Bacopa monnieri*), seashore paspalum (*Paspalum vaginatum*), California bulrush (*Schoenoplectus californicus*), coastal

cattails (*Typha domingensis*), jointed flatsedge, and American bulrush (*Schoenoplectus pungens*). According to C-CAP, there are approximately 3,020 acres of palustrine emergent wetlands in the project area. As previously mentioned, C-CAP data are more accurate at larger spatial scales and coarser-grained spatial analysis, and may overestimate vegetation or habitat types at the project footprint spatial scale. Field verifications within PAs 8 and 9 revealed some overestimates of this vegetation type. Within the project footprint, PA 8 (which contains two small stock ponds) contains common arrowhead (*Sagittaria* sp.), Walteri millet (*Echinochloa walterii*), rattle bush (*Sesbania drummondii*), seacoast sumpweed (*Iva annua*), frogfruit, St. Augustine grass (*Stenoptaphrum secundatum*), Chinese tallow (*Sapium sebiferum*), marshhay cordgrass, gulf cordgrass (*Spartina spartinae*), sea-ox eye daisy, and smooth cordgrasss. PA 8 is adjacent to a prominent wetland swale, which has been excluded from project impacts through avoidance measures. Ephemeral wetland swales on PAs 8 and 9 generally consist of a semipermanent water regime, with water depths potentially approaching 3–5 inches during winter months. Within the project footprint at PAs 8 and 9, there are 39 acres of ephemeral freshwater marsh that will be impacted by the project (see Table 3.12-1).

3.12.2.2.3 Freshwater Shrub/Scrub Wetlands

Freshwater shrub/scrub wetlands in the coastal zone may include woody species such as buttonbush (*Cephalanthus occidentalis*), baccharis shrub (*Baccharis* sp.), big leaf sumpweed, and tamarisk. According to C-CAP, there are approximately 1,106 acres of palustrine shrub/scrub wetlands in the project area. Within the project footprint, there are no freshwater shrub/scrub wetlands (see Table 3.12-1).

3.12.2.2.4 Freshwater Forested Wetlands

Forested wetlands, typical of the Columbia Bottomlands, are located farther inland than the project area, and are upstream along the Brazos River, creeks, and sloughs, as described earlier. The plant communities may include Ash Flats (dominated by green ash and including water hickory, eastern swamp privet, and swamp panic grass) and Water Oak Flats. Bald cypress (*Taxodium distichum*) also occurs along some of the waterways. There are some forested wetlands, mapped by C-CAP, within leveed (impounded) areas. It is assumed that these are not the more mature communities described above but are more likely to be dominated by black willow (*Salix nigra*), Chinese tallow, or similar pioneer-type species. None of these wetlands have direct hydrologic connections to the Freeport Harbor Channel. C-CAP data identify 248 acres of freshwater forested wetlands within the project area. No freshwater forested wetlands occur within the project footprint.

3.12.2.2.5 Freshwater Flats **(Unconsolidated Shore)**

Freshwater flats are unvegetated to sparsely vegetated areas with sand or mud substrate. Common species are the same as freshwater marshes. Although C-CAP data (NOAA, 2006) map

946 acres of 'unconsolidated shore' (which includes flats) within the project area, C-CAP data do not differentiate between estuarine and palustrine 'unconsolidated shore' (including flats). Figure 3.12-2 does not map the freshwater flats as a unique feature. However, the relative location to estuarine waters as shown on Figure 3.12-2 indicates whether flats would likely be estuarine or palustrine. As previously mentioned, C-CAP data are more accurate at larger spatial scales and coarser-grained spatial analysis, and may overestimate vegetation or habitat types at the project footprint spatial scale. No freshwater flats occur within the Freeport Harbor Channel or within the project footprint.

3.13 TERRESTRIAL WILDLIFE

The study area is within the Texan Biotic Province, as described by Blair (1950). The climate of the region is moist subhumid, with some excess rainfall. The vertebrate fauna of the province includes considerable elements of Austroriparian as well as grassland species. Wildlife habitats within the study area include beach, shell ramp-barrier flats, dredged material, saltwater marsh, brackish to freshwater marsh, fresh to brackish waterbodies (i.e., ponds and lakes), inland freshwater marsh, grassland, and riparian forest (McGowen et al., 1976).

The Texan Biotic Province supports a diverse fauna composed of a mixture of species common to neighboring provinces. Austroriparian species from the east are generally restricted to forests, bogs, and marshes. Grassland species, entering the area from the west, are generally restricted to the prairies. No vertebrate species are endemic to the Texan Biotic Province (Blair, 1950).

At least 49 mammal species occur or have occurred in the Texan Biotic Province (Blair, 1950). Although terrestrial habitat is of limited extent in the study area, common terrestrial mammals of potential occurrence include Virginia opossum (*Didelphis virginiana*), least shrew (*Cryptotis parva*), nine-banded armadillo (*Dasypus novemcinctus*), swamp rabbit (*Sylvilagus aquaticus*), eastern cottontail (*Sylvilagus floridanus*), black-tailed jackrabbit (*Lepus californicus*), eastern fox squirrel (*Sciurus niger*), American beaver (*Castor canadensis*), marsh rice rat (*Oryzomys palustris*), fulvous harvest mouse (*Reithrodontomys fulvescens*), white-footed mouse (*Peromyscus leucopus*), northern pygmy mouse (*Baiomys taylori*), hispid cotton rat (*Sigmodon hispidus*), eastern woodrat (*Neotoma floridana*), nutria (*Myocastor coypus*), coyote (*Canis latrans*), common gray fox (*Urocyon cinereoargenteus*), northern raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), bobcat (*Lynx rufus*), and white-tailed deer (*Odocoileus virginianus*) (Schmidly, 2004).

At least 16 species of lizards and 39 species of snakes occur or have occurred in the Texan Biotic Province (Blair, 1950). In addition, at least 5 urodeles (newts and salamanders) and 18 anurans (frogs and toads) have occurred in the Texan Biotic Province (Blair, 1950). Terrestrial amphibian and reptile species of potential occurrence in the study area include Blanchard's cricket frog (*Acris crepitans blanchardi*), Gulf Coast toad (*Bufo nebulifer*), Cope's gray treefrog (*Hyla*

chrysoscelis), green treefrog (*Hyla cinerea*), squirrel treefrog (*Hyla squirella*), gray treefrog (*Hyla versicolor*), American bullfrog (*Rana catesbeiana*), southern leopard frog (*Rana sphenocephala*), small-mouthed salamander (*Ambystoma texanum*), green anole (*Anolis carolinensis*), eastern six-lined racerunner (*Aspidoscelis sexlineata sexlineata*), Mediterranean house gecko (*Hemidactylus turcicus*), little brown skink (*Scincella lateralis*), southern copperhead (*Agkistrodon contortrix contortrix*), western cottonmouth (*Agkistrodon piscivorus leucostoma*), eastern yellow-bellied racer (*Coluber constrictor flaviventris*), western diamond-backed rattlesnake (*Crotalus atrox*), Texas ratsnake (*Elaphe obsoleta*), western coachwhip (*Masticophis flagellum testaceus*), several species of watersnake (*Nerodia* spp.), Gulf saltmarsh snake (*Nerodia clarkii clarkii*), Gulf Coast ribbonsnake (*Thamnophis proximus orarius*), and three-toed box turtle (*Terrapene carolina triunguis*) (Dixon, 2000).

The immediate study area and vicinity support an abundant and diverse avifauna. Tidal flats, bay margins, and beaches provide excellent habitat for numerous species of herons and egrets, shorebirds, wading birds, gulls, and terns. According to the USFWS Texas Colonial Waterbird Census (TCWC) (USFWS, 2010), several rookeries occur within the study area (Figure 3.13-1). Table 3.13-1 provides information on nesting activities at these rookeries. Common species of potential occurrence in the study area include great blue heron (*Ardea herodias*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), little blue heron (*Egretta caerulea*), white ibis (*Eudocimus albus*), roseate spoonbill (*Platalea ajaja*), clapper rail (*Rallus longirostris*), common moorhen (*Gallinula chloropus*), killdeer (*Charadrius vociferus*), black-necked stilt (*Himantopus mexicanus*), yellowlegs (*Tringa* spp.), willet (*Catoptrophorus semipalmatus*), long-billed curlew (*Numenius americanus*), sanderling (*Calidris alba*), least sandpiper (*Calidris minutilla*), dunlin (*Calidris alpina*), dowitchers (*Limnodromus* spp.), Wilson's snipe (*Gallinago delicata*), laughing gull (*Larus atricilla*), ring-billed gull (*Larus delawarensis*), herring gull (*Larus argentatus*), Forster's tern (*Sterna forsteri*), and least tern (*Sternula antillarum*) (Richardson et al., 1998). In addition, prairies and marshes provide habitat for numerous waterfowl, several species of raptors, and a variety of songbirds. Texas is one of the most significant waterfowl wintering regions in North America with 3 to 5 million waterfowl annually wintering in the state (Texas Coastal Management Program [TCMP], 1996). In addition, the mainland and barrier islands of the Texas Gulf Coast provide critical stopover habitat for numerous species of neotropical songbirds during migration.

3.14 AQUATIC ECOLOGY

3.14.1 Aquatic Communities

Many aquatic communities are present in the study area that serve to support ecological diversity and abundance. These include commercial and recreational species, oyster reef habitat, and offshore sands, as discussed in the following sections. In general, fish species found mainly in

Rookery

N
W E
S

0 6,250 12,500
Feet

Figure 3.13-1
Rookeries
in and near the Project Area

Prepared for: USACE Galveston	
Job No.: 044190100	Scale: 1 inch equals 6,250 feet
Prepared by: A.Christiansen	Date: 03/14/2008

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Table 3.13-1
Number of Nests of Colonial Waterbirds at Selected Rookeries in the Study Area

Rookery/ ID	Common Name	Scientific Name	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
Freeport Dow/ 610-100	Black skimmer	*Rynchops niger*	–	–	–	–	320	380	–	1,600	725	500
	Gull-billed tern	*Sterna* (now *Gelochelidon*) *nilotica*	–	–	–	–	–	25	–	60	72	60
	Least tern	*Sterna* (now *Sternula*) *antillarum*	–	–	–	–	40	30	–	40	50	17
Bryan Beach State Park/ 610-101	Black skimmer	*Rynchops niger*	–	–	–	–	–	–	–	–	–	–
	Least tern	*Sterna* (now *Sternula*) *antillarum*										
Bryan Beach Spoil/ 610-102	Tricolored heron	*Egretta tricolor*	–	–	–	–	–	–	–	–	–	–
	Little blue heron	*Egretta caerulea*	–	–	–	–	–	–	–	–	–	–
	Least tern	*Sterna* (now *Sternula*) *antillarum*	–	–	–	–	–	–	–	–	–	–
	Great egret	*Ardea alba*	–	–	–	–	–	–	–	–	–	–
	Great blue heron	*Ardea herodias*	–	–	–	–	–	–	–	–	–	–
	Cattle egret	*Bubulcus ibis*	–	–	–	–	–	–	–	–	–	–
	Black skimmer	*Rynchops niger*	–	–	–	–	–	–	–	–	–	–
Bryan Mound/ 610-103	Roseate spoonbill	*Ajaia ajaja*	–	–	–	–	–	–	–	–	8	30
	Neotropic cormorant	*Phalacrocorax brasilianus*	–	–	–	–	–	–	–	–	20	60
	Least tern	*Sterna* (now *Sternula*) *antillarum*	–	–	–	–	–	–	–	–	5	15
	Gull-billed tern	*Sterna* (now *Gelochelidon*) *nilotica*	–	–	–	–	–	–	–	–	–	–
	Great egret	*Ardea alba*	–	–	–	–	–	–	–	–	5	4
	Great blue heron	*Ardea herodias*	–	–	–	–	–	–	–	–	4	3
	Cattle egret	*Bubulcus ibis*	–	–	–	–	–	–	–	–	–	200

Table 3.13-1 (Cont'd)

Rookery/ ID	Common Name	Scientific Name	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
	White ibis	*Eudocimus albus*	–	–	–	–	–	–	–	–	–	–
	White-faced ibis	*Plegadis chihi*	–	–	–	–	–	–	–	–	–	–
	Tricolored heron	*Egretta tricolor*	–	–	–	–	–	–	–	–	–	–
	Snowy egret	*Egretta thula*	–	–	–	–	–	–	–	–	1	–
	Black-crowned night-heron	*Nycticorax nycticorax*	–	–	–	–	–	–	–	–	–	2
Dow Gate A-40/ 610-104	Least tern	*Sterna* (now *Sternula*) *antillarum*	24	–	–	–	–	–	–	–	6	2
	Gull-billed tern	*Sterna* (now *Gelochelidon*) *nilotica*	50	–	–	–	–	–	–	–	–	–
	Black skimmer	*Rynchops niger*	500	–	–	–	–	–	–	–	–	–
Dow Tern/ 610- 105	Least tern	*Sterna* (now *Sternula*) *antillarum*	–	–	–	–	–	–	–	–	–	–
Bryan Beach Diked Spoil/ 610-106	N/A		–	–	–	–	–	–	–	–	–	–

Source: TCWC Database (USFWS, 2010)

shallow areas include Gulf killifish (*Fundulus grandis*), sheepshead minnow (*Cyprinodon variegates*), and silversides (*Menidia* sp.) (Pattillo et al., 1997). Inhabitants of marsh areas include the pinfish (*Lagodon rhomboids*), silver perch (*Bairdiella chrysoura*), and gizzard shad (*Dorosoma cepedianum*) (Pattillo et al., 1997). Species often found in deeper areas include the Atlantic croaker (*Micropogonias undulatus*), Gulf menhaden (*Brevoortia patronus*), and hardhead catfish (*Arius felis*), while a number of fish occur in abundance in both marsh and deeper areas, including bay anchovy (*Anchoa mitchilli*), spot (*Leiostomus xanthurus*), and striped mullet (*Mugil cephalus*) (Pattillo et al., 1997). These species are ubiquitous along the Texas coast with seasonal differences in abundance. Newly spawned fish and shellfish begin migrating into the estuary in winter and early spring, with the maximum biomass observed during the summer months (Parker, 1965). A list of fish species found in the study area is presented in Table 3.14-1. Marine mammals of potential occurrence in the study area include the bottlenose dolphin (*Tursiops truncatus*).

The entire food chain is dependent on the microscopic plankton that utilize nutrients and provide an abundant food source. The plankton community consists of small plants (phytoplankton) and animals (zooplankton) that are suspended in the water column. Diverse and abundant plankton communities exist throughout the study area. The dominant phytoplankton assemblages include diatoms, green algae, and blue-green algae, while the dominant zooplankton include the barnacle nauplii, the copepod *Acartia tonsa*, and the dinoflagellate *Noctiluca scintillans* (Armstrong et al., 1987).

The open-water bottom includes all areas of the study area not covered with oyster reefs (Lester and Gonzales, 2001). Benthic organisms are divided into two groups: 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 (Green et al., 1992). Mollusks and some other infaunal organisms are filter feeders that strain suspended particles from the water column. Others, such as polychaetes, feed by ingesting sediments and extracting nutrients. Many of the epifauna and infauna feed on plankton, and are then fed upon by numerous fish and birds (Armstrong et al., 1987; Lester and Gonzales, 2001). The open-water bottom includes flat areas consisting of mud and sand that contribute large quantities of nutrients and food, making them one of the most important components of this habitat type. The distribution of the benthic macroinvertebrates is primarily influenced by bathymetry and sediment type (Calnan et al., 1988). Benthic macroinvertebrates found in the sediments of the Freeport area are primarily polychaetes, bivalves, gastropods, and crustaceans (Calnan et al., 1988). The dominant bivalves include the dwarf surf clam (*Mulinia lateralis*) and the concentric nut clam (*Nuculana concentrica*); the dominant gastropods are the Eastern white slipper shell (*Crepidula plana*) and the vitrinella (*Vitrinella floridana*); the dominant polychaetes are *Mediomastus californiensis* and *Paraprionospio pinnata*; and the dominant crustaceans are *Ampelisca abdita* and *Ampelisca agassizi*.

Table 3.14-1
Representative Fish Species Found within the Study Area

Common Name	Scientific Name	Relative Abundance
Bay squid	*Lolliguncula brevis*	common
Brown shrimp	*Farfantepenaeus aztecus*	abundant
Pink shrimp	*Farfantepenaeus duorarum*	common
White shrimp	*Litopenaeus setiferus*	abundant
Grass shrimp	*Palaemonetes pugio*	highly abundant
Blue crab	*Callinectes sapidus*	common
Gulf menhaden	*Brevoortia patronus*	abundant
Gizzard shad	*Dorosoma cepedianum*	common
Bay anchovy	*Anchoa mitchilli*	highly abundant
Hardhead catfish	*Arius felis*	common
Sheepshead minnow	*Cyprinodon variegatus*	abundant
Gulf killifish	*Fundulus grandis*	abundant
Silversides	*Menidia* sp.	abundant
Bluefish	*Pomatomus saltatrix*	common
Crevalle jack	*Caranx hippos*	common
Gray snapper	*Lutjanus griseus*	common
Pinfish	*Lagodon rhomboides*	abundant
Silver perch	*Bairdiella chrysoura*	common
Sand trout	*Cynoscion arenarius*	common
Spotted trout	*Cynoscion nebulosus*	common
Spot	*Leiostomus xanthurus*	abundant
Atlantic croaker	*Micropogonias undulatus*	highly abundant
Black drum	*Pogonias cromis*	common
Red drum	*Sciaenops ocellatus*	common
Striped mullet	*Mugil cephalus*	common
Spanish mackerel	*Scomberomorous maculatus*	rare
Southern flounder	*Paralichthys lethostigma*	common
Gag grouper	*Mycteroperca microlepis*	occurrence
Scamp	*Mycteroperca phenax*	occurrence
Red snapper	*Lutjanus campechanus*	common
Lane snapper	*Lutjanus synagris*	common
Greater amberjack	*Seriola dumerilli*	common
King mackerel	*Scomberomorus cavalla*	common
Cobia	*Rachycentron canadum*	common

Source: Pattillo et al. (1997); Gulf of Mexico Fisheries Management Council (GMFMC, 2004).

Aquatic reptiles of potential occurrence in the study area include American alligator (*Alligator mississippiensis*), snapping turtle (*Chelydra serpentina*), Mississippi mud turtle (*Kinosternon subrubrum hippocrepis*), stinkpot (*Sternothorus odoratus*), red-eared slider (*Trachemys scripta elegans*), and Texas diamond-backed terrapin (*Malaclemys terrapin littoralis*).

The project area includes a small portion of the Old Brazos River Channel, and the Gulf nearshore waters at the Freeport Harbor Channel. Within the project area, environmental fluctuations are extreme and the inhabitant biota reflect and are adapted to this lack of stability in the environment (Warshaw, 1975). Large changes in habitat can occur on a daily basis with respect to wind, tidal action, salinity regimes, and freshwater inflow. These ongoing natural processes are coupled with other natural events such as freezes, droughts, hurricanes, and anthropogenic pressures (i.e., management practices and coastal projects) in the study area. Nevertheless, the biological community present in the project area remains diverse and abundant. The Gulf nearshore community includes many species found in both estuarine and offshore oceanic habitats (Tunnell et al., 1996). Most of the species in the Gulf nearshore waters are temperate in biogeographic distribution with a few tropical species (Tunnell et al., 1996).

3.14.1.1 Commercial and Recreational Species

Over the years, many commercially important fish have been subject to overfishing and subsequent decline in the Gulf. In recent years, however, certain fish stocks in the Gulf are no longer overfished and are beginning to show signs of rebuilding (NOAA, 2004). TPWD does not collect commercial or recreational fishery statistics for the Brazos River estuary. The most important commercially harvestable species that utilize the Brazos River estuary include brown shrimp (*Farfantepenaeus aztecus*), white shrimp (*Litopenaeus setiferus*), pink shrimp (*Farfantepenaeus duorarum*), blue crab (*Callinectes sapidus*), and southern flounder (*Paralichthys lethostigma*). Important recreational species include red drum (*Sciaenops ocellatus*), red snapper (*Lutjanus campechanus*), speckled trout (*Cynoscion nebulosus*), black drum (*Pogonias cromis*), southern flounder, greater amberjack (*Seriola dumerili*), Spanish mackerel (*Scomberomorus maculatus*), and king mackerel (*Scomberomorus cavalla*). No oysters are commercially harvested within the project area.

3.14.1.2 Oyster Reef Habitat

Many organisms, including mollusks, barnacles, crabs, gastropods, amphipods, polychaetes, and isopods, can be found living on oyster reefs, forming a very diverse community (Sheridan et al., 1989). Oyster reef communities are dependent upon food resources from the open bay and marshes. Many organisms feed on oysters including fish, such as black drum, crabs (*Callinectes* spp.), and gastropods such as the oyster drill (*Thais haemastoma*) (Lester and Gonzales, 2001; Sheridan et al., 1989). When oyster reefs are exposed during low tides, shore birds will use the reef areas as resting places (Armstrong et al., 1987).

Scattered reefs of eastern oyster (*Crassostrea virginica*) are present in areas surrounding Oyster Creek, and scattered oysters are found in many of the nearby open-water areas (Swan Lake, Bryan Lake); however, no oysters are found within the immediate project area. Oysters are not commercially harvested from the project area. The Freeport area has been classified as restricted by the Texas Department of State Health Services (TDSHS, formerly the Texas Department of Health) and is closed to the harvesting of molluscan shellfish from this system (TDSHS, 2007). In addition, TDSHS does not have any bay water sampling stations for monitoring oysters within the project area (Heideman, 2006).

3.14.1.3 Offshore Sands

Few seagrasses or attached algae are found in the offshore sands within the project area due to the strong currents and unstable sediments. Most of the bottom surface is populated with macroinfauna, with the exception of an occasional hermit crab, portunid crab, or ray. Even though there is little life on the sand surface itself, the overlying waters are highly productive. Phytoplankton are abundant, including microscopic diatoms, dinoflagellates, and other algae (Britton and Morton, 1989).

Much of the faunal diversity lies buried in the sand and relies on the phytoplankton for food. Bivalves found in offshore sands include the blood ark (*Anadara ovalis*), incongruous ark (*Anadara brasiliana*), southern quahog (*Mercenaria campechiensis*), giant cockle (*Dinocardium robustum*), disk dosinia (*Dosinia discus*), pen shells (*Atrina serrata*), common egg cockle (*Laevicardium laevigatum*), cross-barred venus (*Chione cancellata*), tellins (*Tellina* spp.), and the tusk shell (*Dentalium texasianum*). One of the most common species occurring in the shallow offshore sands is the sand dollar (*Mellita quinquiesperforata*) as well as several species of brittle stars (*Hemipholis elongata*, *Ophiolepis elegans*, and *Ophiothrix angulata*). Many gastropods are common, including the moon snail (*Polinices duplicatus*), ear snail (*Sinum perspectivum*), Texas olive (*Oliva sayana*), Atlantic auger (*Terebra dislocata*), Salle's auger (*Terebra salleano*), scotch bonnet (*Phalium granulatum*), distorted triton (*Distorsio clathrata*), wentletraps (*Epitonium* spp.), and whelks (*Busycon* spp.). Crustaceans inhabiting these waters include white and brown shrimp (both commercially caught species), rock shrimp (*Sicyonia brevirostris*), blue crabs, mole crabs (*Albunea* spp.), speckled crab (*Arenaeus cribrarius*), box crab (*Calappa sulcata*), calico crab (*Hepatus epheliticus*), and pea crab (*Pinotheres maculatus*). The most abundant infaunal organism, with respect to the number of individuals, are the polychaetes (Capitellidae, Orbiniidae, Magelonidae, and Paraonidae) (Britton and Morton, 1989).

3.14.2 Essential Fish Habitat

Congress enacted amendments to the Magnuson-Stevens Fishery Conservation and Management Act (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 National Marine Fisheries Service (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 that could adversely affect EFH is subject to the consultation provisions of the above-mentioned act. The rules also identify consultation requirements. The DEIS initiated EFH consultation under the Magnuson-Stevens Fishery Conservation and Management Act.

EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S. Code 1802(10)). EFH is separated into estuarine and marine components. The estuarine component is defined as "all estuarine waters and substrates (mud, sand, shell, rock, and associated biological communities); sub-tidal vegetation (seagrasses and algae); and adjacent inter-tidal vegetation (marshes and mangroves)." The marine component is defined as "all marine waters and substrates (mud, sand, shell, rock, and associated biological communities) from the shoreline to the seaward limit of the Exclusive Economic Zone" (Gulf of Mexico Fisheries Management Council [GMFMC], 2004).

The GMFMC has identified the project area as EFH for adult and juvenile brown, white, and pink shrimp, red drum, gag grouper (*Mycteroperca microlepis*), scamp (*Mycteroperca phenax*), red snapper, gray snapper (*Lutjanus griseus*), lane snapper (*Lutjanus synagris*), greater amberjack, king mackerel, Spanish mackerel, cobia (*Rachycentron canadum*), Atlantic bluefin tuna (*Thunnus thynnus*), bonnethead shark (*Sphyrna tiburo*), blacktip shark (*Carcharhinus leucas*), bull shark (*C. leucas*), and Atlantic sharpnose shark (*Rhizoprionodon terraenovae*) (Appendix A-4). The categories of EFH that occur within the project area include estuarine water column, estuarine mud and sand bottoms (unvegetated estuarine benthic habitats), estuarine emergent wetlands, marine water column, and marine nonvegetated bottoms. EFH that occurs within the project footprint includes marine water column and marine nonvegetated bottoms. Although there are a few areas of quality EFH within the project area, the habitat within the project footprint in the Freeport Harbor Channel and areas immediately adjacent to the project footprint is dominated by industrial, commercial, and residential development, which does not represent high-quality EFH. Additionally, marine water column and marine nonvegetated bottoms occur in abundance within the study area and are, therefore, not unique to the area.

The following describes the preferred habitat, life history stages, and relative abundance of each federally managed species based on information provided by GMFMC (2004). Table 3.14-2 describes EFH for each of these species.

Brown Shrimp: Brown shrimp eggs are demersal (bottom-dwelling) and are deposited offshore. The larvae begin to migrate through passes with flood tides into estuaries as postlarvae. Migrating occurs at night mainly from February to April, with a minor peak in the fall. Brown shrimp postlarvae and juveniles are associated with shallow vegetated habitats in estuaries, but

Table 3.14-2
Essential Fish Habitat – Adult and Juvenile Presence
in Port Freeport Study Area

Common Name/ Scientific Name	ESTUARINE		MARINE	
	Adults	Juvenile	Adults	Juvenile
Brown shrimp (*Farfantepenaeus aztecus*)	not present	abundant year-round	major adult area spring, summer, fall	spawning area
			spawn year-round at depths greater than 13 m	
White shrimp (*Litopenaeus setiferus*)	common April–June	abundant November–June highly abundant July–October	adult area year-round	not present in study area
Pink shrimp (*Farfantepenaeus duroarum*)	not present	common November–March	adult area year-round summer spawning	not present in study area
Red drum (*Sciaenops ocellatus*)	no data	common year-round	adult area year-round	spawning area fall and winter – spawn in shallow coastal waters
Gag grouper (*Mycteroperca microlepis*)	not present	not present	adult occurrence	not present in study area
Scamp (*Mycteroperca phenax*)	not present	not present	adult occurrence	not present in study area
Red snapper (*Lutjanus campechanus*)	not present	not present	not present in project area	nursery area year-round
Gray snapper (*Lutjanus griseus*)	not present	not present	major adult area year-round spawn June to August	nursery area
Lane snapper (*Lutjanus synagris*)	not present	not present	not present in project area	nursery area
Greater amberjack (*Seriola dumerilli*)	not present	not present	adult area year-round year-round spawning	nursery area year-round
King mackerel (*Scomberomorus cavalla*)	not present	not present	adult area year-round	nursery area year-round
			spawn May to November	
Spanish mackerel (*Scomberomorus maculatus*)	common April–October rare November–March	rare July–October	adult area year-round	spawning area summer and fall nursery area year-round
Cobia (*Rachycentron canadum*)	not present	not present	adult area summer	nursery area year-round
			spawn in spring and summer	
Atlantic bluefin tuna (*Thunnus thynnus*)	not present	not present	potential occurrence	potential occurrence
Bonnethead shark (*Sphyrna tiburo*)	potential occurrence	potential occurrence	potential occurrence	potential occurrence
Blacktip shark (*Carcharhinus limbatus*)	not present	potential occurrence	potential occurrence	potential occurrence
Bull shark (*Carcharhinus leucas*)	potential occurrence	potential occurrence	potential occurrence	potential occurrence
Atlantic sharpnose shark (*Rhizoprionodon terraenovae*)	potential occurrence	potential occurrence	potential occurrence	potential occurrence

are also found over silty sand and nonvegetated mud bottoms. Postlarvae and juveniles occur in salinity ranging from zero to 70 ppt. The density of late postlarvae and juvenile brown shrimp is highest in marsh-edge habitat and submerged vegetation, followed by tidal creeks, inner marsh, shallow, open water, and oyster reefs. Muddy substrates seem to be preferred in unvegetated areas. Juvenile and subadult brown shrimp can be found from secondary estuarine channels out to the continental shelf, but prefer shallow estuarine habitats, such as soft, muddy areas associated with plant-water interfaces. Subadult brown shrimp migrate from estuaries, at night, on ebb tides during new and full moon phases in the Gulf. Their abundance offshore correlates positively with turbidity and negatively with hypoxia (low levels of oxygen in the water). Adult brown shrimp inhabit neritic Gulf waters (marine waters extending from MLT to the edge of the continental shelf) and are associated with silt, muddy sand, and sandy substrates (GMFMC, 2004). Juvenile brown shrimp are common within the study area estuaries year-round.

Larval brown shrimp feed on phytoplankton and zooplankton. Postlarvae brown shrimp feed on phytoplankton, epiphytes, and detritus. Juvenile and adult brown shrimp prey on amphipods, polychaetes, and chironomid larvae, but graze on algae and detritus (Pattillo et al., 1997).

White Shrimp: White shrimp inhabit Gulf and estuarine waters and are pelagic or demersal, depending on their life stage. Their eggs are demersal and larval stages are planktonic, and both occur in nearshore Gulf waters. Postlarvae migrate into estuaries through passes from May to November, with most migration occurring in June and September. Migration is in the upper 6.5 feet of the water column at night and at mid-depths during the day. Postlarval white shrimp become benthic once they reach the estuary. Here they seek shallow water with mud or sand bottoms high in organic detritus or rich marsh where they develop into juvenile white shrimp. Postlarvae and juveniles prefer mud or peat bottoms with large quantities of decaying organic matter or SAV. Densities are usually highest along marsh edge and in SAV, followed by marsh ponds and channels, inner marsh, and oyster reefs. White shrimp juveniles prefer salinities of less than 10 ppt and occur in tidal rivers and tributaries. As white shrimp juveniles mature, they migrate to coastal areas where they mature and spawn. Adult white shrimp are demersal and inhabit soft mud or silt bottoms (GMFMC, 2004).

Adult and juvenile white shrimp are common to highly abundant in the estuary throughout the year. Adult white shrimp also occur throughout the Gulf to depths of about 131 feet. White shrimp larvae feed on phytoplankton and zooplankton. White shrimp postlarvae feed on phytoplankton, epiphytes, and detritus. Juvenile and adult white shrimp prey on amphipods, polychaetes, and chironomid larvae, but also graze on algae and detritus (Pattillo et al., 1997).

Pink Shrimp: Pink shrimp inhabit Gulf and estuarine waters and are pelagic or demersal, depending on their life stage. After spawning offshore, postlarval pink shrimp recruitment into the estuaries occurs in the spring and fall through passes. Juveniles can be found in SAV meadows where they burrow into the substrate; however, postlarvae, juvenile, and adults may

prefer a mixture of coarse sand/shell/mud. Densities of pink shrimp are lowest or absent in marshes, low in mangroves, and greatest near or in SAV. Adults occur offshore in depths of 30 to 145 feet and prefer substrates of coarse sand and shell (GMFMC, 2004). Juvenile pink shrimp are common from November through March in the study area estuaries.

Pink 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 offshore depths of 131 feet to very shallow estuarine waters. Spawning occurs in the Gulf near the mouths of bays and inlets during the fall and early winter. Eggs usually hatch in the Gulf, and larvae are transported with tidal currents into the estuaries where they mature. Adult red drum use estuaries, but tend to migrate offshore where they spend most of their adult life. Red drum occur over a variety of substrates including sand, mud, and oyster reefs and can tolerate a wide range of salinities (GMFMC, 2004).

Estuaries are especially important to larval, juvenile, and subadult red drum. Juvenile red drum are most abundant around marshes, preferring quiet, shallow, protected waters over mud substrate or among SAV. Subadult and adult red drum prefer shallow bay bottoms and oyster reefs (GMFMC, 2004). Adult red drum that migrate into the Gulf are pelagic.

Estuaries are also important for the prey of larval, juvenile, and subadult red drum. Red drum larvae feed primarily on shrimp, mysids, and amphipods, while juvenile red drum prefer fish and crabs. Adult red drum feed primarily on shrimp, blue crab, striped mullet, and pinfish (GMFMC, 2004). Juvenile red drum are common year-round within the estuary.

Gag Grouper: Gag grouper are demersal and are most common in the eastern Gulf. Eggs are pelagic and are spawned from December through April. Larvae are pelagic and most abundant in the early spring. Postlarvae and pelagic juveniles move through inlets into high-salinity estuaries from April through May, where they become benthic and settle into grass flats and oyster beds. Older juveniles move offshore in the fall to shallow reef habitat in depths of 3 to 165 feet. Adults prefer depths of 33 to 328 feet and utilize hard bottoms, oil platforms, and artificial reefs. Spawning occurs on the west Florida shelf from December through April (GMFMC, 2004).

Gag grouper feed on estuarine-dependent organisms such as shrimp, small fish, and crabs during their juvenile stages. As they mature and move offshore, they become opportunistic predators, feeding on a variety of fish and crustaceans (GMFMC, 2004). Adult gag grouper occur in Gulf waters within the study area.

Scamp: Scamp are demersal and widely distributed on shelf areas of the Gulf. Scamp eggs and larvae are pelagic and are spawned offshore in the spring. Juvenile scamp occur on shallow, nearshore hard bottoms and reefs in depths of 40 to 620 feet. Scamp spawn in aggregations from late February to early June.

Juvenile scamp feed on estuarine-dependent organisms such as shrimp, small fish, and crabs. As they mature and move offshore, they become opportunistic predators, feeding on a variety of fish and crustaceans (GMFMC, 2004). Adult scamp occur in Gulf waters within the study area.

Red Snapper: Red snapper are demersal and found over sand and rock substrates around reefs, and underwater objects to depths of 656 feet. However, adult red snapper prefer depths ranging from 131 to 360 feet (GMFMC, 2004). Spawning occurs in the Gulf from May to October, at depths of 60 to 122 feet over fine sand substrate. Larvae, postlarvae, and early juveniles occur from July through November in shelf waters. Early and late juveniles are often associated with underwater structures or small burrows, but are also abundant over barren sand and mud bottoms.

Juvenile red snapper feed on shrimp, but after age one, prey primarily on fish and squid. Of the vertebrates consumed, most are not obligate reef dwellers, indicating that red snapper feed away from reefs (GMFMC, 2004). Juvenile red snapper occur in the Gulf waters within the study area.

Gray Snapper: Gray snapper can be demersal, structure, or mid-water dwellers inhabiting marine, estuarine, and riverine habitats. They inhabit depths to about 550 feet in the Gulf. Juvenile gray snapper are common in shallow water around SAV, while adult gray snapper tend to congregate in deeper Gulf waters around natural and artificial reefs. Spawning occurs in the Gulf from June to August around structures and shoals. Their eggs are pelagic and the larvae are planktonic, both occurring in Gulf shelf waters and near coral reefs. Postlarvae migrate into the estuaries and are most abundant over *Halodule* and *Syringodium* grassbeds. Juveniles seem to prefer *Thalassia* grassbeds, seagrass meadows, marl bottoms, and mangrove roots, and are found in estuaries, bayous, channels, grassbeds, marshes, mangrove swamps, ponds, and freshwater creeks (GMFMC, 2004).

Juvenile gray snapper feed on estuarine-dependent organisms such as shrimp, small fish, and crabs. Gray snapper are classified as opportunistic carnivores at all life stages (Pattillo et al., 1997). In estuaries, juvenile gray snapper feed on shrimp, larval fish, amphipods, and copepods. Adult gray snapper feed primarily on fish, but smaller individuals will prey on crustaceans (GMFMC, 2004). Adult and juvenile gray snapper are found in the Gulf waters of the study area.

Lane Snapper: Lane snapper are demersal, occurring over all substrate types, but are most commonly found near coral reefs and sandy bottoms. Spawning occurs in Gulf waters from March through September. Nursery areas include mangrove and grassy estuarine habitats in southern Texas and Florida and shallow waters with sand and mud bottoms along all Gulf states.

Juvenile lane snapper appear to favor grass flats, reefs, and soft bottoms to depths of 66 feet. Adult lane snapper occur offshore in depths ranging from 13 to 433 feet near sand bottoms, natural channels, banks, and artificial and natural structures (GMFMC, 2004).

Juvenile lane snapper feed on estuarine-dependent organisms such as shrimp, small fish, and crabs. Lane snapper are considered to be unspecialized, opportunistic predators, feeding on a variety of crustaceans and fish. However, adult lane snapper tend to prefer fish (GMFMC, 2004). Juvenile lane snapper are found in estuaries and Gulf waters within the study area.

Greater Amberjack: Greater amberjack occur throughout the Gulf to depths of 1,300 feet. Adults are pelagic and epibenthic, occurring near reefs and artificial structures. Spawning occurs offshore, and juvenile greater amberjack are associated with floating sargassum and debris (GMFMC, 2004). Greater amberjack feed on small fish, crabs, squid, and a variety of crustaceans and invertebrates (GMFMC, 2004). Adult and juvenile greater amberjack are found in the Gulf within the study area.

King Mackerel: King mackerel are pelagic and found in Gulf waters from nearshore to 655 feet. Spawning occurs in the Gulf from May to October. Eggs are pelagic, occurring over depths of 98 to 590 feet. Nursery areas are located in marine waters with juveniles only occasionally entering estuaries (GMFMC, 2004).

While estuaries are important for most king mackerel prey, they feed on a variety of fishes, extensively utilizing herrings. Squid, shrimp, and other crustaceans are also prey for king mackerel. Adult and juvenile king mackerel are found in the Gulf within the study area.

Spanish Mackerel: Spanish mackerel are pelagic, inhabiting depths to 245 feet throughout the Gulf coastal zone. Adult Spanish mackerel are usually found from nearshore to the edge of the continental shelf. However, they may also migrate seasonally into estuaries with high salinity, but this migration is infrequent and rare. Spawning occurs in the Gulf from May through October. Larvae typically occur in the Gulf in depths ranging from 30 to 275 feet. Juveniles inhabit the Gulf surf and sometimes estuarine habitats. However, juvenile Spanish mackerel prefer marine salinities and are not considered estuarine-dependent. Adult and juvenile Spanish mackerel are found in the Gulf year-round within the study area. Juvenile Spanish mackerel prefer clean sand bottoms, but the substrate preferences of the other life stages are unknown (GMFMC, 2004).

While Spanish mackerel rarely use estuarine environments, estuaries are important for most of their prey. They feed on a variety of fishes, extensively herrings. Squid, shrimp, and other crustaceans are also fed upon by Spanish mackerel.

Cobia: Cobia are large pelagic fish, occurring from nearshore to depths of 131 feet near artificial and natural structures, including floating objects. In the study area, cobia occur only in the Gulf and do not use estuarine waters (GMFMC, 2004).

However, estuaries are important for most cobia prey. They feed on a variety of fishes, extensively herrings. Squid, shrimp, and other crustaceans are also prey for cobia (GMFMC, 2004).

3.14.2.1 Highly Migratory Species

Atlantic Bluefin Tuna: Atlantic bluefin tuna are a pelagic species found in brackish to marine waters at depths from 0 to 9,840 feet. Spawning occurs from April to June in the Gulf, but individuals may spawn more than once a year. Larvae are found around the 1,000 fathom curve in the northern Gulf, with intermittent collections off Texas. Juveniles can be found over the continental shelf in the summer and farther offshore in the winter. Adult Atlantic bluefin tuna prey on schooling fish, benthic invertebrates, and cephalopods (NMFS, 2006a). Eggs, larvae, and spawning adults occur in the Gulf portion of the study area.

***Bonnethead Shark*:** Bonnethead sharks can be found on sand or mud bottoms in shallow coastal waters. The bonnethead shark is viviparous, reaching sexual maturity at about 30 inches. The pups are born in late summer and early fall, measuring 12 to 13 inches (Froese and Pauly, 2007). Both juveniles and adults inhabit shallow coastal waters up to 82 feet deep, inlets, and estuaries over sand and mud bottoms (Froese and Pauly, 2007; NMFS, 2006a). They feed mainly on small fish, bivalves, crustaceans, and octopi (Froese and Pauly, 2007). Juveniles and adults occur year-round in the Gulf and estuarine portion of the study area.

***Blacktip Shark*:** Blacktips are fast-moving sharks, occurring in shallow waters and offshore surface waters of the continental shelf. Blacktips are viviparous, and young are born in bay systems in late May and early June after a year-long gestation period. The reproductive cycle occurs every 2 years. Juveniles are found in all Texas bay systems in a variety of habitats and shallow coastal waters from the shore to the 82-foot isobath (NMFS, 2006a). They feed mainly on pelagic and benthic fishes, cephalopods and crustaceans, and small rays and sharks (Froese and Pauly, 2007). Juvenile blacktip sharks occur in the Gulf and estuarine portions of the study area and adults in the Gulf portions of the study area.

***Bull Shark*:** Bull sharks are coastal and freshwater sharks that inhabit shallow waters, especially in bays, estuaries, rivers, and lakes. They frequently move between fresh and brackish water and are capable of covering great distances. Adults are often found near estuaries and freshwater inflows to the sea (Froese and Pauly, 2007). Bull sharks are viviparous, have a gestation period of a little less than 1 year, and it is assumed the reproductive cycle occurs every 2 years. Juveniles are found in waters less than 82 feet deep in shallow coastal waters, inlets, and estuaries (NMFS, 2006a). They feed on bony fishes, sharks, rays, shrimp, crabs, squid, sea

urchins, and sea turtles (Froese and Pauly, 2007). Juvenile bull sharks occur in the Gulf and estuarine portions of the study area.

***Atlantic Sharpnose Shark*:** Atlantic sharpnose shark inhabits intertidal to deeper waters, often in the surf zone off sandy beaches, bays, estuaries, and river mouths (Froese and Pauly, 2007). They are viviparous, and mating occurs in June, with a gestation period of about a year (NMFS, 2006a). They feed on fish, shrimp, crab, mollusks, and segmented worms (Froese and Pauly, 2007). Juvenile Atlantic sharpnose shark occur in the Gulf and estuarine portions of the study area.

3.15 THREATENED AND ENDANGERED SPECIES

Congress enacted the ESA [16 USC 1531 et seq.] of 1973, as amended, to provide a program for the preservation of threatened and endangered species and to provide protection for the ecosystems upon which these species depend for their survival. All Federal agencies are required to implement protection programs for these designated species and to use their authorities to further the purposes of the act. An endangered species is one that is in danger of extinction throughout all or a significant portion of its range in the U.S. A threatened species is one likely to become endangered within the foreseeable future throughout all or a significant portion of its range. USFWS and NMFS are the primary agencies responsible for implementing the ESA. USFWS is responsible for terrestrial and freshwater species, while NMFS is responsible for marine and anadromous species.

The State of Texas also has regulations to protect endangered species (chapters 67, 68, and 88 of the TPWD Code and sections 65.171–65.184 and 69.01–69.14 of Title 31 of the Texas Administrative Code). These regulations, administered by TPWD, prohibit commerce of threatened and endangered plants and wildlife and the collection of listed plant species from public land without a permit. This assessment addresses State-listed threatened and endangered species; however, the ESA does not protect these species.

Only those species that USFWS or NMFS lists as threatened or endangered have complete Federal protection under the ESA. Inclusion on the following lists does not imply that a species occurs in the study area, but only acknowledges the potential for occurrence. USFWS (2007), NMFS (2007a), and TPWD (2007) provided county-level lists of endangered and threatened species of potential occurrence in the study area (see Appendix A-2). In addition, TPWD's Texas Natural Diversity Database (TXNDD, 2007) provided digital map data presenting specific locations of listed species within the study area.

3.15.1 Plants

TPWD's official State list of threatened and endangered species includes the same species that USFWS lists as threatened or endangered as well as species that carry a global conservation

status indicating a species is critically imperiled, very rare, vulnerable to extirpation, or uncommon. USFWS (2007) currently identifies 30 plant species as threatened or endangered in Texas; however, USFWS indicates no Federal or State-listed plant species of potential occurrence in Brazoria County (USFWS, 2007; TPWD, 2007). TPWD (2007) indicates five plant species as rare species (Table 3.15-1); however, these species have no regulatory listing status. These plant species of potential occurrence in Brazoria County include coastal gay-feather (*Liatris bracteata*), giant sharpstem umbrella-sedge (*Cyperus cephalanthus*), Texas meadow-rue (*Thalictrum texanum*), Texas windmill grass (*Chloris texensis*), and threeflower broomweed (*Thurovia triflora*). Of these, only the Texas meadow-rue is not found throughout coastal habitat types. This plant is most commonly found in upland woodland habitat types and is therefore unlikely to occur within the project area.

The coastal gay-feather is endemic to the Gulf Coastal Plain of Texas in Brazoria County and others, and is found in coastal prairie grasslands of various types, from salty prairie on low-lying somewhat saline clay loams to upland prairie on nonsaline clayey to sandy loams (Poole et al., 2007). This plant is likely to occur in grasslands encompassed by the project area.

The only known extant population of giant sharpstem umbrella-sedge in Texas occurs in Brazoria County. Poole et al. (2007) does not specify the exact location of this population in Brazoria County; however, this population is described as occurring in saturated fine sandy loam soils along nearly level fringes of deep prairie depressions, and frequently occurs with other *Cyperus* species. This species is likely to occur where conditions similar to these are found throughout grassland areas encompassed by the project area.

Texas windmill grass is also endemic to the Gulf Coastal Plain of Texas in Brazoria County. This species is likely to occur in the project area where sandy to sandy loam soils in relatively bare areas in coastal grassland remnants exist, and on roadsides where regular mowing may mimic natural prairie fire regimes (Poole et al., 2007).

Threeflower broomweed is another Gulf Coastal Plain endemic from Brazoria County and is also likely to occur in the project area where preferred conditions are present. Near the coast, this species is most commonly encountered in sparse, low vegetation on a veneer of light-colored silt or fine sand over saline clay along drier upper margins of ecotone between salty prairies and tidal flats (Poole et al., 2007).

3.15.2 Wildlife

According to USFWS (2007), NMFS (2007a), and TPWD (2007), 32 federally and/or State-listed threatened or endangered wildlife species, 9 NMFS-designated wildlife species of concern (SOC), and 15 rare wildlife species are of potential occurrence in Brazoria County, Texas (see Table 3.15-1). As noted above, inclusion on the following list does not imply that a species occurs in the study area, but only acknowledges the potential for occurrence.

Table 3.15-1
Threatened, Endangered, and Rare Species and Species of Concern of Possible Occurrence in Brazoria County, Texas[a]

Common Name[b]	Scientific Name[b]	Status[c]			Likelihood of Occurrence
		USFWS	NMFS	TPWD	
PLANTS					
Coastal gay-feather	*Liatris bracteata*			R	Likely
Giant sharpstem umbrella-sedge	*Cyperus cephalanthus*			R	Likely
Texas meadow-rue	*Thalictrum texanum*			R	Unlikely
Texas windmill grass	*Chloris texensis*			R	Likely
Threeflower broomweed	*Thurovia triflora*			R	Likely
INVERTEBRATES					
False spike mussel	*Quincuncina mitchelli*			R	Unlikely
Ivory bush coral	*Oculina varicosa*		SOC		Unlikely
Pistolgrip	*Tritogonia verrucosa*			R	Unlikely
Rock pocketbook	*Arcidens confragosus*			R	Unlikely
Smooth pimpleback	*Quadrula houstonensis*			R	Unlikely
Texas fawnsfoot	*Truncilla macrodon*			R	Unlikely
FISHES					
American eel	*Anguilla rostrata*			R	Unlikely
Dusky shark	*Carcharhinus obscurus*		SOC		Likely
Largetooth sawfish	*Pristis pristis*		SOC		Unlikely
Night shark	*Carcharhinus signatus*		SOC		Unlikely
Saltmarsh topminnow	*Fundulus jenkinsi*		SOC		Unlikely
Sand tiger shark	*Carcharias taurus*		SOC		Unlikely
Sharpnose shiner	*Notropis oxyrhynchus*			R	Unlikely
Smalltooth sawfish	*Pristis pectinata*		E		Unlikely
Speckled hind	*Epinephelus drummondhayi*		SOC		Unlikely
Warsaw grouper	*Epinephelus nigritus*		SOC		Unlikely
White marlin	*Tetrapturus albidus*		SOC		Unlikely
TERRESTRIAL REPTILES					
Texas horned lizard	*Phrynosoma cornutum*			T	Unlikely
Timber rattlesnake	*Crotalus horridus*			T	Unlikely
AQUATIC REPTILES					
Alligator snapping turtle	*Macrochelys temminckii*			T	Unlikely
Green sea turtle	*Chelonia mydas*	T	T	T	Likely
Gulf saltmarsh snake	*Nerodia clarkii*			R	Likely
Hawksbill sea turtle	*Eretmochelys imbricata*	E	E	E	Likely
Kemp's ridley sea turtle	*Lepidochelys kempii*	E	E	E	Likely
Leatherback sea turtle	*Dermochelys coriacea*	E	E	E	Unlikely
Loggerhead sea turtle	*Caretta caretta*	T	T	T	Likely
Texas diamondback terrapin	*Malaclemys terrapin littoralis*			R	Likely
BIRDS					
Bald eagle	*Haliaeetus leucocephalus*	DL[d]		T	Likely

Table 3.15-1 (Cont'd)

Common Name[b]	Scientific Name[b]	Status[c]			Likelihood of Occurrence
		USFWS	NMFS	TPWD	
Black rail	*Laterallus jamaicensis*			R	Likely
Eskimo curlew	*Numenius borealis*	E		E	Unlikely
Henslow's sparrow	*Ammodramus henslowii*			R	Unlikely
Piping plover	*Charadrius melodus*	T w/CH		T	Likely
Peregrine falcon	*Falco peregrinus*			E/T	Unlikely
Peregrine falcon (American subspecies)	*Falco peregrinus anatum*			E	Unlikely
Peregrine falcon (Arctic subspecies)	*Falco peregrinus tundrius*			T	Unlikely
Reddish egret	*Egretta rufescens*			T	Likely
Snowy plover	*Charadrius alexandrinus*			R	Likely
Snowy plover (southeastern subspecies)	*Charadrius alexandrinus tenuirostris*			R	Likely
Snowy plover (western subspecies)	*Charadrius alexandrinus nivosus*			R	Likely
Sooty tern	*Onychoprion fuscatus* (formerly *Sterna fuscata*)			T	Unlikely
White-faced ibis	*Plegadis chihi*			T	Likely
White-tailed hawk	*Buteo albicaudatus*			T	Likely
Whooping crane	*Grus americana*	E, EXPN		E	Unlikely
Wood stork	*Mycteria americana*			T	Likely
MAMMALS					
Jaguarundi	*Herpailurus yaguarondi*			E	Unlikely
Louisiana black bear	*Ursus americanus luteolus*			T	Unlikely
Ocelot	*Leopardus pardalis*			E	Unlikely
Plains spotted skunk	*Spilogale putorius interrupta*			R	Unlikely
Red wolf	*Canis rufus*			E	Unlikely
MARINE MAMMALS					Unlikely
Blue whale	*Balaenoptera musculus*		E/D		Unlikely
Fin (finback) whale	*Balaenoptera physalus*		E/D		Unlikely
Humpback whale	*Megaptera novaeangliae*		E/D		Unlikely
Sei whale	*Balaenoptera borealis*		E/D		Unlikely
Sperm whale	*Physeter macrocephalus*		E/D		Unlikely
West Indian manatee	*Trichechus manatus*			E	Unlikely

[a]According to USFWS (2007), NMFS (2007a), and TPWD (2007).

[b]Nomenclature follows American Ornithologists' Union (AOU, 1998, 2000, 2002, 2003, 2004, 2005, 2006, 2007), Crother et al. (2000, 2001, 2003), Baker et al. (2003), Brant and Jones (2005), USFWS (2007), NMFS (2007a), and TPWD (2007).

[c]E – Endangered; T – Threatened; T w/CH – Threatened with Federal designated Critical Habitat; DL – Federally delisted; EXPN – Experimental Population; D – Depleted as defined by the Marine Mammal Protection Act; SOC – Species of Concern (NMFS only); R – Rare but with no regulatory listing status (TPWD only).

[d]On July 9, 2007, USFWS published the final rule to remove the species from the list of Federal endangered and threatened species (72 *Federal Register* 37345–37372); the rule became official on August 8, 2007.

Thirteen of the 56 wildlife species of possible occurrence listed in Table 3.15-1 are identified by USFWS and/or NMFS as federally threatened or endangered in Brazoria County. These include the smalltooth sawfish (*Pristis pectinata*), green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), Kemp's ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), piping plover (*Charadrius melodus*), whooping crane (*Grus americana*), blue whale (*Balaenoptera musculus*), fin (or finback) whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), Sei whale (*Balaenoptera borealis*), and the sperm whale (*Physeter macrocephalus*).

Nine of the 56 wildlife species listed in Table 3.15-1 are identified by NMFS as SOC: ivory bush coral (*Oculina varicosa*), dusky shark (*Carcharhinus obscurus*), largetooth sawfish (*Pristis pristis*), night shark (*Carcharhinus signatus*), saltmarsh topminnow (*Fundulus jenkinsi*), sand tiger shark (*Carcharias taurus*), speckled hind (*Epinephelus drummondhayi*), Warsaw grouper (*Epinephelus nigritus*), and the white marlin (*Tetrapturus albidus*). These species, while listed by NMFS as SOC, do not receive Federal protection under the ESA.

TPWD (2007) includes the federally listed endangered Eskimo curlew (*Numenius borealis*), endangered jaguarundi (*Herpailurus yaguarondi*), threatened Louisiana black bear (*Ursus americanus luteolus*), endangered ocelot (*Leopardus pardalis*), endangered red wolf (*Canis rufus*), and endangered West Indian manatee (*Trichechus manatus*) on their Brazoria County annotated list of rare species. USFWS (2007), however, does not include these species on their county-by-county list for Brazoria County. In addition to these, 12 species are identified by TPWD as solely State-listed threatened or endangered species in Brazoria County. These include the Texas horned lizard (*Phrynosoma cornutum*), timber rattlesnake (*Crotalus horridus*), alligator snapping turtle (*Macrochelys temminckii*), American peregrine falcon (*Falco peregrinus anatum*), Arctic peregrine falcon (*Falco peregrinus tundrius*), bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), reddish egret (*Egretta rufescens*), sooty tern (*Onychoprion fuscatus*), white-faced ibis (*Plegadis chihi*), white-tailed hawk (*Buteo albicaudatus*), and wood stork (*Mycteria americana*). These species do not receive Federal protection under the ESA, but may receive protection under other Federal and/or State laws, such as the Migratory Bird Treaty Act (MBTA), Bald Eagle Protection Act (BEPA), chapters 67, 68, and 88 of the TPWD Code, and sections 65.171–65.184 and 69.01–69.14 of Title 31 of the Texas Administrative Code.

Fifteen wildlife species listed in Table 3.15-1 are identified as rare species by TPWD (2007). Just as with the rare plants discussed in Section 3.15.1, these wildlife species also have no regulatory status. These species include the false spike mussel (*Quincuncina mitchelli*), pistolgrip (*Tritogonia verrucosa*), rock pocketbook (*Arcidens confragosus*), smooth pimpleback (*Quadrula houstonensis*), Texas fawnsfoot (*Truncilla macrodon*), American eel (*Anguilla rostrata*), sharpnose shiner (*Notropis oxyrhynchus*), gulf saltmarsh snake (*Nerodia clarkii*),

Texas diamondback terrapin (*Malaclemys terrapin littoralis*), black rail (*Laterallus jamaicensis*), Henslow's sparrow (*Ammodramus henslowii*), snowy plover (*Charadrius alexandrinus*), southeastern snowy plover (*Charadrius alexandrinus tenuirostris*), western snowy plover (*Charadrius alexandrinus rivosus*), and the plains spotted skunk (*Spilogale putorius interrupta*).

The following discusses those species listed in Table 3.15-1 that are either federally listed threatened, endangered, or SOC. Species are considered "likely to occur" in the project area if the presence of at least one individual not only has potential for occurrence, but is probable to occur. Species are considered to have "potential" for occurrence if presence of a preferred habitat type exists that has potential to sustain the species. Rarity typically refers to frequency or commonness of occurrence in a general area and does not necessarily indicate the likelihood of occurrence in the project area.

3.15.2.1 Invertebrates

Colonies of ivory bush coral (NMFS-SOC) are found to depths of 152 meters on substrates of limestone rubble, low-relief limestone outcrops, and high-relief, steeply sloping prominences (NMFS, 2007b). The project area is not located within the historical range for this species, and potential habitat is absent, and therefore this species is unlikely to occur in the project area.

3.15.2.2 Fishes

The dusky shark (NMFS-SOC) is a large shark with a wide-ranging distribution in warm-temperate and tropical continental waters. In the western Atlantic, it occurs from Massachusetts to Florida, the Caribbean, the northern Gulf, and south to northern South America (McEachran and Fechhelm, 1998; NMFS, 2007c). It is coastal and pelagic in its distribution, where it occurs from the surf zone to well offshore (McEachran and Fechhelm, 1998; NMFS, 2007c). Habits of this shark are not well known, although a number have been taken over the middle shelf (Hoese and Moore, 1998). Potential habitat is present for this species in the study area, and this species is known to occur in the northern Gulf; therefore, this species is likely to occur within the project area.

The largetooth sawfish (NMFS-SOC) is a sluggish demersal fish inhabiting near-shore marine, coastal, estuarine, and tidal freshwater habitats (NMFS, 2007d). In the U.S., historic records of largetooth sawfish exist from the northern Gulf; however, the species is considered extirpated in U.S. waters and is not likely to occur in the study area (NMFS, 2007d).

The night shark (NMFS-SOC) is a deep-water shark reported in waters from Delaware south to Brazil, including the Gulf (McEachran and Fechhelm, 1998). This shark is usually found at depths greater than 150–200 fathoms during the day and 100 fathoms at night (NMFS, 2007e). Potential habitat for this shark does not exist in the project area, and therefore this species is not likely to occur.

The saltmarsh topminnow (NMFS-SOC) is endemic to the north-central coast of the Gulf from Galveston Bay eastward to western Florida (McEachran and Fechhelm, 1998; NMFS, 2007f). They tend to live in salt marshes and brackish water. This species requires shallow flooded marsh surfaces for breeding and feeding (NMFS, 2007f). In Texas, the saltmarsh topminnow is known only from Dickinson Bayou near Galveston Bay and is not likely to occur in the project area (Hubbs et al., 1991).

The sand tiger shark (NMFS-SOC) has a broad distribution, occurring in the eastern and western Atlantic, southwestern Indian, and western Pacific oceans (McEachran and Fechhelm, 1998). In the western Atlantic, this shark occurs from the Gulf of Maine to South America, the Gulf, the Bahamas, and east to Bermuda (McEachran and Fechhelm, 1998). The species typically occurs in coastal waters, generally from the surf zone out to depths of 75 feet, although they may occur in waters with depths to 600 feet (McEachran and Fechhelm, 1998; NMFS, 2007g). They also frequent shallow bays. Hoese and Moore (1998) indicate that the sand tiger is uncommon in the Gulf, and is not likely to occur in the project area.

The smalltooth sawfish (NMFS-endangered) is a circumtropical species that typically occurs in shallow coastal waters with muddy and sandy bottoms, but also occurs in sheltered bays, on shallow banks, and in estuaries or river mouths (NMFS, 2007h). In the western Atlantic, the smalltooth sawfish historically ranged from Brazil through the Caribbean and Central America, the Gulf, and along the Atlantic coast of the United States (NMFS, 2006b). Smalltooth sawfish were historically common in the Gulf; however, since 1971, only three documented capture records of smalltooth sawfish exist from the region, all of which are from Texas (NMFS, 2006b). The current range of this species has contracted to peninsular Florida, and smalltooth sawfish are relatively common only in the Everglades region at the southern tip of the state (NMFS, 2007h). This species is extremely rare to Texas and is not likely to occur in the project area.

The speckled hind (NMFS-SOC) inhabits warm, moderately deep waters from North Carolina to Cuba, including Bermuda, the Bahamas, and the Gulf (McEachran and Fechhelm, 1998; NMFS, 2007i). The preferred habitat is hard-bottom reefs in depths ranging from 150 to 300 feet (NMFS, 2007i). This species is rare in the northwestern Gulf (Hoese and Moore, 1998) and is not likely to occur in the project area.

The Warsaw grouper (NMFS-SOC) is a very large fish found in the deep-water reefs of the southeastern U.S. This fish ranges from North Carolina to the Florida Keys and throughout much of the Caribbean and Gulf to the northern coast of South America (McEachran and Fechhelm, 1998; NMFS, 2007j). This species inhabits deep-water reefs on the continental shelf break in waters 350 to 650 feet deep (NMFS, 2007j). The Warsaw grouper is known to occur near jetties and offshore oil platforms (Hoese and Moore, 1998); however, the nearest offshore oil platform is at least 5 miles away from the project area. Although the Warsaw grouper could occur in the project area, their occurrence is not likely.

The white marlin (NMFS-SOC) is found in offshore waters throughout the tropical and temperate Atlantic Ocean and adjacent seas (McEachran and Fechhelm, 1998; NMFS, 2007k). They prefer deep blue water over 100 m deep (NMFS, 2007k). Preferred habitat for this species does not exist in the project area; therefore, this species is not likely to occur.

3.15.2.3 Reptiles

The green sea turtle (USFWS and NMFS threatened) is a circumglobal species in tropical and subtropical waters. In U.S. Atlantic waters, it occurs around the U.S. Virgin Islands, Puerto Rico, and continental U.S. from Massachusetts to Texas. Major nesting activity occurs on Ascension Island, Aves Island (Venezuela), Costa Rica, and in Surinam. Relatively small numbers nest in Florida, with even smaller numbers in Georgia, North Carolina, and Texas (Hirth, 1997; NMFS and USFWS, 1991). The green turtle in Texas inhabits shallow bays and estuaries where its principal foods, the various marine grasses, grow (Bartlett and Bartlett, 1999). While green turtles prefer to inhabit bays with seagrass meadows, they may also be found in bays that are devoid of seagrasses. The green turtles in these Texas bays are mainly small juveniles. Adults, juveniles, and even hatchlings are occasionally caught on trotlines or by offshore shrimpers or are washed ashore in a moribund condition. Green turtle nests are rare in Texas. Five nests were recorded at the Padre Island National Seashore in 1998, none in 1999, and one in 2000 (Shaver, 2000). For the last 7 years, up to five nests per year have been recorded from the Texas coast, including three in 2007 (National Park Service [NPS], 2006, 2007; Shaver, 2006). Since long migrations of green turtles from their nesting beaches to distant feedings grounds are well documented (Green, 1984; Meylan, 1982), the adult green turtles occurring in Texas may be either at their feeding grounds or in the process of migrating to or from their nesting beaches. The juveniles frequenting the seagrass meadows of the bay areas may remain there until they move to other feeding grounds or, perhaps, once having attained sexual maturity, return to their natal beaches outside of Texas to nest. The USACE Sea Turtle Data Warehouse (USACE, 2008b) maintains records of documented incidental takes of sea turtles as a result of hopper dredging activities throughout southeastern coastal waters. Incidences involving impacts to two green sea turtle individuals within Freeport Harbor Channel were recorded in 2006. One incident regarding impact to an individual green sea turtle within the Outer Bar and Jetty channels was documented in 2007. These documented events provide clear indication of the likelihood of these turtles occurring within the project area.

The hawksbill sea turtle (USFWS and NMFS endangered) is circumtropical, occurring in tropical and subtropical seas of the Atlantic, Pacific, and Indian oceans (Witzell, 1983). This species is probably the most tropical of all marine turtles, although it does occur in many temperate regions. The hawksbill sea turtle is widely distributed in the Caribbean Sea and western Atlantic Ocean, with representatives of at least some life history stages regularly occurring in southern Florida and the northern Gulf (especially Texas), south to Brazil (NMFS, 2006c). The hawksbill generally inhabits coastal reefs, bays, rocky areas, passes, estuaries, and

lagoons, where it occurs at depths of less than 70 feet. Like some other sea turtle species, hatchlings are sometimes found floating in masses of marine plants (e.g., sargassum rafts) in the open ocean (National Fish and Wildlife Laboratory [NFWL], 1980). In the continental U.S., the hawksbill largely occurs in Florida where it is sporadic at best. In 1998 the first hawksbill nest recorded on the Texas coast was found at Padre Island National Seashore. This nest remains the only documented hawksbill nest on the Texas coast (NPS, 2007). Elsewhere in the western Atlantic, hawksbills nest in small numbers along the Gulf Coast of Mexico, the West Indies, and along the Caribbean coasts of Central and South America (Musick, 1979). Texas is the only state outside of Florida where hawksbills are encountered with any regularity. Most of these sightings involve posthatchlings and juveniles and are primarily associated with stone jetties. These small turtles are believed to originate from nesting beaches in Mexico (NMFS, 2006c). This species is likely to occur in the study area. The USACE Sea Turtle Data Warehouse (USACE, 2008b) has yet to document any incidental takes of this species in the Galveston District.

Kemp's ridley sea turtle (USFWS and NMFS endangered) inhabits shallow coastal and estuarine waters, usually over sand or mud bottoms. Adults are primarily restricted to the Gulf, although juveniles may range throughout the Atlantic Ocean since they have been observed as far north as Nova Scotia (Musick, 1979) and in coastal waters of Europe (Brongersma, 1972). Almost the entire population of Kemp's ridley nests on an 11-mile stretch of coastline near Rancho Nuevo, Tamaulipas, Mexico, approximately 190 miles south of the Rio Grande. Sporadic nesting has been reported from Mustang Island, Texas, southward to Isla Aquada, Campeche. Kemp's ridley occurs in Texas in small numbers and in many cases may well be in transit between crustacean-rich feeding areas in the northern Gulf and breeding grounds in Mexico. It has nested sporadically in Texas in the last 50 years. The number of nestings in Texas, however, has increased over the last 12 years from 4 nests in 1995 to 51 nests in 2005, to a record 128 nests in 2007, 73 of which were from the Padre Island National Seashore (NPS, 2006, 2007; Shaver, 2006). Several of the ridley nests were from headstarted individuals. Such nestings, together with the proximity of the Rancho Nuevo rookery, probably account for the occurrence of hatchlings and subadults in Texas. Kemp's ridley has been recorded from the study area. In 1994, an angler accidentally caught a headstarted Kemp's ridley on a rod and reel in the GIWW and later released the turtle alive (TXNDD, 2007). This species has also nested in the study area. One nest was found on Quintana Beach in 2002, and another was found near Surfside Beach in 2003 (Yeargan, 2006). In 2006, one nest was found on Surfside Beach (Echols, 2006), while two nests were found on Surfside Beach and one on Bryan Beach in 2007 (NPS, 2007). The USACE Sea Turtle Data Warehouse (USACE, 2008b) documents the taking of two Kemp's ridley turtles within the Outer Bar and Jetty channels in 2007. Thus, this species is likely to occur in the project area.

The leatherback sea turtle (USFWS and NMFS endangered) is probably the most wide-ranging of all sea turtle species. It occurs in the Atlantic, Pacific, and Indian oceans; as far north as British Columbia, Newfoundland, Great Britain, and Norway; as far south as Australia, Cape of

Good Hope, and Argentina; and in other water bodies such as the Mediterranean Sea (NFWL, 1980). The leatherback is mainly pelagic, inhabiting the open ocean, and seldom approaches land except for nesting (Eckert, 1992) or when following concentrations of jellyfish (TPWD, 2006), when it can be found in inshore waters, bays, and estuaries. It dives almost continuously, often to great depths. Leatherbacks nest primarily in tropical regions and only sporadically in some of the Atlantic and Gulf states of the continental U.S., with one nesting reported as far north as North Carolina (Schwartz, 1976). In the Atlantic and Caribbean, the largest nesting assemblages occur in the U.S. Virgin Islands, Puerto Rico, and Florida (NMFS, 2006c). No nests of this species have been recorded in Texas for at least 70 years (NPS, 2007); the last two, one from the late 1920s and one from the mid-1930s, were both from Padre Island (Hildebrand, 1982, 1986). Apart from occasional feeding aggregations such as the large one of 100 animals reported by Leary (1957) off Port Aransas in December 1956, or possible concentrations in the Brownsville Eddy in winter (Hildebrand, 1983), leatherbacks are rare along the Texas coast, tending to keep to deeper offshore waters where their primary food source, jellyfish, occurs (NMFS and USFWS, 1992). Although this species is unlikely to occur along the Texas coast, a leatherback was caught by a relocation trawler in a shipping channel approximately 1.5 miles north of Aransas Pass in 2003 (NMFS and NOAA, 2003). The USACE Sea Turtle Data Warehouse (USACE, 2008b) has yet to report any documented incidental takes of this species in the Galveston District.

The loggerhead sea turtle (USFWS and NMFS threatened) is widely distributed in tropical and subtropical seas, being found in the Atlantic Ocean from Nova Scotia to Argentina, the Gulf, the Indian and Pacific oceans (although it is rare in the eastern and central Pacific), and the Mediterranean Sea (Iverson, 1986; Rebel, 1974; Ross, 1982). In the continental U.S., loggerheads nest along the Atlantic coast from Florida to as far north as New Jersey (Musick, 1979) and sporadically along the Gulf coast, including Texas. Like the worldwide population, the population of loggerheads in Texas has declined. The loggerhead is the most abundant turtle in Texas marine waters, preferring shallow inner continental shelf waters and occurring only very infrequently in the bays. It is often seen around offshore oil rig platforms, reefs, and jetties. Loggerheads are probably present year-round but are most noticeable in the spring when one of their food items, the Portuguese man-o-war, is abundant. Loggerheads constitute a major portion of the dead or moribund turtles washed ashore (stranded) on the Texas coast each year. A large proportion of these deaths are the result of accidental capture by shrimp trawlers, where caught turtles drown and their bodies are thrown overboard. In 1999, two loggerhead nests were confirmed in Texas, while in 2000, five loggerhead nests were confirmed (Shaver, 2000). Between 2001 and 2005, up to five loggerhead nests per year were recorded from the Texas coast (Shaver, 2006); in 2007, six loggerhead nests were recorded (NPS, 2007). Between 1995 and 2000, eight loggerheads were caught in Freeport Harbor, and during Freeport Harbor maintenance dredging (July 13 to September 24, 2002), a relocation trawler captured one loggerhead (NMFS and NOAA, 2003). More recently, an additional loggerhead was incidentally taken in the Outer Bar and Jetty channels in 2007 USACE (2008b) as a result of dredging

activities. Since the species has been recorded from the study area, it is therefore likely to occur within the project area.

3.15.2.4 Birds

The bald eagle is present year-round in Texas, including breeding, wintering, and migrating birds. In Texas, bald eagles breed along the Gulf Coast and on major inland lakes and reservoirs in the eastern two-thirds of the state (Lockwood and Freeman, 2004). Additional numbers of bald eagles winter in these habitats, as far west as the Trans-Pecos (Lockwood and Freeman, 2004). Bald eagles prefer large bodies of water surrounded by tall trees or cliffs, which they use as nesting sites (Buehler, 2000). On July 9, 2007, the USFWS published its final ruling to remove the bald eagle from the list of endangered and threatened wildlife (72 *Federal Register* 37345–37372), and the change of listing status became official on August 8, 2007. The bald eagle will still receive protection at the State level and under provisions of the BEPA and the MBTA. Ortego (2002, 2005) identified 160 nesting territories statewide, of which at least 4 currently exist in Brazoria County. Ortego (2005) does not disclose the locations of bald eagle nests; therefore, the exact locations of the nests are unknown. TXNDD (2007) indicates an active bald eagle territory north of Freeport, between Clute and Oyster Creek (TPWD nest #020-8A). The species is likely present in Brazoria County at some time during the year; however, no suitable nesting habitat is present in the project area.

The piping plover (USFWS threatened) is a small shorebird that inhabits coastal beaches and tidal flats. Approximately 35 percent of the known global population of piping plovers winters along the Texas Gulf Coast, where they spend 60 to 70 percent of the year (Campbell, 1995; Haig and Elliott-Smith, 2004). The piping plover population that winters in Texas breeds on the northern Great Plains and around the Great Lakes. The species is a common migrant and rare to uncommon winter resident on the upper Texas coast (Lockwood and Freeman, 2004; Richardson et al., 1998). The USFWS has designated critical habitat for the species in its nesting and wintering range (65 *Federal Register* 41781–41812). Designation of critical habitat became final on July 10, 2001 (66 *Federal Register* 36038–36143), and was modified on May 19, 2009 (74 *Federal Register* 23475-23600). Critical Habitat Unit TX-33 encompasses approximately 211 acres between the mouth of the Brazos River and FM 1495 and includes Bryan Beach and adjacent beach habitat (74 *Federal Register* 23475-23600), which occurs in the study area. Although TXNDD (2007) maps show no documented records within the project area, this species is likely to occur.

The whooping crane (USFWS endangered) is a large wading bird that in the last 50 years has returned from the brink of extinction. Currently, only two wild populations of whooping cranes exist, the largest of which is the self-sustaining Aransas/Wood Buffalo population, which breeds in Wood Buffalo National Park in northern Canada and migrates annually to Aransas NWR and adjacent areas of the central Texas coast in Aransas, Calhoun, and Refugio counties where it

winters (Lewis, 1995; USFWS, 1995). A second, smaller experimental nonessential population was reintroduced in 1993 in Florida (Lewis, 1995). In Texas, the whooping crane's wintering habitat includes estuarine marshes, shallow bays, and tidal flats, and occasionally nearby rangelands or farmlands. During migration, whooping cranes stop over at wetlands and pastures to roost and feed. According to the USFWS (1995), Brazoria County is within the species' migration corridor; however, the species is unlikely to occur in the study area because of the absence of suitable wintering habitat. TXNDD (2007) indicates documented records of whooping cranes from marshes west of the Brazos River; however, these likely represent vagrant birds, and no wintering populations are known from the study area, and thus this species is not likely to occur in the project area.

3.15.2.5 Mammals

The blue whale (NMFS endangered) is the largest of all whales and ranges worldwide, where it occurs in both coastal and pelagic environments. The blue whale is considered only an occasional visitor in the U.S. Atlantic waters (NMFS, 2007l). This may represent the southern limit of the western North Atlantic blue whale's feeding range, although the actual southern limit of its range is unknown (NMFS, 2007l). Blue whales are accidental visitors to the Gulf, and only two documented records exist from Gulf waters (Schmidly, 2004). The only documented Texas record is of a stranded individual between Freeport and San Luis Pass in 1940 (Schmidly, 2004). The blue whale is not expected to occur in the project area.

The fin whale (NMFS endangered) is a nomadic offshore species that occurs worldwide. Fin whales occur in high latitudes during the summer and spring, while in the fall these whales migrate several thousand miles to equatorial waters to mate and calve (NMFS, 2007m). While the fin whale has been recorded year-round in the Gulf, only one documented record exists from Texas, a stranded individual found at Gilchrist, Chambers County, in 1951 (Schmidly, 2004). The fin whale is not expected to occur in the project area.

The humpback whale (NMFS endangered) is a highly migratory species with worldwide distribution. During the winter breeding season, humpbacks occur in temperate and tropical waters of both hemispheres, while in the summer feeding season, most humpbacks occur in higher-latitude waters with high biological productivity (NMFS, 2007n). There are currently four recognized stocks (based on geographically distinct winter ranges) of humpback whales in the U.S.: Gulf of Maine, the eastern North Pacific, the central North Pacific, and the western North Pacific stocks (NMFS, 2007n). In the Gulf, humpbacks have occurred around the Florida Keys, the west coast of Florida, Alabama, and Cuba (Schmidly, 2004; Tove, 2000). Only one documented humpback has occurred in Texas waters, an immature individual observed in 1992 at Bolivar Jetty near Galveston (Schmidly, 2004). The species is very rare in the Gulf and is unlikely to occur in the project area.

The sei whale (NMFS endangered) is a migratory species that occurs in both hemispheres, but is generally restricted to mid-latitude oceans. During the winter breeding season, sei whales occur in subtropical and tropical waters of both hemispheres, while in the summer, they move to high-latitude feeding grounds (NMFS, 2007o). In the western North Atlantic, sei whales occur offshore from the Gulf and Caribbean Sea north to Nova Scotia and Newfoundland (Schmidly, 2004; Tove, 2000). Stranding records exist from Louisiana and Florida; however, no Texas records exist (Schmidly, 2004). The sei whale is not expected to occur in the project area.

The sperm whale (NMFS endangered) is a migratory species with worldwide distribution. Sperm whales inhabit deep waters (1,970 feet or more, and less commonly in waters less than 985 feet deep) (NMFS, 2007p). Their distribution is dependent on their food source and suitable conditions for breeding, and varies with the sex and age composition of the group. Sperm whale migrations are not as predictable or well understood. In some mid-latitudes, there seems to be a general trend to migrate north and south depending on the seasons (whales move poleward in the summer). However, in tropical and temperate areas, there appears to be no obvious seasonal migration (NMFS, 2007p). The sperm whale is the most common large whale in the Gulf, and aerial and shipboard sightings off the Texas Coast are common (Schmidly, 2004). Stranding and sighting records have occurred in every month, suggesting a stock unique to the Gulf, although this remains unsubstantiated (Schmidly, 2004). Although the sperm whale is known to occur in the Gulf, they typically inhabit the deepest offshore waters and are not likely to occur in the project area.

3.16 CULTURAL RESOURCES

The project area is located in Brazoria County, Texas, which is part of the Southeast Texas Archeological Region of the Eastern Planning Region of Texas (Kenmotsu and Perttula, 1993). The cultural history of the study area has been assigned to four primary developmental periods: 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.

The earliest generally accepted culture of the Americas, the Paleoindian (10,000–6500 B.C.), 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, 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. 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 farther inland where the environment is characterized by a mixture of deciduous and pine woodlands (Aten, 1983). According to Aten (1983), this type of habitat typically supports low-density human populations. Archeological evidence synthesized by Story et al. (1990) from numerous counties composing 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 that migrated widely in pursuit of seasonal subsistence resources.

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 (7000 B.C.–A.D. 700), this next period of cultural development in the New World has been further subdivided into Early, Middle, and Late subperiods based on changes observed in the archeological record, which 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 Coastal 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 archeological 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. 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).

The Late Preceramic, which coincides in part with the 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 intrasite artifact frequencies (Aten, 1983). Hall (1981) has 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 that 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).

The Late Prehistoric, or Ceramic period (700–1519 A.D.), cultures experienced a relatively static environment. This period lasted from the time when ceramics were adopted until European interaction with the aboriginal populations became firmly established.

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 helped to decimate 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.

3.16.1 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 natives of southwestern Louisiana. The Karankawan groups spoke a language of the Coahuiltecan family and were more closely related to the Indians farther south in Texas and Mexico.

In spite of differences in language and apparent cultural derivation, the Atakapa and Karankawa maintained similar cultural patterns (Ricklis, 1996). Both groups were nomadic, although the Atakapa maintained semipermanent winter villages in the interior. 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. Conical huts and skin tents served as shelter for the Atakapa, while the Karankawa lived in portable windbreak-style huts. 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, the bow and arrow, 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 groups were equally unprepared to defend themselves and their cultural traditions from the newly arrived Europeans. By the late eighteenth century, both the Atakapa and Karankawa peoples were in serious decline (Ricklis, 1996).

3.16.2 European Exploration and Colonization

European exploration of the Texas coast began, albeit by accident, in November 1528. Álvar Núñez Cabeza de Vaca was a member of the Narváez expedition that was destined for Pánuco (Tampico), Mexico. Cabeza de Vaca and his men were plagued with misfortune when the expedition departed from Florida in April (Creighton, 1975). While adrift and seeking fresh water, Cabeza de Vaca's group discovered the mouth of the Brazos River, naming it Los Brazos de Dios, the Arms of God.

French exploration of Texas in the seventeenth century was focused primarily in the Matagorda Bay area. René Robert Cavelier, Sieur de La Salle traversed the Brazos River in 1686, though his journey did not take him to the river's mouth. An unfortunate malady that occurred at this time inspired La Salle to name the river the Rivière Maligne. While crossing the river on a raft, La Salle's servant Dumesnil was pulled into the water by an alligator and killed (Weddle, 1991).

The Spanish conducted preliminary exploration and mapping of the Freeport area in the early eighteenth century. In 1724, Brigadier Pedro de Rivera y Villalón began a 3-year-long inspection tour of the 23 military outposts in northern New Spain (Chipman 1992; Weddle 1991). A series of six maps of northern New Spain created by Francisco Alvarez Barriero during the expedition is considered the first attempt at a systematic mapping of Texas (Weddle, 1991). Following this study, the Texas governor was required to conduct an annual surveillance of the coast from Matagorda Bay to the Sabine River (Weddle, 1991).

Captain Carlos Luis Cazorla conducted a survey in 1772 to identify the level of trade between the local tribes and newly established English trading posts. On his return trip he traveled down

the Brazos to its entry into the Gulf, near present-day Freeport. He discovered that the stream divided into two channels with a maze of lagoons. This was the first exploration of the mouth of the Brazos (Weddle, 1992). Ineffectual organization and motivation prevented additional substantial exploration of the Texas coast east of Matagorda Bay. It would not be until the early nineteenth century that successful immigration to the Brazos would be realized.

3.16.3 Early Settlements (1800–1835)

In 1821 the governor of Texas, Antonio Martínez, granted permission to Moses Austin for the creation of Mexican colonies in Texas. After Moses's death later that year his son, Stephen F. Austin, selected the lands for colonization. Austin organized a group of 18 immigrants that landed at the mouth of the Brazos River in late December 1821 (Bugbee, 1899). Though they mistakenly landed at the Brazos River instead of the intended destination of the Colorado River, the group labored for several weeks exploring the immediate area and building seven boats for carrying their supplies upriver. In February, the party journeyed up the Brazos until the first "high land" was sighted. At this site (Velasco), a large log house was erected and preparations were made for planting a corn crop (Bugbee, 1899). Asa Mitchell arrived at the mouth of the Brazos in January 1822 and opened a salt-manufacturing business (Creighton, 1975). He received the title to this land in 1824 and lived in the Velasco area until moving to Washington-on-the-Brazos in 1835, thus becoming possibly the first colonist to settle permanently at the site (Earls et al., 1996).

The advantageous location of Mitchell's land grant, at the juncture of the Brazos River and the Gulf, persuaded Austin in 1823 to propose the location as a port. Austin acknowledged, in December of 1835, that Velasco was without a natural harbor and also had a treacherous sand bar at the mouth of the river (Earls et al., 1996). Despite these drawbacks, entrepreneurs encouraged steamboat navigation on the Brazos to cater to the cotton plantations along the river. The establishment of a trading post at Bell's Landing (now East Columbia) by John Richardson Harris in the 1820s encouraged the use of the river for the trade and transportation of commodities. Harris's small schooner, *The Rights of Man*, may have been the first vessel specially designated for trade between the Brazos River, Galveston Bay, and New Orleans (Earls et al., 1996). The popularity of Velasco as a commercial trade center was superceded by Brazoria, 15 miles upriver, which had been established about 5 years earlier. In 1833, Mitchell formed a land association with his neighbors William H. Wharton and Branch T. Archer. This collaboration would develop Mitchell's property into a thriving river and seaport (Earls et al., 1996).

Increased immigration into Texas in the 1820s possibly encouraged Mexico to create several military outposts, one of which was established at Velasco in 1831 (Rowe, 1903). Asa Mitchell was commissioned to serve as a boarding officer at Velasco by the fall of that year (Earls et al., 1996). With the establishment of the fort and customhouse at Velasco, the Mexican government

attempted to forcibly regulate Brazos River traffic and exert tax and customs control. The conflicts created by these new restrictions culminated at Velasco in 1832. In response to friction between Mexican authority and the colonists, 150 men gathered to attack General Ugartechea at Velasco. The Mexican force commanded by Ugartechea was composed of 91 men. On June 26, three divisions of colonists attacked the fort until sunrise the following morning (Rowe, 1903). The fort's cannon fired upon the town's structures, destroying all but the customhouse and a small office (Smith, 1910). Surrender was negotiated on June 29, in which Ugartechea's troops were ordered to withdraw (Rowe, 1903).

Following the battle, Mitchell began to sell portions of his property, possibly to facilitate town rebuilding. In addition to the public sale of lots, the Velasco Association also announced construction of a major hotel to accommodate its many anticipated visitors. A nationwide cholera epidemic finally touched Velasco in the spring of 1833; only 12 of the 20 townspeople survived. This tragedy, and a diversion of town resources towards Texas's quest for independence, would quell the building initiative envisioned by the Velasco Association. Their grand designs would not again be revisited until after the conclusion of the Texas Revolution in 1836 (Earls et al., 1996).

3.16.4 Texas War for Independence (1835–1836)

Though Velasco was not a location of direct military engagements after 1832, it was used as a training post for Texas militia. John Sowers Brooks began drilling 250 men in late December 1835 (Roller, 1906). Anticipating a military conflict with Mexico, the abandoned fort at Velasco was refortified with a long 18-pound cannon and several smaller artillery pieces (Earls et al., 1996). Though humble in appearance, the fort was described as the best coastal defense work in Texas in May of 1836 (Pierce, 1969).

Velasco itself did not witness growth during the years of conflict (Earls et al., 1996); however, its location at the mouth of the Brazos River was strategically important to the movement of troops and supplies throughout Texas. The region experienced a marked increase in maritime activity during the Texas Revolution. Quintana, Velasco's competitor on the river's east bank, was also the location for the mercantile house of Thomas McKinney and Samuel Williams. This commercial house is accredited with establishing the first regular steam commerce on the Brazos and served plantation owners such as William Wharton (Puryear and Winfield, 1976). It was also instrumental in providing funds and military supplies for the Texas cause (Miller, 2004). Military supplies for the Texas volunteers were stored in warehouses in Velasco and Quintana (Miller, 2004). Vessels transported supplies and volunteers from New York and New Orleans to both Quintana and Velasco (Brinkley, 1937). These materials were then transshipped to locations such as Galveston, Matagorda, Columbia, and Copano Bay (Brinkley, 1936).

Velasco was homeport to the vessels *Invincible*, *Yellow Stone*, and *Independence*. The schooners *Invincible* and *Independence* were both purchased as vessels of the "privateer" Texas navy organized in 1836 (Barker, 1927; General Council, 1839). The steamboat *Yellow Stone* was used by Sam Houston to transport troops and supplies across the Brazos River in April 1836 (Hardin, 1992).

The surrender of the Mexican army at San Jacinto was negotiated in the Treaty of Velasco, signed at Velasco on May 14, 1836, by Antonio López de Santa Anna and David G. Burnet, ad interim president of Texas. Santa Anna was forced to stay on the schooner *Invincible* when Texas troops under Thomas Jefferson Green refused to allow his departure to Veracruz. Santa Anna spent the next several months as a prisoner at Velasco until he was moved to Columbia towards the end of the year (Miller, 2004).

3.16.5 Texas Republic (1836–1845) and Early Statehood (1845–1862)

Following the battle of San Jacinto, ad interim President David G. Burnet selected Velasco as the location for his government offices (Winkler, 1906). Velasco was never able to earn the distinction of being Texas's "first capital," as the seat of government was transferred to Columbia in October 1836 (Pierce, 1969). Brazoria County was subsequently created on December 20, 1836. Velasco, Columbia, and Brazoria were incorporated in June 1837. These first few years of the Texas Republic, from 1836 to 1840, were the greatest period of development for Velasco (Earls et al., 1996).

At the close of the war, and with the resumption of port and customs activities, Velasco received renewed commercial interest. The Velasco Association reorganized and expanded its membership to include such key individuals as Jeremiah Brown and Isaac Hoskins. The year 1837 was both the height of land sales/building activity in Velasco and the beginning of a boom in port activity. An average of 425 persons arrived annually at Velasco in 1837, 1838, and 1839. Velasco additionally had an average of 36 vessels visiting its port annually during the Republic years. The largest number of vessels to anchor at Velasco was 85 in 1838 (Earls et al., 1996).

Velasco's growth and importance as a commercial entity declined with the emergence of Galveston as one of Texas's principal ports. An analysis of commercial activity in 1839 demonstrated that even with Galveston's more-abundant maritime traffic, its export value was nearly matched by Velasco. Additionally, delayed effects of an economic depression in 1837 would impact the value of property lots, causing them to crash near the end of 1839 (Earls et al., 1996). The economic crash and the effects of reoccurring storms would quash Velasco's continued growth and development as a commercial center.

In an attempt to sustain Velasco's role in trade, a steam vessel, *Lafitte*, was built in 1840 to run on the Brazos between Velasco, Galveston, and the Sabine River (Earls et al., 1996). The use of the *Lafitte* for Brazos River shipping was fleeting. In 1842, with renewed hostilities with

Mexico, the *Lafitte* was pressed into Texas government service as she lay at anchor in Galveston Bay (Haviland, 1852). In this same year, Sam Houston spent $9,000–10,000 fortifying the 370-mile Texas coastline at three places: Galveston, Velasco, and Matagorda (Wells, 1960). The effort to reinforce and protect Texas's coast, however, did not prevent the economic demise of Velasco.

The decline in shipping at Velasco, combined with the associated hazards of its riverine access, initiated the overland transportation of goods in this area. In the waning years of the Republic period, Velasco continued to depreciate in both real estate and shipping. A major tropical storm in 1842 dropped Velasco's sea trade to only five vessels in that year. By the mid-1840s Velasco had digressed from its reputation as "coming city of the Gulf" to a seaside resort and mail stop (Earls et al., 1996).

In spite of the difficulties at Velasco, the Brazos area prospered in cotton and sugar. Planters transported their goods overland and shipped them from Galveston. In the 1850s a proposed intracoastal waterway between Velasco and Galveston promised to bring more commercial activity to the mouth of the Brazos. With completion of the canal in 1856, sternwheel steamers transported cargoes from Galveston up the Brazos River. Rather than revitalize maritime commerce in this area, the waterway circumvented trade from Velasco to Galveston (Dorchester, 1936). Planters continued to ship goods down the waterway to Galveston, which as a consequence bolstered the city's now undeniable reputation as a maritime trade center.

3.16.6 American Civil War (1861–1865)

In antebellum Texas, in the region of Houston and Galveston, the farming of cotton and sugarcane was highly profitable. Planters along the Brazos River were increasingly dependent on slave labor. In 1860, 18 of the state's 44 slaveholders resided in Brazoria, Wharton, and Fort Bend counties. Many of the planters who lived in this region were very wealthy; one-fifth of all Texans with estates valued at over $100,000 were from these three counties. These slaveholders collectively owned more than 100 slaves. The dependence on slave labor created unyielding support for secession, and an overwhelming majority of residents voted in favor of withdrawal from the Union on February 23, 1861 (Buenger, 1984).

Texas itself became important as a source of military supplies for the Trans-Mississippi region of the Confederacy (Barr, 1961). Federal gunboats patrolled the Texas coastline in an effort to blockade strategic waterways such as Galveston Bay and the Sabine River. Forts were erected at Quintana and Velasco (Looscan, 1898). At the outbreak of the Civil War there were only four Federal blockaders operating off the Texas coast. In January 1862, the ships *Midnight*, *Arthur*, and *Rachel Seaman* shelled the coastal fortifications at both Aransas Pass and Velasco (Barr, 1961). The fort at Velasco fired upon the vessels with such accuracy that the captain of the

Midnight thought the fort was defended by heavy (possibly rifled) guns. The fort had only a single piece of artillery, an 18-pounder (Creighton, 1975).

Following Confederate victories at Galveston and Sabine Pass in 1863 and with Union possession of the southern half of Texas's coast, Confederate forces concentrated on holding Sabine Pass, Galveston, and Velasco at all costs. Velasco itself was so heavily reinforced, with a battery of six 32-pounders, that Federal blockaders never engaged the fort for any great length of time. By late 1864 the number of cannons at Velasco had increased to 8, with Galveston having a total of 41 cannons. Blockade-running in Texas had grown to such an extent that by 1865 the blockade squadron off the Texas coast had no fewer than 20 ships (Barr, 1961).

3.16.7 Post–Civil War and Early Industrial Revolution (1865–1910)

With the close of the Civil War and the abolition of slavery, the commercial viability of Velasco and Quintana became greatly depressed. At the end of the nineteenth century Velasco had only a general store and boat-builder's shop. Only 2 of the 20 plantations in Brazoria County were still held by their prewar owners, the rest having been sold or lost to taxes (Earls et al., 1996).

Storms in the late 1860s and early 1870s forced many families to move inland or leave the area altogether. The remaining Velasco lands were sold in 1872 and transferred to the Texas Land Company. With the acquisition of these properties, Velasco ceased to be a municipal entity. The great storm of 1886 and the hurricane that followed in 1887 destroyed any remaining town structures (Earls et al., 1996).

At the urging of W.M.D. Lee, Velasco was redeveloped in order to facilitate the building of a deepwater port at the mouth of the Brazos River. Lee was a Texas cattle baron and oilman. He believed a deepwater port at the mouth of the Brazos was the best way to move his cattle to market (Earls et al., 1996). In February 1888, Lee filed his charter for the Brazos River Channel and Dock Company. When construction began in April 1889, the influx of workers increased the population of Velasco from 50 residents to 700 by the end of the year (Earls et al., 1996). A new location for Velasco was surveyed and laid out in 1891, with the old site becoming the town of Surfside. Surfside was platted as a resort town, and a large beachfront hotel was built to help raise funds for the construction project (Earls et al., 1996). The Galveston hurricane of 1900 destroyed much of the Brazoria County coastline, including the hotel. A second hotel, built on its original site, was destroyed by fire in 1904 (Earls et al., 1996). These successive events destroyed any remaining impetus for the development of commercial enterprise at this location until the founding of Freeport in 1912.

The City of Freeport, Texas, was founded on November 20, 1912, on the west bank of the Brazos River and adjacent to the historic site of Velasco (Freeport Townsite Company, 1912). The Brazos River itself was strategically important for the transportation of needed goods and

supplies inland. The importance of this riverine passage to mercantile trade preempted the founding of Freeport, as well as Velasco and historic Quintana.

3.16.8 File and Literature Review

A site file and records review was conducted for the Freeport Channel Widening Project in Brazoria County. The files at the Texas Archeological Research Laboratory (TARL) at The University of Texas at Austin and at the Texas Historical Commission (THC) were both examined for the location of recorded terrestrial archeological sites, listed National Register of Historic Places (NRHP) properties, State Archeological Landmark (SAL) sites, and Texas Historic Markers. The shipwreck files at the THC's State Marine Archeologist's Office were also examined for the location of plotted shipwrecks. The results of the file and literature review are presented in the following section.

3.16.9 Previous Investigations

Several terrestrial and marine archeological investigations have been conducted in the project area surrounding Freeport, Texas. The previous projects relevant to this project consist of terrestrial surveys and data recovery projects, marine surveys and diver investigations, and archival research. These projects are summarized below.

In 1975 the USACE contracted with the Texas A&M Research Foundation to conduct an intensive archeological survey of an area between the Brazos River Diversion Channel and the Freeport Harbor navigation channel (Ippolito and Baxter, 1976). One prehistoric site (41BO117) and three historic sites (41BO116, 41BO123, and 41BO125) were recorded as a result of this effort. Site 41BO117 was recorded as a prehistoric shell midden. However, subsequent research determined this site was not cultural in origin, and the location is no longer considered an archeological site. Site 41BO116 consists of two earthen mounds used as gun batteries during World War II. Site 41BO123 is the cemetery for the old city of Quintana. Site 41BO125 was originally recorded as the location of Fort Velasco. However, subsequent investigations identified this site as part of the community of Quintana (Fox et al., 1981).

In 1977, the USACE contracted with Odom Offshore Surveys, Inc. (Odom) to conduct a marine magnetometer survey for the Freeport Harbor, Texas 45-foot Project (Odom, 1978). The survey covered portions of the ship channel, an area north of the North Jetty, and an offshore PA. The survey resulted in the identification of seven magnetic anomalies that required additional research.

In 1978, the USACE contracted with Fairfield Industries to conduct additional marine magnetometer survey of the anomalies identified during the survey by Odom (Lawrence and Hole, 1979). This survey resulted in the reidentification of the anomalies identified during the previous survey conducted by Odom and the identification of numerous additional anomalies.

Based on additional research, 18 magnetic anomalies were recommended for additional investigations.

In 1979, the USACE requested the NPS conduct diver investigations on a cluster of magnetic anomalies identified during the Fairfield investigations (Murphy and Lenihan, 1980). As a result of this investigation, the cluster of magnetic anomalies was identified as portions of a modern shipwreck.

In 1980, the USACE contracted with the Cultural Resources Laboratory of TAMU to conduct diver investigations on six of the magnetic anomalies identified during the Fairfield Survey (Bond, 1980). All six of the anomalies were identified as either not being cultural or historic in origin.

In 1980, the USACE contracted with the Center for Archaeological Research, University of Texas at San Antonio to conduct extensive testing at the communities of Quintana (41BO125) and Velasco (41BO135) (Fox et al., 1981). Based on this fieldwork, it was determined that very little of either community survived. The lack of structural remains at both locations is attributed to severe and numerous hurricanes, modern street building, drainage, and large surface modifications.

In 1981, the USACE contracted with the Archaeology Program of the Institute of Applied Sciences, North Texas State University, and TAMU's Department of Nautical Archaeology to conduct additional diver investigations on five of the anomalies identified during the Fairfield survey (Hays, 1981). This work identified three of the anomalies as modern, and no source could be identified for the remaining two anomalies. All five of the anomalies were recommended as not being of historic interest.

In 1988 the USACE contracted with Coastal Environments, Inc. to conduct emergency investigations on a shipwreck discovered during the construction of the North Jetty (Pearson, 1989). The shipwreck was identified as the *General C.B. Comstock* (41BO171), a USACE self-propelled hopper dredge that burned and sank in 1913. The USACE contracted with CEI to perform data recovery on the *General C.B. Comstock* since construction on the North Jetty would totally destroy the ship (James et al., 1991).

Prewitt and Associates, Inc. (PAI) in late 1992 and early 1993 conducted site testing and data recovery at the old Velasco townsite (41BO125) for the USACE. Erosion of the northeast bank of the channel, dredged as part of the 45-foot Project, had exposed cultural materials from the Velasco townsite. A 200-x-400-feet (61.0-x-121.9-meter) area centered over the exposed culture material was selected for archeological assessment. Over 475 features, including 311 postholes, were recorded. The majority of the large artifact assemblage recovered from the site supports an 1830–1840s habitation date. Planned improvements to the channel included construction of a

new jetty inland of the PAI project area. Portions of the Velasco townsite were later destroyed to accommodate creation of the new jetty (Earls et al., 1996).

Following the excavations conducted by PAI at Velasco townsite in 1992 and 1993, the USACE funded production of two catalogs illustrating the transfer-print ceramics collected by the Brazosport Archaeological Society at Velasco and Quintana (Blake and Freeman, 1998; Pollen et al., 1995). The 1995 catalog of Velasco transfer-printed ceramics features only the artifacts recovered by Brazosport Archaeological Society though many examples are portions of vessels collected during the 1992–1993 excavation. Over 400 ceramic vessels are represented in this study. The ceramic artifacts were collected in the general vicinity of the former 1917 lighthouse and related parking lot.

In the summer and fall of 1994, PAI conducted archival research as an aid in determining property ownership boundaries related to Civil War fortifications and bombardment sites (Freeman, 1995). Research was focused in the area of the Brazos River mouth at Quintana and Velasco, and at Virginia Point in Galveston, Texas.

Between 1996 and 1997, PBS&J conducted reconnaissance-level archival research along the GIWW in preparation for proposed channel modifications (Hoyt et al., 1999). The study area encompassed the full length of the GIWW between High Island and the Brazos River Floodgate. Over 200 cartographic sources were reviewed for the study; 194 properties of unknown significance were identified, 50 of which are within the vicinity of the current project area. These properties ranged from graveyards to historic buildings, forts, bridges, and shipwrecks.

In 1999, PBS&J evaluated historical sites, both terrestrial and nautical, in relation to proposed channel modifications along the GIWW (Hoyt et al., 1999). Thirteen shipwrecks were identified in the report, lying between Oyster Creek and the Brazos River. Eight of these shipwrecks are located in or near the survey area. The locations for all the shipwrecks in this study were drawn from historical and archival sources.

In 2005, Shiner Mosley and Associates contracted with PBS&J to conduct marine surveys for the Freeport Harbor Ship Channel widening project (Borgens et al., 2005). This survey resulted in the identification of 11 magnetic anomalies and two sonar targets that had the potential to be significant cultural resources. Subsequently, in 2006, the Brazos River Harbor Navigation District contracted with PBS&J to conduct additional close-order surveys on the identified magnetic anomalies and sonar targets (Borgens et al., 2007a). Based on the additional close-order surveys, only three of the anomalies required diver investigations. The diver investigations determined that none of the anomalies were significant cultural resources.

In 2006, the USACE contracted with PBS&J to conduct marine magnetometer and side-scan sonar surveys of areas proposed for modification for the Freeport Harbor Improvement Project (Borgens et al., 2007b). The survey resulted in the identification of three sonar targets with

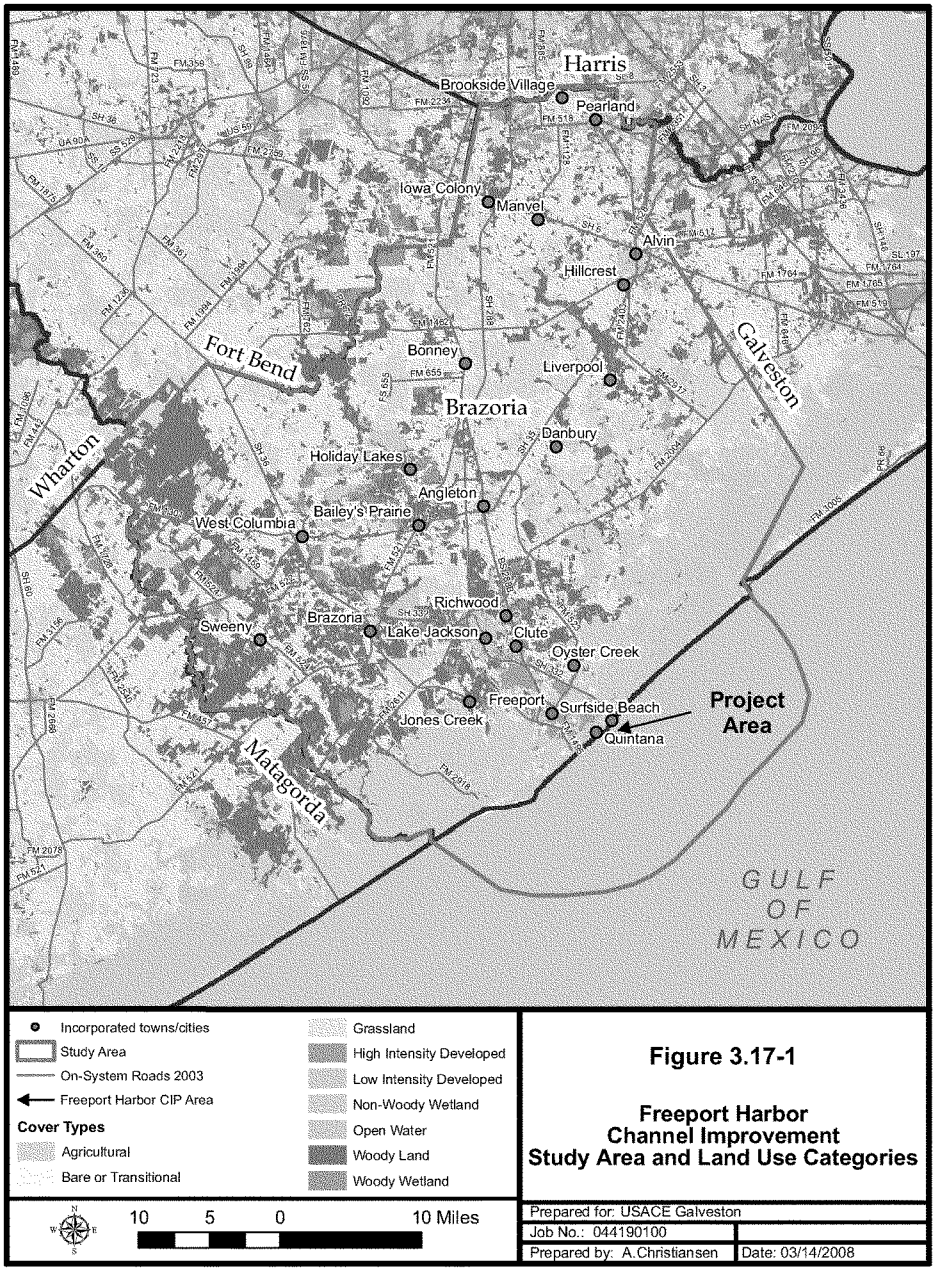
potential to be significant cultural resources. Additional analysis and research has determined that none of the targets are cultural in origin (see Appendix E).

In 2007, the USACE contracted with PAI to conduct geoarcheological and historical research for the Freeport Harbor Improvement Project. PAI determined that PA 8 and PA 9 had the potential to contain Historic Properties (PAI, 2007). Based on this recommendation, the USACE had PAI conduct field investigations in both areas. As a result of these investigations, two historic sites were identified, 41BO226 and 41BO227. Both of these sites are located on PA 9; no cultural resources were identified in PA 8 (PAI, 2008). Site 41BO226 consists of three mounds. These mounds (A, B, and C) each measure approximately 10 to 15 meters in diameter and rise 80 to 100 centimeters (cm) above the surrounding terrain. Test excavations in Mound A produced an array of historic artifacts, including hand-made bricks, a small-gauge railroad rail section, and other unidentifiable metal objects. In addition, a brass survey marker with raised letters identifying it as a "UNITED STATES ENGINEER DEPARMENT" marker with the notation "US ENGINEER OFFICE GALVESTON TEXAS" was also discovered at Mound A. A survey using a metal detector did not identify artifacts in mounds B or C, possibly because they would be buried too deeply (PAI, 2008). Based on the existing evidence, 41BO226 is most likely the remains of a Confederate gun battery. Site 41BO227 consists of four livestock watering troughs (PAI, 2008). This site is not recommended as eligible for inclusion in the NRHP, and no further work is recommended. Additional investigations on 41BO226 are under way to determine the significance and extent of the site.

In 2008, the USACE, the Texas State Historic Preservation Officer (SHPO), and Port Freeport signed a PAg regarding compliance with Section 106 of the National Historic Preservation Act (NHPA) for the construction and maintenance of the Federal Freeport Harbor Navigation Channel Improvement Project. The PAg addresses the identification of historic properties, the evaluation of significance, the assessment of effects, the resolution of adverse effects, and unanticipated discoveries for the construction and maintenance of the Federal project (see Appendix E).

3.17 SOCIOECONOMIC RESOURCES

This section presents a brief summary of economic and demographic characteristics of the study area within Brazoria County. The study area includes Brazoria County as well as the following towns/cities: Alvin, Angleton, Bailey's Prairie, Bonney, Brazoria, Brookside Village, Clute, Danbury, Freeport, Hillcrest, Holiday Lakes, Iowa Colony, Jones Creek, Lake Jackson, Liverpool, Manvel, Oyster Creek City, Pearland, Quintana, Richwood, Surfside Beach, Sweeny, and West Columbia. Data were collected for Brazoria County and for the towns and cities that are within the study area (Figure 3.17-1), as described in the sections below. Population, employment, the area economy, a historical perspective of economic development, and



Incorporated towns/cities
Study Area
On-System Roads 2003
Freeport Harbor CIP Area

Cover Types

Agricultural
Bare or Transitional
Grassland
High Intensity Developed
Low Intensity Developed
Non-Woody Wetland
Open Water
Woody Land
Woody Wetland

10 5 0 10 Miles

Figure 3.17-1

Freeport Harbor Channel Improvement Study Area and Land Use Categories

Prepared for: USACE Galveston	
Job No.: 044190100	
Prepared by: A.Christiansen	Date: 03/14/2008

File: N:/Clients/U_Z/USACE/Projects/Freeport/044190100/projects/AppG_Fig3_15_1_vr2.mxd

Environmental Justice (EJ) are key areas of discussion. Additional information is provided in Appendix F.

3.17.1 Population

The proposed FHCIP is located in Brazoria County with a 2009 population of 304,844 persons. Brazoria County maintained steady growth, increasing by 13 percent between 1980 and 1990, by 26 percent between 1990 and 2000, and 26 percent between 2000 and 2009. Populations given for the study area towns/cities represent 2009 population estimates (Texas State Data Center, 2010). The City of Freeport, population 13,677, is located south of Oyster Creek (population 1,429), which is located northwest of the proposed FHCIP, while Quintana (population 37) and Surfside Beach (population 922) make up the southern portion of the study area.

Population projections provided by the TWDB 2006 Regional Water Plan indicate that growth in Brazoria County is expected to occur at a similar rate to the state through 2040. Brazoria County is projected to grow 37 percent from 2009 to 2040 while the State of Texas is projected to grow 50 percent during the same time (see Appendix F). In addition, towns/cities within the study area are also expected to grow between 2007 and 2040. Cities that are expected to have the greatest growth include Freeport (82 percent increase), Oyster Creek (48 percent increase), and Brookside Village (47 percent increase).

Due to the expected growth within the study area, a likely concern is the amount of available housing, so a multiple listing service was reviewed to determine the amount of housing within the study area. The data (provided in Appendix F) indicate that adequate housing is available within the study area to meet the demands of a growing population.

The U.S. Census Bureau's 2000 census data were used to identify general population characteristics (Tables 3 through 7 are provided in Appendix F). Whenever possible, the most up-to-date information has been provided to characterize the study area general population. The 2000 data are the most consistent for all parameters at the city/town level.

The study area general population can be characterized as comprising family households with an average family size of 3.16 persons that own their own home. The largest age cohort was persons between 35 and 49 years of age (25.6 percent), followed by persons 50 to 64 years of age (13.9 percent), and persons 5 to 14 years of age (16.0 percent).

The study area median household income was $44,311, and the total percentage of persons living below the poverty level was 10.2 percent. The majority of the population attained a high school diploma and attended college. However, on average, only 7 percent received an Associates Degree, 9.5 percent received a Bachelors Degree, and 4.5 percent received a Graduate or Professional degree.

3.17.2 Community Services

Brazoria County has a well-developed infrastructure to provide health, police, fire, emergency, and social services within the study area. A wide range of public services and facilities are offered at different locations for the local communities of Surfside Beach, the City of Freeport, Quintana, and the Lake Jackson/Clute area. A brief summary is provided in the following paragraphs. Additional discussion is provided in Appendix F.

Fire protection within the vicinity of the study area is provided by the various fire departments of the study area cities. The project area is served by the Freeport Fire Department. The Freeport Fire & Emergency Medical Service Department currently provides service to the City of Freeport and Quintana. Surfside Beach provides emergency services through the Surfside Beach Police Department (*The Alliance*, 2006a). Law enforcement within the vicinity of the study area is served by both state and local departments. The Texas Highway Patrol maintains an office in Angleton. The Brazoria County Sheriff's office and the Texas Highway Patrol serve the highways in unincorporated areas of Brazoria County. Within the incorporated area of Brazoria County, the cities of Alvin, Angleton, Brazoria, Brookside Village, Clute, Danbury, Hillcrest, Freeport, Jones Creek, Lake Jackson, Manvel, Oyster Creek, Pearland, Quintana, Richwood, Surfside Beach, Sweeny, and West Columbia all provide police protection.

Brazoria County is served by eight school districts: Alvin Independent School District (ISD), Angleton ISD, Brazosport ISD, Columbia-Brazoria ISD, Damon ISD, Danbury ISD, Pearland ISD, and Sweeny ISD. Higher education is offered at Alvin Community College and through the Brazosport College campus located in Lake Jackson. Within Brazoria County, a variety of entities provide electric utility, natural gas, water, wastewater, and solid waste disposal services. These services are summarized in Table 8 of Appendix F.

3.17.3 Employment

According to the Texas Workforce Commission (TWC), the largest percentages of jobs in Brazoria County are within education and health services, trade, transportation and utilities, and government service sectors. Third-quarter employment in 2007 had a total of 84,819 persons employed in Brazoria County, of which 19 percent were employed in trade, transportation, and utilities, 19 percent in education and health services, and 18 percent in the government sector. The workforce decreased 3.2 percent from 2007 to 2009, with a total of 82,063 persons employed in Brazoria County for the third quarter of 2009. The top three employment sectors for the third quarter of 2009 were trade, transportation and utilities (21 percent), the government sector (20 percent), and education and health care services (20 percent). Between 2007 and 2009, unemployment rates increased from 4.8 to 7.5 (TWC, 2010).

According to the U.S. Census Bureau 2000 data, the class of workers within the study area is similar to the State of Texas when looking at the percentage of government workers and unpaid

family workers and has a slightly lower percentage of self-employed workers and a slightly higher percentage of private wage and salary workers (Table 9 in Appendix F).

Approximately 55,192 Texas jobs are related to the activity within Port Freeport. The port is responsible for 11,696 direct local jobs, which creates $1.11 billion in personal income, with Brazoria County residents holding 75 percent of those jobs (Port Freeport, 2009). Top employers within the Brazosport area are primarily oil industry/port-related enterprises, healthcare, government, and retail industries (Table 10 in Appendix F).

The number of workers who work outside their place of residence but still within the state and county in which they reside are much higher when compared to the State of Texas. The study area has a similar percentage of persons working inside their state of residence (99.1 percent) when compared to the state, with 99.0 percent; the percentage of workers that work inside their county of residence (59.7 percent) is much lower than the state (78.6 percent); and outside their place of residence (75.6 percent) is higher than the State of Texas (44.6 percent) (Table 11 in Appendix F).

3.17.4 Economics

The economy of Brazoria County and the Port Freeport area is broadly based in manufacturing, agriculture, and fishing. The primary economic bases of the county include chemical manufacturing, petroleum processing, offshore production maintenance services, biochemical and electronic industries, commercial fishing, and agriculture. The deepwater channel and port facilities, sports fishing services, and tourism are major components of the county's economic base (Brazos River Harbor Navigation District [BRHND], 2004).

Port Freeport handles large volumes of commodities, including petroleum products, agricultural products, and general cargo such as animal feed, synthetic rubber, and automobiles (BRHND, 2004). The port is ranked 16th in U.S. foreign tonnage and 27th in the U.S. in total tonnage. Port Freeport totaled over $28.6 million in revenue in 2009. As a result of local and regional purchases by the 11,696 employees, an additional 43,496 induced jobs are estimated to be supported in the regional economy resulting in $4.6 billion in personal income, $10.2 billion in total economic activity in Texas, and $1.3 billion of investment in the local economy over the past 5 years (Port Freeport, 2009).

Several new or expanded businesses are in progress or anticipated in the near future including the following efforts for BASF Corporation, Freeport LNG, Dow Texas Operations, a new Velasco Terminal, and Air Liquide.

These new efforts will increase the industrial activity at Port Freeport, generate thousands of jobs in the area, and add docking area to the port (*The Alliance*, 2005a, 2006b; Evans, 2007; Hagerty, 2007; Tompkins, 2006).

3.17.4.1 Tourism and Recreation

Tourism is a major contributor to the study area economy. The natural resources of the Gulf provide extensive recreational opportunities. Outdoor recreation in the area includes fishing, bird watching, windsurfing, boating, jet skiing, swimming, shelling, and beachcombing (among others). Brazoria County was chosen as the location for the 2006 Texian Rally, sponsored by The Texas Independence Trail Region, because of its association with the Texas Independence Trail as well as being the original burial place of Stephen F. Austin (*The Alliance*, 2006c).

Freeport ranks as one of the top areas in the Nation for diversity of species and number of species encountered (*Texas Explorer*, 2006). There are several marinas located within the Freeport area that support recreational as well as commercial fishing. There are numerous parks located within the area that provide beach access and are used for swimming, picnicking, and fishing. Quintana Beach Park includes such amenities as restrooms, showers, concession stand, boardwalks, picnic areas, and shaded pavilions for group rentals. On the property is the Coveney House, which has a beach ecology laboratory featuring hands-on displays. One of the newest parks is the Surfside Jetty Park, which has a visitor's center, shuffleboard, picnic tables, public showers, convenience store, restrooms, playground, horseshoe pits, lighted volleyball courts, and a sidewalk from the park to the jetty and beach. The Surfside Pedestrian Beach is located on the west side of Surfside Beach (City of Freeport, 2006). The City of Freeport and TPWD have signed an agreement for enhancements to Bryan Beach Park (*The Alliance*, 2006d). Additionally, a marina is proposed on the Old Brazos River that could become the catalyst for downtown revitalization with restaurants, hotels, and gift shops. An agreement has been reached for Surfside Beach to lease ½ acre, adjacent to city hall, for a nature trail and home for Surfside Beach's Save Our Beach Association (*The Alliance*, 2005b).

3.17.4.2 Community Values

Overall, the communities in the study area support development at Port Freeport. Future growth at the port includes new construction and expansion of existing facilities for companies such as Freeport LNG, BASF Corporation, Dow Chemical, and ConocoPhillips. New jobs in the Brazosport community are a direct result of the expansion of Port Freeport. However, the Gulf-front beaches also promote a relaxed, beachfront community atmosphere.

3.17.4.3 Commercial Fisheries

There is little commercial fishing in the Freeport area. Commercial fishing within the Galveston Bay system is a relatively moderate contributor to the Freeport area economy compared to other industry sectors.

3.17.4.4 Tax Base

In Texas, the state sales tax is 6.25 percent, with local sales/use tax not to exceed an additional 2 percent. Property is appraised and property tax is collected by local (county) tax offices or appraisal districts (Texas Comptroller of Public Accounts, 2010). The predominant property tax jurisdictions within the study area include ISDs, municipalities, and municipal utility districts (Table 12 in Appendix F).

Activity at Port Freeport terminals generates $163.6 million in state and local taxes. Also, the Federal government receives $6.3 million of customs revenue from cargo activity at the public and private facilities (Port Freeport, 2004).

3.17.5 Environmental Justice

In compliance with EO 12898 – Federal Action to Address Environmental Justice (EJ) in Minority Populations and Low-Income Populations—an analysis has been performed to determine whether the proposed action would have a disproportionately adverse impact on minority or low-income population groups within the study area. The EO requires that minority and low-income populations do not receive disproportionately high adverse human health and environmental impacts and requires that representatives of minority or low-income populations, who could be affected by the project, be involved in the community participation and public involvement process.

The data used in this study to determine the potential for disproportionate impacts to low-income and/or minority populations within the project study area and within the region and the state are presented in Tables 13 and 14 in Appendix F. The information is based on 2000 U.S. Census Bureau state, county, and block group level data for ethnicity and income.

In terms of ethnicity, the population living within the study area census tracts (CT) (with a total minority population of 37.6 percent) is less ethnically diverse than Brazoria County and the State of Texas. The percentage of white persons within the study area is 65.3 percent with the largest percentage of minority persons being Hispanic or Latino, with 22.8 percent of the total population. Within the study area, Freeport has the largest minority population (67.0 percent), which is predominantly composed of Hispanic (51.6 percent) and African American (13.2 percent) persons. Freeport also has the highest percent of persons living below poverty in the study area. The percentage of persons living below poverty within the study area is 10.2 percent. The poverty rates of the study area cities range from 3.0 percent (Bonney and Manvel) to 22.9 percent (Freeport).

To better understand the affected human environment for minority and low-come populations, an evaluation of the social make-up and economic baseline of the study area communities was conducted. Those communities that were determined to have substantial minority and/or low-

income populations (total minority and/or low-income population exceeds 50 percent of the community) were then further evaluated. Within the study area, three communities were identified for further study—Clute, Holiday Lakes, and Freeport. Because Holiday Lakes is located more than 20 miles from the project area and is less likely to be impacted by the proposed project, it was removed from further analysis. Clute and Freeport are proximate to the project area and more susceptible to any potential impacts associated with the proposed action and are therefore subject to further analysis. All information discussed in the following can be found in Tables 1–18 of Appendix F.

According to the 2000 census, Freeport has a population of 12,717 people of which 67.0 percent are considered minority. The majority of the population identifies as Hispanic or Latino (51.6 percent). The median household income in Freeport for 2000 was $30,245, which though significantly lower than the median household income for Brazoria County ($48,632), is still higher than the 2011 U.S. Department of Health and Human Services (HHS) poverty guideline for a family of four ($22,350) (HHS, 2011). However, the percentage of those living below the poverty level in Freeport (22.9 percent) is more than double the percentage for Brazoria County (10.2 percent). Freeport could therefore be considered a minority population and potentially a low-income population.

Clute has a population of 10,424 people according to the 2000 census, 57.6 percent of which are considered minority, and 48.1 percent of Clute's population identifies as Hispanic or Latino. Clute's median household income in 2000 was $32,622, which is only slightly lower than Brazoria County, and well above the HHS 2011 poverty guideline (HHS, 2011). The percentage of those living below the poverty level in Clute is 18.2 percent, which is higher than Brazoria County (10.2 percent). Considering these factors, Clute would be considered a minority population but not low income.

Clute and Freeport also have higher populations of persons 5 years of age and older with limited English proficiency. According to 2000 U.S. Census data, 10.9 percent of Clute's population and 14.0 percent of Freeport's population speak English either "not well" or "not at all," compared to 4.2 percent of the population of Brazoria County (U.S. Census Bureau, 2000).

In terms of housing, Clute and Freeport have high percentages of housing units occupied by renters rather than owners. In Clute, 56 percent of housing units are renter-occupied, and 43 percent of housing units in Freeport are occupied by renters rather than owners (U.S. Census Bureau, 2000). The majority of households in these communities are composed of families (70 percent for Clute and 74 percent for Freeport), compared to 77 percent for Brazoria County. The average family sizes for these communities (3.35 for Clute and 3.59 for Freeport) are slightly higher than that of Brazoria County (3.23) (U.S. Census Bureau, 2000).

Clute and Freeport are also somewhat less educated than Brazoria County. For the population 25 and older for Brazoria County, only 20.4 percent of the population did not receive a high school diploma, some college, an associate's degree, bachelor's degree, or graduate or professional degree. By comparison, 35.3 percent of Clute's population and 44.9 percent of Freeport's population have either less than a 9th grade education or completed 9th–12th grade and received no diploma (U.S. Census Bureau, 2000).

EO 13166, "Improving Access to Services for Persons with Limited English Proficiency (LEP)," signed by President Bill Clinton on August 11, 2000, calls for all agencies to ensure that their federally conducted programs and activities are meaningfully accessible to LEP individuals. Table 14 in Appendix F contains the percent LEP population for the study area, which ranges between 0.0 (Bonney, Manvel, and Quintana) and 9.4 percent (Holiday Lakes).

A small percentage of persons in the study area do not speak English or have difficulty speaking English. Data for "Ability to Speak English" for the population 5 years old and over indicates that 3 percent of the population in the study area speak English "not well," while 1.2 percent of the population speak English "not at all" (see Table 14 in Appendix F).

Census tracts within the project area that contain and surround the project area components are CTs 6639, 6641, 6642, 6643, 6644, and 6645. The population living within these census tracts is predominantly white, with the exception of CT 6644, whose minority population is 61.8 percent of the total population. One of the PAs (PA 1) is located in CT 6644; PAs 8 and 9 are both located in CT 6645. The highest percentage of Hispanic or Latino persons within the project area components was found in CT 6643 (58.0 percent) and CT 6644 (48.4 percent). The largest percentage of other minority persons (Black or African American, American Indian/Alaskan Native, Asian, and Native Hawaiian or other Pacific Islander) was also found in CT 6643 (16.2 percent) and CT 6644 (13.5 percent).

Median household incomes for persons living in the project area components range from $23,415 in CT 6643 to $40,271 in CT 6641. Overall, median household incomes for the project area components are lower than Brazoria County ($48,632) or the State of Texas ($39,927); however, they are still above the HHS 2008 poverty guideline of $22,200 for a family of four (see Table 13 in Appendix F).

Within the project area components, the percentage of persons living below poverty is generally higher than Brazoria County. The population in CT 6643 has the largest percentage of persons living below poverty with 27.3 percent, followed by the City of Freeport (22.9 percent), CT 6644 (19.5 percent), and CT 6642 (16.6 percent). These percentages are higher than Brazoria County (10.2 percent) and the State of Texas (15.4 percent); therefore, the project area components do have some areas that have high percentages of persons living below poverty.

3.17.6 Protection of Children from Environmental Health Risks and Safety Risks

In compliance with EO 13045—Protection of Children from Environmental Health Risks and Safety Risks—an analysis was performed to determine the potential of the proposed action to have disproportionate impacts to child populations within the project area. The EO requires that Federal agencies "(a) shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children, and (b) shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks and safety risks."

Detailed information regarding age characteristics of the study area are provided in Table 5 of Appendix F. The percentage of the population aged 19 and under for communities within the study area varies from 13.2 percent (Quintana) to 39.2 percent (Holiday Lakes). In Freeport, 39.1 percent of the population is aged 19 and under, with 30.1 percent aged 14 and under. While Freeport's population had one of the highest percentages of population aged 19 and under (second only to Holiday Lakes), it is not significantly greater than the average for Brazoria County (31.4 percent) (U.S. Census Bureau, 2000).

The following Brazosport ISD schools are located in Freeport in the vicinity of the proposed action. The proximity to the project area and 2009–2010 enrollments (Texas Education Agency, 2011) for these schools are as follows:

- Jane Long Elementary – 526 students (approximately 1.3 miles from the project area boundary)
- O.A. Fleming Elementary School – 330 students (approximately 0.5 mile from project area boundary)
- Velasco Elementary School – 597 students (approximately 1.6 miles from the project area boundary)
- R.O. Lanier Middle School – 423 students (approximately 1.6 miles from the project area boundary)
- Freeport Intermediate School – 558 students (approximately 1.8 miles from the project area boundary)
- Brazosport High School – 1,104 students (approximately 1.9 miles from the study area boundary)

Several child care facilities are also located within the vicinity of the proposed project. These are Luna Daycare, Precious Jewels Preschool, and Memorial Child Care Center.

3.18 LAND USE/AESTHETICS

3.18.1 Land Use

The Freeport Channel system is located in Brazoria County within the Coastal Bend region, on the mid to upper Texas coast, about 40 miles southwest of Galveston, Texas. Land use within the study area consists of agricultural land, industrial land, urban-residential and urban-commercial land, recreational land and facilities, and marshlands. Water use includes mineral production, commercial and sport fishing, recreation, and transportation.

In Brazoria County, agriculture has historically been and continues to be an important part of the economy. Approximately 61 percent of the land is used for agriculture, with 41 percent used for range and pastureland and the remaining 20 percent cultivated (NRCS, 2000). Within Brazoria County, only about 14 percent of land use is considered urban. According to the U.S. Department of Agriculture (USDA) 2002 Census of Agriculture, Brazoria County had 2,455 farms in 2002, up 8 percent from 1997, and had approximately 614,000 acres of land in farms. In 2002, the market value of production for Brazoria County was $47,422,000, with crop sales accounting for 52 percent and livestock sales accounting for the remaining 48 percent (USDA, 2002).

For the purposes of this analysis, the study area includes the following towns/cities: Alvin, Angleton, Bailey's Prairie, Bonney, Brazoria, Brookside Village, Clute, Danbury, Freeport, Hillcrest, Holiday Lakes, Iowa Colony, Jones Creek, Lake Jackson, Liverpool, Manvel, Oyster Creek City, Pearland, Quintana, Richwood, Surfside Beach, Sweeny, and West Columbia (see Figure 3.17-1).

The study area is approximately 1,110,643 acres in size. It is primarily comprised of open water (245,336 acres) and undeveloped land. The undeveloped land consists of grassland (335,531 acres), woody (forested) land (208,508 acres), agricultural (118,698 acres), nonwoody wetland (113,517 acres), and bare or transitional (3,418 acres). Developed land (28,833 acres high intensity, 19,919 acres low intensity) is primarily concentrated in the northeastern portion of the study area around Pearland and Alvin as well as the southern portion of the study area in communities near Port Freeport and along major roadways.

Port Freeport currently comprises 186 acres of developed land and 7,723 acres of undeveloped land (Port Freeport, 2006). Facilities along the west side of the Jetty Channel include the Exxon Quintana Station and LNG Quintana Terminal, as well as the USCG Boat Basin and access channel located on the east side of the channel. Continuing northward along the Brazos River Channel, ConocoPhillips facilities and the BASF Corporation Terminal are to the west and Dow Chemical is to the east of the channel. The northernmost facilities in the project area include Chiquita, American Rice Inc., and Vulcan Materials Bulk Aggregate Facility, located just south of the Stauffer Turning Basin. All parcels are accessible by water, highway, and rail.

Golf courses and county parks are located within the study area, including those that provide beach access (Figure 3.18-1). In addition to public and private parks, there are state and Federal areas located in the study area. These include Nannie M. Stringfellow Wildlife Management Area (WMA) located in the southwestern portion of the study area as well as the Peach Point WMA, Brazoria NWR, San Bernard NWR, and Christmas Bay State Park located along the coastline.

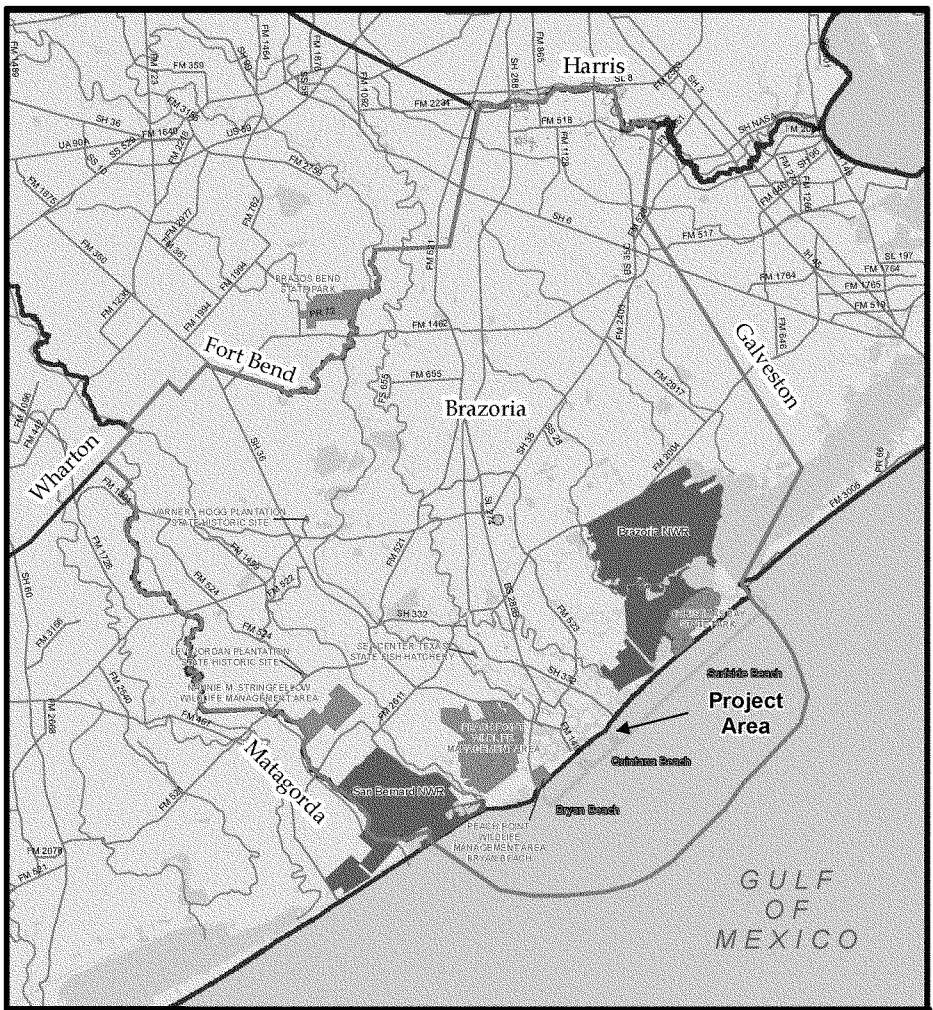
3.18.2 Transportation

Projects listed on the 2008–2011 Statewide Transportation Improvement Program are planned to be constructed. These projects include the construction of a four-lane County Road (CR) 220 from FM 521 to SH 288, widening of existing CR 220 from SH 288 to FM 523, construction of a six-lane toll highway (SH 99) from the Harris County line to FM 1093, the reconstruction of FM 2351 (CR 129) to a four-lane divided highway from SH 35 to the Galveston County line, widening of FM 523 from FM 2004 to SH 332, and the replacement of the CR 160 bridge at the Gulf Coast Water Canal (TxDOT, 2007). Enhancements to rail capabilities will include replacement of a rail bridge over the Old Brazos River Channel in downtown Freeport to serve increasing cargo volumes from Port Freeport (*The Alliance*, 2006e). Future transportation projects specific to the port include reconstructing the intersection of Fifth Street and Terminal Street to include an entrance road with two 16-foot lanes with 8-foot shoulders, and widening of a truck-queuing area along Navigation Boulevard.

Major roadways within the study area include FM 523, which provides access from Angleton to Oyster Creek; SH 288, the primary land route connecting the Freeport area with the Houston metropolitan area; SH 36, which provides north-south connection from Rosenberg to Freeport; and SH 332, which provides a direct route from Lake Jackson to Surfside Beach. There is direct access to the GIWW and Freeport Harbor utilizing FM 523, SH 36, SH 288, and SH 332, with rail service provided by the Union Pacific Railroad (UPRR).

Rail transportation is integral to the operations of Port Freeport and numerous industrial sites located along the Freeport Jetty Channel, GIWW, Brazos River Channel, Brazos Harbor, Brazosport Turning Basin, and the Stauffer Turning Basin. The UPRR provides direct service to these facilities (Port Freeport, 2006).

Regarding air travel, Brazoria County Airport is the only airport serving the project area vicinity. Brazoria County Airport is located 13.25 miles northeast of Freeport, in the city of Angleton, Texas.



Golf Courses
City Parks
Study Area
On-System Roads 2003
Freeport Harbor CIP Area
County Parks
State areas
Federal Refuges
Beaches

10 5 0 10 Miles

Figure 3.18-1

Freeport Harbor Channel Improvement Project Study Area and Recreational Areas

Prepared for: USACE	
Job No.: 044190100	
Prepared by: Amy C./RCoop	Date: 03/14/2008

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3.18.3 Aesthetics

The term aesthetics deals with the subjective perception of natural beauty in a landscape by attempting to define and measure an area's scenic qualities. Consideration of the visual environment includes a determination of aesthetic values (where the major potential effect of a project on the resource is considered visual) and recreational values (where the location of a proposed project could potentially affect the scenic enjoyment of the area). Aesthetic values considered in this study, which combine to give an area its aesthetic identity, include:

- topographical variation (hills, valleys, etc.);
- prominence of water in the landscape (rivers, lakes, etc.);
- vegetation variety (woodlands, meadows, etc.);
- diversity of scenic elements;
- degree of human development or alteration; and
- overall uniqueness of the scenic environment compared to the larger region.

The study area (see Figure 3.1-1) consists of a variety of terrain characterized by varying levels of aesthetic quality. The topography of the area is mostly flat to gently rolling. Generally, the study area consists mostly of undeveloped areas. Within the southern portion of the study area, landscapes with water as a major element are generally considered visually pleasing, and this is the case for recreational land adjacent to these water features. The southern portion of the study area includes a variety of land uses, including residential development, commercial development, public and private marinas, parkland, relatively undisturbed natural areas, fishing and tourism-related businesses, civic uses, transportation systems (highways and railways), port facilities, and heavy industry areas. Generally, the study area is considered to be visually pleasing, with the exception of industrial and port facilities located in the southern portion along the Freeport Harbor Channel. However, the area is distinguished in aesthetic quality from other adjacent areas within the region that lack the vast waterbodies and many of the outdoor recreational amenities. The landscape exhibits a generally moderate to high level of impact from human activities. No designated scenic views or scenic roadways were identified from the literature review.

3.18.4 Future Development

Throughout Brazoria County, future projects include expansion of highways, new schools, new businesses, and improvements to water and sewer projects in communities such as Surfside Beach. Big industrial employers, including Freeport LNG, BASF, Dow Chemical, and ConocoPhillips, plan to expand with major projects.

There are numerous developments planned or in progress including the following:

- Freeport will become BASF Corporation's manufacturing base for nylon intermediates and polymers in North America, with a new plant to be constructed on-site (*The Alliance*, 2005a).
- Food companies such as GrupoSOS began construction of the first phase of their $200 million expansion (*The Alliance*, 2006f).
- Freeport is discussing the possible annexation of 122 acres along the GIWW adjoining the Bridge Harbor subdivision. If approved, the mile-long parcel would likely be used for residential/commercial development (*The Alliance*, 2007a). Subsequently, Freeport has plans for a marina to be built on the Old Brazos River, which would potentially attract restaurants and hotels around the site (*The Alliance*, 2006g).
- In 2007, the Velasco Drainage District gave Freeport permission to make cuts in the Old Brazos River levee for the dry-stack boat storage facility (*The Alliance*, 2007b).
- Future development in Surfside Beach includes a proposed 9-acre, 260-slip, dry dock marina that would be located off the SH 322 Intracoastal Bridge (*The Alliance*, 2007c).
- A joint venture among Surfside Beach, Brazoria County, and TPWD is planned to construct a four-bay boat ramp between Village Hall and the USCG Station (*The Alliance*, 2007d).
- Industrial construction and/or expansion projects include the construction of Shintech's new 500-acre site near current industrial plants in the Chocolate Bayou area (*The Alliance*, 2007e).
- AirLiquide plans to construct an air separation unit adjacent to its current Oyster Creek plant (*The Alliance*, 2007f).
- Future expansion of Port Freeport includes an LNG facility (under construction) including the construction of new berths and a transit shed. The project is expected to be completed in 2011. There are approximately 8,000 acres of land adjacent to the Gulf available for future development in Port Freeport.
- New construction within Port Freeport would include the construction of a new Velasco Terminal that will add 2,400 feet of docking area to the port (*The Alliance*, 2006h).
- Future development of property located south of SH 36 (Parcel 14) would provide a multi-modal facility with on-site warehousing and rail facilities (Port Freeport, 2009).
- Future development of property located adjacent to Navigation Boulevard and the Channel to Brazos Harbor (Parcel No. 25) would expand Port Freeport's warehousing and rail facilities (Port Freeport, 2006). With the increasing warehousing capabilities of the port, companies like Reliance Bulk Carriers of Houston will be able to utilize the storage facilities (*The Alliance*, 2007g).

Transportation improvement projects include:

- Construction of a four-lane CR 220 from FM 521 to SH 288;
- Widening of existing CR 220 from SH 288 to FM 523;
- Construction of a six-lane toll highway (SH 99) from the Harris County line to FM 1093;
- Reconstruction of FM 2351 (CR 129) to a four-lane divided highway from SH 35 to the Galveston County line;
- Widening of FM 523 from FM 2004 to SH 332; and
- Replacement of the CR 160 bridge at the Gulf Coast Water Canal (TxDOT, 2007).

Enhancements to highway capabilities in the area will also include widening SH 36 from two lanes to four lanes to facilitate hurricane evacuations and passenger and freight movement. There will also be improvements made to SH 288, the main direct north-south route between Freeport and Houston.

Enhancements to rail capabilities will include replacement of a rail bridge over the old Brazos River Channel in downtown Freeport to serve increasing cargo volumes from Port Freeport (*The Alliance*, 2006e). In addition, UPRR plans to construct a new rail line through Angleton (*The Alliance*, 2006i).

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 ENVIRONMENTAL SETTING

Due to the timing of the 600-foot Widening Project for the Freeport Channel system Outer Bar and Jetty channels (Widening Project), the FWOP-1 Alternative description has been written to assume the Widening Project would occur with placement of 300,000 cy of silty/sand new work material at Quintana, and that the NED and LPP are compared to the FWOP-1 Alternative regarding impacts (see Section 2.2).

4.1.1 Physiography and Geology

4.1.1.1 FWOP-1 Alternative

The FWOP-1 Alternative would cause no significant change to physiography or geology. The Widening Project is expected to result in approximately 3.2 mcy of new work dredged material. Approximately 2.9 mcy would be placed in the previously designated New Work ODMDS and 300,000 cy of silty/sand material would be placed on Quintana Beach in front of the Seaway PA. Maintenance dredging of existing ship channels and placement of that dredged material at PAs would continue as it is currently. The amount of material dredged from the Outer Bar and Jetty channels during maintenance cycles is expected to be about 3.3 mcy per year, an increase of about 1 mcy over existing conditions. This material would continue to be placed in the Maintenance ODMDS. The amount of material dredged from the remainder of the channels would remain unchanged from current conditions.

4.1.1.2 NED Alternative

Under this alternative, channel improvements would have minimal impacts on the physiography of the project area. The proposed channel improvements would impact approximately 13.8 linear miles of the existing Freeport Harbor Channel from the Stauffer Turning Basin (Station 260+00) to offshore Channel Station –470+00. In addition, the proposed upland PAs 8 and 9 ranging in size from approximately 160 to 250 acres, respectively, would be constructed. The existing PA 1 would continue to be used for placement of dredged material.

The NED Alternative construction would generate approximately 20.4 mcy of new work dredged material. Of this, approximately 6.6 mcy of material would be placed in PAs 8 and 9, and approximately 15.0 mcy of material would be placed in the New Work ODMDS.

While local changes would occur to bathymetry and topography with construction of this alternative, these alterations would be expected to have negligible impacts on the overall physiography and geology of the submerged and subaerial portions of the project area. Equipment staging areas and dredge pipelines would not result in any detrimental effects to

physiography and geology of the project area. Upland PAs would be accessed through existing waterways, road or highway rights-of-way, or disturbed areas.

4.1.1.3 LPP Alternative

The potential effects of the LPP Alternative are similar to those of the NED Alternative; however, less dredged material would be generated (17.3 mcy) and placed into the New Work ODMDS and PAs. Approximately 4.6 mcy of material would be placed in PAs 8 and 9, and approximately 12.7 mcy of material would be placed in the New Work ODMDS.

While local changes would occur to bathymetry and topography during construction of the LPP Alternative, 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. Last, equipment staging areas and dredge pipelines would not result in any detrimental effects to physiography and geology of the project area. Upland PAs would be accessed through existing waterways, road or highway rights-of-way, or disturbed areas.

4.1.2 Water Exchange and Inflows

4.1.2.1 Projected Relative Sea Level Rise Impacts for the Project Area

The potential for RSLR impacts in the FHCIP area includes impacts on low-lying, tidal wetlands due to higher water levels, impacts on vessel traffic due to changes in current velocities in the area, and impacts on surge levels.

In general, the functioning of the navigation features associated with all alternatives (channel depths of 55 through 60 feet, turning basins, PAs, and ODMDSs) would be insignificantly affected by the full range of potential sea level change. Upland confined PAs and mitigation features are located at elevations higher than the full range of potential RSLR calculated by ERDC. The following discussion describes possible ways that RSLR might affect the project alternatives.

Hydrodynamic modeling performed for the proposed project shows that implementation of the NED or LPP would result in changes in current velocities in the harbor, tidal timing and range within the harbor, and a small change in the height of tidal surge. The depth-averaged velocities in the harbor for both plans show a decrease in peak ebb and flood velocities of from 0.0 to 0.18 foot/second (5.4 centimeters per second [cm/sec]), the decrease becoming less moving upstream into the harbor. The LPP and NED alternatives produce tidal results that are essentially identical. Tidal differences include advancement of the flood and ebb tides by approximately 30 minutes in this diurnal system, and an increase in the mean tide range of about 0.3 percent, or 0.01 foot (0.2 cm). The surge values for alternatives 4 and 5 are about 0.16 foot (5 cm) higher with the proposed changes than without them. These differences in tidal velocities, tidal timing

and tide range, and surge height are the result of physical changes to the system that would result from the LPP and NED alternatives, primarily associated with deepening and widening of the channels.

Both types of changes tend to increase the coupling of the harbor to the Gulf. The excavation of portions of the southwest peninsula would increase the tidal prism of the harbor by about 0.05 percent. This increased tidal prism would result in more water moving into and out of the system during each tidal cycle. Since more water is entering and leaving the system during each tidal cycle, peak velocities would be expected to increase as a result. Deepening and widening of the Jetty Channel and the Lower Turning Basin also would result in a stronger coupling between the Gulf and the harbor. This deepening and widening of the harbor would result in increases in the volume of the harbor of from 5.8 percent (NED) to 6.4 percent (LPP). The increased cross-sectional area for the water to flow into the system would result in decreased peak velocities. Hydrodynamic modeling shows that the net effect of these competing processes would be to lower the peak velocities, up to 0.18 foot/second (5.4 cm/sec), in the harbor, as one would expect from the relative size of the effects. With the projected RSLR the system is, in effect, deepened from 0.36 foot (11.0 cm) to 2.4 feet (73.2 cm) further, depending on the sea level rise and subsidence scenario. This additional "deepening" would result in further, though slight, decreases in peak velocities by further increasing the cross section of the channel.

The increased coupling would also affect the tide. The advancement of the timing of the tide means that, with the deeper and wider channel, the tide could move into and out of the harbor more easily and, thus, the timing of the tide would change. Deepening of this type generally also causes an increase in the tide range inside a waterway; the range of the driving Gulf tide is diminished less as it experiences relatively less friction, due to the deeper water, as it travels up into the system. In this case, however, the system in its existing condition is already well coupled to the Gulf, as evidenced by the similarity of the tides in the jetties to those in the harbor. Given the lack of resonant behavior in the short channel (about 3 miles [5 kilometers] from jetties to the end of the deepened portion of the channel), only small increases in the tide range, predicted to be about 0.3 percent, or 0.01 foot (0.2 cm), for a mean tide of 1.64 feet (50 cm), would be expected with further deepening and widening. Again, with the projected RSLR for this system, no additional increase in tidal range would be expected since the incremental change, due to RSLR, decreases the relative differences between the existing condition and LPP or NED Plan conditions.

The increased coupling due to the project would also affect the surge, increasing surge levels by about 0.16 foot (5 cm) locally. The percent differences of water level in the system between the with-project and without-project cases for RSLR of 0.36 foot (11.0 cm) to 2.4 feet (73.2 cm) would be smaller than without RSLR. The differences in surge height would thus be expected to be less, as well. Additionally, the effects of increased surge due to the project would be local and, given the general inundation of the greater Freeport area during a significant surge, the

additional water elevation due to the project, with or without RSLR, would be expected to be small.

Given the above discussion, impacts on wetlands in the Freeport Harbor project area are thus expected to be negligible for two reasons. First, there are no low-lying, tidal wetlands in the footprint of the channel system. Second, changes in tidal range are expected to be small and difficult to measure, residing in the millimeter range. Since Freeport Harbor is a highly developed industrial area with no tidal wetlands, water level changes due to RSLR would have an effect on the harbor similar to that of a deepening. As seen in the modeling and an examination of the tide data, the harbor is already closely coupled to the Gulf so that any further increases in depth would result in very small increases in tide range. Thus, RSLR is expected to result in an insignificant difference between the existing channel conditions and the LPP or NED Plan.

Impacts on navigation would also be negligible, with currents likely decreasing with RSLR, even further from the decreases expected with the project. RSLR, serving in this case as essentially a deepening, means that an even larger effective cross-sectional area would be available for the flooding and ebbing tides, and that the peak velocities would decrease further. Hence, RSLR would be expected to cause an insignificant difference between the existing channel and the LPP or NED Plan.

Finally, impact differences on the surge levels due to the project, with and without RSLR, would be expected to be very small and local.

4.1.2.2 FWOP-1 Alternative

Conditions during potential high-inflow events such as tropical storms and hurricanes would not change significantly from what is currently experienced. There would also be essentially no changes in storm surge moving in from the Gulf. The widening is expected to slightly increase the amount of water that would move through the channel system during high-inflow events such as hurricanes. However, that should have very little effect on the surge elevations inside the jetties because the area affected by surge behind the jetties is small. With a small area and volume of water, the channel cross-sectional area has little effect on the amount of water entering or leaving with a surge.

4.1.2.3 NED Alternative

The proposed FHCIP would cause a small increase in the amount of water entering or leaving the channel. Thus, it is still reasonable to expect that the current levee system would provide adequate protection following the proposed channel improvements. Last, equipment staging areas and dredge pipelines would not result in any detrimental effects to water exchange and flows of the project area. Hydraulic-pipelines would not affect water exchange or block flows.

4.1.2.4 LPP Alternative

As noted for the NED Alternative, the proposed LPP channel improvements are expected to result in a small increase in storm-surge elevations inside the jetties. Likewise, the proposed channel improvements are not expected to have a substantial effect on the level of protection offered by the current levee system. Thus, impacts would be the same as described for the NED Alternative.

4.1.3 Shoreline Change

4.1.3.1 FWOP-1 Alternative

The existing patterns of shoreline erosion on both the Surfside and Quintana beaches are expected to continue. The current average rate of shoreline retreat is between approximately 9 and 10 feet/year (BEG, 2007).

A study was conducted by ERDC to determine potential impacts to longshore sediment transport rates on adjacent shorelines for four proposed options to deepen and widen the Outer Bar and Jetty channels (ERDC, 2007). The four channel alternatives considered were 50 feet deep by 600 feet wide, 55 feet deep by 600 feet wide, 58 feet deep by 540 feet wide, and 60 feet deep by 540 feet wide. The first alternative is closest to the FWOP-1 Alternative. Analysis included consideration of Texas shoreline change rates calculated by BEG. The study used the GENESIS model to predict long-term shoreline change and the STWAVE model to incorporate wave effects on longshore sediment transport. Results of the ERDC study indicate that although sediment transport impacts on adjacent shorelines would increase with depth of the offshore channel, the impacts would be minor and so slight they would not be noticeable, and would be dwarfed by the annual shoreline retreat of 9 to 10 feet, as noted above. Thus, the FWOP-1 Alternative is not expected to significantly affect shoreline erosion rates at either Surfside or Quintana beaches.

Additionally, 300,000 cy of silty/sand material would be placed on Quintana Beach in front of the Seaway PA. Although this material is expected to remain in this location for only about a year, it would act as a sand source for downdrift shorelines, potentially providing material for those beaches.

4.1.3.2 NED Alternative

The ERDC modeling described above for the FWOP-1 Alternative evaluated how changes in wave-refraction due to the proposed deepening and extension of the Freeport Entrance Channel could affect the Gulf shoreline in the study area (ERDC, 2007). The study concluded that the wave-induced impacts on the adjacent shorelines would be slight and limited to within a few miles of the jetties. Although there is a general erosion trend along much of the study area, the

pattern is not straightforward. Individual shorelines do not maintain a fixed relationship to each other and the year-to-year change of a shoreline position is on the order of a few feet to a few tens of feet per year.

The ERDC modeling determined that within about 0.25 mile of each jetty, the shoreline change rate for the NED Alternative could increase by up to 1.5 feet/year. However, the background change rate is approximately 6 times greater than the wave-induced impacts attributable to the proposed project, and thus is much higher than the potential change due to the project. In addition, not all of the potential changes would result in an increase in shoreline erosion. A much larger length of shoreline could experience a slight reduction in the erosion rate. In areas from 0.5 to about 3 miles from the jetties, the modeling indicated that the shoreline erosion rate could decrease by up to 0.6 foot/year. Thus, the primary conclusion from this analysis is that impacts from construction of the NED Alternative would be so slight that they would not be noticeable against the background changes in shoreline position.

4.1.3.3 LPP Alternative

Shoreline impacts from the LPP Alternative would be less than the NED alternative. Within about 0.25 mile of each jetty, the shoreline change rate could increase by up to 1.0 feet/year. However, the background change rate is approximately 10 times greater than the wave-induced impacts attributable to the proposed project, and thus is dramatically higher than the potential change due to the project. In addition, not all of the potential changes would result in an increase in shoreline erosion. A much larger length of shoreline could experience a slight reduction in the erosion rate. In areas from 0.5 to about 3 miles from the jetties, the modeling indicated that the shoreline erosion rate could decrease by up to 0.5 foot/year. Thus, the primary conclusion from this analysis is that impacts from construction of the LPP Alternative would be so slight that they would not be noticeable against the background changes in shoreline position.

4.2 WATER QUALITY

The proposed project has been reviewed for compliance with Section 404(b)(1) guidelines of the CWA. Results are presented in Appendix G. CEQ has concurred that there is reasonable certainty that the proposed project would not violate water quality standards and has provided water quality certification for the Preferred Alternative.

4.2.1 Salinity and Other Water Quality Parameters

4.2.1.1 FWOP-1 Alternative

Under the FWOP-1 Alternative, there would also be no changes in the water inflows and no change in wastewater or stormwater runoff sources. Because the FWOP-1 Alternative assumes a wider channel would be in place, there would be minor changes in the pattern of maintenance

dredging and a very slight increase in tidal exchange. Water quality conditions, including salinity, dissolved oxygen, indicator bacteria, and other chemical constituents, should not change in a detectable fashion relative to the current baseline conditions.

4.2.1.2 NED Alternative

Under the NED Alternative there would be no changes in wastewater or stormwater runoff sources or water inflows, but there would be a slight increase in tidal water exchange due to the larger channel cross section. Hypoxic conditions are not expected to occur with respect to increased channel depth because conditions are not favorable for stratification and projected vessel traffic would continue to promote vertical mixing and aeration within the water column. Because there would be no significant changes in inflows and only a slight increase in tidal exchange, there should be no detectable changes in water quality conditions, including salinity, dissolved oxygen, indicator bacteria, and other chemical constituents, relative to the FWOP-1 Alternative. There would be changes associated with dredging activities that would be similar to those under the FWOP-1 Alternative. Last, equipment staging areas and dredge pipelines would not result in any detrimental effects to water quality of the project area and appropriate Best Management Practices (BMPs) would be implemented where necessary.

4.2.1.3 LPP Alternative

Effects under this alternative are similar to those described for the NED and FWOP-1 alternatives. There should be no significant effects on salinity, dissolved oxygen, indicator bacteria, or other chemical constituents relative to current baseline conditions. Last, equipment staging areas and dredge pipelines would not result in any detrimental effects to water quality of the project area and appropriate BMPs would be implemented where necessary.

4.2.2 Water and Elutriate Chemistry

4.2.2.1 FWOP-1 Alternative

Under the FWOP-1 Alternative, there would be construction dredging associated with the Widening Project. This construction material has been tested for contaminants (USACE, 2008a), and no causes for concern were found. There should be no water quality impacts from beach nourishment, aside from short-term increased turbidity. The impacts from ocean placement of 2.8 mcy of new work material were found to be acceptable (USACE, 2008a), in that only increases in turbidity would be expected from ocean placement. There would be less new work material under the FWOP-1 Alternative than under the NED or LPP alternatives and therefore less turbidity.

Under the FWOP-1 Alternative, the long-term water quality in the project area would be essentially as it is described in Section 4.2.1.1. There would be short-term increases in turbidity.

4.2.2.2 NED Alternative

As noted in Section 2.4.2, all construction material and all future maintenance material is destined for ocean placement or upland confined placement. Therefore, there are three impacts of interest: impacts from dredging, impacts from ocean placement, and impacts from the effluent coming from the PA spillways.

All of the impacts noted above for maintenance dredging with the FWOP-1 Alternative would also be expected with the construction dredging associated with the NED Alternative. However, the construction material from the Outer Bar and Jetty channels has been tested for contaminants, and there was monitoring of the water column before, during, and after dredging and placement in the New Work ODMDS in the early 1990s (see Section 3.4.2; EH&A, 1994). No causes for concern for the water column were found upon placement of this material in the New Work ODMDS. While the construction material for the NED Alternative has not been subjected to water quality analyses, it is virgin bottom material. Sediment quality analyses of construction material from the portion of the Jetty Channel from the Widening Project (USACE, 2008a) have been conducted (see Section 3.5.1). Samples were collected to the depth of the NED Alternative, and no causes for concern were determined. Therefore, there should be no unacceptable water quality impacts from dredging or open-ocean placement. However, as noted in Section 3.5.1, during the PED phase of the project, the USACE plans additional sampling of construction material from the extension of the Outer Bar Channel. Additional effects of ocean placement can be found in Appendix B.

As noted in Section 3.4.2, elutriate chemistry was performed on the material from the inner portions of the Freeport Harbor Channel, and monitoring was conducted on the effluent from a PA where sediments from the Inner Channel were placed. No unacceptable water quality impacts were found (USACE, 1978), and, therefore, none should be expected with the NED Alternative. USACE anticipates additional testing of the Inner Channel. Last, equipment staging areas and dredge pipelines would not result in any detrimental effects to water quality of the project area and appropriate BMPs would be implemented where necessary.

4.2.2.3 LPP Alternative

Water quality impacts from this alternative would be the same as those described for the NED Alternative, except that there would be less construction and maintenance material. However, the sources of the material would be the same, so water quality impacts would be essentially the same as those described for the NED Alternative, but with a slightly shorter duration for construction and maintenance activities. Last, equipment staging areas and dredge pipelines would not result in any detrimental effects to water quality of the project area and appropriate BMPs would be implemented where necessary.

4.2.3 Ballast Water

Ballast water has the potential to include potentially invasive species from a remote location. Recognizing this danger, the U.S. has adopted a BWM program described in Section 3.4.4. It includes a number of management measures, including having ballast water exchange a minimum of 200 miles offshore, substantially reducing the risk of introducing invasive species in discharged ballast water in port. It should be noted that vessels loading cargo for export are a small percentage of the vessel traffic at Port Freeport.

4.2.3.1 FWOP-1 Alternative

The number of ballast water exchange reports that were submitted for Freeport Harbor between 2004 and 2006 was 217 (NBIC, 2006). This existing rate of activity is expected to continue under the FWOP-1 Alternative. However, the risk of introducing invasive species through ballast water releases may increase slightly with the projected increase in tonnage handled and number of port calls per year with the widened Outer Bar and Jetty channels.

4.2.3.2 NED Alternative

Under the NED Alternative, there would be a slight increase in risk of potential impacts from ballast water releases. The improved channel would allow the use of larger vessels that would need fewer port calls to carry cargo. This could act to reduce the risk. However, the larger channel may create the opportunity for new development at Port Freeport, thus resulting in additional ship traffic, potentially from ports not currently calling at Port Freeport. This could increase the risk relative to the FWOP-1 Alternative. However, current compliance with USCG BWM protocols, as described in Section 3.4.4, would continue. Thus, ballast water exchange would continue to occur a minimum of 200 miles offshore, reducing the risk of introducing invasive species. The risk of introduction, despite these management protocols, correlates with the number of ships calling at the port.

4.2.3.3 LPP Alternative

Potential impacts from ballast water releases would be slightly less than under the NED Alternative. However, the risk is greatly reduced through compliance with USCG BWM protocols.

4.3 SEDIMENT QUALITY

4.3.1 Surficial Sediments (New Work Material)

4.3.1.1 FWOP-1 Alternative

Some of the material excavated from the channel would nourish the beach at Quintana, and the remainder would be placed in the New Work ODMDS. Sediment quality is discussed in Section 3.5.1, which indicates no cause for concern with this sediment. The 300,000 cy of silty sand that would be excavated was determined to be of sufficient quality to be used for beach placement (PBS&J, 2005b) at Quintana Beach. Fine material would be placed offshore (USACE, 2008a). Thus, no impacts from disposal of new work material are expected.

4.3.1.2 NED Alternative

As noted above, the quality of sediment from the Jetty Channel is discussed in Section 3.5.1. While the extension of the Outer Bar Channel has not been tested, it is virgin Gulf bottom far removed from sources of contamination. The NED Alternative would generate approximately 20.4 mcy of sediment. Of this, roughly 15.0 mcy would be placed offshore in the New Work ODMDS. Modeling of the placement of the projected amount of construction material was performed (Appendix B, Section 5.0), and it was determined that maximum mound height would be 12 feet, although since the site is dispersive, the material would not stay in the New Work ODMDS long term. The modeling indicates that a very small amount of dredged material placed in the New Work ODMDS during construction will slough outside the boundaries of the site (see Appendix B, Attachment A). Almost all benthos inside the New Work ODMDS would be buried. However, monitoring of the New Work ODMDS after construction of the 45-foot Project showed no significant impacts outside the ODMDS attributed to the placement of sediment at the site. In addition, the majority of benthos at the site were opportunistic species that would be able to rapidly repopulate the area. There is no reason to believe that more impacts will occur for the NED Alternative than for the 45-foot Project, and monitoring would be conducted to ensure that there is no excessive mounding and that there is no short-term transport of sediment outside the New Work ODMDS (Appendix B, Attachment B). There would also be monitoring for contamination at and near the New Work ODMDS before construction begins, at the end of construction, and 6 months and 1 year after cessation of dredging (see Appendix B, Attachment B). Appendix B provides more details on the potential impacts of the sediment that is projected to be placed offshore. All other sediment would be placed in upland PAs.

4.3.1.3 LPP Alternative

The LPP Alternative would generate less (17.3 mcy) sediment than the NED Alternative, of which 12.7 mcy would be destined for offshore placement. Thus, the New Work ODMDS would still be needed and benthos would be buried. Long-term impacts are not expected, as the

opportunistic species in the area (EH&A, 1994) would be expected to repopulate in a relatively short period of time. Mounding of material placed in the New Work ODMDS for the LPP Alternative was not modeled, since the NED Alternative was used as a worst-case scenario. However, it is reasonable to expect mounding would be less with the LPP Alternative than with the NED Alternative because the dredged material quantities are smaller. However, the thickness would still be sufficient to prevent significant migration of benthic organisms. The same monitoring noted above for the NED Alternative would also be conducted under the LPP Alternative.

4.3.2 Maintenance Material

4.3.2.1 FWOP-1 Alternative

The existing maintenance material is described in Section 3.5.2. The quality of this material would not be expected to change with the FWOP-1 Alternative. Currently 2.23 mcy/year of maintenance material is dredged from the 45-foot Project, which would increase to approximately 3.3 mcy/year, with the FWOP-1 Alternative. Over the next 50 years, approximately 161.5 mcy of maintenance material is expected to be dredged from the permitted channel, an increase of about 49 mcy over 50 years.

4.3.2.2 NED Alternative

The quantity of this material is expected to increase significantly from the FWOP-1 Alternative. Over the 50-year life of the proposed project, approximately 190.5 mcy of maintenance material would be dredged from the FHCIP. This is an increase of approximately 29.0 mcy over 50 years, relative to the FWOP-1 Alternative. However, the quality is not expected to change, since the source of the maintenance material and the method of placement will not change. USACE also routinely tests the maintenance material according to RIA, Green Book, and Inland Testing Manual protocols before dredging to ensure that there are no causes for concern. As noted in Section 3.5.2, past testing of maintenance material with chemical analyses, whole mud bioassays, and bioaccumulation studies has indicated no cause for concern. Thus, impacts associated with maintenance dredging and material placement would not be expected to change from the FWOP-1 Alternative except that the quantity of material would be larger.

4.3.2.3 LPP Alternative

The LPP Alternative is similar to the NED Alternative relative to maintenance material. Over the 50-year proposed period of analysis, approximately 175.9 mcy of maintenance material would be dredged from the FHCIP. This is approximately 14.4 mcy more than would be dredged for the FWOP-1 Alternative over the same 50-year time period, but the quality should not change.

4.4 AIR QUALITY

This section provides a discussion of the air quality impacts associated with the No Action, FWOP, and potential alternatives. It addresses both direct and indirect effects and discusses their impacts relative to the inventory of air emissions for the HGB nonattainment area. As discussed in Section 3.6, for air quality monitoring and planning purposes, the EPA relies on the designation of nonattainment areas for air pollutants within the boundaries of geographical planning units. For consistency with the EPA's designations, the HGB nonattainment area was considered to determine the potential air quality impacts of the proposed alternatives.

The evaluation of impacts to air quality associated with the alternatives was based on the identification of air contaminants and estimated emission rates. The air contaminants considered are those covered by the NAAQS (except for lead [Pb], which is not relevant to project emissions) including CO, O_3, NO_X, PM_{10}, $PM_{2.5}$, and SO_X. Air emissions were considered for channel improvement activities and placement of dredged material as well as emissions from vehicular traffic associated with the project employees' commute. Project emissions were estimated based on preliminary assumptions regarding construction timing and equipment developed for this project. It is not within the scope of this analysis to perform the refined dispersion modeling necessary to predict concentrations for each contaminant and alternative. Rather, the impact of emissions was analyzed relative to the existing inventory and monitored data for air contaminant emissions in the HGB nonattainment area.

The estimated air contaminant emissions, except O_3 and its precursors, were compared to the 2002 emissions inventory for the HGB nonattainment area. Assuming an increase in air emissions would result in a corresponding increase in the ambient air concentration for that air contaminant, the ratio of the estimated emissions to the existing 2002 emissions for that contaminant provided a relative indication of the potential increase in ambient concentrations for the air contaminant. Because air emissions are generally dispersed with distance and time, a relatively small increase in emissions may be assumed to cause a correspondingly small increase in ambient air quality concentrations for that air contaminant, and it may be expected that the increase in emissions would not cause an exceedance of the NAAQS. Because authorization for the project is considered a Federal action, emissions were also considered in terms of the General Conformity Rules.

4.4.1 No Action Alternative

No construction or new operating GHG emission sources are associated with the No Action Alternative. However, it is expected that air contaminant emissions will increase due to continued operational constraints on the existing system and projected increased ship traffic resulting both from growth of existing business and from new business at the Port. Without project implementation, air quality within the area will continue at current trends. Port Freeport

is within a nonattainment area for ozone. Although mobile emission sources are expected to increase in the area, EPA standards for cleaner-burning engines and fuel sources are expected to reduce emissions. Over the past 15 years, ozone monitored values have decreased, despite a 36 percent increase in area population from 1991 to 2005 (TCEQ, 2010a). It is anticipated that there would be a continued reduction in ozone due to controls imposed by the Texas SIP requirements. By 2019, the area is expected to achieve and maintain attainment with the NAAQS for ozone. The planning and implementation of these SIP requirements incorporate the effects of population and industrial growth, technology changes, and national or statewide control measures.

4.4.2 FWOP-1 Alternative

The Widening Project is expected to result in between 231 and 214 tpy of NO_X emissions in the first year of construction and between 82 and 76 tpy of NO_X emissions in the second year of construction, not to exceed 100 tpy in the second year of construction (USACE, 2008a). The exact amount of emissions is dependent on the type of equipment used for widening the Jetty Channel. The final estimate of projected emissions will be communicated to the TCEQ for seeking concurrence that these updated emissions are conformant with the SIP. Under the FWOP Alternative, it is expected that, after construction, air contaminant emissions will continue at roughly current trends.

GHG emissions produced under the FHCIP FWOP Alternative would likely be similar to emissions generated under existing conditions but may be slightly higher or lower depending on any changes in shipping patterns or volume. Any increase in GHG emissions under the FWOP alternative would most likely be minor and would not cause an individually discernible impact on global climate change.

4.4.3 NED Alternative

The evaluation of air quality impacts associated with the NED Alternative was based on the identification of air contaminants and estimated emission rates for this project alternative. Air contaminant emissions were estimated for project-related activities based on the schedule, equipment use, capacity, and other related assumptions developed for this alternative. Detailed emissions estimates are contained in the reference document in Appendix C.

The emission sources for this alternative would consist of marine vessel and land-based mobile sources that would be used during the channel improvement activities, as follows:

- Marine Vessels – dredges (cutterhead and hopper) and support equipment (tugboats and survey boats), and shrimp trawlers; and
- Land-based – off-road (bulldozers) and on-road (employee vehicles).

Air contaminant emissions associated with the channel improvement would be primarily combustion products from fuel burned in equipment used for project dredging, support vessels, and dredged material placement equipment. Activities at dredged material placement sites would involve the use of earth-moving equipment. The marine vessel emission sources would be primarily diesel-powered engines. The off-road equipment was assumed to be a mix of gasoline- and diesel-powered and the on-road vehicles all gasoline-powered vehicles.

Regarding the use of low-emission diesel and newer equipment (with lower NO_X), USACE would (1) encourage construction contractors to apply for Texas Emission Reduction Plan grants, the EPA's Voluntary Diesel Retrofit Program, or the EPA's Diesel Emission Reduction Plan offering the opportunity to apply for resources for upgrading or replacing older equipment to reduce NO_X emissions, (2) encourage contractors to use cleaner, newer equipment with lower NO_X emissions, (3) direct contractors and operators that will use non-road diesel equipment to use clean, low-sulfur fuels, (4) direct contractors that will use tugboats during construction to use clean, low-sulfur fuels, (5) direct operators of the assist tugboats used in maneuvering dredge vessels to use clean, low-sulfur fuels, and (6) direct operators of the dredging vessels to use clean, low-sulfur fuels. A more detailed discussion of methods used for estimation of air contaminant emissions can be found in Appendix C.

4.4.3.1 Air Quality Analysis Results – NED Alternative

Emissions from the activities associated with the NED Alternative would include VOC, NO_X, CO, SO_X, PM_{10}, and $PM_{2.5}$. As $PM_{2.5}$ is a subset of PM_{10} particles, when the estimation model used did not specifically provide a $PM_{2.5}$ emission rate, the estimated $PM_{2.5}$ emission rate was conservatively assumed to be equivalent to that of PM_{10}. These construction activities would be considered one-time activities, i.e., the channel improvement activities would not continue past the date of completion. Because of the high moisture content of the dredged material, it is expected that there would be no particulate matter emissions from the placement of dredged material in upland placement areas. Further, the non-Federal sponsor has no plans to move the dredged material after placement. Thus no future release of particulate matter associated with the movement of dry material is anticipated.

A summary of the total estimated emissions in tons resulting from the use of dredging equipment, nonroad equipment, and on-road equipment for the project NED Alternative is presented in Table 4.4-1. A detailed summary of emissions can be found in the reference document (see Appendix C).

Table 4.4-1
NED Alternative – Total Estimated Project Emissions by Source*

Air Contaminant	Dredging Equipment Emissions (tons)	Nonroad Vehicle Emissions (tons)	On-road Vehicle Emissions (tons)
CO	397	14.7	162
NO_X	3,522	32.9	11.8
$PM_{2.5}$	80	2.4	0.26
PM_{10}	84	2.4	0.57
SO_2	541	5.1	0.18
VOC	41	2.4	15.5

*Project construction is expected to be completed over a period of about 5 years.

For a discussion of air quality impacts, the total air contaminant emissions from the NED Alternative were compared to the 2002 emissions inventory for Brazoria County as described in Section 3.6.2. The comparison is presented in Table 4.4-2.

Table 4.4-2
NED Alternative – Peak Annual Estimated Project Emissions Compared with Brazoria County and HGB Emissions (2002)

Air Contaminant	Peak Estimated Project Emissions (tpy)	Project Emissions % of Brazoria County Emissions	Project Emissions % of HGB Emissions
CO	144	0.2	0.01
NO_X	945	2.1	0.26
$PM_{2.5}$	22	0.3	0.04
PM_{10}	23	0.06	0.01
SO_X	156	1.4	0.1
VOC	15	0.1	0.01

As shown in Table 4.4-2, air contaminant emissions from the NED Alternative would result in a relatively small increase in emissions above those from existing sources in the county and the HGB nonattainment area. As a result, it is expected that air contaminant emissions from the combustion of fuel in equipment used for dredging and placement activities would also result in correspondingly minor short-term impacts on air quality in the immediate vicinity of the project area and even less as emissions are dispersed over the HGB nonattainment area. Due to the anticipated short-term duration of the channel improvement activities, there would be no long-term impacts, and therefore emissions from these activities are not expected to adversely impact the long-term air quality in the area.

The estimated annual GHG emissions as CO_2e for the NED Plan Alternative are summarized in Table 4.4-3 for each year of the anticipated construction activities. Appendix N presents a project-level analysis of GHG emissions.

Table 4.4-3
NED Plan Alternative – Summary of GHG Emissions
(metric tons per year as CO_2 Equivalent)

Activity	2011	2012	2013	2014	2015	2016
Dredging Activities	6,175	51,832	57,073	48,099	33,716	18,504
Land-side Dredged Material Placement	0	698	9	865	731	122
Employee Commuter Vehicles	58	1,252	931	1,248	663	244
Totals	**6,233**	**53,782**	**58,013**	**50,212**	**35,111**	**18,870**

4.4.3.2 General Conformity Applicability – NED Alternative

For comparison with the thresholds defined in the General Conformity Rule, the estimated emissions of NO_X and VOC for the NED Alternative are summarized in Tables 4.4-4 and 4.4-5 for each year during which the project activities are anticipated to occur. Emissions of CO, SO_2, and particulate matter are not considered in the General Conformity evaluation, as the HGB Air Quality Control Region is in attainment with the NAAQS for those pollutants.

As shown in Table 4.4-4, emissions of VOC for project-related activities are exempt from a General Conformity Determination because they are below the 25 tpy threshold.

Table 4.4-4
NED Alternative – Summary of VOC Emissions (tpy)

Activity	2011	2012	2013	2014	2015	2016
Dredging Activities	1.16	9.61	10.78	9.08	6.41	3.48
Land-side Dredged Material Placement	--	0.48	0.65	0.62	0.58	0.10
Employee Commuter Vehicles	0.2	4.41	3.28	4.40	2.34	0.86
Totals	**1.36**	**14.51**	**14.71**	**14.11**	**9.33**	**4.43**

As shown in Table 4.4-5, NO_X emissions for project construction activities show the project would exceed the conformity threshold, i.e., greater than 25 tpy, for all years of projected construction activity. Therefore, a General Conformity Determination for NO_X emissions would be required for these years.

Table 4.4-5
NED Alternative – Summary of NO_X Emissions (tpy)

Activity	2011	2012	2013	2014	2015	2016
Dredging Activities	100.96	847.8	933.1	786.4	551.1	302.6
Land-side Dredged Material Placement	--	6.75	9.0	8.48	7.44	1.24
Employee Commuter Vehicles	0.16	3.36	2.50	3.35	1.78	0.65
Totals	**101.1**	**857.9**	**944.6**	**798.2**	**560.4**	**304.5**

As noted in Section 4.4.4.3, a General Conformity Determination has been prepared by the USACE (see Appendix C). This document was noticed for public review concurrent with the

DEIS in December 2010. Subsequent coordination with the EPA and TCEQ will ensure the project is compliant with the SIP.

4.4.4 LPP Alternative

The evaluation of air quality impacts associated with the LPP Alternative was based on the identification of air contaminants and estimated emission rates for this project alternative. Emissions inventories were estimated for project-related activities based on the schedule, equipment use, capacity, and other related assumptions developed for this alternative. Detailed emissions estimates are contained in the reference document in Appendix C.

The emission sources corresponding to the LPP Alternative are consistent with those described for the NED Alternative and include both marine vessels and land-based equipment. However, dredged material quantities would be smaller for the LPP Alternative, and this is taken into account in emissions estimates.

4.4.4.1 Air Quality Analysis Results – LPP Alternative

Emissions from the activities associated with the LPP Alternative would be considered one-time activities, i.e., the channel improvement activities would not continue past the date of completion. Because of the high moisture content of the dredged material, it is expected that there would be no particulate matter emissions from the placement of dredged material in upland placement areas. Further, the non-Federal sponsor has no plans to move the dredged material after placement. Thus no future release of particulate matter associated with the movement of dry material is anticipated.

A summary of the total estimated emissions in tons resulting from the use of dredging equipment, nonroad equipment, and on-road equipment from the LPP Alternative is presented in Table 4.4-6. A detailed summary of emissions can be found in the reference document (see Appendix C).

Table 4.4-6
LPP Alternative – Total Estimated Project Emissions by Source*

Air Contaminant	Dredging Equipment Emissions (tons)	Nonroad Vehicle Emissions (tons)	On-road Vehicle Emissions (tons)
CO	296	25.7	164.8
NO_X	2620	59.5	12.0
$PM_{2.5}$	59	4.19	0.27
PM_{10}	63	4.32	0.58
SO_2	434	9.33	0.18
VOC	30	4.33	15.8

*Project construction is expected to be completed over a period of about 4 years.

For a discussion of air quality impacts, the total air contaminant emissions from the LPP Alternative were compared to the 2002 emissions inventory for Brazoria County and the HGB Air Quality Control Region as described in Section 3.6.2. The comparison is presented in Table 4.4-7.

Table 4.4-7
LPP Alternative – Peak Annual Estimated Project Emissions Compared with Brazoria County and HGB Emissions (2002)

Air Contaminant	Peak Estimated Project Emissions (tpy)	Project Emissions % of Brazoria County Emissions	Project Emissions % of HGB Air Quality Control Region Emissions
CO	169	0.3	0.02
NO_X	883	2.0	0.25
$PM_{2.5}$	21	0.3	0.04
PM_{10}	22	0.06	0.01
SO_X	146	1.3	0.10
VOC	17	0.1	0.01

As shown in Table 4.4-7, air contaminant emissions from the LPP Alternative would result in a relatively small increase in emissions above those from existing sources in the county and the HGB Air Quality Control Region. As a result, it is expected that air contaminant emissions from the combustion of fuel in equipment used for dredging and placement activities would also result in correspondingly minor short-term impacts on air quality in the immediate vicinity of the project area and even less as emissions are dispersed over the HGB Air Quality Control Region. Due to the anticipated short-term duration of the channel improvement activities, there would be no long-term impacts, and therefore emissions from these activities are not expected to adversely impact the long-term air quality in the area

The estimated annual GHG emissions for the LPP Plan Alternative are summarized in Table 4.4-8 for each year of the anticipated construction activities. Appendix N presents a project-level analysis of GHG emissions.

Table 4.4-8
LPP Alternative – Summary of GHG Emissions (metric tons per year as CO_2 Equivalent)

Activity	2011	2012	2013	2014	2015
Dredging Activities	5,833	45,694	52,306	43,051	13,355
Land-side Dredged Material Placement	0	2,008	2,677	1,421	7
Employee Commuter Vehicles	41	2,104	906	1,081	0
Totals	**5,875**	**49,805**	**55,890**	**45,554**	**13,362**

4.4.4.2 General Conformity Applicability – LPP Alternative

For comparison with the thresholds defined in the General Conformity Rule, the estimated emissions of NO_X and VOC for the LPP Alternative are summarized in Tables 4.4-9 and 4.4-10 for each year during which the project activities are anticipated to occur. Emissions of CO, SO_2, and particulate matter are not considered in the General Conformity evaluation, as this area is in attainment with the NAAQS for each of those pollutants.

As shown in Table 4.4-9, emissions of VOC for project-related activities are exempt from a General Conformity Determination because they are below the 25 tpy threshold.

Table 4.4-9
LPP Alternative – Summary of VOC Emissions (tpy)

Activity	2011	2012	2013	2014	2015
Dredging Activities	1.09	8.52	9.86	8.18	2.55
Land-side Dredged Material Placement	--	1.39	1.86	1.08	--
Employee Commuter Vehicles	0.15	7.42	3.19	3.81	1.18
Totals	1.24	17.33	14.91	13.08	3.73

Table 4.4-10
LPP Alternative – Summary of NO_X Emissions (tpy)

Activity	2011	2012	2013	2014	2015
Dredging Activities	95.4	747.3	855.2	703.7	218.3
Land-side Dredged Material Placement	--	19.41	25.88	14.23	--
Employee Commuter Vehicles	0.11	5.65	2.43	2.90	0.90
Totals	95.5	772.4	883.5	720.9	219.2

As shown in Table 4.4-10, NO_X emissions for project construction activities show the project would exceed the conformity threshold, i.e., greater than 25 tpy, for all years of projected construction activity. Therefore, a General Conformity Determination for NO_X emissions would be required for these years.

4.4.4.3 General Conformity Determination

As part of the General Conformity process, the USACE has prepared a Draft General Conformity Determination to discuss whether emissions that would result from the proposed FHCIP are in conformity with the Texas SIP for the HGB nonattainment area. This document (included as Appendix C) was noticed for public comment concurrent with the DEIS in December 2010 and was submitted to TCEQ, EPA, and the Brazoria County Health Department, the local air pollution control program. Following coordination with TCEQ and the EPA regarding conformity with the SIP, a Final General Conformity Determination that provides the

USACE final determination with regard to the conformity of this project with the SIP will be prepared.

In response to the issuance of the Draft General Conformity Determination in December 2010, TCEQ provided a General Conformity Concurrence letter dated March 1, 2011. A copy of this letter is provided in Appendix C.

In its letter, the TCEQ provided its General Conformity concurrence for the proposed FHCIP and a determination that emissions from the project would not exceed the emissions budgets in the most recent SIP approved by the EPA. The most recently approved SIP revision, the "HGB Reasonable Further Progress SIP BPA Rate-of-Progress," adopted by the TCEQ on May 23, 2007, was approved by the EPA on March 29, 2010. In addition, the TCEQ suggested that the USACE adopt pollution prevention and/or reduction measures in conjunction with this and future projects including the following:

- Encourage construction contractors to apply for Texas Emission Reduction Plan grants;
- Establish bidding conditions that give preference to clean contractors;
- Direct construction contractors to exercise air quality BMPs;
- Direct contractors that will use tugboats during construction to use clean fuels;
- Direct operators of the assist tugboats used in maneuvering dredge vessels to use clean fuels;
- Select assist tugs based on lowest NO_X emissions instead of lowest price; or
- Purchase and permanently retire surplus NO_X offsets prior to commencement of operations.

The EPA also provided comments with regard to the Draft General Conformity Determination by letter dated February 11, 2011, as follows:

> "The DEIS and appendices do not indicate plans for this project to use cleaner, newer equipment with lower NO_X emissions. EPA encourages the use of clean, lower-emissions equipment and technologies to reduce pollution. Further, EPA's final Highway Diesel and Nonroad Diesel Rules mandate the use of lower-sulfur fuels in nonroad and marine diesel engines beginning in 2007. Please indicate a discussion of additional measures the project will incorporate to reduce emissions and the anticipated reductions in emissions. Initiatives such as the EPA Voluntary Diesel Retrofit Program, the EPA Diesel Emission Reduction Program (DERA), and the Texas Emissions Reduction Plan (TERP) on the State level offer the opportunity to apply for resources for upgrading and replacing older equipment to reduce NO_X emissions."

In response to these suggestions USACE will:

1. Encourage construction contractors to apply for Texas Emission Reduction Plan grants, the EPA's Voluntary Diesel Retrofit Program, or the EPA's Diesel Emission Reduction Plan offering the opportunity to apply for resources for upgrading or replacing older equipment to reduce NO_X emissions;
2. Encourage contractors to use cleaner, newer equipment with lower NO_X emissions;
3. Direct contractors and operators that will use non-road diesel equipment to use clean, low-sulfur fuels;
4. Direct contractors that will use tugboats during construction to use clean, low-sulfur fuels;
5. Direct operators of the assist tugboats used in maneuvering dredge vessels to use clean, low-sulfur fuels; and
6. Direct operators of the dredging vessels to use clean, low-sulfur fuels.

Based on the General Conformity Concurrence letter provided by TCEQ, USACE has prepared a Final General Conformity Determination (see Appendix C) to document that emissions that would result from the proposed FHCIP are in conformity with the Texas SIP for the HGB nonattainment area. A Notice of Availability of this document was published in the newspaper of general circulation in Brazoria County concurrent with the EIS and was submitted to TCEQ, EPA, and the Brazoria County Health Department, the local air pollution control program.

TCEQ and USACE's determination of conformity is based on the emissions information and project schedule proposed at the time. Once a final project schedule is completed, USACE will provide an update of the General Conformity documentation to TCEQ and EPA for review and concurrence that the updated emissions and schedule will still be conformant with the currently approved Houston-Galveston area SIP.

4.4.5 Additional Maintenance Dredging

After the improvements to the channel are completed, maintenance dredging of the channel will be required. Maintenance dredging is conducted within the channel by USACE on a cyclical basis with a current maintenance volume of 1.88 mcy per every 10.1 months (equivalent to 2.23 mcy per year), with material taken to an approved disposal site. Under the FWOP Alternative, maintenance dredging volumes would be approximately 3.23 mcy per year. The forecasted total maintenance volume after the channel deepening and widening (NED Alternative) has been accomplished is 3.81 mcy per year; an increase in 1.58 mcy per year over the No Action Alternative and 0.58 mcy per year over the FWOP Alternative. Similarly, the forecasted total maintenance volume after the channel deepening and widening (LPP Alternative) has been accomplished is 3.51 mcy per year; an increase in 1.28 mcy per year over the No Action Alternative and 0.28 mcy per year over the FWOP Alternative.

A summary of the estimated emissions in tons resulting from the additional maintenance dredging equipment is shown in Tables 4.4-11 and 4.4-12, for the NED and LPP Alternatives, respectively.

Table 4.4-11
NED Alternative – Additional Maintenance Dredging – Total Estimated Emissions

Air Contaminant	Dredging Equipment Emissions (tons/year)
CO	8.09
NO_X	69.90
$PM_{2.5}$	1.59
PM_{10}	1.67
SO_2	11.06
VOC	0.85

Table 4.4-12
LPP Alternative – Additional Maintenance Dredging – Total Estimated Emissions

Air Contaminant	Dredging Equipment Emissions (tons/year)
CO	6.55
NO_X	56.63
$PM_{2.5}$	1.28
PM_{10}	1.36
SO_2	9.40
VOC	0.69

Although included as part of the project impact evaluation, the General Conformity rules specifically exclude maintenance dredging and debris disposal. Therefore, the General Conformity Determination for this project does not include emissions from the additional maintenance dredging activities.

4.5 NOISE

Project-related noise impacts were evaluated by calculating the worst-case noise levels related to the proposed dredge and placement operations at noise-sensitive receivers. Worst-case conditions would be considered to occur when all dredging or placement equipment is operating in one specific location simultaneously. However, noise levels related to these operations would be based upon the actual number/type of equipment operating in one location at a specific time, and would also fluctuate as equipment is maneuvered throughout the channel. Worst-case impacts were assessed by comparing the noise levels of typical dredge and construction equipment with the ambient noise levels in the vicinity of the project area. Project-related noise

levels at receivers were calculated based on numerous properties of noise attenuation and industry accepted standards (see Table 3.7-2).

Noise attenuation between dredge activities and sensitive receivers was calculated based on the assumption that noise attenuates 6 dBA per doubling distance from its source. For example, if dredging activities are measured at 87 dBA at 50 feet, the noise levels would decrease 6 dBA to 81 dBA at 100 feet, decrease an additional 6 dBA to 75 dBA at 200 feet, and decrease to 69 dBA at 400 feet, etc.

4.5.1 FWOP-1 Alternative

Construction of the Widening Project would result in increased noise levels at area receptors. Increases would range from between 12 and 23 dBA over ambient conditions. However, this is only a slight increase (3 to 6 dBA at Surfside Beach Jetty Park and 4 dBA at Surfside Beach residences) over noise impacts currently experienced during maintenance dredging.

The existing regime of maintenance dredging would continue as normal. However, the Widening Project would result in maintenance dredging activities being closer to noise receptors at Surfside. Thus, noise levels associated with maintenance dredging under the FWOP-1 Alternative are expected to increase noise levels during maintenance dredging activities by approximately 3 to 6 dBA at Surfside Jetty Park and approximately 4 dBA at the nearest residences. These noise increases will be barely perceptible to the human ear.

As noted in Section 2.6, there is potential for growth to occur at Port Freeport under the FWOP-1 Alternative. If this were to occur, it is likely ship traffic would increase, resulting in slightly higher noise levels along the Freeport Harbor Channel.

4.5.2 NED Alternative

The NED Alternative is not expected to result in long-term noise impacts. No permanent noise sources would be installed as part of this project. The NED Alternative would, however, create short-term noise level increases at noise-sensitive receivers. Equipment and duration for the proposed action varies by contract or channel reach. Worst-case conditions under the NED Alternative would occur in the vicinity of the Jetty Channel and the Stauffer Turning Basin. Like maintenance dredging, the NED Alternative's dredging operations would utilize a hopper dredge and tending boats in the Jetty Channel. Therefore, noise level increases in this portion of the project would be nearly identical to the increases during maintenance dredging (approximately 79 dBA at the Surfside Beach Jetty Park and 67 dBA at Surfside Beach's nearest residences). This is equivalent to a 12 to 23 dBA increase over ambient conditions, which is the same as described for the FWOP-1 Alternative. Dredging operations in the Stauffer Turning Basin would utilize a 30-inch cutterhead dredge and tending boats. Under the NED Alternative, worst-case

noise levels at the nearest receivers in the vicinity of the Stauffer Turning Basin were calculated at 68 dBA. This could contribute to slightly increased noise levels in the vicinity.

The proposed NED Alternative would also include activities at PAs 1, 8, and 9. The construction and placement activities could cause temporary noise level increases at nearby sensitive receivers. Initially, levees would be raised around the perimeter of the sites to provide the capacity for future maintenance material. Construction equipment would be operated on an as-needed basis at the PA. Material would be delivered to the site through a pipeline and moved by various earth-moving equipment. As shown in Table 3.7-1, the typical noise level of a bulldozer operating at 50 feet is approximately 82 dBA. Noise emissions would be reduced to 76 dBA at 100 feet, 70 dBA at 200 feet, and diminish quickly as the distance from the noise source increases. Proposed PAs 8 and 9 are located along SH 217, southwest of Freeport. Noise-sensitive receivers in this area include residential structures, a church, and the Freeport Municipal Golf Course. The greatest sound level increases related to placement would occur at the golf course, located approximately 600 feet west of PA 9. Noise levels from construction and placement activities could temporarily reach approximately 60 dBA at this distance. Existing noise conditions at the golf course are influenced by vehicle traffic on SH 217, as well as mowers and maintenance equipment operated throughout the course. The proposed action would not be expected to substantially increase noise levels above current conditions.

Although the NED Alternative is not expected to directly result in increased ship traffic, it could allow for larger ships to enter Port Freeport, and allow the opportunity for additional development at the port, resulting in an increased number of calls to the port and increased ship traffic in the channel. This could contribute to increased noise levels in the vicinity. However, these indirect impacts would be similar to potential increases under the FWOP-1 Alternative.

4.5.3 LPP Alternative

The LPP Alternative is not expected to result in long-term noise impacts. No permanent noise sources would be installed as part of this project. The proposed action, however, would create short-term noise levels at noise-sensitive receivers. Equipment for this alternative would be identical to that described for the NED Alternative, but the duration would vary. Worst-case conditions under the LPP Alternative would also occur in the vicinity of the Jetty Channel and the Stauffer Turning Basin. Noise level increases would be almost identical to the NED Alternative; however, the duration of operations would be expected to last about 2 months longer in the Stauffer Turning Basin, and almost 6 months less in the Jetty Channel than for the NED Alternative. Noise levels during the maintenance dredging would be essentially the same as described for the FWOP-1 Alternative for the Outer Bar and Jetty channels.

The proposed LPP Alternative would also include activities at PAs 1, 8, and 9. Expected noise level increases would be identical to those described for the NED Alternative.

Although the LPP Alternative is not expected to directly result in increased ship traffic, it could allow for larger ships to enter Port Freeport, and allow the opportunity for additional development at the port, resulting in an increased number of calls to the port and increased ship traffic in the channel. This could contribute to increased noise levels in the vicinity. These potential indirect impacts are expected to be the same as the NED Alternative and similar to the FWOP-1 Alternative.

4.6 ENERGY AND MINERAL RESOURCES

4.6.1 FWOP-1 Alternative

The Widening Project would not require relocation of any wells or pipelines.

4.6.2 NED and LPP Alternatives

There are no reported oil or gas wells located within the project area that would be directly or indirectly impacted by the proposed dredging or dredged material placement for any of the alternatives. However, there are 14 reported pipelines that cross the ship channel or its PAs (see Tables 3.8-2 and 3.8-3). Five of the pipelines cross under the two ODMDSs (see Table 3.8-4; RRC, 2006). For the NED and LPP alternatives, the required depth for pipelines up to the Stauffer Channel would be 80 feet. At this time, USACE has determined that all pipelines are at least 80 feet below msl, thus no pipeline relocations are needed.

4.7 SOILS INCLUDING PRIME AND UNIQUE FARMLANDS

4.7.1 FWOP-1 Alternative

Under the FWOP-1 Alternative, no new impacts to surface soils and prime and/or unique farmlands would occur from construction of the Widening Project. However, impacts to surface soils and prime farmland could occur primarily from commercial and/or residential development, which would continue according to expected trends, with potential for accelerated development from the Widening Project.

4.7.2 NED and LPP Alternatives

For both the NED and LPP Alternatives, soils within the project area would be impacted by construction of new upland PAs 8 and 9. These areas would be converted from pasture to areas used for placement of dredged material. However, the conversion would be consistent with current practices in the area.

Prime farmland soils located within the project area would be impacted by the NED Alternative. Construction of PA 9 would convert approximately 250 acres of prime farmland to a dredged material PA, thus making the area unavailable for future agricultural use. Additionally,

preservation of about 132 acres as part of the mitigation for impacts to PAs 8 and 9 would preclude the use of this area from future farming. Coordination with NRCS has been completed using Form AD-1006 (Farmland Conversion Impact Rating). According to NRCS, PA 9 and the mitigation area do contain soils classified as Important Farmland and are subject to the Farmland Protection Policy Act (FPPA). NRCS (2011) calculated the Farm Conversion Impact Rating to be a total of 161. However, this EIS presents detailed alternatives analyses that identified no other practicable alternatives for the placement of dredged material from this project.

4.8 GROUNDWATER HYDROLOGY

4.8.1 FWOP-1 Alternative

The FWOP-1 Alternative would not impact groundwater hydrology within the project area. Any groundwater quality impacts are contingent upon the amount and type of development that may take place within the study area.

4.8.2 NED and LPP Alternatives

Construction and operation activities associated with the NED and LPP Alternatives are not expected to result in impacts to groundwater hydrology, quantity, or quality. In addition, no groundwater withdrawals are anticipated for the project. No apparent private, public, or industrial water wells registered with TWDB (2006a) would be destroyed and/or affected based on their proximal distances and completed depths below surface grade.

Possible impacts to shallow groundwater along the axis of the channel may result from a greater channel depth allowing Gulf salinity to exist at a greater depth. However, this will not negatively affect water supply wells in the area. As noted in Section 3.10, all nearby wells are from the Chicot Aquifer and are screened at depths ranging from 250 to 1,330 feet, well below the proposed channel depths.

4.9 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

4.9.1 FWOP-1 Alternative

Under the FWOP-1 Alternative, the chance of encountering hazardous material during construction of the Widening Project is considered negligible, as no known sites exist within the proposed widening footprint.

4.9.2 NED and LPP Alternatives

Proposed improvements for either alternative would remove new work material consisting primarily of 80–90 percent clays, which are highly impermeable to contaminant migration, located beneath existing maintenance overburden. Based on this and the findings of the HTRW

survey that reported no known sites in the project footprint, contaminants at concentrations of concern are not likely to be encountered during proposed channel construction.

4.10 VEGETATION

4.10.1 Uplands

The vegetation communities are described and mapped in Section 3.12. The following describes potential nonwetland vegetation impacts associated with each of the alternatives. The potential impacts to wetlands are described in Section 4.10.2.

4.10.1.1 FWOP-1 Alternative

Upland habitats in the majority of the project area would be expected to remain as described in Section 3.12; however, development unrelated to the proposed Widening Project may convert upland habitat to developed areas. Additionally, if current subsidence, shoreline erosion, and sea level rise rates continue as described in Section 3.12, some habitats nearest the coastline could be converted to marshes or open-water habitat.

The Widening Project would remove approximately 1.65 acres of herbaceous/grassland and 0.25 acre of beach located along the north (Surfside) side of the Jetty Channel between Surfside Jetty Park and the USCG Station (Figure 4.10-1).

4.10.1.2 NED and LPP Alternatives

The impacts to upland vegetation would be the same for both the NED and LPP alternatives. Impacts to 21 acres of riparian forest, 358 acres of grassland, and 39 acres of ephemeral freshwater wetlands would result from the construction of PAs 8 and 9 (Table 4.10-1; Figure 4.10-2), which would occur under both alternatives. Section 5.0 and Appendix H provide detailed information on these habitats and their mitigation, which is the same for both alternatives. Last, equipment staging areas and dredge pipelines may result in temporary minor effects to uplands within the project area. Appropriate BMPs would be implemented where necessary to avoid and minimize potential effects. Upland PAs would be accessed through existing waterways, road or highway rights-of-way, and disturbed areas to minimize impacts.

Table 4.10-1
Vegetation Impacts from Construction of PAs 8 and 9

Placement Area	Forest	Grasslands	Ephemeral Freshwater Wetlands
PA 8	0 acre	145 acres	23 acres
PA 9	21 acres	213 acres	16 acres
Totals	**21 acres**	**358 acres**	**39 acres**

Dredge Top of Cut

Shore Protection Rock

Area of Widening Project Land Cut

0 100 200 400 Feet

Note: Imagery flown in 2005- TNRIS.

Figure 4.10-1
Widening Project Jetty Channel
Shoreline Impacts

Prepared for: USACE	
Job No.: 044190100	Scale: 1 inch equals 200 feet
Prepared by: J. Soulas	Date: 02/03/2006

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Figure 4.10-2

VEGETATION IMPACTS
FROM PAS 8 AND 9

File: I:\projects\hc1\usace\galv\441901\pdeis document\pdeis 3\pdeis 3 figures\use these\figure4_10-3.ai

4.10.2 Wetlands and Aquatic Vegetation Communities

4.10.2.1 FWOP-1 Alternative

The following describes potential changes in each of the wetland and aquatic vegetation communities considered in the project area when the proposed Widening Project is implemented.

4.10.2.1.1 Estuarine Habitats

Beach nourishment that would occur with construction of the Widening Project would provide limited protection to inter-ridge swales of the Brazos River delta as sediments placed on Quintana Beach eroded and were carried down drift. Limited estuarine habitat found along the Jetty Channel includes some shallow-water habitat and intertidal mud flats, amounting to less than 0.1 acre. Approximately 2 acres of sandy, tidal mudflats would be removed along the north (Surfside) side of the Jetty Channel between Surfside Jetty Park and the USCG Station.

4.10.2.1.2 Freshwater Habitats

Although the Widening Project is not expected to directly impact the wetland area located in the Jetty Channel on the north (Surfside) shoreline, indirect impacts to this area are expected to result in loss of habitat. These impacts are likely to result from equipment staging, site access, and upland and waterside construction activities, including the potential relocation of some of the old jetty rocks.

4.10.2.2 NED and LPP Alternatives

4.10.2.2.1 Estuarine Habitats

Some shallow-water habitat and intertidal mud flats along the Jetty Channel would be destroyed by the Widening Project. While there are estuarine marshes outside of the NED and LPP project footprints that are hydrologically connected to the project area by the GIWW, there will be no direct or indirect project impacts from either alternative. Because of the lack of changes to the salinity regime (see Section 4.2.1), no indirect salinity-related impacts to any of these habitats would be expected.

4.10.2.2.2 Freshwater Habitats

A wetland located on the north (Surfside) side of the Jetty Channel east of the USCG Station would be impacted by the Widening Project prior to construction of either the NED or LPP alternatives. There would be no impacts to freshwater habitat for either the NED or LPP alternatives resulting from channel construction or salinity-related impacts.

The NED and LPP alternatives would both impact freshwater wetlands as a result of PA construction, as described in Section 4.10.1.2, above. Construction of PAs 8 and 9 would impact

23 acres and 16 acres of wetlands, respectively. The Habitat Evaluation Procedure (HEP) Analysis in Appendix H-1 presents an extensive discussion of impacts to this resource, which would be mitigated. Last, appropriate BMPs would be implemented to avoid and minimize the potential for equipment staging areas and dredge pipelines to result in temporary direct and indirect impacts to wetlands and vegetation adjacent to PAs 8 and 9 along the Brazos River. Upland PAs would be accessed through existing waterways, road or highway rights-of-way, and disturbed areas to minimize impacts.

4.11 TERRESTRIAL WILDLIFE

4.11.1 FWOP-1 Alternative

Construction of the Widening Project would result in removal of approximately 1.9 acres of shoreline near the Jetty Channel along the north (Surfside) side of the channel. This area includes some upland grass and shrub/scrub vegetation, and some portions of sandy beach. Removal of this habitat is not expected to have negative effects on local wildlife because of the small size of the area being removed and the presence of similar habitat types within the project area. Dredging activities from the Widening Project may have some indirect temporary effects to shorebirds, wading birds, and waterfowl in the immediate vicinity by potentially reducing the availability of the food supply through increased turbidity. Temporary impacts to aquatic communities and habitat from increased sedimentation and turbidity would be expected from placement of dredged material at the ODMDSs. This in turn may affect birds in the area by potentially reducing the availability of their local food supply temporarily. However, due to the large area of Gulf waters surrounding the project, it is doubtful that construction and dredged material placement operations would have any meaningful impact on the local food supply for birds in the area. Impacts would be short term and would be only slightly higher than those that occur during current maintenance and dredging activities for the existing channel, which occur approximately every 10 months. Due to the distance of known rookeries in relation to the ODMDSs, rookeries would not be impacted by the placement of dredged material at these sites.

The noise of equipment and increased human activity during dredging activities may disturb some local wildlife, particularly birds, especially during the breeding season. Such impacts, however, should be temporary and without significant long-term implications. Furthermore, noise and artificial lighting impacts related to proposed activities would have minimal additive effects, given the current environment is affected by a number of transportation-related (i.e., barges, railway, roadway, etc.) and heavy industrial activities. Salinity effects are unlikely and are not expected to affect infaunal organisms in the area. Beach placement under FWOP-1 would potentially impact piping plovers and sea turtles. These potential impacts to endangered species are addressed in Section 4.13, below.

4.11.2 NED and LPP Alternatives

NED and LPP Alternatives impacts would be similar for this resource. Although there will be less material dredged under the LPP Alternative, the footprint of the projects is the same. Dredging activities may have a minimal impact on terrestrial wildlife species as a result of increased turbidity and altered hydrology, which in turn may indirectly affect shorebirds, wading birds, and waterfowl in the immediate vicinity of the dredge by potentially reducing the availability of the food supply. These impacts are local and temporary and are not likely to be significant considering the overall availability of similar habitats in the general area, the mobility of birds, and the frequent occurrence of similar impacts due to maintenance activities.

Additional impacts from noise and increased human activity would be the same as those described for the FWOP-1 Alternative, except that they would occur farther up the channel to the Stauffer Turning Basin.

According to the USFWS TCWC (USFWS, 2010), several rookeries occur within the study area. Table 3.13-1 provides information on nesting activities at these rookeries. Dredging activities for the FHCIP would occur immediately adjacent to rookeries 610-101 and 610-102 (USFWS, 2010). Rookery 610-101 (Bryan Beach State Park), which is located near the intersection of the Freeport Harbor Channel system and the GIWW, historically supported nesting populations of black skimmer (*Rynchops niger*) and least tern; however, the black skimmer has not nested at the site since 1991 and least terns have been absent since 1982 (USFWS, 2010). Rookery 610-102 (Bryan Beach Spoil) is on the south side of the Freeport Harbor Channel system, situated on the southwest portion of the TEPPCO Peninsula. This rookery historically supported several species of herons and egrets, least terns, and black skimmers, but is currently inactive (USFWS, 2010). A field survey conducted on June 18, 2010 (USACE, 2010), confirmed that rookeries 610-101 and 102 are presently inactive, based on the absence of nests and nesting birds. Therefore, dredging activities at present would not affect these rookeries. Other rookeries in the study area include 610-100 (Freeport Dow), 610-103 (Bryan Mound), 610-104 (Dow Gate A-40), 610-105 (Dow Tern), and 610-106 (Bryan Beach Diked Spoil). Dredging activities would not result in impacts to these rookeries. Last, equipment staging areas and dredge pipelines may result in temporary direct and indirect minor impacts to wildlife and habitats during construction only. Upland PAs would be accessed through existing waterways, road or highway rights-of-way, and disturbed areas to minimize impacts.

4.12 AQUATIC ECOLOGY

4.12.1 Aquatic Communities

4.12.1.1 FWOP-1 Alternative

Aquatic communities would be temporarily affected by construction of the Widening Project. Aquatic organisms in the area would be impacted by short-term increases in turbidity, excavation of bay bottom, and dredged material placement. Benthic organisms would be impacted by construction and placement, although they would be expected to recover quickly. Benthic community structure and abundance would eventually return to preplacement levels at the New Work ODMDS site. In contrast, repeated placement of dredged material at the Maintenance ODMDS may result in the benthic community not fully recovering to preplacement populations between maintenance cycles. The Maintenance ODMDS is currently used for placement of dredged material from maintenance cycles, and therefore continued placement of maintenance material at the site would not be expected to change current conditions. No long-term effects would be expected.

4.12.1.2 NED and LPP Alternatives

Construction of the FHCIP and future maintenance activities would bury benthic organisms and generate suspended solids and turbidity, as described for the FWOP-1 Alternative, above. Repeated dredging in one place may prevent benthic organisms from fully developing (Dankers and Zuidema, 1995). Excavation destroys the community that previously existed but creates new habitat for colonization (Montagna et al., 1998). Excavation can actually maintain high rates of macrobenthos productivity (Rhoades et al., 1978). By repeatedly creating new habitat via disturbance, new recruits continually settle and grow. However, these new recruits are always small, surface-dwelling organisms with high growth rates. Large, deep-dwelling organisms that grow slower and live longer are lost to the areas of repeated excavation. In this way, excavation may not cause a decrease in production, but rather a shift in community structure (Montagna et al., 1998).

Although water column turbidity would increase during project construction and maintenance dredging, such effects are usually temporary and local. Elevated turbidities during construction and maintenance dredging may affect some aquatic organisms near the dredging activity; however, turbidities can be expected to return to near ambient conditions within a few hours after dredging ceases or moves out of a given area. Shideler (1984) reports similar total suspended solids (TSS) levels from dredging and storm events. Overall, motile organisms are mobile enough to avoid highly turbid areas (Hirsch et al., 1978). Under most conditions, fish and other motile organisms are only exposed to localized suspended-sediment plumes for short durations (minutes to hours) (Clarke and Wilber, 2000). These impacts would be the same as those described for the FWOP-1 Alternative. Notwithstanding the potential harm to some individual

organisms, compared with the existing condition, no significant impacts to finfish or shellfish populations are anticipated from project construction or maintenance dredging activities for either alternative.

No salinity changes are anticipated with channel improvements. Additionally, no sensitive estuarine or marsh environments occur within the Freeport Channel system, and therefore no adverse effects are expected to occur to finfish or shellfish populations due to changes in salinity. Last, equipment staging areas and dredge pipelines would not result in any detrimental effects to the aquatic ecological resources, and appropriate BMPs would be implemented. Upland PAs would be accessed through existing waterways, road or highway rights-of-way, and disturbed areas to minimize impacts.

4.12.2 Essential Fish Habitat

4.12.2.1 FWOP-1 Alternative

EFH is not expected to be significantly affected by construction of the Widening Project. Impacts from maintenance dredging would include short-term increases in water column turbidity and benthic impacts, although no long-term effects would be expected. NMFS concurred with this determination per letter dated December 5, 2006 (Appendix A-4).

4.12.2.2 NED Alternative

EFH for adult and juvenile brown, white, and pink shrimp, red drum, gag grouper, scamp, red snapper, gray snapper, lane snapper, greater amberjack, king mackerel, Spanish mackerel, cobia, Atlantic bluefin tuna, bonnethead shark, blacktip shark, bull shark, and Atlantic sharpnose shark occur in the study area and include estuarine emergent wetlands, estuarine mud and sand bottoms, estuarine water column, marine water column, and marine nonvegetated bottoms. EFH that occur within the direct project footprint and immediately adjacent areas include marine water column and marine nonvegetated bottoms. Estuarine emergent wetlands, estuarine mud and sand substrates, and estuarine water column that exist within the project area boundary would not be directly impacted by the proposed project and are not likely to be indirectly impacted as well.

Benthic organisms would be impacted by construction and ODMDS disposal, but are expected to quickly recover. Turbidity could impact EFH during construction and maintenance dredging, but these impacts are not considered significant.

4.12.2.3 LPP Alternative

Under the LPP Alternative, impacts to EFH would be the same as those described for the NED Alternative (see Section 4.12.2.2). The shorter construction duration for the LPP Alternative would shorten the potential impact duration in comparison to the NED Alternative.

4.13 THREATENED AND ENDANGERED SPECIES

A Biological Assessment (BA) for this project has been prepared to fulfill the USACE requirements as outlined under Section 7(c) of the ESA, as amended, and is included in Appendix I. The BA has been provided to NMFS and USFWS for review and serves to initiate consultation with these agencies.

4.13.1 FWOP-1 Alternative

Placement of 300,000 cy of silty/sand material on Quintana Beach may affect, but is not likely to adversely affect, piping plovers. Hopper dredging activities during construction may affect sea turtles. According to the Biological Opinion (BO) published by NMFS dated August 21, 2007, the construction of the Widening Project is likely to adversely affect, but is not likely to jeopardize the continued existence of, Kemp's ridley, loggerhead, leatherback, green, and hawksbill sea turtles. The BO specifies that incidental take by injury or mortality would consist of 2 sea turtles and 32 noninjurious takes by relocation trawling. The USFWS and NMFS have not indicated the potential for additional threats to threatened or endangered species as a result of existing maintenance activities. Hopper dredging would continue to directly affect sea turtles. These potential impacts are addressed in the November 19, 2003, Gulf Regional Biological Opinion (GRBO) to USACE on Hopper Dredging of Navigation Channels and Borrow Areas in the U.S. Gulf of Mexico, and Revision 2 to the GRBO, issued January 9, 2007, for USACE dredging projects on the Gulf Coast.

Since no federally protected fish or whale species occur in the project area (see sections 3.15.2.2 and 3.15.2.5), the FWOP-1 Alternative would have no impacts on any threatened and endangered fish or whales, and fish SOC and candidate species would remain as described in Section 3.15.2.2.

4.13.2 NED Alternative

4.13.2.1 Dredging/Construction Activities

No federally listed plant species are of potential occurrence in Brazoria County (USFWS, 2007). Thus, the proposed project would not result in impacts to any threatened and endangered plant species.

The NED Alternative is unlikely to affect any threatened and endangered terrestrial animal species. Many are inland species that are not likely to occur in the affected areas, while others are migrants that pass through the region seasonally. Listed species of potential occurrence in the study area during some portion of the year include the whooping crane and piping plover, and sea turtles. The whooping crane, while of potential occurrence in the study area, would only occur as a transient within the project area and, therefore, is unlikely to be affected by the proposed project. Thus, there is likely to be no effect to these species. Further, equipment staging

areas and dredge pipelines would not result in any direct and indirect impacts to threatened and endangered species. Upland PAs would be accessed through existing waterways, road or highway rights-of-way, and disturbed areas to minimize impacts.

Wintering piping plovers are of potential occurrence on Gulf beaches and mudflats along the bay margins of the project area. No construction or placement of dredged material would impact designated piping plover critical habitat, which occurs near the project area. The project area is not likely to be an important feeding or resting area for piping plovers due to year-round human recreational use. Piping plovers have been observed using upland PAs for resting and loafing between placement activities. PA 1 is currently used every 10 months for maintenance, and no change in that placement schedule is anticipated. The NED Alternative will have no effect on piping plovers.

Green, loggerhead, Kemp's ridley, and hawksbill sea turtles may occur in the project area. Of the five species of sea turtle known to potentially occur in Texas waters, the leatherback is the least likely to occur in the project area due to its pelagic nature. The proposed project calls for the use of both pipeline and hopper dredges. It has been well documented that hopper dredging activities occasionally result in sea turtle entrainment and death, even with seasonal dredging windows, V-shaped turtle-deflector dragheads, and concurrent relocation trawling (NMFS and NOAA, 2003). Between 1995 and 2008, a total of 73 turtles were taken as a result of Gulf-wide hopper dredging, including loggerheads (29), greens (29), and Kemp's ridleys (15). Hawksbills and leatherbacks are not known to have been caught in hopper dredges since monitoring began (USACE, 2008b). Sea turtles easily avoid pipeline dredges due to the slow movement of the dredge. Restriction of hopper dredging activities to between December 1 and March 31, whenever possible, would reduce the likelihood of mortality. Any dredging activities outside of this window should be with hydraulic dredges, if possible, to reduce mortality. Hopper dredging impacts to sea turtles can also be reduced by having a trawler precede the dredges to capture turtles and relocate them away from the project. An increase in marine traffic could result in a higher incidence of collisions with sea turtles. Other potential impacts of the project include disorientation because of lighting on vessels and increased accumulation of plastic detritus. If sea turtles are present at ODMDSs, they may be affected by sedimentation and turbidity. Nevertheless, no significant adverse impacts are expected to sea turtles from material placement activities.

Green sea turtles have been recorded in the project area. The USACE Sea Turtle Data Warehouse (USACE, 2008b) maintains records of incidental takes from hopper dredging activities. Two green sea turtle takes occurred in Freeport Harbor in 2006, and one green sea turtle take occurred in the Entrance Channel in 2007.

Kemp's ridley has also been recorded in the study area, and two takes are documented in the Entrance Channel in 2007 (USACE, 2008b). If dredging were to occur during the nesting season (March 15–October 31), Kemp's ridley hatchlings, if present, could be adversely affected by

disorientation from bright lights generated by hopper dredges. Typically, hatchlings take the shortest route to water; however, bright lights can cause hatchlings to move toward the lights rather than the water, resulting in disorientation and increased danger from predators. Although nesting is uncommon in the study area, project impacts could occur. The loggerhead sea turtle has been recorded in the study area. Between 1995 and 2000, eight loggerheads were caught in Freeport Harbor Channel, and during maintenance dredging (July 13 to September 24, 2002), a relocation trawler captured one loggerhead (NMFS and NOAA, 2003). In 2007 a loggerhead was taken in the Entrance Channel by dredging (USACE, 2008b).

Four sea turtle species (green, hawksbill, Kemp's ridley, and loggerhead) could be negatively impacted by hopper dredging activities. Relocation trawlers working ahead of the hopper dredges would help to reduce these impacts. Because of the history of turtle takes by dredging along the Texas coast, the NED Alternative is likely to adversely affect these four sea turtle species. However, these impacts are not likely to jeopardize the continued existence or recovery of these species. Placement of dredged material associated with the proposed project may affect, but is not likely to adversely affect, these four sea turtles species.

Of the five species of sea turtles occurring in Texas waters, the leatherback is the species least likely to be affected by the proposed project because of its rare occurrence and pelagic nature. It is unlikely to occur in the project area and has not been caught in hopper dredges. Although no impact to this species is anticipated to result from the proposed project, because the leatherback does occur within Texas waters, the proposed project may affect, but is not likely to adversely affect, this species.

Following consultation with NMFS regarding potential impacts to sea turtles during hopper dredging activities, Terms and Conditions described in the November 19, 2003, GRBO, in Revision 2 to the GRBO issued January 9, 2007, and in their anticipated project-specific BO for new work dredging would be implemented to minimize impacts and the incidental take of sea turtles during construction of the proposed project. The following measures are proposed:

1. Hopper dredging activities shall be completed, whenever possible, between December 1 and March 31, when sea turtle abundance is lowest throughout Gulf coastal waters.

2. Because they are not known to take turtles, pipeline or hydraulic dredges must be used whenever possible between April 1 and November 30.

3. NMFS-approved protected species observers will be aboard the hopper dredges for sea turtle monitoring. Observer coverage sufficient for 100 percent monitoring (i.e., two observers) of hopper dredging operations is required aboard the hopper dredges between April 1 and November 30, and whenever surface water temperatures are 11 °Celsius or greater.

4. During periods in which hopper dredges are operating and NMFS-approved protected observers are NOT required, additional instruction and notification to NMFS must be enacted.

5. When sea turtle observers are required on hopper dredges, 100 percent inflow screening of dredged material is required and 100 percent overflow screening is recommended. If conditions prevent 100 percent inflow screening, inflow screening may be reduced gradually, but 100 percent overflow screening is then required.

6. Standard operating procedure shall be that dredging pumps shall be disengaged by the operator when the dragheads are not firmly on the bottom to prevent impingement or entrainment of sea turtles within the water column. This precaution is especially important during the cleanup phase of dredging operations.

7. A state-of-the-art rigid deflector draghead must be used on all hopper dredges at all times.

8. Observer reports of incidental take by hopper dredges must be submitted appropriately by onboard NMFS-approved protected species observers, the dredging company, or the Galveston District USACE within 24 hours of any sea turtle or other listed species take observed. A final report summarizing the results of the hopper dredging and any documented sea turtle or other listed species takes must be submitted to NMFS within 30 working days of completion of the dredging project.

9. The Sea Turtle Stranding and Salvage Network state representative shall be notified of the start-up and completion of hopper dredging operations and bed-leveler dredging operations, as well as any sea turtle strandings in the project areas that may be a result of the project construction. Written reports shall be submitted within 30 days of project completion if any strandings are identified.

10. NMFS's southeast regional office shall receive a report detailing incidents, with photographs when available, of stranded sea turtles that bear indications of draghead impingement or entrainment.

11. An end-of-project report shall be provided to NMFS within 30 days of completion of any relocation trawling.

12. Handling of sea turtles captured during relocation trawling in association with the dredging project shall be conducted by NMFS-approved protected species observers. Relocation trawling shall be undertaken after the take of one sea turtle during the project.

13. Relocation trawling for the project is subject to trawl time, handling during trawling, captured sea turtle holding, scientific measurement, take and release time during trawling, injury, flipper tagging, PIT-Tag scanning, and other sampling procedure conditions. There are also PIT-Tag scanning and data submission requirements and handling fibropapillomatose turtle guidelines that must be followed.

14. NMFS-approved protected species observers aboard a relocation trawler or hopper dredge is authorized for tissue sampling of live or dead sea turtles without the need for an ESA permit.

15. All contracted personnel involved in operating hopper dredges must receive thorough training on measures of dredge operation that will minimize sea turtle takes.

16. From May 1 through October 31, sea turtle nesting and emergence season, all lighting aboard hopper dredges and hopper dredge pumpout barges operating within 3 nautical miles of sea turtle nesting beaches shall be limited to the minimal lighting necessary to comply with USCG and/or Occupational Safety and Health Administration requirements. Nonessential lighting shall be minimized through reduction, shielding, lowering, and appropriate placement.

4.13.3 LPP Alternative

Impacts to threatened and endangered species resulting from dredging, construction, and operational activities associated with the LPP Alternative would be similar to those associated with the NED Alternative, which are discussed in Section 4.13.2, above. The LPP Alternative would result in the placement of less dredged material than the NED Alternative; however, footprints of the projects would be the same. A summary of effect determinations for threatened and endangered species listed by USFWS and NMFS within the project area is provided in Table 4.13-1.

4.14 CULTURAL RESOURCES

Pursuant to Section 106 of the NHPA, a Federal agency shall take into consideration the effects a project will have on any district, site, building, structure, or object that is included in or eligible for inclusion in the NRHP (Historic Property). An adverse effect is defined as occurring when an undertaking alters any of the characteristics of a historic property that qualify it for inclusion in the NRHP in a manner that would diminish the property's eligibility (36 CFR 800.5).

The following sections discuss potential adverse effects to Historic Properties for each of the alternatives.

4.14.1 FWOP-1 Alternative

The Widening Project is not expected to have adverse impacts on terrestrial or nautical cultural resource sites. As growth naturally occurs within the project area, impacts could occur to known resources (and there is potential for unknown resources to be identified as well). Port Freeport has plans to develop portions of Tract Eight, the site of the proposed PA 8, for the two action alternatives (Appendix H-1). Where this development occurs, there is potential to impact cultural resources that may be present on that tract of land. Under this alternative, the Programmatic

Table 4.13-1
Effect Determinations Summary for the Proposed LPP

Common Name[1]	Scientific Name[1]	Dredging Activity	Placement of Dredged Materials
FISHES			
Smalltooth sawfish	*Pristis pectinata*	No effect	No effect
REPTILES			
Green sea turtle	*Chelonia mydas*	Likely to adversely affect*	May affect, but not likely to adversely affect
Hawksbill sea turtle	*Eretmochelys imbricata*	Likely to adversely affect*	May affect, but not likely to adversely affect
Kemp's ridley sea turtle	*Lepidochelys kempii*	Likely to adversely affect*	May affect, but not likely to adversely affect
Leatherback sea turtle	*Dermochelys coriacea*	May affect, but not likely to adversely affect	May affect, but not likely to adversely affect
Loggerhead sea turtle	*Caretta caretta*	Likely to adversely affect*	May affect, but not likely to adversely affect
BIRDS			
Piping plover**	*Charadrius melodus*	No effect	No effect
Whooping crane	*Grus americana*	No effect	No effect
MAMMALS			
Blue whale	*Balaenoptera musculus*	No effect	No effect
Finback whale	*B. physalus*	No effect	No effect
Humpback whale	*Megaptera novaengliae*	No effect	No effect
Sei whale	*B. borealis*	No effect	No effect
Sperm whale	*Physeter macrocephalus*	No effect	No effect

*The likelihood of adverse effects (incidental take) of sea turtles due to dredging activities is greatly reduced by implementation and adherence to the conservation measures. Adverse effects are not expected to jeopardize the continued survival or recovery of the species.

**No effect to piping plover critical habitat is expected.

[1]Nomenclature follows AOU (1998, 2000, 2002, 2003, 2004, 2005, 2006, 2007), Crother et al. (2000, 2001, 2003), TPWD (2007), and USFWS (2007).

Agreement would not apply to the above-mentioned activity since there would be no Federal involvement.

4.14.2 NED Alternative

Under the NED Alternative, two new upland confined PAs (PAs 8 and 9) would be constructed. PAI (2007) conducted prefield geoarcheological and historical research on PAs 8 and 9. No cultural resources sites were identified in PA 8, but two historic archeological sites were identified on PA 9: 41BO226 and 41BO227. Additional research and coordination for these two sites is being handled under the PAg. The marine portion of the project area has been fully surveyed, and no historic properties were identified. Last, equipment staging areas and dredge pipelines are not expected to result in any direct and indirect impacts to cultural resources, as these areas can be adjusted to avoid potential impacts, if necessary. If unidentified cultural resources are encountered during construction of the project, the identification, evaluation of significance, assessment of adverse effect, and resolution of adverse effect will be handled pursuant to the PAg.

4.14.3 LPP Alternative

Under the LPP Alternative, two new upland confined PAs (PAs 8 and 9) would be constructed. PAI (2007) conducted prefield geoarcheological and historical research on PAs 8 and 9. No cultural resources sites were identified in PA 8, but two historic archeological sites were identified on PA 9: 41BO226 and 41BO227. Additional research and coordination for these two sites is being handled under the PAg. The marine portion of the project area has been fully surveyed and no historic properties were identified. Last, equipment staging areas and dredge pipelines are not expected to result in any direct and indirect impacts to cultural resources, as these areas can be adjusted to avoid potential impacts, if necessary. If unidentified cultural resources are encountered during construction of the project, the identification, evaluation of significance, assessment of adverse effect, and resolution of adverse effect will be handled pursuant to the PAg.

4.15 SOCIOECONOMICS

4.15.1 Population and Demographics

4.15.1.1 FWOP-1 Alternative

Based on the current population projections, any increase in population associated with the Widening Project would likely have negligible effects on overall population growth within the study area. This alternative would not result in potentially significant impacts.

4.15.1.2 NED Alternative

The NED Alternative would not require business or residential relocations. The proposed action would likely have a negligible effect on population growth trends within Brazoria County. Population in this county is projected to grow at a rapid rate of 78 percent between 2000 and 2040, regardless of the proposed project. As a result of the NED Alternative, demand for community facilities, services, and housing would be expected to increase at a rate that is consistent with the projected population growth and similar to what is expected for the FWOP-1 Alternative. The location of these resources would generally follow development and land use plans currently identified. Most of the construction workers are likely to come from labor forces outside of Brazoria County, which would lead to temporary increases in population and an increased demand for temporary housing. These increases would be temporary, as workers are not likely to permanently relocate. As indicated in Section 3.17.1, there is adequate housing available within the study area for the anticipated population growth.

The NED Alternative would allow for larger vessels to enter the channel and increase business, which in turn could lead to increased employment opportunities and increased population. However, as the population of the county is already expected to experience significant growth regardless of the project, this increase would likely have a negligible effect on population growth in the study area. This alternative would not result in potentially significant impacts.

4.15.1.3 LPP Alternative

The LPP Alternative would not require business or residential relocations. Impacts to population would be similar to those of the NED Alternative. However, as the LPP Alternative represents a smaller increase in channel depth, benefits could be slightly decreased, which could have negligible affects on changes in employment in the study area. Infrastructure, including health, police, fire, emergency, and social services within the study area is well developed and will continue to expand as demand increases; therefore, no adverse impacts to current or future infrastructure are anticipated.

4.15.2 Employment

4.15.2.1 FWOP-1 Alternative

The FWOP-1 Alternative would have a negligible effect on local employment within the study area and within Brazoria County. Following completion of the construction of the Widening Project, increases in employment may be observed and residual effect may still be present. It would not change industry trends. Employment would increase in response to projected population growth.

4.15.2.2 NED Alternative

Full-time dredge workers would be needed throughout the duration of the construction period. Minor indirect and induced employment would occur within Brazoria County as dredge workers spend some of their disposable income locally and as operation of the dredges would necessitate expenditures on fuel, which would be purchased from local vendors.

When the proposed project is completed, it is likely that new industrial development would occur within Freeport Harbor. The widened and deepened ship channel would provide an additional benefit to industry, which would likely attract new companies to locate within the Freeport area. With the improved channel in place, it would be more likely that new petrochemical plants, bulk grain facilities, and petroleum and natural gas refineries would be built within the area. The impact of these new industries on employment within Brazoria County is unknown. This increase in employment may augment the already projected 78 percent rate of immigration and the demand for housing, schools, and other services within Brazoria County between 2000 and 2040. As a result of the increased rate of immigration, it is likely that an increase in single-family homes would occur in Brazoria County where vacant land is available for such development and is located near such available industrial sites. This increase in new residents within Brazoria County would also increase the demand for commercial development, schools, roads, and other services.

During the proposed project construction, Brazoria County would experience a temporary increase in employment and local purchases of construction materials. As construction dollars are spent locally, there would be a beneficial effect on local employment in the area.

4.15.2.3 LPP Alternative

Impacts associated with the LPP Alternative would be similar to those of the NED Alternative. The channel widening could lead to the establishment of additional businesses in the study area, which in turn could lead to an increase in employment opportunities.

4.15.3 Economics

4.15.3.1 FWOP-1 Alternative

The FWOP-1 Alternative would have a negligible effect on the local economy within the study area. Following completion of the Widening Project, two-way traffic would be allowed in the channel, which would reduce delay times for all vessels and barges transiting the Freeport Harbor Channel. As a result, the total annual national economic benefits due to time saving are estimated to be over $41.2 million (Martin Associates, 2006; TransSystem Corp., 2006). However, without further improvements to channel dimensions, there will continue to be some, although reduced, vessel delays and economic impact.

Tourism and recreation, both large contributors to the economy, would be somewhat impacted during construction dredging activities. Turbidity associated with dredging activities is likely to result in short-term impacts to recreational opportunities such as fishing in the project area. No long-term effects are expected.

4.15.3.2 NED Alternative

Within Brazoria County, the economic effects accruing from the proposed project would simply contribute to the current development trends that have historically affected the regional economy. During project construction, Brazoria County would have an increase in construction employment and local purchases of construction materials. As construction dollars are spent locally, there would be a beneficial effect on local economic output, income, and employment in the area.

The increase in jobs, economic output, and the tax base would be fairly moderate and consistent with historical growth trends. Port Freeport and its associated industries and international commerce currently serve an important role for the Freeport area economy. These industries provide jobs, income, and a tax base for the area, and the effects reverberate within other industries such as housing, retail services, and wholesale trade. The proposed project may provide a boost to the development of industrial sites along the Freeport Harbor Channel and in Brazoria County. Larger ships would be able to navigate the channel, providing cost savings for commercial vessels. In short, Port Freeport would become a more attractive location for companies involved in industry and international commerce to conduct their business. This goal would be consistent with a steady historical trend towards increased reliance on these industries and these types of development within the region.

According to the Freeport FS, average annual benefits for the NED Alternative (60-foot depth alternative) would result in average annual benefits of approximately $65.3 million in transportation savings for crude petroleum imports, petroleum product and chemicals import and export. Total average annual net excess benefits are expected to be $42.6 million.

As previously discussed, the primary economic bases of the county include chemical manufacturing, petroleum processing, offshore production maintenance services, biochemical and electronic industries, commercial fishing, and agriculture. As a result of the proposed project, the positive economic effects to the Brazoria County economy would be moderate at the least and substantial at best.

Tourism and recreation, both large contributors to the economy, would be somewhat impacted during construction dredging activities. Turbidity associated with dredging activities is likely to result in short-term impacts to recreational opportunities such as fishing in the project area. No long-term effects are expected. These impacts would be similar to impacts expected for the FWOP-1 Alternative. However, turbidity associated with construction of the FHCIP would occur

farther up the Freeport Harbor Channel and would be in addition to what would occur under the FWOP-1 Alternative.

4.15.3.3 LPP Alternative

The economic effects of the LPP Alternative are similar to those of the NED Alternative, but may be slightly less substantial. According to the Freeport FS, average annual benefits for the LPP Alternative (55-foot depth alternative) would result in annual benefits of approximately $38.4 million in transportation savings for crude petroleum imports, petroleum product and chemical import and export. This is about half the annual benefits of the NED Alternative (60-foot depth). Total average annual net excess benefits are expected to be $22.6 million, and $20 million less than the NED Alternative. The LPP Alternative would have a beneficial effect to the local economy, as it would allow for more-efficient movement of large vessels in the channel and would have similar benefits as the NED Alternative.

Tourism and recreation, both large contributors to the economy, would be somewhat impacted during construction dredging activities. Turbidity associated with dredging activities is likely to result in short-term impacts to recreational opportunities such as fishing in the project area. No long-term effects are expected. These impacts would be similar to impacts expected for the FWOP-1 Alternative. However, turbidity associated with construction of the FHCIP would occur farther up the Freeport Harbor Channel and would be in addition to what would occur under the FWOP-1 Alternative.

4.15.4 Environmental Justice

4.15.4.1 FWOP-1 Alternative

Under the FWOP-1 Alternative, the Widening Project is not expected to result in adverse changes that would affect minority or low-income populations. Increased spending in the area may boost the local economy, resulting in a benefit to these populations. The trends of disproportionately higher minority and/or low-income populations in Clute and Freeport will continue unaffected.

In the event of an oil spill within the Freeport Harbor Channel, Freeport would likely face minimal impacts as such an event would be confined to Gulf waters and potentially to immediately adjacent beaches. There is little commercial fishing and recreation associated with Freeport, thus impacts to fishing in the area would not be substantial. A hazardous material spill poses a higher risk, depending on the type of hazardous material involved. The City of Clute is farther removed from the Freeport Harbor Channel and would have no impact from any spill event.

In the event of an oil spill or other incident, the Brazosport Industrial Community Awareness and Emergency Response (CAER) plan would be initiated. CAER is a program that provides information to the community in the event of an emergency in the industrial area surrounding the port. CAER has developed an emergency siren system that places 14 sirens in the industrial port area. The sirens only sound in the community it affects. A telephone notification is activated in the community to inform area residences and businesses of the potential issue as well as any actions that should be taken. The emergency notification system would also be activated. These measures would be provided to all persons regardless of their minority or low-income status.

Additionally, USCG has Incident Action Plans specific to Freeport in place in the event of hazardous material spills, LNG incidents, and oil spills (USCG, 2008). The City of Freeport is involved in the USCG and CAER plans. Additionally, the City of Freeport has an Emergency Management Office that takes control of the city during times of emergency and provides a crisis hotline for residents to call (City of Freeport, 2011).

In the event of an accident that causes a hazardous material spills, LNG incidents, and oil spills, local communities would be the first place most citizens would turn to for information and assistance. The plans and initiatives being undertaken by CAER and the USCG are designed to assist and even relieve the local communities of some responsibility for handling emergency situations should they occur. These initiatives are designed to provide safety and assurance to area communities and would be implemented without regard to minority or low-income status. As a result, long-term impacts to local and regional populations, including Freeport, would be minimized.

4.15.4.2 NED Alternative

The minority and low-income populations living within the project area would experience no adverse changes to the demographic, economic, or community cohesion characteristics within their neighborhoods as a result of the proposed project. Generally speaking, the population living within these census tracts could benefit from the proposed project. These benefits would be manifested mainly in a slight increase in economic output, jobs, and tax base within these communities. New development expands the tax base, benefiting existing taxpayers by alleviating their overall tax burden. Therefore, the proposed project would not result in disproportionately high and adverse impacts on minority and low-income persons living within the project area components.

Freeport, a minority population, would likely be most affected by the NED Alternative, as it is the city most proximate to the proposed project. Under the NED Alternative, it is anticipated that the same types of commodities would continue to be imported and exported as under the FWOP-1 Alternative. The deeper channel would allow more-efficient utilization of the channel, as vessels can be loaded more fully, and the number of vessels required to transport crude oil

would actually be reduced over FWOP-1 conditions. Therefore, potential impacts of an oil or hazardous material spill would be similar to those described for the FWOP-1 Alternative.

4.15.4.3 LPP Alternative

As with the NED Alternative, the minority and low-income populations living within the project area for the LPP Alternative would experience no adverse changes to the demographic, economic, or community cohesion characteristics within their neighborhoods as a result of the proposed project. Generally speaking, the population living within these census tracts could benefit from the proposed project. These benefits would be manifested mainly in a slight increase in economic output, jobs, and tax base within these communities. Therefore, the proposed project would not result in disproportionately high and adverse impacts on minority and low-income persons living within the project area components.

Similar to the NED Alternative, Freeport would likely be most affected as it is the city most proximate to the proposed project. Under the LPP Alternative, it is anticipated that the same types of commodities would continue to be imported and exported as under the FWOP-1 Alternative. The deeper channel would allow more-efficient vessel utilization of the channel, as vessels can be loaded more fully. The number of vessels required to transport crude oil would actually be reduced over FWOP-1 conditions but slightly higher than the NED Alternative. Therefore, potential impacts of an oil or hazardous material spill would be similar to those described for the FWOP-1 Alternative.

4.15.5 Protection of Children from Environmental Health Risks and Safety Risks

According to EPA, children are more susceptible to environmental health hazards because "their bodily systems are still developing; they eat more, drink more, and breathe more in proportion to their body size; and their behavior can expose them more to chemicals and organisms" (EPA, 2011a). The following sections are consistent with EO 13045, which requires that Federal agencies assess and evaluate potential disproportionate impacts to children.

4.15.5.1 FWOP-1 Alternative

Under the FWOP-1 Alternative, the Widening Project could potentially present environmental health hazards to child populations within the vicinity of the proposed action. Current projections indicate that crude imports will increase in the near future. As these imports increase, the number of lightering vessels and product carriers will also increase, adding to shipping delays, congestion, and the potential risk of collision or spill. In the event of a collision or spill, children would be more sensitive to any contaminants. In Freeport, 10.0 percent of the population is under age 5 (approximately 127 persons), and 20.1 percent is between the ages of 5 and 14 (approximately 2,542 persons).

In the event of such a catastrophe, emergency plans are in place that would enable the population (including children) to avoid contact with any contaminants. While there is a potential risk for oil spills, these would likely be confined to the water and beaches. As there is little recreational swimming and fishing within the study area, this would likely have little effect on children. In the event of hazardous material spills, LNG incidents, or collisions of vessels in the harbor carrying potentially flammable or toxic substances, populations of children within the study area would be affected.

In the event of an emergency, the City of Freeport has an Emergency Management Office that takes control of the city during times of emergency, and provides a crisis hotline for residents to call (City of Freeport, 2011). The Brazosport Industrial CAER plan encompasses all of Brazoria County, and includes information regarding emergency levels, and instructions for events when the CAER sirens are sounded. In addition to these plans, Brazosport ISD has Crisis Response Guidelines, which outlines crisis procedures for action during chemical spills and gas release, and instructions for any evacuations (Brazosport ISD, 2011).

4.15.5.2 NED Alternative

The NED Alternative does not have the potential to increase risks to children's health and safety. The same types of commodities would continue to be imported and exported as under the FWOP-1 Alternative. The deeper channel would allow more-efficient utilization of the channel, as vessels can be loaded more fully, and the number of vessels required to transport crude oil would actually be reduced over FWOP-1 conditions. Therefore, potential impacts of an oil or hazardous material spill would be similar to those described for the FWOP-1 condition. In the event of an emergency, the Brazosport CAER emergency notification system would be utilized. This system would be used to notify schools, day care centers, and residences of the emergency and recommended actions.

4.15.5.3 LPP Alternative

The LPP Alternative does not have the potential to increase risks to children's health and safety. The same types of commodities would continue to be imported and exported as under the FWOP-1 Alternative. The deeper channel would allow more-efficient utilization of the channel, as vessels can be loaded more fully. The number of vessels required to transport crude oil would actually be reduced over FWOP-1 conditions but would be slightly higher than the NED Alternative. Therefore, potential impacts of an oil or hazardous material spill would be similar to those described for the FWOP-1 condition. In the event of an emergency, the Brazosport CAER emergency notification system would be utilized. This system would be used to notify schools, day care centers, and residences of the emergency and recommended actions.

4.16 LAND USE/AESTHETICS

4.16.1 FWOP-1 Alternative

Under the FWOP-1 Alternative, the project area and surrounding areas, including Brazoria County, would continue on its present course of moderate population growth and of fairly rapid commercial, residential, and industrial land development with the potential for slight increases following the Widening Project. Port Freeport would continue to function as an important port for its industrial facilities and international commerce. Port Freeport would also continue to develop its industrial properties, but at a slower rate than it would with the proposed action.

Future conditions include an increase in crude petroleum imports, refined petroleum and chemicals, and LNG with or without the Widening Project. The amount and types of future imports depend greatly on the channel dimensions at Port Freeport. Three significant developments known to the port include the construction of a $750 million facility to receive and store LNG, which converts the LNG back to a gas and transports it to commercial and industrial users via pipeline. The project is expected to generate increased funding for the port and provide facilities for the local petrochemical industry. The Freeport LNG facility began receiving LNG in spring 2008. The port also plans to construct three 1,200-foot berths, which began with the construction of 800 feet in October 2006. Proposed Berth No. 7 will include an 800-foot-long berth along with 20 acres of stabilized backlands to handle new cargo activity and future development for Parcel No. 25. Berth No. 5 property is expected to facilitate the port's warehousing and rail facilities (BRHND, 2004). In addition, the port has begun engineering design for Transit Shed 6 adjacent to Dock 5. The 125,000-square-foot facility would include rail service and is likely to attract new business to the port (Port Freeport, 2006). Without the channel deepening and widening, lightering and lightening operations would continue.

There would be no changes in the visual quality within the project area; therefore, no impact to aesthetic quality is anticipated. It should be noted that following completion of the Widening Project, the visual quality of the Quintana Beach portion of the study area would be temporarily affected by placement of material for beach nourishment.

4.16.2 NED and LPP Alternatives

Under both alternatives, the channel would be deepened following the current channel alignment beginning offshore near the 60-foot contour and terminating at the Stauffer Channel Turning Basin. Both would provide two new upland confined PAs (PAs 8 and 9), which would be located adjacent to the Brazos River along SH 36 (see Figure 2.5-1). The proposed PAs will be leveed and contain spillways for discharge of effluent. The surface areas of PAs 8 and 9 are approximately 168 and 250 acres, respectively.

Land-use impacts are also related to PAs, which would change current land use at PAs 8 and 9 from agricultural to dredged material storage, and indirect future land development that may occur as a result of the proposed action. Dredged material removed from the Lower Turning Basin, upstream through the Channel to Stauffer Turning Basin is to be placed at PAs 8 and 9.

Port Freeport currently owns large tracts of land along the Freeport Channel system, of which a large portion is marsh. Therefore, it is likely that only a small percentage of this land would be available for development of commercial or industrial sites. When completed, however, the project would have a wider and deeper ship channel that could provide incentive for new development at all of the port properties, based on navigation cost savings. Future industrial development could include oil and gas refineries, petrochemical plants, and bulk grain facilities. The long-term land use effects of these industrial facilities are largely unknown; however, they would likely lead to an increase in demand for new housing development, new roads, commercial services, schools, and other services within Brazoria County.

The alternatives would have a minimal effect on the overall visual quality within the project area. New PAs 8 and 9 may be visible from the channel and industrial sites at Port Freeport, as well as the Peach Point WMA, Quintana Beach, and Bryan Beach. The Freeport Municipal Golf Course is located northwest of PA 9 and is anticipated to have potential visual impacts arising from the approximately 50-foot berm. However, PA 9 would not be inconsistent with land uses within the project area (i.e., placement area currently located across Freeport Harbor Channel to the north).

In conclusion, under both the NED and LPP Alternatives there would be two new upland confined PAs (PAs 8 and 9) located along SH 36. The new PAs would have relatively minor land use impacts. However, the new PAs could have a visual impact in the immediate area. The greatest long-term land use consequence of the alternatives would likely be an increase in the rate of industrial development that may occur in response to the proposed channel improvements. These future developments are not considered part of the proposed action but would be far less likely to occur without it.

4.16.3 Transportation

4.16.3.1 FWOP-1 Alternative

Under the FWOP-1 alternative, there would be no change to projected transportation improvements in the project area, and no increased potential for an aircraft wildlife-strike in the project vicinity.

4.16.3.2 NED and LPP Alternatives

Under the NED and LPP alternatives, the existing transportation system within the project area could be temporarily affected by the influx of construction workers and the delivery of

construction equipment and materials to the project area. The addition of employees accessing the project area on a daily basis would not result in a significant increase in volume adversely affecting traffic on area roadways. As stated in the Houston-Galveston Area Council 2025 Regional Transportation Plan, the port will sponsor various transportation projects to accommodate future port services. Future transportation projects specific to the port include reconstructing the intersection of Fifth Street and Terminal Street to include an entrance road with two 16-foot lanes with 8-foot shoulders and reconstruct a portion of Port Road, with a total cost of $803,000. Along Navigation Boulevard, from FM 518 to Pete Schaff Boulevard, a truck-queuing area will be widened to provide a left-turn lane at the entrance to Port Freeport. In addition, an additional queuing space will be constructed to alleviate truck congestion, with a total cost of $480,000. Without the proposed action, these future transportation projects may be cancelled or delayed.

Regarding potential impacts to area airports, the alternatives, like the FWOP-1, are not expected to increase the potential for an aircraft wildlife-strike near airports, and no further coordination is required.

4.16.4 Future Development

Future expansion of Port Freeport includes construction of new berths and the building of a transit shed.

4.16.4.1 FWOP-1 Alternative

Under the FWOP-1 Alternative, future expansion of Port Freeport and increases in cargo volumes would be consistent with long-range plans developed by the port and communities, depending on the economic vitality of the port.

4.16.4.2 NED and LPP Alternatives

The NED and LPP alternatives are compatible with existing and proposed land uses in the project area. Improvements would support current local land-use objectives for property adjacent to the project area and are consistent with long-range plans to increase cargo capacity into the port. The alternatives would not require changes in local agency zoning codes or site-specific zoning. These alternatives would not require the conversion of land use types and the displacement of general land uses or structures within the project area would be negligible; therefore, no impact to future development or zoning is anticipated.

5.0 MITIGATION

Mitigation refers to the avoidance, minimization, and rectification, reduction, or compensation of impacts resulting from implementation of an action. For the proposed FHCIP, the majority of potential project-related impacts were avoided. Thus, mitigation in the form of minimization or rectification, reduction, or compensation was initiated for only potential impacts to freshwater wetlands and riparian forest.

To mitigate for the loss of wetland and riparian forest from construction of PAs 8 and 9, USACE worked in conjunction with resource agency personnel from USFWS and TPWD to develop a mitigation plan (Appendix H-2). Approximately 418 acres of upland habitats would be impacted from construction of PAs 8 and 9, including 21 acres of riparian forest and 39 acres of ephemeral wetlands. In accordance with USACE guidance ER 1105-2-100, impacts to significant resources were avoided or minimized to the extent practicable and a HEP analysis was used to determine the amount of mitigation needed to appropriately compensate for project impacts. The mitigation plan was also developed to satisfy requirements for cost effectiveness and incremental cost analysis requirements.

The focus of the Mitigation Plan is the compensatory replacement of impacted riparian forest and ephemeral wetland habitats with forest or wetland of equivalent value. HEP analysis was used to quantify the impacts, incorporating the area and quality (functional value) of specific habitats into a standardized value. The HEP Analysis report is included as Appendix H-1, which should be consulted for a detailed description of the methods used and results of this analysis. Approximately 21 acres of riparian forest, 358 acres of grassland, and 39 acres of ephemeral freshwater wetlands (described as swales with a semipermanent water regime that supports 3- to 5-inch water depths in winter) would be destroyed by the construction of PAs 8 and 9. Although grassland impacts were quantified, no mitigation is provided for impacts to grasslands as the existing affected grasslands are neither scarce nor unique.

Mitigation for riparian forest and wetland impacts from PAs 8 and 9 is proposed to be located within the larger real estate tracts Eight and Nine (see Appendix H-2). Forest areas lying north and east of PA 9 and east of PA 8, all of which are situated within the confines of tracts Eight and Nine, are available for mitigation purposes. The proposed mitigation forests north and east of PA 9 are a continuation of the impacted forest on PA 9. These forest areas could be used for mitigating project losses to forest on PA 9, and also potentially be used for the creation of wetlands to offset wetland project losses incurred on PAs 8 and 9. Additionally, nonproject lands, including port-owned lands adjacent to Peach Point WMA, were considered as mitigation sites.

Ultimately, it was determined that project impacts would be compensated for by preserving approximately 131 acres of riparian forest north of PA 9 and enhancing its habitat value by

clearing approximately 11 acres of tallow trees and establishing approximately 11 acres of woodlands (7.7 average annual habitat units (AAHUs) to compensate for 7.41 AAHUs of impact). The non-Federal sponsor has agreed to grant a conservation easement for the 131 acres used for mitigation to TPWD or a recognized nature conservancy (see Port Freeport letter dated December 21, 2009 in Appendix A-6). Additionally, about 3 acres of wetlands (1.5 AAHUs to compensate for 1.1 AAHUs of impact) would be established between the forest and the northern boundary of PA 9. An additional acre of trees would be created around the wetland, resulting in a total of 12 acres of tree plantings. The mitigation sites are within Tract Nine, adjacent to PA 9. Forest mitigation consists of planting about 150 seedling trees per acre, spaced as forest openings will allow. Wetland mitigation includes construction of one 3-acre pond planted with a variety of aquatic plant plugs on 5-foot to 6-foot centers. Approximately 3 years after the seedling tree plantings, mitigation forest areas would be cleared of tallows. Additionally, 30 percent of seedling trees will be replanted to offset expected mortality (see Appendix H-2).

5.1 ECOLOGICAL RISK AND UNCERTAINTY

Uncertainty is present in all ecological modeling and risk assessments, and is complicated by variation in characteristics of the environment and within species themselves. For example, significant variability in survivability and growth rates can occur within the same species under different environmental conditions, as well as under similar conditions. Therefore, it is necessary to identify risk and uncertainty to avoid the impression that modeling fully captures variability in nature, with respect to survivability and establishment of the proposed mitigation measures in the project area. Moreover, risk to survivability potentially induced by causes not related to ecology must also be considered.

Professional judgment is often used to determine uncertainty associated with information taken from the literature, and for any extrapolations used in developing expected outcomes. The following is an overview of potential risk and uncertainty associated with habitat modeling for developing the proposed mitigation measures.

5.1.1 Habitat Modeling

As a species-habitat approach for assessing environmental impacts, HEP is used to document the quality and quantity of available habitat for selected wildlife species. Habitat value is assessed through use of a habitat suitability index (HSI), whose value is derived from an evaluation of the ability of key habitat components to supply life requisites of selected species of fish and wildlife. HSI values are obtained for individual species through use of documented habitat suitability models employing measurable key habitat variables. However, the ability to document data and ultimately compare alternatives presents inherent limitations. One of the challenges is documenting the differences in quality (HSI) and quantity (area) between existing habitat conditions (baseline) and various projected future sets of conditions for selected evaluation

species. This is because HEP does not currently provide guidance for performing future projections. Therefore, projected impacts are no better than the user's ability to predict future conditions. However, potential uncertainty in assessing future ecological conditions for modeling and mitigation efforts within proposed FHCIP habitats is offset by the combined professional judgment of resource agency and USACE personnel. The use of professional judgment, while still subjective, alleviates a measure of uncertainty concerning future conditions and the success of mitigation measures.

Also, identification of differing types and magnitudes of impacts is dependent on the validity and sensitivity of the HSI models used to generate data for HEP. As with other approaches, the results of an impact assessment employing HEP are no better than the reliability of resource data used. Similarly, because HEP is a species-habitat approach to impact assessment, it conceptually addresses only the issues of species populations and habitat. However, the degree to which these indicators are addressed is again dictated by the HSI models. Improved HSI models could more completely examine the remaining issues of biological integrity and environmental values. Nonetheless, with regard to the proposed project, the species models used are likely the most appropriate and technically complete models available for the project area, with respect to establishing acceptable mitigation schemes.

5.1.2 Mitigation Monitoring and Contingency Plans

Monitoring and contingency plans for the mitigation measures are presented in Appendix H-2 (Mitigation Monitoring and Contingency Plans).

The monitoring and contingency plans for mitigation measures have been developed in accordance with recent implementing guidance for Section 2036 (a) of WRDA 07. The monitoring plans identify specific ecological success criteria to be used in determining if the mitigation measures have been successful. Details of the monitoring plan for project mitigation sites including monitoring parameters, periodicity, costs, and responsible parties are presented in Appendix H-2.

Periodic monitoring to determine the success of mitigation measures would continue until the District Engineer determines that the ecological success criteria established for the mitigation features have been met. This determination would be based upon monitoring results and reports provided to the District Engineer, from a USACE-led monitoring team consisting of USACE personnel, the resource agencies, and the non-Federal sponsor, whose responsibility is long-term preservation of the mitigation measures. The team would be consulted annually to determine progress in the planning, construction, and postconstruction evaluation of the ecological success of the measures.

Contingency plans (adaptive management measures) were also developed to address unforeseen natural events such as drought and flooding, or anthropogenic activities that could disrupt or

impede successful establishment of mitigation features, and achievement of defined success criteria. Adaptive management measures and costs are also presented in Appendix H-2.

6.0 CUMULATIVE IMPACTS

The CEQ defines cumulative impacts as those impacts "on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or persons undertake such actions." Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Impacts include both direct effects (caused by the action and occurring at the same time and place as the action), and indirect effects (caused by the action but removed in distance and later in time, and reasonably foreseeable).

Cumulative effects can result from a wide range of activities including the addition of materials to the affected environment, repeated removal of materials or organisms from the affected environment, and repeated environmental changes over large areas and long periods. Complex cumulative effects can occur when different types combine to produce a single effect or suite of effects. Cumulative impacts may also occur when individual disturbances are clustered, creating conditions where effects of one episode have not dissipated before the next occurs (timing) or are so close that their effects overlap (distance).

In assessing cumulative impact, consideration is given to the following:

- the degree to which the proposed action affects public health or safety;
- unique characteristics (physical, biological, and socioeconomic factors) of the geographic area;
- the degree to which the effects on the quality of the human environment are likely to be highly controversial;
- the degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks; and,
- whether the action is related to other actions with individually insignificant, but cumulatively significant, impacts on the environment.

The methodology is consistent with similar Federal projects.

6.1 ASSESSMENT METHOD

The FHCIP EIS follows a traditional cumulative impact assessment method, addressing impacts for a finite set of criteria, comparing projects within the study area to the LPP Alternative. Thirteen cumulative impact criteria were identified to evaluate projects relevant to the future condition of the study area (project area and surrounding Brazoria County). Fifteen projects were considered.

6.1.1 Evaluation Criteria

Criteria include ecological, physical, chemical, socioeconomic, and cultural attributes, listed in Table 6.1-1. These parameters were identified as key resources discussed in NEPA documents and project reports, and they form a basis for comparison of other projects in the area with the LPP Alternative.

Table 6.1-1
Cumulative Impacts Criteria

Ecological Environment	Physical/Chemical Environment	Socioeconomic Environment
Wetlands	Air Quality	Environmental Justice
Benthos	Noise Impacts	Cultural Resources
Essential Fish Habitat	Water Quality	Commercial Fisheries
Threatened/Endangered Species	Sediment Quality	Recreational Fisheries
	Shoreline/Bank Erosion	

6.1.2 Individual Project Evaluation

Twenty-two past, present, and reasonably foreseeable projects/activities within the study area were determined relevant for this cumulative impacts analysis (in no particular order). These projects are listed in Table 6.1-2 and are compared to the LPP Alternative presented in this EIS.

Table 6.1-2
Past, Present, and Reasonably Foreseeable Actions within the Study Area

Past or Present Projects/Activities	Reasonably Foreseeable Future Projects/Activities
Freeport Harbor Channel 45-foot Project	BP Exploration Gulf of Mexico Fiber Optic Network
Freeport Harbor Jetties	Freeport LNG Phase II
Brazos River Diversion Channel	Port Freeport modifications
GIWW maintenance	TEPPCO Seaway Crude Pipeline Company facility modification(s)
Freeport Hurricane Flood Protection Levees	Surfside Beach Shoreline Protection
Bryan Mound Strategic Petroleum Reserve	Freeport Desalinization Plant
CenterPoint Energy 69-kV electric transmission line	Gulf Coast Regional Spaceport
Petrocom Fiber Optic Network	Park Upgrades and Marinas
Freeport Area Industrial Complex(es)	Freeport Marine
Freeport Harbor Channel Outer Bar and Jetty Channels Widening (Widening Project)	Parcel 14 Developments
Freeport LNG Phase I	Various Roadway Improvement Projects
Surfside Marina	
Velasco Terminal	

Individual project documents were reviewed for impacts to selected habitats based on the evaluation criteria described above. No attempts were made to verify or update published documents, nor were the disposal practices proposed in reviewed documents verified for current ongoing projects. In addition, no field data were collected to verify project impacts described in reviewed documents. Mitigation outlined in individual project documents may be in place or proposed. This analysis recognizes that some of the projects assessed are undergoing revisions that may alter their environmental impact. This analysis relied only on existing published documents. Project descriptions follow in sections 6.2 (Past or Present Projects) and 6.3 (Reasonably Foreseeable Future Actions).

6.1.3 Resource Impact Evaluation

Biological/ecological, physical/chemical, and cultural/socioeconomic resource impacts were evaluated based on individual project reviews. Acreages and rankings for the past, present, and reasonably foreseeable projects, compared to the quantifiable impacts of the LPP Alternative, are presented in Table 6.1-3. Impacts and mitigating factors of the LPP Alternative considered in this cumulative analysis are presented in sections 4.0 and 5.0 and summarized in this analysis table. Direct impacts to specific habitats that could be quantified (acreage) from existing project documents were considered. Where relevant information is not quantifiable, impacts are given a ranking: Benefit or Net Benefit, No Long-term Impact, Not Available. Cumulative impact conclusions follow the project descriptions and summary table. Although 24 projects are discussed in the following sections, only 10 are included in Table 6.1-3. Five projects were not included in the table for various reasons, as specifically described for each project below.

6.2 PAST OR PRESENT ACTIONS

6.2.1 Freeport Harbor Channel 45-Foot Project (Past and Current Condition)

The existing 45-foot Project was constructed in 1978. The Freeport Harbor Channel Jetty and Outer Bar channels are currently maintained by USACE to a depth of –47 feet MLT at a width of 400 feet. These existing channels are approximately 6.3 miles long. Ongoing routine maintenance requires the removal of an average (since 1992) of 1.90 mcy of material per maintenance cycle for placement in the Maintenance ODMDS at a roughly 10-month interval. Maintenance impacts are included in Table 6.1-3.

6.2.2 Freeport Harbor Jetties

The original project for Federal improvement at Freeport was authorized by the River and Harbor Act (RHA) of June 14, 1880, which provided for construction of jetties for controlling and improving the channel over the bar at the mouth of the Brazos River (Alperin, 1977). The work was started in 1881 and continued to 1886 when operations were suspended due to lack of

funds. USACE repaired and strengthened the jetties in 1908. Currently, the jetties extend approximately 7,700 feet and 8,640 feet on the north and south sides of the channel, respectively. The North Jetty was relocated north of its original location as part of 45-foot project improvements; approximately 3,500 feet were added onshore to protect against flanking, and it was lengthened seaward by 500 feet. The South Jetty was also rehabilitated concurrent with the North Jetty improvements. It is generally believed that construction of the jetties blocks sand transport in either direction across the harbor entrance (Watson, 2003). In addition, sand moving southwest along the beach at Surfside is carried out along the North Jetty and deposited in the channel, where it is regularly removed by hopper dredge and deposited in the Maintenance ODMDS. No quantifiable environmental impacts from this project could be located for inclusion in Table 6.1-3 as it was constructed in the distant past.

6.2.3 Brazos River Diversion Channel

Due to excessive siltation problems at Freeport, the Brazos River was diverted in 1929 (Alperin, 1977). A diversion dam about 7.0 miles above the original river mouth and a diversion channel rerouted the Brazos River from the dam to an outlet in the Gulf about 6.5 miles southwest of the original mouth. This project was authorized by Congress on March 3, 1925, and the project was completed in 1929. This diversion of the river downdrift of the predominant littoral current has starved the Surfside and Quintana beaches of river sand (Watson, 2003). The old Brazos delta has completely eroded away and no longer serves as a nearshore source for sand that waves can bring onshore to nourish the beach, and a new delta has formed at the mouth of the diversion channel. No quantifiable environmental impacts from this project could be located for inclusion in Table 6.1-3 as it was constructed in the distant past.

6.2.4 GIWW Maintenance Activities

The GIWW is a coastal canal from Brownsville, Texas, to the Okeechobee Waterway at Fort Myers, Florida. The Texas portion of the canal system extends 426 miles, from Sabine Pass to the mouth of the Brownsville Ship Channel at Port Isabel (Leatherwood, 2002). The GIWW crosses the existing Freeport Harbor Channel project near mile 1.5. A Galveston District 1975 EIS addressed maintenance dredging potential impacts, based on the best available information at that time. The current authorized maintenance dimensions of the GIWW are 12 feet by 125 feet, maintained using a hydraulic pipeline dredge. The GIWW from Chocolate Bayou to Freeport Harbor is dredged at approximately 36- to 48-month intervals, and the estimated annual maintenance material according to recent Dredging Conference Reports (USACE, 2005) is 1.5 to 2 mcy. The GIWW from Freeport Harbor to Cedar Lakes is maintained every 24 months with an estimated annual maintenance material of 1 mcy. Dredged material from the GIWW in the vicinity of the project area is placed in PAs designated for GIWW maintenance dredging (USACE, 1975). In Table 6.1-3, potential impacts for the GIWW segment(s) within the Freeport

LPP Alternative study area have been generally estimated from the 1975 EIS, although the maintenance segments are not exactly correlated to study area boundaries.

6.2.5 Freeport Hurricane Flood Protection Levees

Galveston District studies in 1958 led to legislation in 1962 providing for hurricane-flood protection projects at Freeport and Port Arthur (USACE, 1977, 2002). Both areas had local levee systems at the time, challenged by Hurricane Carla; the newer Federal projects were designed to improve and augment existing protection. At Freeport, approximately 42 square miles (including areas of Freeport, Velasco, Lake Jackson, Clute, Lake Barbara, and Oyster Creek) were protected by approximately 56 miles of levees, wave barriers, floodwalls, drainage structures, pumping plants, and a vertical-lift tide gate with a navigation opening 61 feet high and 75 feet wide (USACE, 1977). In 1982, approximately 43 miles of the existing levee system and 2 miles of new levee were constructed, with two pumping stations (USACE, 2002). According to a 2006 report (Edge et al.), the Freeport Harbor levee system is projected to be able to protect the city and port from a 200-year hurricane; therefore, it is not likely that any additional construction would be required for the levee system. No documentation could be located about the construction impacts of the Freeport Hurricane Flood Protection Levee system, either from the 1970s or 1980s. Because this information is not available and no new construction is anticipated, the Freeport Hurricane Flood Protection Levees are not included Table 6.1-3.

6.2.6 Bryan Mound Strategic Petroleum Reserve

The Bryan SPR storage facility occupies 500 acres, close to port and terminal facilities at Freeport and the ConocoPhillips tank farm. The site has a total DOE-authorized storage capacity of approximately 232 million barrels (MMB) as part of the United States's emergency oil supply (DOE, 2004). The Bryan Mound site was proposed as an SPR storage facility in various Congressional reports, workshops, and EISs from 1977 through 1979; the site was operational by 1979 (DOE, 2004). The facility was expanded under two supplemental NEPA documents: Seaway Group EIS (DOE EIS 0021) and Seaway EIS (DOE EIS 0075) (DOE, 2004). A Finding of No Significant Impact (FONSI) was issued in 1993 on a brine pipeline replacement (DOE, 1993a). A new commercial potable water line was permitted by USACE, and the installation was completed in 1985.

Bryan Mound SPR operations have contributed to three of the documented four large brine spills in the SPR system: two spills totaled 606,000 barrels at Bryan Mound and West Hackberry in 1985; one 825,000-barrel spill at Bryan Mound in 1989; and one 74,000-barrel spill at Bryan Mound in 1990 (DOE, 1993a). The 1989 brine spill caused devegetation of a limited area and subacute toxicity over a wider area; eventual recovery was achieved over time in some areas through natural flushing and succession, but revegetation and/or drainage enhancement was required to restore completely any poorly drained areas (DOE, 1993a). According to monitoring

well data, the Bryan Mound brine pond concrete basin was suspected to leak, contaminating shallow and deep aquifers (DOE, 1993b); however, upon final structural inspection in 1998 toward decommissioning in 1999, no structural compromise was detected (DOE, 2000). To date, two principal crude oil pipelines extend from Bryan Mound: a 4-mile, 30-inch-diameter line to the ConocoPhillips terminal and docks; and a 46-inch line to the ARCO Pipeline Company terminal in Texas City, Texas.

In 2005, the Energy Policy Act directed the DOE to select sites necessary to expand the entire SPR system to the authorized capacity of one billion barrels of oil (DOE, 2005). The existing Bryan Mound SPR storage facility was not considered for expansion because the salt dome has no capacity available for additional storage caverns (DOE, 2006). Construction and operational impacts from Bryan Mound are included to the extent available in Table 6.1-3.

6.2.7 CenterPoint Energy, Inc.

Construction and operation of the Freeport LNG Project required that new, dedicated electrical service be brought to the LNG Terminal site (Federal Energy Regulatory Commission [FERC], 2004b). Freeport LNG requested CenterPoint Energy to provide a new 69-kV electric transmission line from an existing CenterPoint Energy substation (FERC, 2004a) to the Freeport LNG substation, located near the storage and vaporization facility on Quintana Island. CenterPoint Energy submitted an Environmental Assessment (EA) in January 2005 (Burns & McDonnell Engineering Company, 2005), and the Public Utility Commission of Texas took the project on the docket in 2006 (No. 30617); the final order was signed in March 2006. Construction on the facility ended in June 2007. Impacts from this transmission line are included in Table 6.1-3, based on the Preferred Route (Route 4) presented in the EA.

6.2.8 Petrocom Fiber Optic Network

Petrocom, a Gulf cellular and microwave communications provider, created a fiber optic ring in a rough oval, starting in Texas from Freeport north to Houston, crossing into Louisiana to New Orleans and south to Fourchon, then offshore south and westward to return to Freeport. Cable installation began in June 1999 (Smith, 1999). The oval network allows bidirectional signal transmission, increasing reliability in case of a break in the cable. This advanced technology provides offshore oil production platforms with the infrastructure for high-volume, high-speed voice, data, and video capabilities (Payne and Miller, 1999). No environmental impacts from this project could be located for inclusion in Table 6.1-3.

6.2.9 Freeport Area Industrial Complex(es)

The Freeport area and surrounding communities within the study area support a wide variety of private industrial uses. Operations, materials storage and transport, and discharges are generally

Table 6.1-3
Freeport Federal Cumulative Impacts Section

	Past or Present Actions						Reasonably Foreseeable Actions				
Resources	**Existing FH-45**	**GIWW**	**Bryan Mound SPR**	**CenterPoint Energy Transmission Line (Route 4)**	**Freeport LNG Phase I**	**Freeport Channel Widening**	**BP Fiber Optic Network**	**Freeport LNG Phase II**	**Port Freeport Modifications (Berth 7)**	**Surfside Beach Shoreline Protection**	**Preferred Alternative**
Wetlands Impacted acres (ac)	NA1 "some water filled low areas and ponds"	dredge: NO disposal: 4,464 ac	20 ac (brackish marsh and creek/river)	8 ac	68 ac	NO	NO	NI	2 ac	NA	39 ac
Wetlands Mitigation (ac)	400 ac acquired by local sponsor	NA2	NA2	NA2	58 ac	NO	NA2	31 ac	16 ac	NA	3 ac with plantings to compensate AAHUs; ~12 ac protected/ enhanced forest
Benthos	NA1	dredge: 3,550 to 3,600 ac disposal: NA1	20 ac potential	NA2	NI	NA1	NO	NA1	NA2	NA	
Threatened or Endangered Species	NA2	NO	NO	NO	NO	may affect, not likely to adversely affect, piping plover, 2 injury or mortality sea turtle takes, 32 noninjurious sea turtle takes allowed per NMFS BO	NO	NO	NA2	NI	likely to affect sea turtles during dredging; may affect, not likely to adversely affect piping plover
EFH	NA2	NA2	NA2	NA2	NI	NA1	NO	NI	NA2	NA	NO
Air Quality	odors	dredge: NO disposal: NI	hydrocarbon emissions periodically exceed stds: NA1	NA2	NO	NO_X exceedances; coordinating regarding compliance with SIP is ongoing	NO	NO	NA2	NI	NO_x exceedances
Noise	NA2	dredge: NO disposal: NO	NO	NA2	NO	NO	NA2	NO	NA2	NI	NO
Water Quality	NO	dredge turbidity: NO disposal turbidity: NO dredge pollutants: NA1 disposal pollutants: NO	possible toxic releases and increase in groundwater salinity: NA1	NO	groundwater: NI surface water: NO	groundwater: NO surface water: NO	NO	groundwater: NI surface water: NO	NA2	NI	groundwater: NO surface water: NO
Sediment Quality	NO	NI	NA2	NA2	NI	NO	NA2	NI	NA2	NA	NO
Shoreline/Bank Erosion	NA2	NI	NA2	NA2	NI: 14 ac planted to prevent erosion	9-ac benefit (Quintana)	NO	NA2	NA2	Net Benefit	NO
Environmental Justice	NA2	NA2	NA2	NA2	NA2	NO	NA2	NA2	NA2	NA2	NO
Cultural Resources	historic USCG building relocation	dredge: NO disposal: NA1	NA2	NO	NO	NO	NI: 3 anomalies, buffered to avoid	NO	NA2	NI	NI: 3 anomalies will require diving, and additional investigation of site 41BO226 in PA 9 will be needed

Table 6.1-3 (concluded)

	Past or Present Actions						Reasonably Foreseeable Actions				
Resources	**Existing FH-45**	**GIWW**	**Bryan Mound SPR**	**CenterPoint Energy Transmission Line (Route 4)**	**Freeport LNG Phase I**	**Freeport Channel Widening**	**BP Fiber Optic Network**	**Freeport LNG Phase II**	**Port Freeport Modifications (Berth 7)**	**Surfside Beach Shoreline Protection**	**Preferred Alternative**
Commercial Fisheries	benefit to shrimping; NO for other fisheries	Benefit	NA2	NA2	NA2	NO	NO	NA2	NA2	NA	NO
Recreational Fisheries	benefit	Benefit	NA2	NA2	NA2	NO	NO	NA2	NA2	NA	NO

Impacts in this table are derived from publicly available project impact documents. These impacts are presented as they were in the documents, at the time of the document production.

Note: Acreage has been rounded to nearest whole number.

Benefit Results that have an overall positive effect, when compared to the FWOP condition of the resource; not quantified, but stated as a benefit in project document(s).

NO No adverse effect from project; limited in duration or extent such that the resource is not adversely affected, according to project document(s).

NI Impact mitigated by compensatory or protective measures, as stated in project document(s).

NA1 Impact may occur or is expected to occur; however, quantified impact information not available in project document(s).

NA2 No impact information is available for the resource in project document.

regulated under EPA and TCEQ guidelines and requirements. According to the EPA EnviroFacts database and mapper, the EPA tracks approximately 528 facilities within Brazoria County. None of the regulated industrial facilities and uses within the study area (Brazoria County) can be classified as Superfund, toxic release, water discharge, hazardous waste, or air emission sites (EPA, 2007d). As construction and operational impact information is not uniformly available on all of these sites, impacts from industrial facilities within the project area are not included in Table 6.1-3.

6.2.10 Freeport Harbor Channel Widening Project (Widening Project)

The BRHND of Brazoria County, Texas (Port Freeport) applied to USACE, Galveston District, for a CWA Clean Air Act Section 404 permit and Rivers and Harbors Act Section 10 permit for dredge and fill activities related to the widening of portions of the Freeport Harbor Channel on April 14, 2005. Activities subject to the jurisdiction of USACE would include dredging in navigable waters to widen portions of the Jetty Channel and all of the Outer Bar Channel, and placement of fill in waters of the U.S. Based on the Section 10/404 permit application submitted by Port Freeport to USACE in April 2005, USACE determined that the permitting action for the proposed dredge and fill activities constitutes a major Federal action.

The proposed project site is located along the northern edge of the Freeport Harbor Jetty and Outer Bar channels, between Surfside and Quintana, in Brazoria County, Texas. The Freeport Harbor Jetty and Outer Bar channels are currently maintained by the USACE to a depth of –47 feet MLT at a width of 400 feet. These existing channels are approximately 6.3 miles in length and approximately 400 feet in width. Port Freeport proposes to widen, but not deepen, the Jetty Channel and all of the Outer Bar Channel. Beginning at Channel Station 63+46, which is just about even with the center of the USCG Station access channel, the Jetty Channel will be gradually widened, at the authorized depth, up to an additional 150 feet to Channel Station 43+00. From that point to Channel Station 38+00, the widening will be less gradual and will go from the additional 150 feet to an additional 200 feet. From Channel Station 38+00 through the rest of the Jetty Channel and to the end of the Outer Bar Channel at Channel Station –260+00, the channel will be widened an additional 200 feet. The length of channel that is proposed for widening is 32,335 feet, or 6.1 miles, of which 5.7 miles will be widened by 200 feet.

Approximately 300,000 cy of silty/sand construction material will be used beneficially to nourish Quintana Beach. The rest of the construction material (2.9 mcy) is Beaumont clay for which there is no viable BU and is proposed for offshore placement. Impacts to resources are included in Table 6.1-3.

Because this Widening Project is further along in the process for implementation than the proposed FHCIP, it is reasonable to assume that the channel widening would have been completed prior to completion of the authorization process for the FHCIP. Therefore, the

Widening Project is included in the "Past or Present Actions" category rather than the "Reasonably Foreseeable Future Actions" category. The project is included in Table 6.1-3.

6.2.11 Freeport LNG Phase I

Freeport LNG Development, LP was permitted to construct the new Freeport LNG Import Terminal Project (Freeport LNG Project) on Quintana Island, Brazoria County, Texas, providing infrastructure to shippers at the Stratton Ridge Meter Station (FERC, 2004a). The 2004 Final Environmental Impact Statement (FEIS) lists the following components for the Freeport LNG Project:

- LNG ship docking and unloading facilities with a protected single berth equipped with mooring and breasting dolphins, three liquid unloading arms, and one vapor return arm;
- reconfiguration of a storm protection levee and a permanent access road;
- two 26-inch-diameter (32-inch outside diameter) LNG transfer lines, one 16-inch-diameter vapor return line, and service lines (instrument air, nitrogen, potable water, and firewater);
- two double-walled LNG storage tanks, each with a usable volume of 1,006,000 barrels (3.5 billion cubic feet of gas equivalent);
- six 3,240-gallon-per-minute (gpm) in-tank pumps;
- seven 2.315-gpm high-pressure LNG booster pumps;
- three boil-off gas compressors and a condensing system;
- six high-pressure LNG vaporizers using a primary closed-circuit water/glycol solution heated with 12 water/glycol boilers during cold weather, and a set of intermediate heat exchangers using a secondary circulating water system heated by an air tower during warm weather, and circulation pumps for both systems;
- two natural gas superheaters and two fuel gas heaters;
- ancillary utilities, buildings, and service facilities at the LNG terminal; and
- 9.6 miles of 36-inch-diameter natural gas pipeline extending from the LNG import terminal to a proposed Stratton Ridge Meter Station (FERC, 2004b).

This first phase of the Freeport LNG Project was completed in April 2008 and is currently operational. Potential impacts associated with this first phase are included in Table 6.1-3. A description of Phase II of the project is presented in Section 6.3.2.

6.2.12 Surfside Marina

Located on the GIWW at the SH 332 bridge, this marina includes 260 dry stack slips and 38 water slips. The 9-acre facility is a full service dock, with 24-hour fuel, ice, and bait and also

offers mechanical services (Surfside Marina, 2010). No environmental impacts from this project could be located for inclusion in Table 6.1-3.

6.2.13 Velasco Terminal

The Velasco Terminal is one of the larger port improvements in the last 40 years. Although it is planned to total 2,400 linear feet of berth, Phase I has completed 800 feet of berth thus far (Port Freeport, 2009). The terminal would handle containerized and break-bulk cargo, with 90 acres of developable land with rail (20 acres are currently under contract). No environmental impacts from this project could be located for inclusion in Table 6.1-3.

6.3 REASONABLY FORESEEABLE FUTURE ACTIONS

6.3.1 BP Fiber Optic Cable Network

BP Exploration and Production, Inc. has proposed installation of a 725-mile fiber optic cable network extending across the Gulf from Pascagoula, Mississippi, to Freeport, Texas. The proposed network will provide offshore oil and gas facilities in the Gulf with updated telecommunications service. Onshore construction in Freeport has been designed to avoid all wetland impacts. Construction would begin at the proposed beach manhole located near the northwest corner of a levee that surrounds the old Phillips Petroleum drilling material deposition site, now owned by the Texas General Land Office (GLO). This location is on Quintana Beach between the Seaway PA and PA 85, adjacent to the Quintana beach PA proposed for the Widening Project (see Section 6.2.8). The proposed fiber optic beach manhole would be a subterranean vaultlike structure that houses the splice linking the terrestrial cable with the submarine cable. From this manhole, the fiber optic cable would continue seaward via a horizontal directionally drilled bore pipe conduit approximately 30 feet below the existing ground elevation and seafloor surface for about 4,920 feet. At this point the cable would exit and lie on the Gulf floor, except at two fairway crossings (within the Galveston District), where it would be buried 10 feet below the seafloor. Construction would include building a 150-x-100-foot concrete pad for equipment associated with the horizontal directional drilling and a 20-x-20-foot access road from CR 723 to the existing levee.

Following a preliminary review of the Section 404/10 permit application, the Galveston District made a preliminary determination that an EIS is not required for the project (USACE, 2007). The proposed fiber optic cable network project is subject to Section 404(b)(1) evaluation, Texas Coastal Zone consistency certification, and Section 401 water quality certification from TCEQ. To avoid potential impacts to three previously identified potential cultural resource sites (anomalies), construction will not occur within a 164-foot radius avoidance zone around each anomaly. Preliminary indications are that no known threatened or endangered species or their critical habitat will be affected by the proposed project, and no substantial adverse impacts to EFH or federally managed Gulf fisheries are anticipated. An EA and Statement of Findings was

issued August 16, 2007 (Permit Application – SWG-2007-884). This project is included in Table 6.1-3.

6.3.2 Freeport LNG Phase II

In July 2005, Freeport LNG Development, LP submitted environmental documentation to FERC to increase the diameter of the previously authorized 9.6-mile send-out pipeline from 36 inches to 42 inches (amendment to FERC Docket No. CP03-75) (FERC, 2005). As a result, the LNG terminal would also require expansion. The environmental effects for the LNG terminal expansion are presented in FERC Docket No. CP05-361 and the Phase II EA (FERC, 2006). Phase II of the Freeport LNG project includes the following items:

- an additional LNG ship berth and unloading facilities;
- additional vaporizers and associated systems, including an air tower;
- a third LNG storage tank;
- additional utility systems; and
- the Stratton Ridge LNG underground storage facility.

Freeport LNG Development, LP staff concluded that this second phase, with appropriate mitigating measures, would not constitute a major Federal action significantly affecting the quality of the human environment. In 2005, the RRC issued Freeport LNG Development, LP a permit to create, operate, and maintain an underground hydrocarbon storage facility at Stratton Ridge (RRC, 2005, amended 2007). A separate EA was prepared for this nonjurisdictional portion of the Freeport LNG Phase II project. Potential impacts from these underground facilities were also documented in the Freeport LNG Phase II Project EA Appendix A, Nonjurisdictional Facility Analysis (FERC, 2006). This facility for Freeport LNG would provide natural gas storage capacity for the vaporized LNG processed at the Freeport LNG terminal. The major components would include surface and subsurface facilities:

- salt dome natural gas storage caverns and well pads;
- gas-handling facility and solution-mining plant;
- one 20-inch natural gas wellhead pipeline (0.46 mile);
- one 42-inch (or smaller) natural gas pipeline (1.05 miles);
- two 6-inch water supply pipelines (1.46 miles and 0.46 mile);
- two 16-inch brine disposal pipelines (1.46 miles and 0.46 mile); and
- one 3.5-inch diesel pipeline (0.46 mile).

Impacts associated with Phase II for the Freeport LNG development are presented in Table 6.1-3.

The Stratton Ridge storage facility proposed for the Freeport LNG project is not related to the Stratton Ridge SPR expansion alternative considered and eliminated by DOE (DOE, 2007). In December 2006, the DOE released an EIS for the Nation's underground SPR expansion, including Stratton Ridge as a potential new facility approximately 5 miles northwest of Freeport. In February 2007, the DOE released its decision to not select Stratton Ridge as a new SPR storage facility because of its location within the Seaway crude oil distribution complex and potential impacts to existing commercial operations (including Dow Chemical) (DOE, 2007).

6.3.3 Port Freeport Modifications

Several projects were identified by Port Freeport as reasonably foreseeable projects in the Freeport area. Based on available information, brief descriptions of the proposed modifications are presented below. Because many of these projects are still in the conceptual planning stages, there is very little information available regarding their potential impacts; since potential impact information was not available for review at the time this document was prepared, impacts are not included in Table 6.1-3, unless otherwise noted.

6.3.3.1 Dock 5 Expansion

Development of Parcel No. 25/Berth 5 is proposed to further augment the port's warehousing and rail facilities. Transit Shed 6 adjacent to Dock 5 is proposed as a 125,000-square-foot facility with rail access (BRHND, 2004). Potential impacts associated with the Dock 5 expansion will include minimal to no wetland impacts for the initial phase and dredging activities with placement of dredged material in the port's PAs (pers. comm., Port Freeport Environmental Coordinator, 2006).

6.3.3.2 Cool Storage Facility

A 38,000- to 40,000-square-foot new waterfront cold storage facility is proposed to serve needs of fruit importers (Dole Fresh Fruit Company and Chiquita Brands, Inc.) The facility will handle palletized fruit and other temperature-sensitive commodities (BRHND, 2004). Construction of the facility involves conversion of a transit shed and does not involve construction of undeveloped land. It will contain four cubicles for fresh fruit storage that can be off-loaded as break-bulk cargo for ships or trucks.

6.3.3.3 Construction of Berth 7

This would be a new 800-foot-long berth with 20 acres of stabilized backlands for new containerized and/or break-bulk cargo activity. The facility will ultimately be 1,200 feet long and is designed to handle new-generation gantry cranes and vessels up to 48-foot draft (BRHND, 2004). According to Port Freeport's Environmental Coordinator, the project is expected to impact approximately 2.08 acres of jurisdictional waters of the U.S. The port is mitigating for

that loss with the creation/enhancement of 15.7 acres of wetlands. Specifically, 8.5 acres of new wetland would be created, and 7.2 acres of existing wetlands in the Peach Point WMA would be enhanced (pers. comm., Port Freeport Environmental Coordinator, 2006). These impacts have been included in Table 6.1-3.

6.3.3.4 BASF Polycaprolactam Facility

A polycaprolactam plant is currently under construction at the BASF facilities in Port Freeport (Real Estate Center, 2006). The plant will build on the existing nylon polymer operations and will produce nylon polymers for engineering plastics used in automotive parts, electronics, and sporting goods, as well as other products (*The Alliance*, 2005a). Projected air emissions for the project have been permitted, and process wastewater will be treated on-site under their existing Texas Pollutant Discharge Elimination System wastewater discharge permit, and no increased water emissions are anticipated with the project (pers. comm., BASF Texas Hub Environmental Team Leader, 2006).

6.3.3.5 American Rice, Inc.

American Rice, Inc. has expansion plans for its on-port facilities:

- a 151,165-square-foot, fully automated warehouse on 4.3 acres for storage of finished goods;
- eight steel storage bins encompassing 45,225 square feet on 1.3 acres for holding rice brought by barge and truck;
- A 36,206-square-foot instant rice plant on 1 acre for producing instant and microwavable products;
- A 116,736-square-foot olive oil–bottling plant on 3.4 acres; and
- A cookie-baking facility.

This expansion is expected to employ approximately 335 people in the Freeport area. In addition, American Rice, Inc. plans to relocate their North American operation headquarters to Freeport (*The Alliance*, 2006j).

6.3.4 TEPPCO Seaway Crude Pipeline

TEPPCO operates the Seaway Crude Pipeline and provides marine terminal and storage services for Texas Gulf Coast area refineries. Three large-diameter lines carry crude oil from Freeport to the Jones Creek Tank Farm, which has six storage tanks capable of handling approximately 3.3 MMB of crude. The Freeport marine terminal is the origin for the 30-inch-diameter crude pipeline, which stretches approximately 500 miles to Cushing, Oklahoma, with a capacity of 350,000 barrels per day (TEPPCO, 2007). Information regarding the impacts of construction was

not available at the time this report was prepared. Potential impacts from the TEPPCO Seaway facility are not included in Table 6.1-3.

6.3.5 Surfside Beach Shoreline Protection

The Federal Emergency Management Agency (FEMA) is considering funding the construction of a revetment structure along the seaward side of Beach Drive in the Village of Surfside Beach, Brazoria County, Texas, to provide protection to the transportation facility and the public infrastructure landward of Beach Drive (FEMA, 2007). The structure would be approximately 3,500 feet long. This proposed revetment is part of a larger, phased (not necessarily sequential) project including the following elements:

- concrete debris removal and demolition;
- relocation and/or removal of homes located on the beach;
- a GLO Shoreline Feasibility Study to develop additional erosion prevention alternatives; and
- evaluation and implementation of additional feasible alternatives.

The village will proceed with application(s) for CEPRA and Coastal Impact Assistance Program funding for beach nourishment, dune reconstruction, and beach stabilization. CEPRA Cycle 5 funding has been approved for house demolition and reimbursement (GLO, 2007). At the time of this document's preparation, the only project for which environmental impact information is currently available is the revetment; therefore, impacts for the revetment are summarized in Table 6.1-3.

6.3.6 Freeport Desalination Plant

In 2004, the Brazos River Authority initiated the preparation of the Freeport Seawater Desalination Project Summary Report. According to this report, extensive analysis concluded that the project would be an integral component to meeting future water demands in Brazoria and Fort Bend counties, Texas (Brazos River Authority, 2004). In December 2006, TWDB produced recommendations and rationale for future desalination pilot projects in the Biennial Report on Seawater Desalination. The Freeport desalination project was not recommended to pursue at this time; however, this project will be considered as a possible candidate for future funding, especially if it can be integrated into broader interregional activities (TWDB, 2006b). Because the project is on hold at this time and environmental documentation has not been fully produced, potential impacts for this project are not included in Table 6.1-3.

6.3.7 Gulf Coast Regional Spaceport

In March 2000, Brazos County Commissioners voted to create the Gulf Coast Regional Spaceport Development Corporation to pursue a Federal Aviation Administration (FAA) license

and develop a site to stage suborbital and orbital rocket launches by private enterprises (Brazoria County, 2000). An approximately 800- to 900-acre site was chosen off FM 2004 near Demi-John Island on a rural tract owned by Dow Chemical, close to the Brazoria NWR. The spaceport received state appropriations, and in 2006, the FAA-initiated public scoping/NEPA processes for licensing the site (FAA, 2006). On February 27, 2007, the Gulf Coast Regional Spaceport Development Corporation was dissolved; therefore, the spaceport is not currently being pursued (Brazoria County, 2007), but could be at some future date by another entity.

6.3.8 Park Upgrades and Marinas

Improvements are anticipated for Freeport's Memorial Park and Bryan Beach Park. Improvements at Memorial Park include electrical upgrades and repairs (in-ground halogen light fixtures, accent flood lights, and sound system) (*The Alliance*, 2006i). At Bryan Beach Park, a new parking lot and a 2.9-mile crushed oyster shell trail are planned; restroom facilities may also be constructed (*The Alliance*, 2006d). The port has proposed a marina on the Old Brazos River that would market to large high-end boats. Additionally, a marina is being planned in Surfside with a 400-slip dry-dock facility, a restaurant, retail shops, showers, and a laundry facility. Off of the Highway 332 bridge, it would cater to sporting craft (*The Alliance*, 2006g).

6.3.9 Freeport Marina

Along the Old Brazos River, City of Freeport has submitted an application with USACE to build a marina with seven floating docks, dry stack storage, fuel, and marina facilities. The action would include dredging a 1,450-foot-long by 15-foot-wide area to a depth of –4 feet MLT, and bulkhead would be installed. Currently, the Old Brazos River is littered with debris and garbage; the proposed action would remove and improve the river bottom. There were no significant environmental effects identified from the proposed work (USACE, 2008c) and thus this project is not included in Table 6.1-3.

6.3.10 Parcel 14 Developments (Warehouse and Rail Multimodal Facility)

Parcel 14 is an environmentally mitigated tract immediately south of SH 36. The location would be developed as a multimodal facility with on-site warehousing and rail access. With a grade separation at FM 1495 and SH 36, connectivity with other port parcels is contiguous, with nonport traffic separated from port traffic (Port Freeport, 2009). No environmental impacts from this project could be located for inclusion in Table 6.1-3.

6.3.11 Various Roadway Improvement Projects

Several roadway improvement projects are planned for the area (TXDOT, 2010) and include two projects for improvements to CR 220, expansion of FM 2351 (to four lanes from SH 35 to Galveston County), widening of FM 523 (from FM 2004 to SH 332), bridge replacement of

CR 160 at the Gulf Coast Water Canal, and Segment B of the Grand Parkway. Because many of these projects are still in the planning stages, minimal information is available regarding their potential impacts; since no environmental impacts for these projects could be located, they are not included in Table 6.1-3.

6.4 CUMULATIVE IMPACTS DISCUSSION

6.4.1 Ecological and Biological Resources

6.4.1.1 Wetlands

The LPP Alternative would impact 39 acres of ephemeral wetlands, mitigated by one 3-acre pond planted with appropriate vegetation to fully compensate for lost AAHUs. Additional wetland habitat impacts over time are related to the Bryan Mound SPR, CenterPoint Energy electric transmission line, 45-foot Project, Freeport LNG, and Port Freeport modifications. From the 1950s to 2002, the Brazos Delta and surrounding area has shown a significant estuarine marsh loss trend (White et al., 2004). Losses can be attributed to erosion at the mouth of the diverted Brazos River, conversion to uplands due to early placement of dredged materials (e.g., the GIWW), agricultural land conversion, and residential and industrial development. Freeport Harbor and channel improvements are consistent with a steady trend toward increased reliance on area industry and continuing development. It is difficult to estimate cumulative functional impacts to area wetlands as many mitigation documents, if available, only discuss acreage lost and replacement acreage, if required. In recent years, compensatory and mitigation strategies have evolved to more fully replace wetland functionality, in addition to lost acreage. Measures taken by this proposed channel improvement project aim to accomplish that; therefore, this project's measures should not be considered to add cumulatively to the area's past adverse impacts to wetlands.

6.4.1.2 Benthos

Organisms present on open-bay bottom would be temporarily affected by the project excavation and placement of dredged materials. Other past, present, and potential projects in the study area have identified similar benthic community impacts through dredging for construction and maintenance. As noted in Section 4.12.1, excavation of open-water bottom buries and removes organisms; Sheridan (1999) found that benthic communities can take anywhere from 18 months to over 3 years to recover for certain parameters. Open-water disposal of dredged material in the ODMDSs smothers or buries existing benthic communities. Benthic community structure and abundance may eventually return to preplacement levels at the New Work ODMDS; however, repeated dredging and placement of dredged material at the Maintenance ODMDS site may result in less than full recovery of the benthic community between maintenance cycles, if those activities occur with frequencies more often than 18 months to 3 years. Cumulative benthic impacts may occur without adequate temporal spacing for benthic community recovery to

preplacement populations at the New Work ODMDS because of placement for the Widening Project followed by placement from the FHCIP. However, it is likely that the benthic community would eventually recover, just over a longer period of time.

6.4.1.3 Essential Fish Habitat

In general, placement of dredged material into open-water areas may affect food sources, increase turbidity, and release contaminants in EFH. Several projects compared in this analysis use ODMDSs in construction and/or maintenance, potentially affecting EFH, albeit temporarily. Recovery of some benthic organisms would likely occur relatively quickly, although the assemblage in the dredged material might differ from the assemblage that existed at the PA prior to construction. Impacts to EFH from turbidity associated with ocean placement are not significant. If the material to be dredged is not contaminated, there would be no contamination issues with respect to EFH. Placement of dredged material associated with the projects included in this analysis would occur over time and would be subject to USACE and EPA permitting; therefore, it is reasonable to expect that dredged material placed into open-water sites would not contain contaminants. However, placement of material at the New Work ODMDS for the Widening Project and FHCIP may result in temporary cumulative impacts to the benthic community. Although these impacts may have slight effects on EFH-associated species, this impact is not expected to result in loss of EFH.

6.4.1.4 Threatened and Endangered Species

None of the proposed projects included in this analysis are expected to impact federally protected species, although dredging activities associated with some of the projects may affect Gulf marine turtles. Projects requiring dredging activities necessitate coordination with NMFS to avoid or minimize potential impacts to sea turtles during dredging operations; specific protective measures are engaged to prevent adverse impacts to the extent practicable. Any unavoidable impacts will be to individuals, within thresholds established by NMFS; therefore, the overall potential cumulative impacts are not expected to adversely impact sustainable populations.

6.4.2 Physical and Chemical Resources

6.4.2.1 Air Quality

Objectionable odors (e.g., hydrogen sulfide) may result from the dredging of maintenance sediments containing high concentrations of organic matter in those reviewed projects requiring dredging or digging into aquatic sediments. Current maintenance dredging activities (GIWW and Freeport Harbor Channel) and proposed projects that include dredging activities for construction (Widening Project, proposed FHCIP, Freeport LNG Project, and Port Freeport Modifications) would emit NO_X, CO, particulates, sulfur dioxides, and hydrocarbons. The project area occurs within the HGB, which is a nonattainment area for O_3 (see Section 3.6); therefore, all projects in

the study area with the potential to affect air quality must coordinate with TCEQ in regards to the SIP. This coordination should ensure compliance with the SIP, and thus the NAAQS, resulting in no significant cumulative impact to air quality.

According to the 2011 U.S. Greenhouse Gas Inventory Report (EPA, 2011b), in 2009, total U.S. greenhouse gas emissions were estimated to be 6,633,200,000 metric tons as CO_2 equivalents. Based on the GHG estimates presented in Tables 4.4-3 and 4.4-8, the proposed NED Plan and LPP alternatives would result in a very small increase in GHGs compared to the national inventory. While GHG emissions from the FHCIP alternatives may be negligible relative to the total national emissions inventory, small contributions of GHGs could accumulate in the atmosphere. However, the estimated GHG emissions for the FHCIP alternatives combined with those from the projects indentified above are also expected to result in a small, short-term contribution compared to the national or global inventory of GHG emissions.

The cause of global climate change is generally accepted to be the increased production of GHG emissions worldwide. Unlike criteria pollutant impacts, which are local and regional, climate change impacts occur at a global level. In addition, the relatively long lifespan and persistence of GHGs require that climate change be considered a cumulative and global impact. It is unlikely that an increase in global temperature or sea level could be directly attributed to the emissions resulting from a single project or combination of a few local projects. Rather, it is more appropriate to conclude that the GHG emissions associated with the FHCIP alternatives would combine with emissions across the United States and the globe to cumulatively contribute to global climate change.

6.4.2.2 Noise

Noise impacts included in those projects associated with dredging will include operation and maintenance noise. This impact will be temporary, will move up and down the project area depending on the section being dredged, and is not expected to differ from current maintenance dredging for many of the projects. Additionally, it is unlikely dredging would occur for more than one of the reviewed projects at one time.

6.4.2.3 Water Quality

For those projects that include dredging activities, dredging and placement operations are expected to temporarily degrade water quality in the project vicinity through increased turbidity and the release of nutrients from the sediment. No projects reviewed cited concerns with sediment contamination or nutrients, including the LPP Alternative. Dredging and placement at proposed open-water and upland PAs may increase suspended solids, release contaminants and bound nutrients, and deplete oxygen. This impact is temporary and, except for turbidity, insignificant. If temporary degradation occurs, the study area should rapidly return to ambient conditions upon completion of dredging.

Although ship traffic in the study area may increase, this increase is expected to be offset by efficiency increases derived from the proposed Widening Project and the FHCIP.

Groundwater impacts may occur in two of the projects considered in this analysis; however, no groundwater impacts are foreseeable or expected from implementation of the LPP Alternative. With implementation of BMPs and other permitting requirements, no surface water quality impacts are expected related to this and other projects in the cumulative impacts analysis.

6.4.2.4 Sediment Quality

None of the projects reviewed are known to impact sediment quality or disturb contaminated sediment. Although ship traffic in the study area may increase, with a potential increase in the risk of a toxic spill that could eventually contaminate sediments, that risk is offset by various Freeport Channel system improvement projects and operational measures associated with the LNG transport. No cumulative impacts to sediment quality are expected.

6.4.2.5 Shoreline Erosion

The shoreline in the study area has been fluctuating since 1852, and none of the projects reviewed are expected to alter the ongoing pattern. Shoreline changes have been attributed to RSLR, a reduced sand supply, the Brazos River relocation in 1929, reservoir development in the Brazos River basin, tropical storm and hurricane effects, beach traffic, sand interception from navigation channels and jetties, and wave action caused by large ship traffic. Mathewson and Minter (1976) estimated that about 76 percent of the sand that historically reached the coast was not reaching it in 1975. Efforts to offset shoreline erosion with beach nourishment have been carried out under the Texas CEPRA. These have involved both trucking in at least 950 cy of sand in one project and bringing sand from a DMPA near Baytown by barge for dune rehabilitation (Newby, 2006). A major limitation of beach nourishment in the area is the limited availability and expense of a suitable sand supply. Currently, beaches on both sides of the Freeport jetties are severely eroded. Erosion on the Quintana Beach side is threatening the stability of the Seaway PA, and erosion of Surfside Beach is threatening beachfront homes. Several projects reviewed for the cumulative impacts analysis would enhance shoreline conditions: Quintana beach nourishment (Freeport Harbor Channel Widening Project); 14 acres of planted shoreline stabilizing grasses (Freeport LNG); and additional beach nourishment (Surfside Beach Shoreline Protection). It is not known whether channel traffic frequency will increase with the channel improvements, although the size of vessels is expected to increase. The LPP Alternative is not expected to cumulatively affect shoreline erosion rates in the study area, including Surfside and Quintana beaches.

6.4.3 Cultural and Socioeconomic Resources

6.4.3.1 Environmental Justice

The EO on EJ was instituted in 1994; therefore, several of the projects presented for evaluation in the cumulative impacts analysis did not include this as a criterion. This was not an impact in this project; therefore, the current project would not add to any cumulative impacts in the area.

6.4.3.2 Cultural Resources

Activities associated with any of the reviewed projects have the potential to adversely impact unknown cultural resources by altering the integrity of location, design, setting, materials, construction, or association that contributes to a resource's significance in accordance with the NRHP criteria. Possible cultural resources that could be impacted by the reviewed projects were identified for the Freeport LNG facility and the Widening Project. Both projects are considered a Federal action and are required to coordinate with the SHPO for Section 106 compliance; therefore, any potential impacts to cultural resources associated with these projects would be avoided or mitigated. The LPP Alternative is not expected to contribute to cumulative impacts to cultural resources.

6.4.3.3 Commercial and Recreational Fisheries

Most projects do not mention impacts to fisheries; however, for all projects that do mention impacts to fisheries, no long-term impacts are detailed. Temporary and minor impacts to recreational and commercial fisheries include decreased water quality, increased turbidity during dredging and placement activities, and a removal of productive fish habitat, which could interfere with fishing activities. Fish likely leave dredge and placement areas for more-favorable, less-turbid locations; however, once construction and placement are complete, water and foraging conditions would improve, and fish would return to the area. No long-term cumulative impacts are expected from the FHCIP combined with area projects.

6.5 CONCLUSIONS

Cumulative impacts due to past, existing, and reasonably foreseeable future projects, along with the proposed FHCIP, are not expected to have significant adverse effects in the study area. Many of the projects occurring in the vicinity of the Freeport Harbor Channel, including the FHCIP impacts, are part of the continuing urbanization and industrialization of the predominantly agricultural Brazoria County.

Most of the resources considered in this analysis are not affected by any or are affected by very few of the projects, in minor (small areas, mitigated) and/or temporary (short-term, recoverable with conditions) ways: benthic organisms, threatened or endangered species, shallow Gulf bottom, EFH, water quality, sediment quality, environmental justice focal areas, and commercial

and recreational fisheries. As long as conditions continue to be favorable for recovery between periods of impact, these resources should not be affected by the projects discussed in this assessment in any permanent or cumulative way.

Some resources may experience permanent effects that have been and will be moderated by additional project actions, counteracting the potential for cumulative effects: wetlands (acreage and mitigation), shoreline (nourishment and restoration), and cultural resources (relocation, buffers, surveys for avoidance areas). Impacts associated with the Preferred Alternative for the FHCIP would be fully offset by compensatory mitigation measures.

7.0 COMPLIANCE WITH TEXAS COASTAL MANAGEMENT PROGRAM

The project will be reviewed by the Coastal Coordination Council (CCC) for consistency with the program. A review of potential BU of dredged material for the proposed FHCIP did not identify any cost-effective BUs in the project area. This was based on the characteristics of the dredged material, cost to transport the material, impacts associated with placement and manipulation of the material, and impacts to existing resources. Thus, no BU is proposed for the FHCIP. The LPP Alternative is consistent with the TCMP. All project planning has made efforts to avoid and otherwise minimize the cumulative adverse effects to coastal natural resource areas relating to the LPP Alternative. Dredged material will be placed in three upland confined PAs and two ODMDSs. Use of the ODMDSs would result in placement of dredged material within submerged lands, but these offshore placement areas are dispersive by nature, have been previously used, and will likely revert to the in situ topography prior to the next dredged material disposal. With the exception of submerged lands, which would be temporarily impacted, all Coastal Natural Resource Areas are avoided. Details regarding the LPP Alternative and compliance with the TCMP are documented in Appendix J.

8.0 CONSISTENCY WITH OTHER STATE AND FEDERAL REGULATIONS

This EIS has been prepared to satisfy the requirements of all applicable environmental laws and regulations and has been prepared using the CEQ NEPA regulations (40 Code of Federal Regulations Part 1500–1508) and the USACE's regulation ER 200-2-2 (*Environmental Quality: Policy and Procedures for Implementing NEPA*, 33 CFR 230). USACE will follow provisions of all applicable laws, regulations, and policies related to the proposed actions, including those for which applicability, review, and enforcement are their responsibility. Additionally, the non-Federal sponsor may be required to secure local municipal permits as a "Land, Easements, Rights-of-Way, Relocation and Disposal Areas" requirement. The following sections present brief summaries of Federal environmental laws, regulations, and coordination requirements applicable to this EIS.

8.1 CLEAN AIR ACT

As required by the CAA, EPA has promulgated the General Conformity Rule as codified in 40 CFR Part 51, Subpart W, "Determining Conformity of Federal Actions to State or Federal Implementation Plans." TCEQ has promulgated its own corresponding regulations in 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 of a nonattainment pollutant or its precursors exceeds de minimis levels established by the regulations. The General Conformity Rule establishes conformity in coordination with and as part of the NEPA process. The rule takes into account air pollution emissions associated with actions that are federally funded, licensed, permitted, or approved, to ensure emissions do not contribute to air quality degradation, thus preventing the achievement of State and Federal air quality goals. The purpose of this General Conformity Rule is to assure that Federal agencies consult with State and local air quality districts, and to assure these regulatory entities know about the expected impacts of the Federal action and include expected emissions in their SIP emissions budget.

NO_X emissions for activities subject to USACE responsibility show the project would exceed the conformity threshold, i.e., greater than 25 tpy, for the 4-year construction period. Therefore, a Draft General Conformity Document for NO_X emissions was prepared and submitted to TCEQ and EPA for review. As part of the General Conformity process, USACE made this document available to the public for review and comments for a period of 30 days. The availability of the Draft General Conformity Document was published in the *Federal Register* on November 12, 2010, and in *The Facts* and *The Sentinel*, both local Freeport-area newspapers.

Based on the General Conformity Concurrence letter provided by TCEQ, a Final General Conformity Determination (see Appendix C) was prepared by USACE. A Notice of Availability of this document was published in the newspaper of general circulation in Brazoria County concurrent with the EIS and was submitted to TCEQ, EPA, and the Brazoria County Health Department, the local air pollution control program.

TCEQ and USACE's determination of conformity is based on the emissions information and project schedule proposed at the time. Once a final project schedule is completed, USACE will provide an update of the General Conformity documentation to TCEQ and EPA for review and concurrence that the updated emissions and schedule will still be conformant with the currently approved Houston-Galveston area SIP.

8.2 CLEAN WATER ACT

USACE has received Section 401 State Water Quality Certification for the Preferred Alternative. TCEQ has determined that the requirements for water quality certification have been met and has concluded that the placement of fill material will not violate water quality standards. The Preferred Alternative is the least environmentally damaging practicable alternative. A CWA Section 404(b)(1) evaluation is presented in Appendix G. New work sediments are suitable for use in the proposed upland confined PAs (1, 8, and 9) and for placement in the New Work ODMDS.

8.3 MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT

This Act requires a determination that dredged material placement in the ocean will not reasonably degrade or endanger human health, welfare, or amenities or the marine environment, ecological systems, or economic potential (shellfish beds, fisheries, or recreational areas). EPA is charged with developing ocean-dumping criteria to be used in evaluating permit applications under Section 102(a) of MPRSA. Section 102 of MPRSA authorizes USACE to place dredged material within an ODMDS, subject to EPA concurrence and use of EPA's dumping criteria. Modeling indicates the existing Maintenance ODMDS is large enough to accommodate maintenance material from the improved channel (see Appendix B). Additionally, future maintenance material is expected to have the same properties as existing maintenance material (see Appendix B). Thus, USACE would continue to use the Maintenance ODMDS, pending EPA concurrence that the criteria continue to be met and that analysis meets EPA guidelines.

The New Work ODMDS was a one-time use site for placement of new work material for the existing 45-foot Project. The site would be authorized by EPA under Section 102 for one-time placement of new work material associated with the proposed channel deepening and widening. Concurrence for using both ODMDSs was gained from EPA during August 2008.

An MPRSA Section 102/103 evaluation report for the proposed placement of new work dredged material within the ODMDS is provided in Appendix B of this EIS. Use of the ODMDSs will be in accordance with a Site Monitoring and Management Plan (SMMP) (see Appendix B). EPA has concurred that the dredged material is suitable for disposal in the ODMDSs and that the SMMP is acceptable (see Appendix A-7).

8.4 SECTION 7 OF THE ENDANGERED SPECIES ACT

Interagency consultation procedures under Section 7 of the ESA have been undertaken. A draft BA was prepared describing the study area, federally listed threatened and endangered species of potential occurrence in the study area (as provided by NMFS and USFWS), and potential impacts on these listed species (attached as Appendix I). This Draft BA was submitted to NMFS and USFWS for review with the DEIS (Appendix A-2). USACE has determined that the proposed project may adversely affect but is not likely to jeopardize the continued existence of several sea turtle species. Protective measures and documentation standards have been accepted by NMFS and USACE regarding the take of sea turtles with hopper dredges during maintenance dredging in a 2003 BO issued by NMFS (NMFS and NOAA, 2003, 2005, 2007a, 2007b). Interagency consultation under Section 7 of the ESA has been initiated with NMFS. A new BO from NMFS is anticipated for the project, to institute reasonable and prudent measures to avoid sea turtle impacts and establish new incidental take limits for construction.

8.5 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The Magnuson-Stevens Fishery Conservation and Management Act (PL 94-265), as amended, establishes procedures for identifying 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 that could adversely affect EFH is subject to the consultation provisions of the Act and identifies consultation requirements. EFH consists of those habitats necessary for spawning, breeding, feeding, or growth to maturity of species managed by Regional Fishery Management Councils in a series of Fishery Management Plans. Submittal of the DEIS to NMFS initiated EFH consultation. USACE anticipates minor and temporary impacts to benthic organisms and turbidity during construction.

8.6 SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

Compliance with the NHPA of 1966, as amended, requires identification of all NRHP-listed or NRHP-eligible properties/resources in the project area and development of mitigation measures for those adversely affected in coordination with the SHPO and the Advisory Council on Historic Preservation. As indicated in Section 4.14, a thorough file review did not identify any NRHP-

listed or NRHP-eligible sites or SALs within the project footprint. Historical research and investigations identified a potential Civil War–period site near PA 9. Further investigation of the Civil War site will be addressed under the conditions of the PAg executed for this project (Appendix E). Compliance with the PAg places the project in compliance with NHPA.

8.7 COASTAL ZONE MANAGEMENT ACT

In an effort to encourage states to better manage coastal areas, Congress enacted the Coastal Zone Management Act in 1972, which created the Coastal Zone Management Program. Texas has developed and continues to implement federally approved coastal zone management programs (TCMP). States with approved plans have the right to review Federal activities to determine whether they are consistent with the policies of the state's coastal zone management program. USACE has evaluated the Preferred Alternative for consistency with the TCMP, and has concluded that it is fully consistent to the maximum extent practicable with the enforceable policies of the Texas program. By letter dated December 15, 2010 (Appendix A-4), USACE requested a review of the Consistency Determination, but to date has received no response.

8.8 NATIONAL ENVIRONMENTAL POLICY ACT

This EIS has been prepared in accordance with CEQ regulations in compliance with NEPA provisions. Impacts to the human environment, including those to terrestrial and aquatic resources and socioeconomic factors, have been identified, evaluated, and disclosed in this document.

8.9 FISH AND WILDLIFE COORDINATION ACT

The Fish and Wildlife Coordination Act provides for consultation with the USFWS and, in Texas, with TPWD whenever the waters or channel of a body of water are modified by a department or agency of the U.S. Under this Act, the Federal department or agency shall consult with the USFWS and the State agency with a view to the conservation of wildlife resources. The Act's purposes are to recognize the vital contribution of our wildlife resources to the Nation, and their increasing public interest and significance, and to provide that wildlife conservation receive equal consideration and be coordinated with other features of water-resource development programs through planning, development, maintenance, and coordination of wildlife conservation and rehabilitation. A Coordination Act Report (CAR) was prepared by USFWS and is included in Appendix A-5.

The Fish and Wildlife CAR provides USFWS's analysis of impacts and mitigation for important fish and wildlife resources related to the proposed land disposal plan. Coordination was implemented throughout the planning process to evaluate the affected environment, assess environmental impacts of the proposed activities, and to develop avoidance, minimization, and mitigation strategies for these impacts, as presented within respective sections of the document,

to ensure equal consideration was given to fish and wildlife resources and that measures to conserve these resources will be taken. Per guidance provided in the CAR, riparian areas within the mitigation site will be planted with native, drought-tolerant vegetation.

8.10 MARINE MAMMAL PROTECTION ACT OF 1972

The Marine Mammal Protection Act was passed in 1972 and amended through 1997. It is intended to conserve and protect marine mammals and establish the Marine Mammal Commission, the International Dolphin Conservation Program, and a Marine Mammal Health and Stranding Response Program. The Preferred Alternative is in compliance with this Act. Proposed project improvements are not expected to impact any marine mammals as they are unlikely to occur in Brazoria County, or in the project area.

8.11 FEDERAL WATER PROJECT RECREATION ACT

This 1995 Act requires consideration of opportunities for outdoor recreation and fish and wildlife enhancement in planning water-resource projects. The proposed FHCIP is not expected to have any long-term affect on outdoor recreation opportunities in the area. This is discussed in Section 4.15.3.

8.12 COASTAL BARRIER IMPROVEMENT ACT OF 1990

This Act is intended to protect fish and wildlife resources and habitat, prevent loss of human life, and preclude the expenditure of Federal funds that may induce development on coastal barrier islands and adjacent nearshore areas. There are two Coastal Barrier Resources Act–designated areas near the project area (Coastal Barrier Resources System, 2010): Follets Island Unit T04 and Brazos River Complex T05/T05P. Unit T04 begins roughly 3.9 miles northeast of the North Jetty and continues roughly 10 miles up the coast, with a few exempted areas. There are no Otherwise Protected Areas (OPAs – undeveloped coastal barriers within the boundaries of lands reserved as wildlife refuges, parks, or for other conservation purposes) in T04 along the coastline. Unit T05 begins roughly 0.75 mile to the southwest of the South Jetty and, with one 0.4-mile break, extends to roughly 5.0 miles southwest of the South Jetty. Unit T05P, an OPA, begins roughly 5.0 miles southwest of the South Jetty and extends to, and beyond, the Brazos River mouth. Exceptions to the Federal expenditure restrictions include maintenance of constructed improvement(s) to existing Federal navigation channels and related structures (e.g., jetties), including the disposal of dredged material related to maintenance and construction. Thus, the Preferred Alternative is exempt from the prohibitions identified in this act.

8.13 FARMLAND PROTECTION POLICY ACT OF 1981 AND THE CEQ MEMORANDUM PRIME AND UNIQUE FARMLANDS

In 1980, CEQ issued an Environmental Statement Memorandum "Prime and Unique Agricultural Lands" as a supplement to the NEPA procedures. Additionally, the FPPA was passed in 1981, requiring consideration of those soils which USDA defines as best suited for food, forage, fiber, and oilseed production, with the highest yield relative to the lowest expenditure of energy and economic resources. Construction of PA 9 will impact approximately 250 acres of prime farmland. NRCS (2011; Appendix A-4) calculated the Farm Conversion Impact Rating to be a total of 161. The Farmland Conversion Impact Rating of 161 makes the tract for PA 9 subject to the FPPA. However, this EIS evaluated detailed alternatives that identified no other practicable alternatives for the placement of dredged material from this project. Accordingly, in compliance with NEPA and pursuant to the FPPA, the FHCIP has properly considered a wide range of possible alternatives.

8.14 EXECUTIVE ORDER 11988, FLOODPLAIN MANAGEMENT

This EO directs Federal agencies to evaluate the potential effects of proposed actions on floodplains. Such actions should not be undertaken that directly or indirectly induce growth in the floodplain unless there is no practicable alternative. The Preferred Alternative includes the development of two new PAs within the Brazos River floodplain. Alternatives to avoid the adverse effects of developing these PAs in the floodplain were evaluated, and it has been determined that this is the only practicable alternative.

8.15 EXECUTIVE ORDER 11990, PROTECTION OF WETLANDS

This EO directs Federal agencies to avoid undertaking or assisting in new construction located in wetlands, unless no practicable alternative is available. Construction of the two new PAs (PAs 8 and 9) would impact approximately 39 acres of ephemeral wetland habitat. These impacts are unavoidable and will be mitigated for as described in Section 5.0.

8.16 EXECUTIVE ORDER 12898, ENVIRONMENTAL JUSTICE

This EO directs Federal agencies to determine whether the Preferred Alternative will have a disproportionately adverse impact on minority or low-income population groups within the project area. An evaluation of potential EJ impacts was completed and is presented in Section 4.15.4. The Preferred Alternative is not expected to significantly affect any low-income or minority populations.

8.17 EXECUTIVE ORDER 13186, RESPONSIBILITIES OF FEDERAL AGENCIES TO PROTECT MIGRATORY BIRDS AND THE MIGRATORY BIRD TREATY ACT

The MBTA of 1918 (as amended) extends Federal protection to migratory bird species. Among other activities, nonregulated "take" of migratory birds is prohibited under this Act in a manner similar to the ESA prohibition of "take" of threatened and endangered species. Additionally, EO 13186 "Responsibilities of Federal Agencies to Protect Migratory Birds" requires Federal activities to assess and consider potential effects of their actions on migratory birds (including, but not limited to, cranes, ducks, geese, shorebirds, hawks, and songbirds). The effect of the LPP Alternative on migratory bird species has been assessed in this EIS, and no impacts are expected to migratory birds or their habitat in the study area. Construction contracts will include instructions to avoid impacts to migratory birds and their nests from construction-related activities. The Migratory Bird Conservation Act (16 USC 715–715d, 715e, 715f–715r; 45 Stat. 1222) establishes a Migratory Bird Conservation Commission to approve areas of land or water for acquisition as reservations for migratory birds and is not applicable to the project.

8.18 MEMORANDUM OF AGREEMENT BETWEEN THE FEDERAL AVIATION ADMINISTRATION—AIRCRAFT-WILDLIFE STRIKES

This Memorandum of Agreement (MOA) was executed among FAA, the U.S. Air Force, the U.S. Army, EPA, USFWS, and USDA. Through this MOA, the agencies establish procedures necessary to coordinate their missions to more-effectively address existing and future environmental conditions contributing to aircraft-wildlife strikes throughout the United States. These efforts are intended to minimize wildlife risks to aviation and human safety, while protecting the Nation's valuable environmental resources. A search was made to determine the proximity of airports to the project site. There are no airports located within 5 miles of the proposed Federal FHCIP. Therefore, the proposed project is in compliance with this MOA, and no further coordination is required.

9.0 ANY ADVERSE ENVIRONMENTAL IMPACTS THAT CANNOT BE AVOIDED SHOULD THE PREFERRED ALTERNATIVE BE IMPLEMENTED

The Preferred Alternative would result in minor adverse impacts to benthos and fish from dredging and placement of dredged material, but these impacts will be temporary. Construction of the proposed channel deepening and widening would result in the loss of Gulf bottom. However, as noted in Section 4.12.1, areas impacted by excavation rapidly recover. Construction of PAs 8 and 9 would impact 21 acres of riparian forest, 39 acres of ephemeral freshwater wetlands, and 358 acres of pasture. This includes approximately 250 acres of prime farmland that would no longer be available for agricultural use. No other long-term environmental impacts are expected to occur as a result of the Preferred Alternative.

10.0 ANY IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES INVOLVED IN THE IMPLEMENTATION OF THE PREFERRED ALTERNATIVE

The labor, capital, and material resources expended in the planning and construction of this project are irreversible and irretrievable commitments of human, economic, and natural resources. Deep-water bottom would be lost within the Gulf from proposed improvements for as long as the channel is maintained. Another resource that would be irretrievably committed to construct the proposed project is the approximate 250 acres of prime farmland that would no longer be available for agricultural use following construction and use of PA 9 for placement of dredged material and preservation of mitigation areas.

11.0 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The construction of the Preferred Alternative would result in the loss of deep-water bottom from deepening and widening the Freeport Harbor Channel. However, as noted in Section 4.12.1, the benthic community quickly recovers in excavated areas. Thus, although productivity in excavated areas would be reduced for a short period, those areas would quickly recover to preconstruction productivity levels. The conversion of prime farmland to a dredged material PA (PA 9) would remove those 250 acres from future use as agricultural land. However, allowing placement of new work and maintenance dredged material from the channel improvements will provide an economic boost to the community by reducing shipping constraints and delays at Port Freeport. Preserving approximately 132 acres of forested area for mitigation purposes would remove the area, which is categorized as prime farmland, from potential future agricultural use. However, it is unlikely that the area would be used for agriculture. Additionally, preservation of the forested area will contribute to the ecological and aesthetic value of the area.

12.0 ENERGY AND NATURAL OR DEPLETABLE RESOURCE REQUIREMENTS AND CONSERVATION POTENTIAL OF VARIOUS ALTERNATIVES AND MITIGATION MEASURES

NEPA regulations in 40 CFR 1502.16 (e) and (f) require a discussion of project energy requirements and natural or depletable resource requirements, along with conservation potential of alternatives and mitigation measures in an EIS. The following presents discussion to meet that requirement.

Under the FWOP-1 Alternative, the energy requirements for maintaining the Freeport Harbor Channel would be slightly increased relative to the FWOP-2 Alternative. However, although channel improvements from the Widening Project would increase efficiency for current port users, thus decreasing energy requirements at Port Freeport, the navigation requirements for energy (fuel) to transport commercial products is likely to increase in the future as commerce increases and more traffic increases congestion and navigation time into and out of regional ports. Air quality impacts are likely to increase with an increase in navigation traffic congestion caused by delays and constraints currently in place for the Freeport Harbor Channel.

The Preferred Alternative is expected to reduce energy (fuel) requirements for the transport of products on a ton/mile basis by deepening and widening the channel and turning basins. These channel improvements will allow for:

- Ships to be more heavily loaded with cargo (reduced lightering to enter the channel);
- Larger ships to enter the channel during normal conditions (reduced delays); and
- Two-way traffic in the channel during normal conditions (reduced delays, congestion, and travel time).

Energy (fuel) will be required to deepen and selectively widen the channel, but this is a short-term impact. Energy to maintain the deeper and wider channel, as well as the reauthorized Stauffer Channel, is expected to increase with increased shoaling that is expected for the larger channel. This increase in fuel requirement is expected to be offset by fuel savings from more-efficient use of the channel by ships and reduced air quality impacts. Increased efficiency in moving petroleum and other petroleum-based commodities to the local refineries is expected to help conserve natural or depletable resources in the future. The reduced energy requirements of the more efficient channel should result in lower (or at least smaller increases in) transportation costs in the future, when compared to the FWOP-2 Alternative.

13.0 PUBLIC INVOLVEMENT, REVIEW, AND CONSULTATION

13.1 PUBLIC INVOLVEMENT PROGRAM

13.1.1 Public Scoping Meeting

In accordance with NEPA guidelines, a Public Scoping Meeting was held on January 15, 2004, at the Lake Jackson Civic Center, Lake Jackson, Texas (see Appendix A-1). The meeting was advertised and promoted in conjunction with the non-Federal sponsor, the BRHND (Port Freeport). Advertising and promotion activities were initiated at least 3 weeks in advance of the scoping meeting in two local community newspapers. The meeting was also aired by a local community radio station through public service announcements. In addition, public notices were mailed to recipients that were identified utilizing USACE public and environmental database information and mailing lists maintained by Port Freeport.

The purpose of the meeting was to inform stakeholders and interested parties about the proposed FHCIP, outline the planning and feasibility study processes, present the proposed project schedule, and solicit public comments/input. Solicitation of public comments was a primary objective of the scoping meeting to ensure that significant issues were addressed, as required by NEPA. As such, meeting participants were specifically asked to identify environmental concerns, constraints, opportunities, and recommendations associated with proposed channel improvements. Meeting attendants included an elected official's representative, maritime industry representatives, including Port Freeport representatives, a local environmentalist from the Freeport area, and the general public.

13.2 PUBLIC VIEWS AND RESPONSES

Public views and concerns expressed during this study have been and will be considered during the preparation of the EIS. The views and concerns were used to develop planning objectives, identify significant resources, evaluate impacts of various alternatives, and identify a plan that is socially and environmentally acceptable.

13.2.1 Public Scoping Meeting

The Galveston District solicited both oral and written comments at the public scoping meeting. A court reporter provided by the non-Federal sponsor documented oral comments. Generally, the attending public provided positive comments in support of the proposed project. However, the local environmentalist expressed concerns regarding potential negative impacts associated with proposed channel improvements. The assertion was that the environmental community would probably oppose deepening beyond 50 feet, in an effort to avert similar plans and desires from

competing Gulf ports, which if implemented could result in negative cumulative environmental impacts for the Gulf Coast region.

No oral comments were provided by Federal, State, or local resource agencies at the meeting, and the Galveston District received no subsequent written comments within the allotted comment period. Two additional public information meetings have been held. One was held in February 2006 and the other in February 2008.

13.2.2 DEIS Public Hearing

The notice for the public meeting and availability for the DEIS was published in local papers on December 19, 2010 (*The Facts*, 2010) and in the *Federal Register* on December 23, 2010. The public meeting was held on January 13, 2011, at the Freeport Community House. A website address for the DEIS was included in the notice, and both physical and email addresses were provided for submission of comments, with a comment submission deadline of February 5, 2011. Comments were received during the comment period via email (21), letters (17), comment forms (3), or verbally (3). Within these emails, letters, and written and verbal communications, there were approximately 68 comments. Comments were received from local, State and Federal agencies (e.g., Department of the Interior, EPA, NRCS, NMFS, Brazoria County, TPWD, GLO, and TCEQ), business and economic development entities (Dow Chemical, Chenier Energy, Brazosport Area Chamber of Commerce, BASF, and the Economic Alliance for Brazoria County), and residents from the Village of Surfside.

The various State and Federal agencies provided comments on the DEIS and business and economic development entities expressed support for the project. Comments included issues such as alternatives, air quality, water quality, mitigation, socioeconomic conditions and EJ, cumulative impacts, greenhouse gas emissions and climate change, prime farmland, impacts associated with proposed PAs 8 and 9, and potential impacts from placement of staging areas and the dredged material pipeline. The residents of Surfside expressed concern regarding the effect of the proposed project on erosion within the study area. Many of the residents submitted a petition opposing the project. Verbal comments addressed environmental concerns related to the project. One commenter expressed concern with the types of equipment and assumptions used in the air analyses, specifically in regards to reduction of NO_X emissions. Additionally, it was suggested that USACE require contractors to require low-emission technologies during requests for contractor bids. Another verbal commenter expressed concern that contaminated sediments would be encountered during dredging operations, and the need to properly handle and place the material in an appropriate manner. Last, a comment was made asking for an analysis of the potential negative economic effects of LNG tanker noise and vibration on Quintana residents and park visitors, and how these effects may increase with a deeper channel and changes in ship traffic. All of these comments, as well as others received, are addressed in Appendix A-7, and text has been inserted or revised in the EIS as appropriate.

13.3 REQUIRED COORDINATION

The Draft Feasibility Report and DEIS were circulated to all known applicable Federal, State, and local agencies. Interested organizations and individuals were sent the Notice of Availability with instructions to access the documents online or request electronic or paper copies. Copies were also made available for public review at local libraries or other available repositories in the community. The same will be done for the EIS.

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US Army Corps
of Engineers
Galveston District

Document No. 070175
Job No. 441901

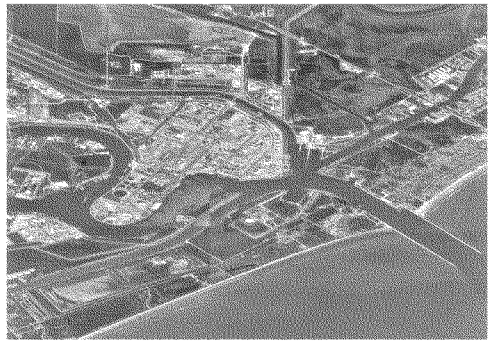
VOLUME II

FINAL

ENVIRONMENTAL IMPACT STATEMENT

FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT BRAZORIA COUNTY, TEXAS

U.S. Army Corps of Engineers, Galveston District
2000 Fort Point Road
Galveston, Texas 77550



September 2012

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Appendix A

Public and Agency Coordination

Appendix A-1

Scoping Meeting

DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Intent To Prepare an Environmental Impact Statement for Improvements to the Freeport Harbor Navigation Project, Brazoria County, TX

AGENCY: Department of the Army, U.S. Army Corps of Engineers, DoD.

ACTION: Notice of Intent.

SUMMARY: The U.S. Army Corps of Engineers, Galveston District, is issuing this notice to announce its intent to prepare a Draft Environmental Impact Statement (DEIS), for the proposed deepening and widening of the deep-draft Freeport Harbor Navigation Project, connecting port facilities in Freeport to the Gulf of Mexico. The District will conduct a study to evaluate deepening and widening alternatives, and dredged material disposal options, which will include both upland confined disposal and ocean disposal at designated sites in the Gulf of Mexico.

The Freeport Harbor Navigation Project study area is located on the mid to upper Texas coast in Brazoria County, TX, extending from approximately 3 miles offshore at the 60-foot depth contour in the Gulf of Mexico, through the jettied Freeport Harbor entrance channel upstream to the Stauffer Channel Turing Basin. Depths and widths of up to 60-feet and 600-feet respectively are being considered from seaward, along with varying dimensions for upstream reaches and basins. The non-federal sponsor is the Brazos River Harbor Navigation District.

ADDRESSES: U.S. Army Corps of Engineers, Galveston District, P.O. Box 1229, Galveston, TX 77553–1229.

FOR FURTHER INFORMATION CONTACT: Mr. Mike Bragg, Project Manager—Project Management Branch, (409) 766–3979; or Mr. George Dabney, Environmental Lead—Planning and Environmental Branch, (409) 766–6345.

SUPPLEMENTARY INFORMATION: The existing navigation project, completed in 1996, is approximately 8.6 miles in length. The project's primary reaches and basins include a 47-foot deep, 400-foot wide entrance channel; a 45-foot deep, 400-foot wide main channel; 45-foot deep turning basins (with 750, 1,000 and 1,200-foot diameters); and a 36-foot deep, 750-foot diameter Brazos Harbor Turning Basin. The existing project encompasses numerous industrial and shipping facilities, located in or adjacent to the Port of Freeport, TX. The non-federal sponsor, the Brazos River Harbor Navigation District, seeks to increase navigation safety and efficiency, and to enhance its competitiveness by improving the existing project to attract larger, deeper draft vessels including LNG tankers, crude carriers and container ships.

To explore the feasibility of proposed project improvements, the non-federal sponsor has partnered with the U.S. Army Corps of Engineers, Galveston District, to conduct a feasibility study for determining optimum depths and widths necessary to safely accommodate current and projected navigation needs. Section 216 of the Flood Control Act of 1970, Public Law 91–611, authorizes the proposed deepening and widening improvements of the existing navigation project.

Project alternatives under evaluation include maintaining primary channel reaches at their existing dimensions (No Action Alternative), or, deepening and widening reaches to either 60 x 540 feet or 55 x 600 feet respectively. The remaining project reaches and basins will be deepened, widened or expanded to compatible dimensions.

The scoping process for public input will involve Federal, State, and local agencies, along with other interested parties and entities. Coordination with natural resources and environmental agencies will be conducted under the Fish and Wildlife Coordination Act, Endangered Species Act, Clear Water Act, Clean Air Act, National Historic Preservation Act, Magnuson-Stevens Fishery Conservation and Management Act, and the Coastal Zone Management Act. Public scoping meetings will also be held to discuss environmental issues associated with proposed channel improvements.

Issues to be considered during the public review and input process include: water and sediment quality, air and noise quality, hazardous, toxic and radiological waste, dredged material disposal, economics, threatened and endangered species, wetlands, historic properties, aesthetics, recreation, cumulative impacts, impact mitigation for natural resources, and other issues affecting public health and welfare. Any person or organization wishing to provide information on issues or concerns should contact the Galveston District Corps of Engineers at (see **ADDRESSES**).

It is estimated the DEIS will be available for public review and comment in April 2008.

Richard Medina,

Chief, Planning and Environmental Branch.

[FR Doc. 07–3817 Filed 8–2–07; 8:45 am]

BILLING CODE 3710–52–M

DEPARTMENT OF DEFENSE

Department of the Navy

Public Hearings for the Draft Environmental Impact Statement/ Overseas Environmental Impact Statement for the Hawaii Range Complex, HI

AGENCY: Department of the Navy, DoD.

ACTION: Notice.

SUMMARY: Pursuant to section 102(2)(c) of the National Environmental Policy Act (NEPA) of 1969 and regulations implemented by the Council on Environmental Quality (40 CFR parts 1500–1508), and Presidential Executive Order 12114, the Department of the Navy (Navy) has prepared and filed with the U.S. Environmental Protection Agency a Draft Environmental Impact Statement (EIS)/Overseas EIS on July 19, 2007, to evaluate the potential environmental effects of conducting current and emerging Navy Pacific Fleet training and defense-related research, development, test, and evaluation (RDT&E) operations within the Hawaii Range Complex (HRC) and to upgrade or modernize range complex capabilities (including hardware and infrastructure). A Notice of Intent for this DEIS/OEIS was published in the **Federal Register**, 71 FR 51188, on August 29, 2006.

The Draft EIS/OEIS was distributed to Federal, State, and Local agencies, elected officials, as well as other interested individuals and organizations on July 20, 2007. On July 27, 2007, Navy issued a revision to the Draft EIS/OEIS that was filed with the U.S. Environmental Protection Agency on July 19, 2007. Errata sheets and a corrected Draft EIS/OEIS were distributed to all Federal, State, and local agencies, elected officials, and other interested individuals and organizations on Navy's distribution list. To allow for the full 45-day review of the Draft EIS/OEIS, the public comment period has been extended from September 10, 2007 to September 17, 2007.

The Navy will conduct four public hearings to receive oral and written comments on the Draft EIS/OEIS. Federal agencies, state agencies, and local agencies and interested individuals are invited to be present or represented at the public hearings. This notice announces the dates and locations of the public hearings for this Draft EIS/OEIS.

Dates and Addresses: An open house session will precede the scheduled public hearing at each of the locations listed below and will allow individuals

NOTICE OF PUBLIC WORKSHOP/SCOPING MEETING FOR THE EVALUATION OF NAVIGATION SOLUTIONS FOR FREEPORT HARBOR, TEXAS (FREEPORT HARBOR FEASIBILITY REPORT)

Interested parties are hereby notified of a public scoping meeting to be conducted by the Galveston District of the U. S. Army Corps of Engineers (Corps) on:

JANUARY 15, 2004
7:00-9:00 PM
LAKE JACKSON CIVIC CENTER
LAKE JACKSON, TEXAS

The purpose of this scoping meeting will be to inform interested parties about the Freeport Harbor navigation study and outline the study process. The meeting will provide an opportunity for all persons to comment and provide information to help ensure that significant issues relating to the Freeport Harbor navigation study are addressed as required by the National Environmental Policy Act.

Information on the Freeport Harbor navigation study will be presented and an overview of the Feasibility evaluation process will be provided. Corps staff will be available to answer questions.

Those unable to attend the meeting may mail written comments no later than February 6, 2004 to:

MR. MIKE BRAGG
PROJECT MANAGER
U. S. ARMY CORPS OF ENGINEERS
GALVESTON DISTRICT
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229
PHONE: 409-766-3979

NOTICE OF PUBLIC WORKSHOP FOR THE EVALUATION OF NAVIGATION SOLUTIONS FOR FREEPORT HARBOR, TEXAS (FREEPORT HARBOR FEASIBILITY REPORT)

Interested parties are hereby notified of a public workshop is to be conducted by the Galveston District of the U. S. Army Corps of Engineers (Corps) on:

FEBRUARY 22, 2006
5:00-7:00 PM
LAKE JACKSON CIVIC CENTER
333 HIGHWAY 332 EAST
LAKE JACKSON, TEXAS

The purpose of this public workshop will be to inform interested parties about the Freeport Harbor navigation study and progress of the study. The workshop will provide an opportunity for all persons to review and discuss significant issues relating to the Freeport Harbor navigation study.

Information on the Freeport Harbor navigation study will be presented at workstations and Project Delivery Team members will be available to answer questions.

Those unable to attend the meeting may mail written comments no later than March 24, 2006 to:

MR. MIKE BRAGG
PROJECT MANAGER
U. S. ARMY CORPS OF ENGINEERS
GALVESTON DISTRICT
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229
PHONE: 409-766-3979

NOTICE OF PUBLIC INFORMATION MEETING
FOR FREEPORT HARBOR, TEXAS
(FREEPORT HARBOR IMPROVEMENT PROJECT FEASIBILITY REPORT)

Interested parties are hereby notified of a public information meeting is to be conducted by the Galveston District of the U. S. Army Corps of Engineers (Corps) and Port Freeport on:

FEBRUARY 27, 2008
6:00-8:00 PM
FREEPORT COMMUNITY HOUSE

FREEPORT, TEXAS

The purpose of this public information meeting will be to inform interested parties about the Freeport Harbor Improvement Project navigation study and progress of the study. The information meeting will provide an opportunity for all persons to review and discuss issues relating to the Freeport Harbor navigation study.

Information on the Freeport Harbor Improvement Project navigation study will be presented at workstations and Project Delivery Team members will be available to answer questions.

PUBLIC WORKSHOP/SCOPING MEETING

FOR THE

EVALUATION OF NAVIGATION SOLUTIONS

FOR FREEPORT HARBOR, TEXAS

(FREEPORT HARBOR FEASIBILITY REPORT)

ON

JANUARY 15, 2004

7:00 P.M.

AT

LAKE JACKSON CIVIC CENTER

333 HIGHWAY 332 EAST

LAKE JACKSON, TEXAS

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P R O C E E D I N G S

DR. SAUNDERS: Good evening. On behalf of Colonel Waterworth, I'd like to welcome you to this public scoping meeting on the Freeport Harbor Feasibility Study.

I apologize. My voice may come and go as we go through this statement.

I'm Dr. Lloyd Saunders, chief of Planning and Environment and Regulatory Division of Galveston District, the U.S. Army Corps of Engineers. At the head table with me is Mr. David Knuckey, director of engineering Port of Freeport; Mr. Robert VanHook, the Galveston District, who is planning this particular piece of the feasibility study.

Right now I'd like to call on David to make a few comments.

MR. KNUCKEY: Just about the time I stand up things get kicked off.

I'd like to welcome everybody here this evening on behalf of the port and, basically, turn this over to my boss, the executive port director, Mr. Pete Reixach and let him make some comments on behalf of the port.

Pete.

MR. REIXACH: Thank you.

1 Good evening. I'll read this statement,
2 brief as it is. My name is Pete Reixach. I'm the
3 executive director for the Brazos River Harbor
4 Navigation District, commonly known as the Port of
5 Freeport; and, again, on behalf of the board of
6 commissioners of the district, I welcome you and the
7 public to this scoping meeting for the Freeport Harbor
8 Improvement Project.
9 Port of Freeport is committed to the
10 economic growth of the region. As stated in the Port's
11 mission statement, Port of Freeport serves its customers
12 and stakeholders in the -- machine over there -- through
13 the development and marketing of competitive world-class
14 navigational capabilities, technically advanced --
15 technically advanced marine and multi-modal terminal
16 services and port-related industrial facilities --
17 that's scary when your voice goes out.
18 DR. SAUNDERS: Tell me about it.
19 MR. REIXACH: I got the same thing you've
20 got.
21 -- terminal services and port-related
22 industrial facilities while achieving profits and
23 creating jobs as a leading economic catalyst for the
24 district and the Texas Gulf Coast. We are looking at
25 this project to achieve part of our mission; that being

1 the development of world-class navigational
2 capabilities.
3 The proposed channel improvements will
4 allow for decreased vessel downtime due to the current
5 daylight-only sailing restrictions on the larger vessels
6 and the current restriction of one-way vessel traffic
7 through the entrance in the jetty channel. Furthermore,
8 increased channel depth is needed to allow for the
9 larger crude carriers, which make up the bulk of the
10 3,000 plus deep-draft vessels plying the Port of
11 Freeport harbor channel system annually, to come
12 straight to the terminals thus eliminating the need for
13 offshore lightering.
14 Based on the information provided in the
15 Reconnaissance Report Section 905(b) analysis, the
16 project appears to be primarily a dredging issue. To
17 widen and deepen the channels will require little
18 additional real estate acquisition, no pipeline
19 relocations and only minor impact on the existing public
20 and private terminals. Port of Freeport also stands
21 committed to provide upland confined dredge material
22 placement sites either existing or proposed to meet the
23 dredging demands of the project and future maintenance.
24 We feel the project will have only minimal
25 negative impacts on the environment and those impacts

1 will be short term in nature. Without the bay and
2 estuary systems that exist at many other Gulf Coast
3 ports, which seem to be the major impediment for
4 widening and deepening of navigation channels, Freeport
5 is blessed from a navigation standpoint. We encourage
6 the Corps to investigate every possible avenue for the
7 beneficial use of the vast quantity of dredge material
8 that will be generated by the project. Port of Freeport
9 has and is currently utilizing the 4.5 million plus
10 cubic yards of dredge material generated by the 45-foot
11 project for industrial structural fill in the expansion
12 of the public facilities as well as road improvements
13 witnessed by the recently completed high-span bridge to
14 Quintana Island. As a member of the Brazoria County
15 Shoreline Restoration Task Force, we encourage the use
16 of placement of beach quality dredge material on the
17 beaches wherever possible.
18 In conclusion, we at Port of Freeport
19 stand ready to work side by side with the Corps of
20 Engineers to see this project to its successful
21 conclusion. We thank you for allowing our comments and
22 those of other members of the navigation district
23 community to be heard and entered into the project
24 design process.
25 I'd like to introduce the rest of the Port

of Freeport staff that's here. We have Commissioner Tobey Davenport back over here. Phyllis Saathoft, I'm not sure if she made it here yet or not. Mike Wilson is our director of trade development; Mike Lumsden, director of finance. Amber Roberson is our marketing representative. Pat Younger is our lobbyist in Washington, and signing in is none other than Al, Al Durel, the director of operations.

Thank you very much.

DR. SAUNDERS: Thank you very much.

Additionally, I'd like to introduce those that are with me from the Corps of Engineers this evening. Colonel Waterworth, district commander, Galveston District; Mike Bragg, project manager; Marilyn Uhrich, public affairs officer; Ashley Jones, public affairs; Diane Laird, planning; and George Dabney, environmental.

We are currently conducting a feasibility study that will consider the economic, engineering and environmental feasibility of navigation improvements to the Freeport Harbor channel. Environmental considerations are an integral part of the study. This meeting is about Freeport Harbor, not maintenance issues, not complaints about the city's plans on the Stauffer Channel.

1 I hope you had an opportunity this evening
2 to take advantage of the displays out in the hall. I
3 encourage you to read all the information that's
4 available in that area. If you'd like to take -- I
5 suppose there's some information on the table back here.
6 If you'd like to take additional copies with you to
7 share with your family and friends, we encourage you to
8 do that.
9 Everyone attending should have filled out
10 an attendance card or put their name on the roster. If
11 you want to speak, it's absolutely essential that you
12 fill out a speaker's card. If you have not done so,
13 please raise your hand and someone will bring you a
14 card.
15 We also have provided some comment cards.
16 These can either be filled out and left in the foyer or
17 they can be mailed to us. They're franked and addressed
18 to come back to us. We encourage you to take as many of
19 these as you would like and share them with your friends
20 and neighbors.
21 The purpose of the meeting is to provide
22 an opportunity to present issues, views, opinions,
23 recommendations and environmental concerns. Your
24 comments will help us in formulating the federal
25 project. We're interested in the diversity of opinion

1 that's out there, both pro and con. We're interested in
2 hearing your ideas.
3 Let me discuss the format for tonight's
4 meeting. Mr. Robert VanHook from the Corps will provide
5 an overview of the study process. Following his
6 presentation, I will open the floor for public comments.
7 We have a court reporter with us this
8 evening. The meeting will be recorded verbatim. I will
9 first recognize those Federal and state officials that
10 have requested to make a statement. Then Federal and
11 state resource agencies can make a statement. Finally,
12 I will recognize each individual who has indicated that
13 they wish to make a statement. Everyone who has
14 indicated on the registration cards a desire to comment
15 will have an opportunity to do so. If anyone needs to
16 turn in a card, please raise your hand and someone will
17 collect your card.
18 Please give all speakers the courtesy of
19 not making any comments during their presentation. All
20 individuals have an equal right to be heard.
21 Now we'll hear from Mr. Robert VanHook,
22 who is the planning lead of the feasibility study.
23 Robert.
24 MR. VANHOOK: Good evening. I'm Robert
25 VanHook the planning lead on the Freeport Harbor

1 Feasibility Study. I'd like to take this opportunity to
2 also welcome you to this public scoping meeting.
3 The aerial photograph shows the Freeport
4 Harbor overview. During this study we will be
5 evaluating the main channel from outside the jetties up
6 through the Brazos Harbor Turning Basin, also part of
7 the Stauffer Channel. The Port has asked us to evaluate
8 deepening and widening the Freeport Harbor channel. The
9 Port's objectives for this study are to remove
10 daylight-only use of the channel, accommodate
11 deep-draft, large crude carriers and, finally, to
12 reauthorize and deepen and widen part of the Stauffer
13 Channel for container ship use.
14 This evening I'd like to give you a short
15 overview of the feasibility study. The slide shows that
16 the study team is made up of the Corps and the Port.
17 As some of you probably saw among our displays in the
18 foyer outside, there is a planning process that we in
19 the Corps are required to follow. This slide depicts
20 this planning process. We have, essentially, performed
21 the first step, specify problems and opportunities.
22 We're into the second step of inventory and forecast
23 conditions, and we'll be performing step three,
24 formulate alternative plans, following this public
25 scoping meeting.

1 Since we began the study in July last
2 year, we have had many study team coordination meetings
3 with the Port of Freeport. We then began the process of
4 defining the study parameters and activities required,
5 the schedule and costs for the study. We established an
6 interdisciplinary study team for the evaluation. The
7 study team has developed preliminary alternative
8 measures. The study will evaluate alternative
9 deepening/widening options up to and include deepening
10 to 60 foot, widening to 600 foot. The existing channel
11 is, essentially, 45-foot deep and 400-foot wide.
12 The study is projected to be completed in
13 December of '07. Then, if an acceptable project can be
14 found, it will be implemented as soon as possible
15 thereafter. Following this scoping meeting and your
16 input, we will be developing the first set of new
17 alternatives for further evaluation. We will develop
18 the scenarios for ship simulation modeling, establish
19 environmental concerns and any issues, develop
20 preliminary cost to benefits for the alternatives and
21 screen these alternatives. The two or three most
22 promising alternatives will then be further evaluated
23 with more detailed engineering design and benefit
24 analysis. This will also include addressing
25 environmental issues and concerns relative to the

1 project alternatives.
2 In the feasibility report we will
3 recommend implementation of the alternative plan with
4 the highest net benefits. This plan is called the
5 National Economic Development or NED plan. The NED plan
6 is not necessarily the plan with the highest
7 benefit-to-cost ratio, or BCR, but the plan that has the
8 most benefits for the Federal dollars invested. If the
9 Port has another more preferred plan, we will carry this
10 plan through as the locally preferred plan of the
11 feasibility report.
12 This slide depicts the schedule of
13 significant events and projected study schedule. As the
14 study progresses, we will keep you-all informed about
15 the study's progress by periodic articles in the Port's
16 newsletter, mailouts to the project mailing list. We
17 also plan to create a website for the project. When
18 this website is posted, we will inform you, the public.
19 There will be another public meeting
20 scheduled at the latter part of the study process to
21 inform you of the study results. In 2007 we will
22 finalize the feasibility report and the environmental
23 impact statement and begin Washington-level project
24 review to obtain Assistant Secretary of the Army for
25 Civil Work's approval.

1 We're very serious about wanting your
2 input into this study process. If you filled out an
3 attendance card tonight, we will include you on
4 subsequent direct mails -- mailings. Please pick up
5 comment cards for yourself, as well as suggested, and
6 take them to your friends and neighbors. These cards
7 solicit input about navigation concerns, asks for
8 written comment on alternative ideas, areas of
9 environmental concern, et cetera. Fill them out at your
10 leisure; but in order for them to be part of the public
11 record for this meeting, they must be returned to us by
12 February 6th of 2004.
13 As I mentioned earlier, if no acceptable
14 beneficial plan can be developed, the study team may
15 recommend that the Corps take no action; and the
16 no-action alternative is required to be examined by us
17 at the Corps.
18 That concludes my overview of the
19 feasibility study. I'll turn the meeting back over to
20 Dr. Saunders for public comments.
21 Thank you.
22 DR. SAUNDERS: Thank you, Robert.
23 At this time we'd like to recognize some
24 public officials or their representatives who might care
25 to speak. Diana Kile, district manager for Congressman

1 Ron Paul.
2 MS. DIANA KILE: Good afternoon -- or good
3 evening. How are y'all doing? I don't have anything to
4 say, other than the Congressman sent me here to
5 represent him and to find out a little bit more about
6 this project.
7 DR. SAUNDERS: Thank you very much.
8 MS. DIANA KILE: Thank you.
9 DR. SAUNDERS: Mr. Ron Bottoms, city
10 manager for Freeport.
11 MR. RON BOTTOMS: Just here to listen.
12 DR. SAUNDERS: Okay, fine. Thank you.
13 I'll now call on those other folks who
14 registered to speak. I would remind you that the
15 purpose of the meeting is to provide you with the
16 opportunity to present your views, opinions and
17 recommendations. If you desire to submit a written
18 statement for the record, you may take your statement to
19 the table at the back of the room over here. I guess
20 it's on the side of the room.
21 So, when you're -- when you're called,
22 please come forward and state your name, who you
23 represent and make your statement.
24 Mr. Ed Zingleman.
25 MR. ED ZINGLEMAN: I didn't really want to

1 speak, but I just wanted to listen. In case I did want
2 to ask something, I could. I guess I -- of course, I
3 mainly came here to learn what was going on -- okay. As
4 far as representing, I mainly represent myself at this
5 time as an individual taxpayer and just trying to figure
6 out what's going to happen in the future to the Port,
7 you know. And concerned about taxes is one thing. Of
8 course, sounds like, I guess, the Government will be
9 financing most of this or all of this.
10 That may be my one question is: Would the
11 Port be responsible for any of this alone, the study
12 period or is this all Corps of Engineers? I guess
13 that's one question.
14 DR. SAUNDERS: That -- the Port's
15 responsible for 50 percent of the study cost and
16 construction costs.
17 MR. ZINGLEMAN: Fine.
18 DR. SAUNDERS: And the O & M cost.
19 MR. ZINGLEMAN: Excuse me?
20 DR. SAUNDERS: And the operations and
21 maintenance cost.
22 MR. ZINGLEMAN: Oh, yes. I understood
23 that. Okay.
24 The other thing is I just -- again, that
25 was the main thing. Just to see what the future plans

1 were for the Port. I know they have to keep on growing.
2 You can't become stagnant, and that's -- that's it.
3 DR. SAUNDERS: Okay. Thank you very much.
4 Mr. Jim Morrison.
5 MR. JIM MORRISON: Thank you,
6 Mr. Chairman.
7 My name is Jim Morrison. I'm
8 vice-president of the West Gulf Maritime Association.
9 We represent stevedores, agents and carriers from Lake
10 Charles to Brownsville. We're also a member of the
11 United States Maritime Association, which represents
12 carriers from Maine to Brownsville and the United
13 States.
14 What the Port is embarking on is something
15 that is very important to Texas and it's important to
16 the movement of commerce and containers and to maritime
17 traffic in Texas. What the Port is establishing is --
18 is -- the only other comment is we have to move forward.
19 Containers is where we need to be, special niche
20 cargoes, that Mr. Reixach and the Commissioner are
21 working on to make Freeport a viable, strong port, is
22 extremely necessary.
23 The widening and deepening and the
24 specific portion where Brazoria County is, as its
25 relations to the Port of Houston and the other ports in

1 Texas, the NAFTA Charter, all these other issues are
2 very fundamental to this widening and deepening. It
3 means jobs to Brazoria County. It means this port will
4 be in the forefront in the future and we look forward to
5 looking more into the progress of this -- this widening
6 and deepening project.
7 We also, as a -- as an industry, are
8 concerned with the environmental issues and we
9 understand from the Port they very well look at that and
10 I know the Colonel looks at these issues and we will be
11 supporting this project in the future.
12 Thank you, Mr. Chairman.
13 DR. SAUNDERS: Thank you very much.
14 Sharron Stewart.
15 MS. SHARRON STEWART: Hi. I'm Sharron
16 Stewart, a local environmental activist; and I'm a
17 founder and executive committee member of the Galveston
18 Bay Foundation.
19 The last time the Port went for a wider
20 and deeper channel, I testified for them before Congress
21 and showed both Congress and several people in the
22 Government who were against this proposal why it had a
23 significant national interest with the strategic
24 petroleum reserve almost next door to the port.
25 At the time I chaired a task force for

1 Texas Environmental Coalition on all deepwater port
2 issues. Therefore, I read every environmental impact
3 statement of every proposal, Corpus Christi, Houston,
4 Galveston and Freeport. And the task force came to the
5 conclusion that Freeport is the one place on the Texas
6 coast where you can have deepwater access with the least
7 amount of environmental harm and that's still true today
8 because it does not go through a bay margin.
9 But if they're going for 60 feet, the
10 environmental community would have some reservations.
11 As I recall when Galveston wanted 60 feet -- and it was
12 for a considerable way out -- we estimated that the
13 amount of dredged material to be used to be dug up just
14 for the creation of the channel, not talking at all
15 about maintenance dredging, would equal the amount of
16 material moved to create the Panama Canal.
17 So, we need to think about how deep ports
18 go in the United States, how deep they really need to
19 be. When you build big vessels, there comes a point
20 where the economy of scale goes beyond the profitable.
21 I recall tankers and oboes in '79 and '80 and '81 that
22 were commissioned and went straight to the scrapyard
23 before ever getting a bareboat charter or operating for
24 any company. You know, there's only so big.
25 Freeport and most of the Gulf ports

1 generally have trading partners primarily with -- I know
2 they come from all over the world -- but with Mexico and
3 Central and South America. This is where the new growth
4 area is. They're not going to need 60 feet or 55 or 50
5 or even 45.
6 Freeport's problems are safety issues. I
7 don't know how they get around if they're going for a
8 deeper port, not having to take off the thumb at Dow
9 that creates the safety problem.
10 At the same time they're looking at a
11 deeper port, they're also looking at an LNG facility
12 right on the channel at Quintana and I think you need to
13 look at that safety issue. If you're going to widen the
14 jetties, are you going to widen it on the Quintana side
15 like you did last time? You'd have to move that port.
16 You know, how long -- if you get 55 or 60 feet, what
17 difference is it going to be made if at least every
18 other day there's an LNG ship coming in and tying up the
19 harbor and the intercoastal?
20 Anyway, I think that at the moment they
21 have competitive projects that are bad for each other.
22 I would hope that what they would really go after is the
23 deeper, wider channel; but, again, the economy of scale
24 is only so deep, so wide. You go beyond what's
25 necessary.

1 Freeport had approval for 50 feet in, what
2 was it, '84 when they -- they got to the 45 foot. At
3 the time that was when Congress and the Corps changed
4 the ratio of what the port had to pay. So, they only
5 went for 45. They got approval for 50. I don't think
6 it would be a problem for them to get approval for 50
7 feet again, but I think you do have to look at the three
8 issues I've mentioned, the spoil issue, the amount of
9 spoil, the LNG facility and even initially, with their
10 total capacity already taken by two local companies --
11 the LNG ships will be here at least every other day.
12 And -- right now I've forgotten what the
13 third one is, but I assume it'll be -- that your court
14 reporter will have that.
15 So, are there any questions?
16 Okay.
17 DR. SAUNDERS: Thank you for your comment.
18 Okay. That's -- those are all the folks
19 that indicated a desire to speak. Let me eat those
20 words.
21 Leo Mencacci.
22 MR. LEO MENCACCI: Leo Mencacci, yes. I
23 couldn't stand by and listen. I had to make some
24 positive statements and comments. First of all I'd like
25 to tell you that hats off to Pete Reixach and staff for

1 taking this to the next level.
2 Shipping is all about depth, width. Ships
3 are being built right now to transit 55- and 60-foot
4 channels. They're being built right now. If the Gulf
5 of Mexico, if a port is going to compete in the shipping
6 business today for additional cargoes, they have to have
7 the depth and the Port of Freeport is ripe. And if we
8 can get a 55-, 60-foot of channel in here, the business
9 is going to come.
10 I'm with Bay Houston Towing Company. We
11 operate and nullify in major ports in Texas. I office
12 in Galveston, Texas; but the Port of Freeport is where I
13 spend most of the time. It's my responsibility; but the
14 point is is we come in contact day in and day out with
15 principals around the world regarding ports,
16 information. And I'd have to say that the big topic
17 today is -- is deeper and wider and you hear that talk
18 amongst all the industry.
19 If we don't do it here, it's going to be
20 done elsewhere, probably New Orleans, maybe Tampa. So,
21 I say to Texas folks we need to get this project going.
22 Thank you very much.
23 DR. SAUNDERS: Thank you, sir.
24 Okay. Anyone else like to make a
25 statement?

1 If there are no further comments, let me
2 say for the record that this public scoping meeting was
3 convened at Lake Jackson Civic Center, 333 Highway 332
4 East, Lake Jackson, Texas, on the 15th of January, 2004.
5 The official record will remain open until 6 February.
6 That means until 6 February we will still accept written
7 comments from the public. So, again, I encourage you,
8 your friends, neighbors to supply comments by 6
9 February.
10 I'd like to thank the Port for
11 participating in the study and joining us tonight. I'd
12 like to thank all the staff of the Corps, the Port of
13 Freeport and everyone else who helped with the publicity
14 and logistics of the meeting. I'd like to thank
15 everyone who came out tonight in the rain for being
16 here.
17 I would like -- again, I'd just like to
18 thank everyone for being here. With that, this meeting
19 is adjourned.
20 (Meeting adjourned)
21
22
23
24
25

1 STATE OF TEXAS

2

3 I, Stephanie J. McClure, a Certified Shorthand
4 Reporter in and for the State of Texas, do hereby
5 certify that the above and foregoing contains a true and
6 correct transcription of all portions of the
7 above-referenced public comments to be included in the
8 transcript of said public comment section, and were
9 reported by me.
10 Given under my hand and seal of office on
11 the 19th day of January, 2004.
12
13 Stephanie J. McClure, CSR, RPR
14 CSR No. 3483, Expiration: 12-31-05
1010 Lamar, Suite 1400
15 Houston, Texas 77002
(713) 739-1400
16
17
18
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22
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Appendix A-2

Endangered Species Act Coordination

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Ave. South
St. Petersburg, FL 33701
(727) 824-5312, FAX (727) 824-5309
http://sero.nmfs.noaa.gov

F/SER3:TM

OCT - 2 2007

Ms. Carolyn Murphy
Chief, Environmental Branch
Department of the Army
Galveston District, Corps of Engineers
P.O. Box 1229
Galveston, TX 77553-1229

Dear Ms. Murphy:

This correspondence responds to the Department of the Army's letter dated September 20, 2007, regarding an Environmental Assessment Statement to address proposed improvements to the Freeport Harbor 40-Foot Navigation Project located on the mid to upper Texas coast in Brazoria County, Texas.

As requested, enclosed is a list of federally-protected species under the jurisdiction of the National Marine Fisheries Service for the state of Texas.

We look forward to continued cooperation with the Army in conserving our endangered and threatened resources. If you have any questions regarding the BSA consultation process, please contact Mr. Robert Hoffman, fishery biologist, at (727) 824-5312, or by e-mail at Robert.Hoffman@noaa.gov.

Sincerely,

David M. Bernhart
Assistant Regional Administrator
Protected Resources Division

Enclosure

File: 1514-22.F.1.TX

Endangered and Threatened Species and Critical Habitats
under the Jurisdiction of the NOAA Fisheries Service

Texas

Listed Species	Scientific Name	Status	Date Listed
Marine Mammals			
blue whale	*Balaenoptera musculus*	Endangered	12/02/70
finback whale	*Balaenoptera physalus*	Endangered	12/02/70
humpback whale	*Megaptera novaengliae*	Endangered	12/02/70
sei whale	*Balaenoptera borealis*	Endangered	12/02/70
sperm whale	*Physeter macrocephalus*	Endangered	12/02/70
Turtles			
green sea turtle	*Chelonia mydas*	Threatened[1]	07/28/78
hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	06/02/70
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	12/02/70
leatherback sea turtle	*Dermochelys coriacea*	Endangered	06/02/70
loggerhead sea turtle	*Caretta caretta*	Threatened	07/28/78
Fish			
smalltooth sawfish	*Pristis pectinata*	Endangered	04/01/03

Designated Critical Habitat
None

Species Proposed for Listing
None

Proposed Critical Habitat
None

[1] Green turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered

Texas

Candidate Species[2]	Scientific Name
none	

Species of Concern[3]	Scientific Name
Fish	
dusky shark	*Carcharhinus obscurus*
largetooth sawfish	*Pristis pristis*
night shark	*Carcharhinus signatus*
saltmarsh topminnow	*Fundulus jenkinsi*
sand tiger shark	*Carcharias taurus*
speckled hind	*Epinephelus drummondhayi*
Warsaw grouper	*Epinephelus nigritus*
white marlin	*Tetrapturus albidus*
Invertebrates	
ivory bush coral	*Oculina varicosa*

[2] The Candidate Species List has been renamed the Species of Concern List. The term "candidate species" is limited to species that are the subject of a petition to list and for which NOAA Fisheries Service has determined that listing may be warranted (69 FR 19975).
[3] Species of Concern are not protected under the Endangered Species Act, but concerns about their status indicate that they may warrant listing in the future. Federal agencies and the public are encouraged to consider these species during project planning so that future listings may be avoided.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
17629 El Camino Real #211
Houston, Texas 77058-3051

February 2007

This responds to your request for threatened and endangered species information in the Clear Lake Ecological Services Field Office's area of responsibility. According to Section 7(a)(2) of the Endangered Species Act and the implementing regulations, it is the responsibility of each federal agency to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any federally listed species. Therefore, we are providing information to assist you in meeting your obligations under the Endangered Species Act.

A county by county listing of federally listed threatened and endangered species that occur within this office's work area can be found at http://www.fws.gov/southwest/es/EndangeredSpecies/lists/ListSpecies.cfm. You should use the county by county listing and other current species information to determine whether suitable habitat for a listed species is present at your project site. If suitable habitat is present, a qualified individual should conduct surveys to determine whether a listed species is present.

After completing a habitat evaluation and/or any necessary surveys, you should evaluate the project for potential effects to listed species and make one of the following determinations:

No effect – the proposed action will not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area). No coordination or contact with the Service is necessary. However, if the project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.

Is not likely to adversely affect – the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects. You should seek written concurrence from the Service that adverse effects have been eliminated. Be sure to include all of the information and documentation you used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.

Is likely to adversely affect – adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species but also is likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires formal Section 7 consultation with this office.

Regardless of your determination, the Service recommends that you maintain a complete record of the evaluation, including steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related articles.

TAKE PRIDE IN AMERICA

The Service's Consultation Handbook is available online to assist you with further information on definitions, process, and fulfilling Endangered Species Act requirements for your projects at http://endangered.fws.gov/consultations/s7hndbk/s7hndbk.htm.

If we can further assist you in understanding your obligations under the Endangered Species Act, please contact Kathy Nemec, Edith Erfling, or Catherine Yeargan at 281/286-8282.

Sincerely,

Stephen D. Parris

Stephen D. Parris
Field Supervisor, Clear Lake Field Office

U.S. Fish & Wildlife Service

Endangered Species List

Back to Start

List of species by county for Texas:

Counties Selected: Brazoria

Select one or more counties from the following list to view a county list:

Anderson
Andrews
Angelina
Aransas
Archer

View County List

Brazoria County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critical Habitat	More Info
bald eagle	*Haliaeetus leucocephalus*	Birds	DM				P
brown pelican	*Pelecanus occidentalis*	Birds	DM, E				P
green sea turtle	*Chelonia mydas*	Reptiles	E, T				P
hawksbill sea turtle	*Eretmochelys imbricata*	Reptiles	E				P
Kemp's ridley sea turtle	*Lepidochelys kempii*	Reptiles	E				P
leatherback sea turtle	*Dermochelys coriacea*	Reptiles	E				P
loggerhead sea turtle	*Caretta caretta*	Reptiles	T				P
piping Plover	*Charadrius melodus*	Birds	E, T				P
whooping crane	*Grus americana*	Birds	E, EXPN				P

BRAZORIA COUNTY

BIRDS

		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	DL	E

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	T

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Bald Eagle	*Haliaeetus leucocephalus*	DL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Black Rail	*Laterallus jamaicensis*		

salt, brackish, and freshwater marshes, pond borders, wet meadows, and grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous year's dead grasses; nest usually hidden in marsh grass or at base of Salicornia

Brown Pelican	*Pelecanus occidentalis*	LE	E

largely coastal and near shore areas, where it roosts and nests on islands and spoil banks

Eskimo Curlew	*Numenius borealis*	LE	E

historic; nonbreeding: grasslands, pastures, plowed fields, and less frequently, marshes and mudflats

Henslow's Sparrow	*Ammodramus henslowii*		

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Peregrine Falcon	*Falco peregrinus*	DL	E T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

Piping Plover	*Charadrius melodus*	LT	T

wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats

Reddish Egret	*Egretta rufescens*		T

resident of the Texas Gulf Coast; brackish marshes and shallow salt ponds and tidal flats; nests on ground or in trees or bushes, on dry coastal islands in brushy thickets of yucca and prickly pear

BRAZORIA COUNTY

BIRDS

		Federal Status	State Status
Snowy Plover	*Charadrius alexandrinus*		

formerly an uncommon breeder in the Panhandle; potential migrant; winter along coast

Sooty Tern	*Sterna fuscata*		T

predominately 'on the wing'; does not dive, but snatches small fish and squid with bill as it flies or hovers over water; breeding April-July

Southeastern Snowy Plover	*Charadrius alexandrinus tenuirostris*		

wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats

Western Snowy Plover	*Charadrius alexandrinus nivosus*		

uncommon breeder in the Panhandle; potential migrant; winter along coast

White-faced Ibis	*Plegadis chihi*		T

prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

White-tailed Hawk	*Buteo albicaudatus*		T

near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March-May

Whooping Crane	*Grus americana*	LE	E

potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties

Wood Stork	*Mycteria americana*		T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

FISHES

		Federal Status	State Status
American eel	*Anguilla rostrata*		

coastal waterways below reservoirs to gulf; spawns January to February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; most aquatic habitats with access to ocean, muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries; diet varies widely, geographically, and seasonally

Sharpnose shiner	*Notropis oxyrhynchus*	C	

endemic to Brazos River drainage; also, apparently introduced into adjacent Colorado River drainage; large turbid river, with bottom a combination of sand, gravel, and clay-mud

MAMMALS

		Federal Status	State Status
Jaguarundi	*Herpailurus yaguarondi*	LE	E

BRAZORIA COUNTY

MAMMALS

		Federal Status	State Status
thick brushlands, near water favored; 60 to 75 day gestation, young born sometimes twice per year in March and August, elsewhere the beginning of the rainy season and end of the dry season			
Louisiana black bear	*Ursus americanus luteolus*	LT	T
possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas			
Ocelot	*Leopardus pardalis*	LE	E
dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November			
Plains spotted skunk	*Spilogale putorius interrupta*		
catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie			
Red wolf	*Canis rufus*	LE	E
extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies			
West Indian manatee	*Trichechus manatus*	LE	E
Gulf and bay system; opportunistic, aquatic herbivore			

MOLLUSKS

		Federal Status	State Status
False spike mussel	*Quincuncina mitchelli*		
substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins			
Pistolgrip	*Tritogonia verrucosa*		
stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins			
Rock pocketbook	*Arcidens confragosus*		
mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins			
Smooth pimpleback	*Quadrula houstonensis*		
small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins			
Texas fawnsfoot	*Truncilla macrodon*		
little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins			

BRAZORIA COUNTY

REPTILES

		Federal Status	State Status
Alligator snapping turtle	*Macrochelys temminckii*		T

perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Atlantic hawksbill sea turtle	*Eretmochelys imbricata*	LE	E

Gulf and bay system

Green sea turtle	*Chelonia mydas*	LT	T

Gulf and bay system; shallow water seagrass beds, open water between feeding and nesting areas, barrier island beaches; adults are herbivorous feeding on sea grass and seaweed; juveniles are omnivorous feeding initially on marine invertebrates, then increasingly on sea grasses and seaweeds

Gulf Saltmarsh snake *Nerodia clarkii*

saline flats, coastal bays, and brackish river mouths

Kemp's Ridley sea turtle	*Lepidochelys kempii*	LE	E

Gulf and bay system

Leatherback sea turtle	*Dermochelys coriacea*	LE	E

Gulf and bay system

Loggerhead sea turtle	*Caretta caretta*	LT	T

Gulf and bay system

Texas diamondback terrapin *Malaclemys terrapin littoralis*

coastal marshes, tidal flats, coves, estuaries, and lagoons behind barrier beaches; brackish and salt water; burrows into mud when inactive; may venture into lowlands at high tide

Texas horned lizard	*Phrynosoma cornutum*		T

open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September

Timber/Canebrake rattlesnake	*Crotalus horridus*		T

swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

PLANTS

		Federal Status	State Status
Coastal gay-feather	*Liatris bracteata*		

endemic; black clay soils of prairie remnants; flowering in fall

Giant sharpstem umbrella-sedge	*Cyperus cephalanthus*		

BRAZORIA COUNTY

PLANTS

Federal Status State Status

remnant coastal prairies in poorly to moderately drained sites

Texas meadow-rue *Thalictrum texanum*

endemic; mesic woodlands or forests, including wet ditches on partially shaded roadsides; flowering March-May

Texas windmill-grass *Chloris texensis*

endemic; sandy to sandy loam soils in open to sometimes barren areas in prairies and grasslands, including ditches and roadsides; flowering in fall

Threeflower broomweed *Thurovia triflora*

endemic; black clay soils of remnant grasslands, also tidal flats; flowering July-November

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF

December 15, 2010

Environmental Section

David M. Bernhart
Assistant RA for Protected Resources
Southeast Regional Office
National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, FL 33701

Dear Mr. Bernhart:

Enclosed please find a paper copy and CD of the Draft Environmental Impact Statement (DEIS) for the Proposed Freeport Harbor Channel Improvement Project, Brazoria County, Texas. This draft report is provided for your agency review pursuant to coordination required under the Endangered Species Act. DEIS Sections 3.15, 4.13 and Appendix I (Draft Biological Assessment) provide information specifically related to existing endangered species in the project area and potential project impacts.

We have prepared a Biological Assessment (BA) for the proposed work as listed species are present within the project area. A description of the proposed project is provided in the BA. We have concluded that the proposed project is likely to adversely affect the federally-listed endangered Hawksbill, Kemp's ridley and Loggerhead sea turtles, the threatened Green sea turtle, and may affect but is not likely to adversely affect the threatened Leatherback sea turtle. The likelihood of adverse effects (incidental take) of sea turtles due to hopper dredging activities would be greatly reduced by implementation and adherence to conservation measures. Adverse effects are not expected to jeopardize the continued survival or recovery of the species. The proposed project will have no effect on federally-listed endangered whales or the endangered Smalltooth sawfish.

Since the proposed project may affect Federally-listed species, we request initiation of formal consultation pursuant to 50 CFR 402.14, to evaluate the effects of the proposed project on threatened and endangered sea turtles. In accordance with Section 402.14(g)(5), we also request that a draft biological opinion be prepared.

We appreciate your continued cooperation in allowing us to fulfill our responsibilities under the Endangered Species Act. Should you require any additional information during review of the enclosed BA, please call Ms. Janelle Stokes at 409/766-3039.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

CF:
Mr. Rusty Swafford
National Marine Fisheries Service
Habitat Conservation Division
4700 Avenue U
Galveston, Texas 77551

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF

December 15, 2010

Environmental Section

Edith Erfling
U.S. Fish and Wildlife Service
Clear Lake Ecological Services Field Office
17629 El Camino Real, Suite 211
Houston, Texas 77058

Dear Ms. Erfling:

Enclosed please find a CD of the Draft Environmental Impact Statement (DEIS) for the Proposed Freeport Harbor Channel Improvement Project, Brazoria County, Texas. This draft report is provided for your agency review pursuant to coordination required under the Endangered Species Act. DEIS Sections 3.15, 4.13 and Appendix I (Draft Biological Assessment) provide information specifically related to existing endangered species in the project area and potential project impacts. A paper copy and CD of the DEIS are also being sent to Ms. Donna Anderson for review and comment in accordance with the National Environmental Policy Act.

We have prepared a Biological Assessment (BA) for the proposed work as both listed species and critical habitat are located within the affected area. We have concluded that the proposed project will have no effect on the federally-listed, threatened Piping plover and its designated critical habitat, or the endangered Whooping crane. No other federally-listed species are likely to occur, and no other designated critical habitat is located in the project area.

We are hereby requesting your written concurrence, pursuant to the informal consultation procedures prescribed in 50 CFR 402.13, that the proposed action is not likely to adversely effect federally-listed species or designated critical habitat. We appreciate your continued cooperation in allowing us to fulfill our responsibilities under the Endangered Species Act.

The results of your review are requested by February 5, 2011. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Janelle Stokes at the letterhead address, by telephone at 409-766-3039, or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF

December 15, 2010

Environmental Section

Donna Anderson
U.S. Fish and Wildlife Service
Clear Lake Ecological Services Field Office
17629 El Camino Real, Suite 211
Houston, Texas 77058

Dear Ms. Anderson:

Enclosed please find a paper copy and CD of the Draft Environmental Impact Statement (DEIS) for the Proposed Freeport Harbor Channel Improvement Project, Brazoria County, Texas. This draft report is provided for your agency review pursuant to coordination required under the National Environmental Policy Act. A CD is also being sent to Ms. Edith Erfling of your office for review and comment on the DEIS in accordance with the Endangered Species Act.

The results of your review are requested by February 5, 2011. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Janelle Stokes at the letterhead address, by telephone at 409-766-3039, or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosures

Appendix A-3

Cultural Resources Coordination

TEXAS HISTORICAL COMMISSION
The State Agency for Historic Preservation

RICK PERRY, GOVERNOR
JOHN L. NAU, III, CHAIRMAN
F. LAWERENCE OAKS, EXECUTIVE DIRECTOR

September 14, 2006

Ms. Jenna J. Enright
PBS&J
206 Wild Basin Rd., Suite 300
Austin, TX 78746

Re: Project review under Section 106 of the National Historic Preservation Act of 1966 and the Antiquities Code of Texas
Draft Report, *Remote-Sensing Survey of Proposed Channel Modifications for Historic Properties, Freeport Harbor Navigation Channel Improvement Project, Freeport Harbor, Brazoria County, Texas.* THC Permit #4023
COE-VD

Dear Ms Enright:

Thank you for your correspondence describing the above referenced project. This letter serves as comment on the proposed project from the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission. As the state agency responsible for administering the Antiquities Code of Texas, these comments also provide recommendations on compliance with state antiquities laws and regulations.

The review staff, led by State Marine Archeologist Steven D. Hoyt, has completed its review. Thank you for your fine report. We concur with the findings of the report's authors regarding avoidance or further investigations of identified sonar targets. The proposed project may proceed without further archeological investigations if identified targets can be avoided.

Please include larger sonar images of vessels 1, 2 and 3 illustrated in figures 2 and 3. At the scale presented, details of the wrecks are not visible

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this federal and state review process, and for your efforts to preserve the irreplaceable heritage of Texas. **If you have any questions concerning our review or if we can be of further assistance, please contact Steve Hoyt at 512/463-7188.**

Sincerely,

for F. Lawerence Oaks, State Historic Preservation Officer

cc: Nicole Minnichbach, US Army Corps of Engineers, Galveston

P.O. BOX 12276 • AUSTIN, TX 78711-2276 • 512/463-6100 • FAX 512/475-4872 • TDD 1-800/735-2989
www.thc.state.tx.us

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF:

October 11, 2007

Policy Analysis Section

SUBJECT: Brazos River Channel

James E. Bruseth, Ph.D.
Deputy State Historic Preservation Officer
Division of Archaeology
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711-2276

Dear Dr. Bruseth:

The Brazos River Harbor Navigation District has proposed plans to temporarily bury a dredge pipe across the bottom of the Brazos River Channel. The pipe would cross at an undetermined location between stations 20+00 and 50+00 (Enclosure 1). The highest point of the pipe will not be higher than 49 feet below Mean Low Tide. A maximum of 10,000 cubic yards will be excavated to construct a trench to bury the dredge pipe and this material will be placed offshore at Placement Area No. 1.

The permit area has been surveyed by PBS&J and is described in the report entitled "Phase I Cultural Resources Nautical Archeological Survey for the Proposed Widening of the Freeport Ship Channel, Brazoria County, Texas," dated October 2005, and prepared by Amy Borgens. Four anomalies were located within the current project area and recommended for testing. These anomalies were: M6/S1, M7, M8, and M9. The anomalies were subsequently tested by PBS&J and the testing was described in the report entitled "Marine Close-Order Remote-Sensing Survey and Diving for the Freeport Ship Channel Widening, Brazoria County, Texas," dated May 2007, and prepared by Amy Borgens. The testing concluded that none of the anomalies were significant (Enclosure 2). The State Historic Preservation Officer concurred that none of the anomalies were historic properties on April 2, 2007.

It is the position of the USACE that no historic properties will be affected by the proposed project. Therefore we request your concurrence with a determination of "No Effect" for the proposed project.

Thank you for your cooperation. If you have any questions or require additional information, please call staff archeologist Nicole Minnichbach at (409) 766-3878.

Sincerely,

Casey Cutler
Chief, Policy Analysis Section

Enclosures

✓Copy Furnished: w/enclosures

Nikki Minnichbach PE-PR

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229
DECEMBER 3, 2007

RECEIVED
DEC 5 - 2007
Texas Historical Commission

Environmental Section

James E. Bruseth, Ph.D.
Deputy State Historic
Preservation Officer
Texas Historical Commission
P.O. Box 12276
Austin, Texas 78711

Dear Dr. Bruseth:

The US Army Corps of Engineers, Galveston District (USACE), proposes to initiate a Programmatic Agreement (PA) pursuant to 36CFR800.6 and 36CFR800.14 (b)(3) to address impacts associated with improving navigation on the existing Freeport Harbor Navigation Channel (FHNC), Brazoria County, Texas. A Draft Environmental Impact Statement (EIS) of the proposed improvements is planned to be released for public comment in late July 2008. We find it necessary to negotiate a PA because effects on historic properties cannot be fully determined prior to approval of this complex undertaking. A draft PA is Attachment 1.

The FHNC consists of 10 reaches. Beginning at the seaward end of the project area and proceeding upstream, they include: the Entrance Channel Extension, the Entrance Channel, the Jetty Channel, the Lower Turning Basin, the Channel to Brazosport Turning Basin, the Brazosport Turning Basin, the Channel to Upper Turning Basin, the Upper Turning Basin, the Channel to Stauffer Turning Basin, and the Stauffer Turning Basin. Attachment 2 includes: maps of the areas to be affected by widening and deepening (Figures 1 to 11); a table of the existing and proposed dimensions of the FHNC (Figure 12); and, maps of the proposed dredged material placement areas 8 & 9 (Figures 13 and 14).

All areas to be impacted by construction of the proposed Federal project have been surveyed and assessed for historic properties with the exception of three submerged vessels located during the initial marine remote-sensing surveys (Enright et al. 2005; Enright et al. 2007) and two proposed dredged material placement areas. An historic properties investigation will need to be conducted on the proposed dredged material placement areas 8 & 9 (Figures 13 and 14). A dive assessment will need to be conducted on the three anomalies/targets to identify potentially eligible shipwrecks which may be affected by proposed improvements to the FHNC.

The USACE proposes negotiation of a PA which outlines procedures to be followed to complete identification, evaluation and assessment investigations of the area of potential effects. We are proposing a three-party PA to be negotiated among the USACE, Port Freeport (Port), and the Texas State Historic Preservation Office (SHPO). The draft PA is being coordinated

concurrently with all consulting parties and the Advisory Council on Historic Preservation (ACHP). The intent of the PA is to avoid or mitigate impacts to historic properties in areas directly affected by new dredging and channel construction, construction staging and access areas, new or extensions of existing placement areas, areas affected by the beneficial uses of dredged material, and ongoing maintenance dredging activities related to the FHNC improvement project in accordance with 36 CFR 800.6.

In summary, the USACE requests your review of the enclosed PA. Please provide a copy of your comments to all of the consulting parties (addresses provided below). Public coordination required by 36 CFR 800.3 (a) will be accomplished by inclusion of the revised draft PA in the Draft EIS, which will be made available for public review and comment. If you have any questions, please don't hesitate to call Ms. Nicole Minnichbach at 409-766-3878.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosures:
1 Draft PA
2 Figures 1 – 14 Project Maps and Channel Dimensions

CF w/ Enclosures
Mr. David Knuckey
Port Freeport
P.O. Box 615
Freeport, Texas 77542-0615

Mr. Don Klima
Advisory Council on Historic Preservation
Office of Federal Agency Programs
Old Post Office Building
1100 Pennsylvania Avenue, NW, Suite 803
Washington, DC 20004

CF w/o Enclosures
Mr. Robert VanHook
CESWG-PE-PL

CONCUR
by
for F. Lawerence Oaks
State Historic Preservation Officer
Date 1/15/08
Track#

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

Executive Office

Mr. James F. Brown Jr.
Chairman of the Board of Commissioners
Port Freeport
200 West 2nd Street
Freeport, Texas 77541-5773

Dr. F. Lawerence Oaks
State Historic Preservation Officer
Texas Historical Commission
1511 Colorado Street
Austin, TX 78701

Dear Signatories:

The US Army Corps of Engineers, Galveston District (USACE) is pleased to enclose for your signature, three final copies of the Programmatic Agreement (PA) for the management of historic properties that may be affected by the construction and maintenance of the proposed Federal Freeport Harbor Navigation Channel Improvement Project (FHNC IP), Brazoria County, Texas.

I greatly appreciate your time and effort in working with us to negotiate this agreement. To expedite the finalization of the PA, we have provided pre-paid FedEx envelopes. We request that Port Freeport sign each of the three copies of the PA and send them, along with this cover letter and the FedEx envelope addressed to the USACE, to the Texas State Historic Preservation Officer (SHPO). The SHPO, as the final signatory, is requested to retain one fully executed original and send the remaining two originals of the PA via enclosed FedEx envelope to the USACE for final distribution. Port Freeport will receive a fully executed original of the document for their records.

Please contact Ms. Nikki Minnichbach at 409-766-3878 if you have any questions concerning this request. Again, thank you for your cooperation in this coordination.

Sincerely,

David C. Weston
Colonel, Corps of Engineers
District Commander

Enclosures

CF w/out Encls:

Mr. David Knuckey
Chief Engineer
Port Freeport
P.O. Box 615
Freeport, Texas 77542-0615

Dr. James E. Bruseth
Deputy State Historic Preservation Officer
Texas Historical Commission
P.O. Box 12276
Austin, TX 78771-2276

TEXAS HISTORICAL COMMISSION
The State Agency for Historic Preservation

RICK PERRY, GOVERNOR
JOHN L. NAU, III, CHAIRMAN
F. LAWERENCE OAKS, EXECUTIVE DIRECTOR

April 8, 2008

Nicole Minnichbach
Corps of Engineers Galveston District
Regulatory Branch, CESWG-PE-PR
PO Box 1229
Galveston, Texas 77553-1229

Re: Project Review under the Antiquities Code of Texas
Report of Field Work: Summary of Field Work for the Geo-Archeological Survey of Proposed Dredge Material Placement Areas at Freeport, Brazoria County, Texas
(COE-VD)

Dear Ms. Minnichbach:

Thank you for providing our agency the above field work summary. This letter serves as comment on the report and associated undertaking from the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission. The review staff has completed its review.

We concur that 41BO226 may be eligible for the National Register of Historic Places and that a 100 meter construction buffer should be maintained around the site until more information about the site becomes available. Small diameter core boring should be able to proceed as planned. Please contact our office again if access roads or drilling pads need constructing during the undertaking.

We look forward to receiving a draft survey report. Thank you for your cooperation in this state review process, and for your efforts to preserve the irreplaceable heritage of Texas. **If you have any questions concerning our review or if we may be of further assistance, please contact Mr. Ed Baker at 512/463-5866.**

Sincerely,

for
F. Lawerence Oaks, Sate Historic Preservation Officer
FLO/elb

cc: Doug Boyd, Prewitt and Associates, Austin

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON TX 77553-1229

October 5, 2005

REPLY TO
ATTENTION OF:
Evaluation Section

SUBJECT: Project Review of 23752
Freeport Harbor Channel Widening

Dr. James Bruseth
Deputy State Historic Preservation Officer
Division of Archeology
Texas Historical Commission
P.O. Box 12276
Austin, Texas 78711-2276

Dear Dr. Bruseth:

The Corps of Engineers Staff Archeologist has reviewed the draft report entitled, *Draft: Phase I Cultural Resources Nautical Archaeological Survey for the Proposed Widening and Deepening of the Freeport Ship Channel, Brazoria County, Texas,* prepared for Shiner Moseley and Associates, Inc. by PBS&J, dated July 2005. The draft report was reviewed in response to our initial request for a cultural resource investigation of the permit area. A copy of the draft report is enclosed for your review.

The proposed permit action is to widen the jetty and entrance channels along the north side of the existing Freeport Harbor Navigation Channel (FHNC) From 400 feet to 600 feet. The applicant proposes to use the dredge material to build a berm approximately 8,000 feet long by 2,000 feet wide and 15 feet high as a beneficial use (BU) area for fisheries (Enclosures 1-7). As documented in the report, eleven magnetic anomalies and two sonar targets have been found and interpreted as potentially significant cultural resource sites. Both Sonar targets (S1 and S2) and seven of the anomalies are located along the north side of the jetty channel (M2, M3, M4, M6, M7, M8 and M9). Three anomalies were found on the south side of the jetty channel (M5, M10, and M11) as shown in Enclosure 8. The remaining anomaly (M1) is located in the proposed offshore BU area (Enclosure 9). No construction will be conducted on the south side of the channel; therefore, anomalies M5, M10, and M11 will not be affected by the proposed by the proposed permit action. If avoidance of anomalies M1, M2, M3, M4, M6, M7, M8 and M9 and sonar targets S1 and S2 is not possible, a close-order remote-sensing survey is recommended.

We request your concurrence in our conclusions that:

1. There will be no effect to anomalies M5, M10 and M11 and therefore require no additional investigations in compliance with Appedix C of 33 CFR Part 325 (7)(a); and

2. If avoidance is not feasible, additional marine investigations in the form of close-order remote-sensing survey should be conducted on sonar targets S1 and S2 and magnetic anomalies M2, M3, M4, M6, M7, M8 and M9 in compliance with appendix C of 33 CFR Part 325 (5)(d).

Thank you for your cooperation in this review process. If you have any questions concerning our review or if we can be of further assistance, please contact Nicole Cooper Minnichbach at 409-766-3878.

Sincerely,

Fred Anthamatten
Chief, Policy Analysis Section

Enclosures

Copy furnished with enclosures:

√ PE-PR - N.C. Minnichnach

Copy Furnished:

Brazos River Harbor Navigation District
P.O. Box 615
La Marque, Texas 77568-0624

TEXAS HISTORICAL COMMISSION
The State Agency for Historic Preservation

RICK PERRY, GOVERNOR
JOHN L. NAU, III, CHAIRMAN
F. LAWERENCE OAKS, EXECUTIVE DIRECTOR

September 14, 2006

Ms. Amy Borgens
PBS&J
206 Wild Basin Rd., Suite 300
Austin, TX 78746

Re: Project review under Section 106 of the National Historic Preservation Act of 1966 and the Antiquities Code of Texas
Draft Report, *Marine Close-Order Remote-Sensing Survey for the Freeport Ship Channel Widening, Brazoria County, Texas*. THC Permit #4024
COE-VD

Dear Ms Borgens:

Thank you for your correspondence describing the above referenced project. This letter serves as comment on the proposed project from the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission. As the state agency responsible for administering the Antiquities Code of Texas, these comments also provide recommendations on compliance with state antiquities laws and regulations.

The review staff, led by State Marine Archeologist Steven D. Hoyt, has completed its review. Thank you for a your fine report. We concur with the findings of the report's authors regarding avoidance or further investigations of identified magnetic anomalies and sonar targets. The proposed project may proceed without further archeological investigations if identified targets can be avoided. In the final report, please include on the figures the standard avoidance margin (50 meters) for each magnetic anomaly as defined in state regulations. If the normal avoidance margin is too large for these confined waters, further consultation with this office will be necessary

Thank you for your cooperation in this federal and state review process, and for your efforts to preserve the irreplaceable heritage of Texas. **If you have any questions concerning our review or if we can be of further assistance, please contact Steve Hoyt at 512/463-7188.**

Sincerely,

for F. Lawerence Oaks, State Historic Preservation Officer

cc: Nicole Minnichbach, US Army Corps of Engineers, Galveston

P.O. BOX 12276 • AUSTIN, TX 78711-2276 • 512/463-6100 • FAX 512/475-4872 • TDD 1-800/735-2989
www.thc.state.tx.us

JAN 11 2006

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF:

December 15, 2006

Policy Analysis Section

SUBJECT: Project review of 23752; Freeport Harbor Channel Widening, Close-Order Remote-Sensing Investigation Report Review

Dr. James Bruseth
Deputy State Historic Preservation Officer
Division of Archaeology
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711-2276

CONCUR
Officer
by
for F. Lawerence Oaks
State Historic Preservation Officer
Date 1/4/07
Track# 200703891

RECEIVED
DEC 27 2006
Texas Historical Commission

Dear Dr. Bruseth:

The U.S. Army Corps of Engineers, Galveston District (USACE) Staff Archeologist has reviewed the draft report entitled, *Marine Close-Order Remote-Sensing Survey for the Freeport Ship Channel Widening, Brazoria County, Texas,* prepared for the Brazos River Harbor Navigation District by PBS&J, dated August 2006. The draft report was reviewed in response to our request for a close-order remote-sensing survey on sonar targets S1 and S2 and magnetic anomalies M2, M3, M4, M6, M7, M8 and M9 in compliance with Appendix C of 33 CFR Part 325 (5)(d).

The proposed permit action is to widen the jetty and entrance channels along the north side of the existing Freeport Harbor Navigation Channel (FHNC) from 400 feet to 600 feet. As documented in the report, six magnetic anomalies, one of which is associated with a sonar target, have been assessed and interpreted as potentially significant cultural resource sites. Three of the six anomalies (M6/S1, M8 and M9) presented attributes significant to historic shipwreck sites, and four of the six anomalies (M3, M4, M7 and M8) could be associated with historic waterfront developments in Velasco and Surfside.

The data recovery of the Townsite of Old Velasco (41BO125) was conducted by Prewitt and Associates, Inc. for the USACE during 1992 and 1993 to mitigate the adverse effects to the site resulting from activities associated with the Freeport Harbor 45-foot Navigation Improvement Project, as per 36 CFR Part 800.6(b)(1)(i). The results of the data recovery effort are found in the report titled, *Testing and Data Recovery at the Townsite of Old Velasco (41BO125), Brazoria County, Texas, Reports of Investigations, Number 94* dated 1996. The report was accepted by your office in a letter dated January 30, 1995.

JAN 1 1 2006

We request your concurrence in our conclusions that:

1. Anomalies M6/S1 and M9 have magnetic signatures similar to those of historic shipwreck sites and are recommended for avoidance.

2. Anomalies M3, M4 and M7 associated with the Townsite of old Velasco (41BO125) do not require further assessment since the aforementioned data recovery is sufficient to mitigate the adverse effects to the site; however, the fourth anomaly (M8) associated with site 41BO125 displays a signature similar to historic shipwreck sites and is recommended for avoidance.

3. If avoidance of anomalies M6/S1, M8 and M9 is not possible, additional marine investigations in the form of dive investigations and/or ground truthing should be conducted in compliance with Appendix C of 33 CFR Part 325 (5)(d).

Thank you for your cooperation in this review process. If you have any questions concerning our review or if we can be of further assistance, please contact Nicole Cooper Minnichbach at 409-766-3878.

Sincerely,

Fred L. Anthamatten
Chief, Regulatory Branch

(Copies Furnished – See Page 3)

TEXAS HISTORICAL COMMISSION
The State Agency for Historic Preservation

RICK PERRY, GOVERNOR
JOHN L. NAU, III, CHAIRMAN
F. LAWERENCE OAKS, EXECUTIVE DIRECTOR

March 14, 2007

Ms. Amy Borgens
PBS&J
6504 Bridge Point Parkway, Suite 200
Austin, TX 78730

Re: Project review under Section 106 of the National Historic Preservation Act of 1966 and the Antiquities Code of Texas
Modified Draft Report, *Marine Close-Order Remote-Sensing Survey and Diving for the Freeport Ship Channel Widening, Brazoria County, Texas.* THC Permit #4024
COE-VD

Dear Ms Borgens:

Thank you for your correspondence describing the above referenced project. This letter serves as comment on the proposed project from the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission. As the state agency responsible for administering the Antiquities Code of Texas, these comments also provide recommendations on compliance with state antiquities laws and regulations.

The review staff, led by State Marine Archeologist Steven D. Hoyt, has completed its review. We concur with the findings of the report's authors. The proposed project may proceed without further archeological investigations in the areas cleared by this report.

Thank you for your cooperation in this federal and state review process, and for your efforts to preserve the irreplaceable heritage of Texas. **If you have any questions concerning our review or if we can be of further assistance, please contact Steve Hoyt at 512/463-7188.**

Sincerely,

for F. Lawerence Oaks, State Historic Preservation Officer

cc: Nicole Minnichbach, US Army Corps of Engineers, Galveston

APR 0 6 2007

RECEIVED
MAR 2 9 2007
Texas Historical Commission

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF:

March 21, 2007

Policy Analysis Section

SUBJECT: Project review of 23752; Proposed Freeport Ship Channel Widening, Brazos River Harbor Navigation District, Brazoria County, Texas

Dr. James Bruseth
Deputy State Historic Preservation Officer
Division of Archaeology
Texas Historical Commission
P.O. Box 12276
Austin, Texas 78711-2276

CONCUR
by [signature]
for F. Lawerence Oaks
State Historic Preservation Officer
Date 4/2/07
Track# 2007-07022

Dear Dr. Bruseth:

The U.S. Army Corps of Engineers, Galveston District (USACE) Staff Archeologist has reviewed the draft report titled, *Marine Close-Order Remote-Sensing Survey and Diving for the Freeport Ship Channel Widening, Brazoria County, Texas,* prepared for the Brazos River Harbor Navigation District by PBS&J, dated March 2007. The draft report was submitted in response to our initial request for a cultural resource investigation of three potentially significant close-order survey anomalies, M6/S1, M8 and M9, located during a previous survey. The applicant was requested to provide a copy of this report to you.

As documented in the report: 1) Anomaly M6/S1 was found to be a large modern object; 2) Anomaly M8 was found to be associated with a pipeline; and, 3) Anomaly M9, after extensive probing was not located.

Therefore no historic properties were found in the permit area and further investigation is not justified. We request your review of the referenced report and your concurrence in our conclusion that no historic properties will be affected by the proposed permit action in compliance with Appendix C of 33 CFR Part 325 (7)(b).

Thank you for your cooperation in this review process. If you have any questions concerning our review or if we can be of further assistance, please contact Nicole Cooper Minnichbach at 409-766-3878.

Sincerely,

Fred L. Anthamatten
Chief, Regulatory Branch

Copies Furnished:

PE-PR - N.C. Minnichbach

David M. Knuckey, P.E.
Port of Freeport
P.O. Box 615
Freeport, Texas 77542-0615

Joe C. Moseley, Ph.D., P.E.
Shiner Moseley and Associates, Inc.
555 N. Carancahua, Suite 1650
Corpus Christi, Texas 78478

Martin Arhelger
PBS&J
6504 Bridge Point Parkway, Suite 200
Austin, Texas 78730

S. HOYT

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF

Environmental Section

January 22, 2010

RECEIVED
JAN 28 2010
Texas Historical Commission

Dr. James Bruseth
Deputy State Historic Preservation Officer
Division of Archaeology
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711-2276

Dear Dr. Bruseth:

The U.S. Army Corps of Engineers, Galveston District (USACE) Staff Archeologist has reviewed the enclosed letter regarding cultural resource recommendations for the report titled "*Remote-Sensing Survey of Proposed Channel Modification for Historic Properties, Freeport Harbor Navigation Channel Improvement Project, Freeport Harbor, Brazoria County, Texas*" prepared by PBS&J, and dated January 2010 (Enclosed). The USACE is seeking your concurrence on the recommendation that all three anomalies described in the letter be considered Not Eligible for inclusion in the National Register of Historic Properties.

Thank you for your cooperation in this review process. If you have any questions concerning our review or if we can be of further assistance, please contact Jerry Androy at 409-766-3821.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

CF w/o enclosures
PE – Jerry Androy

CONCUR
by Steven D. Hoyt
for Mark Wolfe
Executive Director, THC
Date 2/1/2010
Track# 201006292

PBS&J

An employee-owned company

January 12, 2010

Jerry Androy
U.S. Army Corps of Engineers
2000 Fort Point Road
Galveston, Texas 77553

Subject: Cultural resources recommendations for report titled: *Remote-Sensing Survey of Proposed Channel Modifications for Historic Properties, Freeport Harbor Navigation Channel Improvement Project, Freeport Harbor, Brazoria County, Texas*. Contract DACW64-03-D-0001, Task Order No. 0003. Texas Antiquities Permit No. 4023.

Dear Mr. Androy:

At the request of the U.S. Army Corps of Engineers, Galveston District, PBS&J recently began preliminary preparations for diver investigation of potential cultural resource sites in the Freeport Ship Channel, for the above referenced Freeport Harbor Navigation Channel Improvement Project. As part of that effort, PBS&J revisited the Phase I survey results and recommendations presented in the subject archeological report (Borgens et al. 2007). That report identified three sonar targets (Vessel 1, Vessel 2, and Vessel 3) that were indicative of potential historic shipwrecks, and subsequently recommended for avoidance or diver investigation. Upon further review of the data, however, PBS&J no longer considers these targets to be culturally sensitive. Rather than being evidence of shipwrecks, the sonar imagery for Vessels 1 and 2 (Figures 1 and 2) is in fact the result of acoustic reflections off the hulls of floating vessels. Aerial photographs of the target locations further show a dock structure for two vessels adjacent to the survey area (Figure 3).

Figure 1: Sonar image of Vessel 1.

6504 Bridge Point Parkway • Suite 200 • Austin, Texas 78730 • Telephone: 512.327.6840 • Fax: 512.327.2453 • www.pbsj.com

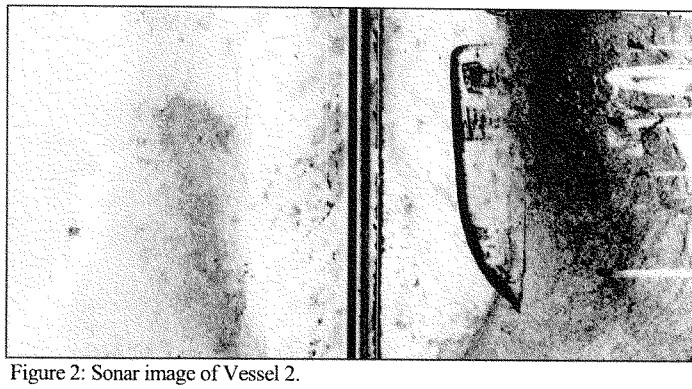


Figure 2: Sonar image of Vessel 2.

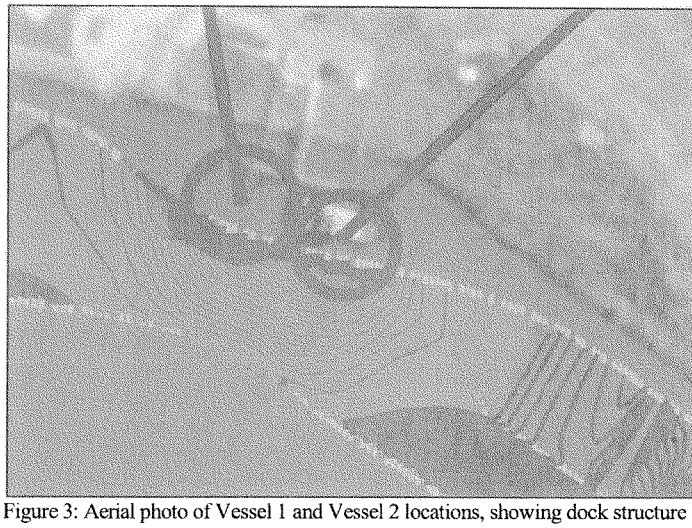


Figure 3: Aerial photo of Vessel 1 and Vessel 2 locations, showing dock structure with a docked vessel (Borgens et al. Appendix B).

For Vessel 3 (Figure 4), the sonar imagery shows an acoustic shadow on the inboard side of the target, indicating that the source is a depression rather than a protrusion from the seabed, and, therefore, not evidence of a shipwreck. This target is also located at the entrance to an industrialized deepwater slip (Figure 5), indicating that the area has likely been dredged out to the ship channel. Though the source for sonar image Vessel 3 is unknown, one possible explanation is the temporary placement area of a jack-up platform spud, which is a common occurrence in industrial harbors along the Texas coast.

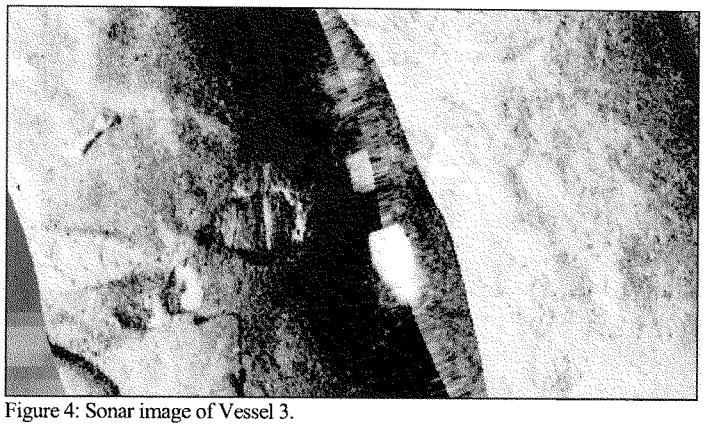


Figure 4: Sonar image of Vessel 3.

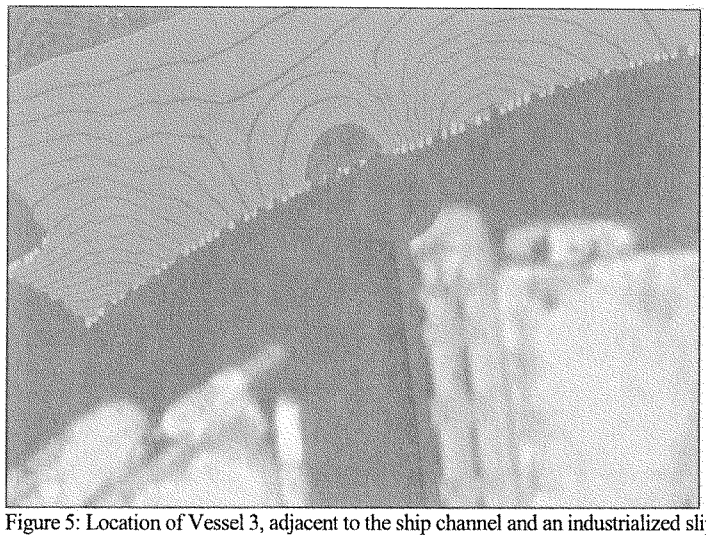
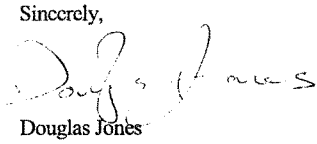


Figure 5: Location of Vessel 3, adjacent to the ship channel and an industrialized slip

Based on this analysis, PBS&J would like to alter our previous recommendation of avoidance for Vessels 1, 2, and 3, to one of full cultural resources clearance for the proposed project. A copy of email correspondence with State Marine Archeologist Steve Hoyt concerning this issue has been included with this letter. If you concur with these recommendations please notify Mr. Hoyt in writing (by letter or email) at your earliest convenience.

PBS&J sincerely apologizes for any inconveniences this modification has caused. Should you have any questions or wish to discuss the matter further, please contact me at 512-342-3347 or by email at dsjones@pbsj.com.

Sincerely,



Douglas Jones
Nautical Archaeologist

cc: Steve Hoyt, Texas Historical Commission

References Cited:

Borgens, Amy, Sara Hoskins, Jenna Enright, and Robert L. Gearhart II

2007 *Remote-Sensing Survey of Proposed Channel Modifications for Historic Properties, Freeport Harbor Navigation Channel Improvement Project, Freeport Harbor, Brazoria County, Texas.* Document No. 060218. PBS&J, Austin, Texas.

Appendix A-4

Agency Coordination

United States Department of Agriculture

NRCS
Natural Resources Conservation Service
101 South Main Street
Temple, Texas 76501-7602

November 14, 2007

PBS&J
6504 Bridge Point Parkway, Suite 220.
Austin, Texas 78730-5091

Attention: James P. Killian, PG, Senior Geologist

Subject: LNU-Farmland Protection-
Proposed Freeport Harbor Deepening and Widening
Brazoria County, Texas

We have reviewed the information provided concerning the proposed Freeport Harbor Deepening and Widening Project in Brazoria County, Texas as outlined in your letter of November 13, 2007. This is part of NEPA evaluation for the U.S Army Corps of Engineers. We have evaluated the proposed area as required by the Farmland Protection Policy Act (FPPA).

The proposed project does contain soils classified as Important Farmland at the site of the proposed spoil placement area and is subject to the FPPA. We have developed a composite rating for the soils in the project area and completed the AD-1006 you submitted. The project had a total point score in Part VII of 147. The FPPA law states that sites with a rating less than 160 will need no further consideration. The project area is adjacent to an urban area. We urge you to use accepted erosion control methods during construction.

I have attached the completed AD-1006 (Farmland Conversion Impact Rating) form for this project indicating the approval status. Thanks for the resource materials you submitted to evaluate this project. If you have any questions please call James Greenwade at (254)-742-9960, Fax (254)-742-9859.

Thanks,

James M. Greenwade
Soil Scientist
Soil Survey Section
USDA-NRCS, Temple, Texas

The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain and improve our natural resources and environment.

An Equal Opportunity Provider and Employer.

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 11-13-2007
Name of Project Freeport Harbor Deepening and Widening	Federal Agency Involved USACOE
Proposed Land Use Spoil Placement	County and State Brazoria County, Texas
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 11-13-2007 / Person Completing Form: James Greenwade

Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES x☐ NO ☐	Acres Irrigated 128	Average Farm Size 318
Major Crop(s) Grain Sorghum	Farmable Land in Govt. Jurisdiction Acres: 752,100 % 83	Amount of Farmland As Defined in FPPA Acres: 909,538 % 78	
Name of Land Evaluation System Used LESA	Name of State or Local Site Assessment System NONE	Date Land Evaluation Returned by NRCS 11-14-2007	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	253.7			
B. Total Acres To Be Converted Indirectly	0			
C. Total Acres In Site	253.7			
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	253.7			
B. Total Acres Statewide Important or Local Important Farmland	0			
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted	0.001			
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value	20			
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)	87			

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	Maximum Points	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)	10			
2. Perimeter In Non-urban Use	(10)	10			
3. Percent Of Site Being Farmed	(20)	15			
4. Protection Provided By State and Local Government	(20)	0			
5. Distance From Urban Built-up Area	(15)	5			
6. Distance To Urban Support Services	(15)	10			
7. Size Of Present Farm Unit Compared To Average	(10)	5			
8. Creation Of Non-farmable Farmland	(10)	0			
9. Availability Of Farm Support Services	(5)	5			
10. On-Farm Investments	(20)	0			
11. Effects Of Conversion On Farm Support Services	(10)	0			
12. Compatibility With Existing Agricultural Use	(10)	5			
TOTAL SITE ASSESSMENT POINTS	160	60			
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	87			
Total Site Assessment *(From Part VI above or local site assessment)*	160	60			
TOTAL POINTS *(Total of above 2 lines)*	260	147			

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☐

Reason For Selection:

Name of Federal agency representative completing this form:	Date:

Bryant, Bob W

From: Killian, James P
Sent: Wednesday, April 23, 2008 11:31 AM
To: 'Kiniry, Laurie - Temple, TX'
Cc: Bulger, Angela G
Subject: RE: USACE Freeport Harbor Deepening and Widening; Brazoria County, Tx

April 23, 2008

Ms. Laurie Kiniry
Natural Resources Conservation Service
101 South Main Street
Temple, TX 76501

Dear Ms. Kiniry,

On behalf of the USACE, please find attached an additional farmland conversion impact rating form AD 1006 for a proposed mitigation area (Site 1 - 131.8 acres) located near placement area PA-9, west of Freeport, Texas. Also attached are two figures showing the location of this proposed mitigation area immediately north of PA-9 and affected soil series. Please disregard proposed mitigation Sites 2 and 3. If you have any questions, please contact me.

Sincerely,

James P. Killian, PG
Senior Geologist
PBS&J
6504 Bridgepoint Parkway, Suite 200
Austin, Texas 78730
(512) 342-3359 Direct
(512) 925-0460 Cell
(512) 327-6840 Receptionist
(512) 327-2453 FAX
jpkillian@pbsj.com

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 4/23/07
Name Of Project Freeport Harbor Deepening and Widening	Federal Agency Involved USACE
Proposed Land Use Mitigation	County And State Brazoria County, Texas
PART II *(To be completed by NRCS)*	Date Request Received By NRCS

Does the site contain prime, unique, statewide or local important farmland? Yes ☐ No ☐ | Acres Irrigated | Average Farm Size
(If no, the FPPA does not apply -- do not complete additional parts of this form).

Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: %	Amount Of Farmland As Defined in FPPA Acres: %
Name Of Land Evaluation System Used	Name Of Local Site Assessment System	Date Land Evaluation Returned By NRCS

PART III *(To be completed by Federal Agency)*	Alternative Site Rating Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	131.8			
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site	131.8	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	0	0	0	0

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use		10			
2. Perimeter In Nonurban Use		10			
3. Percent Of Site Being Farmed		15			
4. Protection Provided By State And Local Government		0			
5. Distance From Urban Builtup Area		5			
6. Distance To Urban Support Services		10			
7. Size Of Present Farm Unit Compared To Average		5			
8. Creation Of Nonfarmable Farmland		0			
9. Availability Of Farm Support Services		5			
10. On-Farm Investments		0			
11. Effects Of Conversion On Farm Support Services		0			
12. Compatibility With Existing Agricultural Use		5			
TOTAL SITE ASSESSMENT POINTS	160	65	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	65	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	65	0	0	0

Site Selected: A	Date Of Selection 4/23/07	Was A Local Site Assessment Used? Yes ☐ No ☒

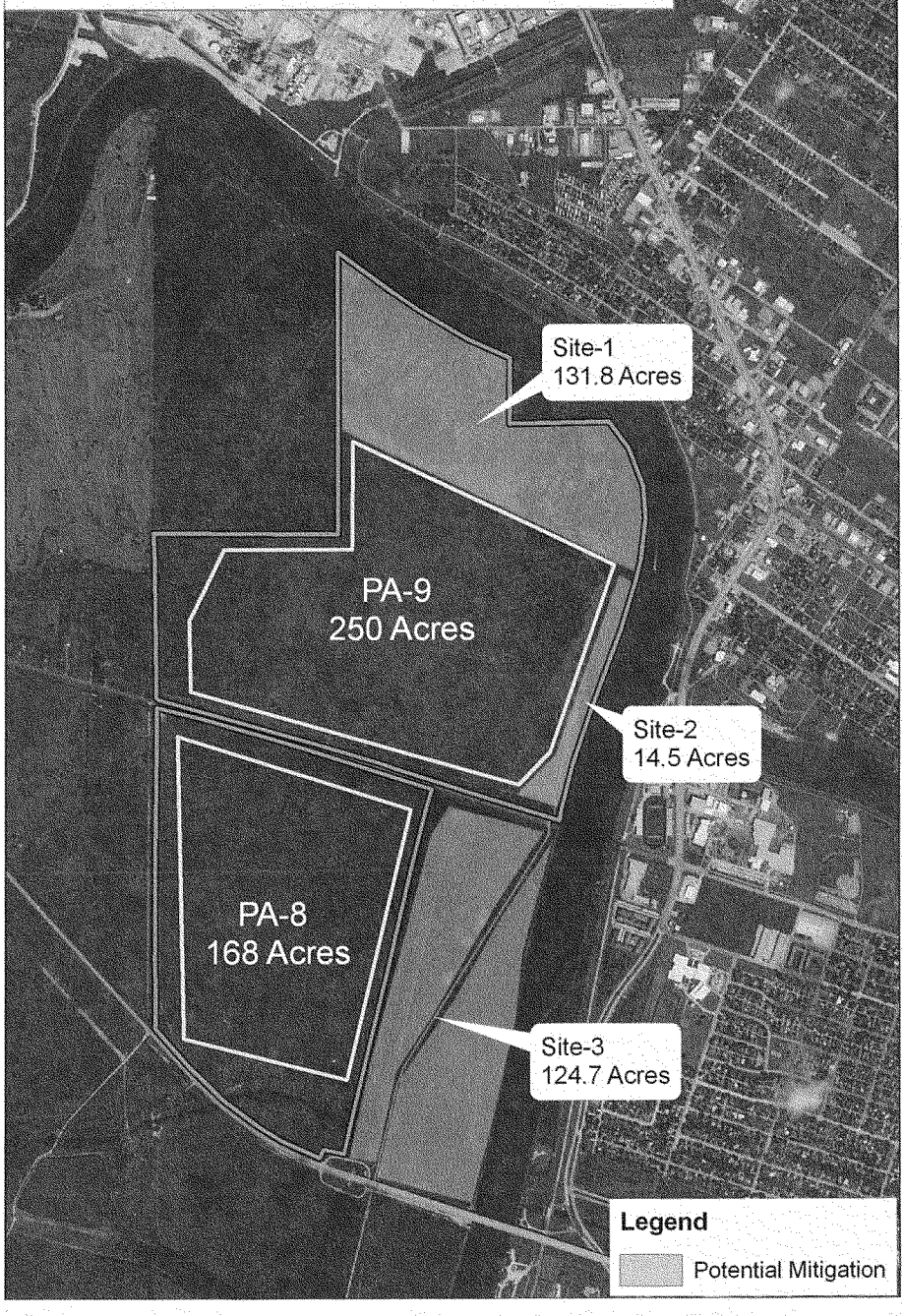
Reason For Selection: Proposed mitigation area (Site 1) near PA-9 for Freeport Harbor Deepening and Widening by USACE.

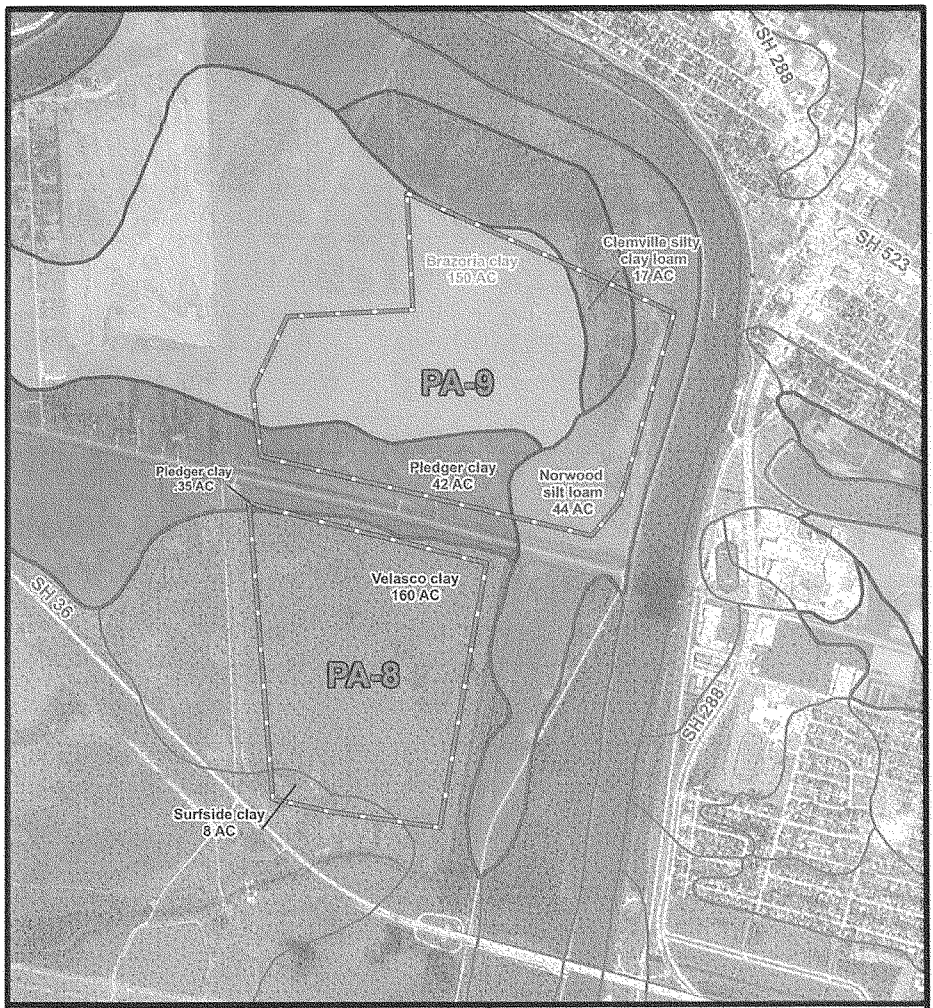
Site A: 131.8 acres (Site 1)

(See Instructions on reverse side) **Form AD-1006 (10-83)**

This form was electronically produced by National Production Services Staff

Figure 2 - FHCIP: Potential Mitigation Areas





NRCS Soil Types within Placement Areas:

Prime Farmland Areas:

- 10, Brazoria clay, 0 to 1 % slopes
- 12, Clemville silty clay loam
- 33, Norwood silt loam, 0 to 1 % slopes
- 36, Pledger clay
- 2, Asa silt loam

Placement Areas

Non-Prime Farmland Areas

N W E S

0 500 1,000 1,500 2,000

Feet

PBSJ
6504 Bridge Point Pkwy, Ste. 200
Austin, Texas 78730
Phone: (512) 329-8342 Fax: (512) 327-2453

Figure 3-7-1

Prime Farmland Areas
Freeport Deepening & Widening Project

Prepared for: USACE Galveston	
Job No.: 441901.00	Scale: 1inch equals 1,500 feet
Prepared by: A.Christiansen	Date: 11-2-2007
File: N:\44190100\projects\Figures\Fig 3-7-1 vr2.mxd	

United States Department of Agriculture
NRCS
Natural Resources Conservation Service

101 S. Main Street
Temple, TX 76501-6624
Phone: 254-742-9861
FAX: 254-742-9859

April 24, 2008

PBS&J
6504 Bridge Point Parkway, Suite 220.
Austin, Texas 78730-5091

Attention: James P. Killian, PG, Senior Geologist

Subject: LNU--Farmland Protection
Freeport Harbor Deepening and Widening Mitigation Area
Brazoria County, Texas

We have reviewed the information provided concerning the Freeport Harbor Deepening and Widening Mitigation Area in Brazoria County, Texas, as outlined in your email of April 23, 2008. This is part of the National Environmental Policy Act (NEPA) evaluation for the U.S. Army Corps of Engineers. We have evaluated the proposed area as required by the Farmland Protection Policy Act (FPPA).

The proposed project does contain soils classified as Important Farmland, and we have completed Parts II, IV, and V of the Farmland Conversion Impact Rating form (AD-1006) that you provided to us. The combined rating of the site is 147. The FPPA law states that sites with a rating less than 160 will need no further consideration.

We have attached the completed AD-1006 form. Thank you for the resource materials you submitted to help in our evaluation. If you have any questions please call Laurie Kiniry at (254) 742-9861, Fax (254)-742-9859.

Sincerely,

Laurie Kiniry

Laurie N. Kiniry
Soil Scientist

Enclosure

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 4/23/07
Name Of Project Freeport Harbor Deepening and Widening	Federal Agency Involved USACE
Proposed Land Use Mitigation	County And State Brazoria County, Texas
PART II *(To be completed by NRCS)*	Date Request Received By NRCS

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).* Yes ☑ No ☐ | Acres Irrigated 17,138 | Average Farm Size 250 acres

Major Crop(s) Grain sorghum	Farmable Land In Govt. Jurisdiction Acres: 752,100 %84%	Amount Of Farmland As Defined In FPPA Acres: 709,538 %79%
Name Of Land Evaluation System Used LESA	Name Of Local Site Assessment System NONE	Date Land Evaluation Returned By NRCS 4/24/08

PART III *(To be completed by Federal Agency)*	Alternative Site Rating Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	131.8			
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site	131.8	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	131.8			
B. Total Acres Statewide And Local Important Farmland	0			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	.02			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	76			
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	~~8~~ 82	0	0	0

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points	Site A	Site B	Site C	Site D
1. Area In Nonurban Use		10			
2. Perimeter In Nonurban Use		10			
3. Percent Of Site Being Farmed		15			
4. Protection Provided By State And Local Government		0			
5. Distance From Urban Builtup Area		5			
6. Distance To Urban Support Services		10			
7. Size Of Present Farm Unit Compared To Average		5			
8. Creation Of Nonfarmable Farmland		0			
9. Availability Of Farm Support Services		5			
10. On-Farm Investments		0			
11. Effects Of Conversion On Farm Support Services		0			
12. Compatibility With Existing Agricultural Use		5			
TOTAL SITE ASSESSMENT POINTS	160	65	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	~~8~~ 82	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	65	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	~~65~~ 147	0	0	0

Site Selected: A	Date Of Selection 4/23/07	Was A Local Site Assessment Used? Yes ☐ No ☒

Reason For Selection: Proposed mitigation area (Site 1) near PA-9 for Freeport Harbor Deepening and Widening by USACE.

Site A: 131.8 acres (Site 1)

(See Instructions on reverse side) Form AD-1006 (10-83)

This form was electronically produced by National Production Services Staff

United States Department of Agriculture

NRCS
Natural Resources Conservation Service
101 South Main Street
Temple, Texas 76501-7602

January 18, 2011

Ms. Janelle Stokes
U.S. Army Corps of Engineers, Galveston District
P. O. Box 1229
Galveston, Texas 77553-1229

Re: COMMENT: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT, BRAZORIA COUNTY, TX

Dear Ms. Stokes:

We have reviewed the Draft Environmental Impact Statement (DEIS) regarding the referenced project. Please accept our comments below.

Placement Area 8 (PA-8)

Depositing dredge material in PA-8 may constitute a wetland conversion according to the Food Security Act of 1985, as amended, if the activity has the effect of making possible the production of an agricultural commodity. Such a conversion would render the landowner ineligible for certain USDA benefits associated with all their operations and may affect the USDA benefits of any affiliated persons.

According to Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx), PA-8 is planned in an area where the soils are mapped as Surfside and Velasco clays. Both are saline soils found in the marshes of Brazoria County. The county Hydric Soils list describes both soils as completely hydric, including inclusions, due to the fact that they are poorly drained and a water table can be found one foot or less below the surface during the growing season.

Considering its position on the landscape and the inherent characteristics of the mapped soils, there is a good chance that significant portions of PA-8 could be considered wetlands according to the Food Security Act of 1985, as amended.

Placement Area 9 (PA-9)

According the Web Soil Survey, all soils mapped in PA-9 are considered *Prime Farmland.* As part of our DEIS review, we examined the prime farmland calculations associated with PA-9 and presented in Appendix A-4.

Ms. Janelle Stokes
Page 2

According to our analysis, the Land Evaluation Criterion Relative Value of Farmland to be "Converted" to be entered in Part V of the Farmland Conversion Impact Rating (Form AD-1006) should be 96. Our calculations are presented below. Also, we noticed in Part VI that the Total Site Assessment Points sum should have been 65 as opposed to the 60 reported. A Land Evaluation Criterion Relative Value, in this case 96, added to the Total Site Assessment Points, in this case 65, gives PA-9 a Farmland Conversion Impact rating of 161 which makes the site subject to the Farmland Protection Policy Act (FPPA).

Thank you for the opportunity to comment.

Soils mapped in FHCIP placement area 9

Soil map unit		Acres in		
Symbol	Name	AOI	NIRR	Score
10	Brazoria clay, 0-1 % slopes	150.9	100	15,090
12	Clemville scl	16.3	90	1,467
33	Norwood silt loam, 0-1 % slopes	41.5	90	3,735
36	Pledger clay	40.9	90	3,681
	Total	249.6		23,973
	Land evaluation criterion relative value	→	**96**	

Thank you for the opportunity to comment. If we can be of further assistance do not hesitate to contact Susan Baggett at 254-742-9805 or susan.baggett@tx.usda.gov.

Sincerely

Salvador Salinas

SALVADOR SALINAS
Acting State Conservationist

cc: Susan Baggett, SRC, NRCS, Temple, TX

TEXAS
PARKS &
WILDLIFE

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October 6, 2005

Mr. George Dabney
Environmental Lead
U.S. Army Corps of Engineers-ERB
P.O. Box 1229
Galveston, Texas 77553-1229

Re: Freeport Harbor- Proposed Upland Placement Areas

Dear Mr. Dabney,

Provided below are Texas Parks and Wildlife Department's comments and recommendations regarding the use of two potential disposal areas for the placement of maintenance dredge material from the Freeport Harbor.

Parcel 9 is a 442-acre parcel adjacent to a designated placement area ("spoil easement Reserved by U.S.A.") and to the Brazos River. The majority of Parcel 9 is over grazed cow pasture vegetated with Seacoast sumpweed, Carolina wolfberry, frog fruit, carpet grass, Bermuda grass, and smutgrass. The designated placement area encompasses a 2.29-acre wooded area at the northern most portion directly adjacent to the Brazos River. Parcel 9 also encompasses a wooded area at its northern most portion adjacent to the Brazos River. The 2.29-acre area is vegetated with a diverse range of species including; hackberry, cedar elm, toothache tree, pecan, red mulberry, honey locust, gum bumelia, Jerusalem tree, Chinaberry, yaupon holly, palmetto, green briar, peppervine, trumpet creeper, poison ivy, dewberry, native chili peppers, iron weed, turk's cap, frog fruit, basketgrass, and unknown grasses sedged and rushes. The wooded are at the northern potion of Parcel 9 is also vegetated with some of these same species but not as mature.

Wooded areas along the coast provide important habitat to migrating songbirds particularly during spring migration when exhausted from their flight across the Gulf of Mexico songbirds flock to wooded areas along the Gulf of Mexico to rest and refuel. Wooded areas such as the two described above provide important habitat for and are used as a "fall out area" by Neotropical migrating birds. Dr. Sidney Gauthreaux's radar studies of Neotropical migrant songbirds have identified the area between Matagorda Bay and east of Sabine Lake into Louisiana as one of the most important migration corridors in North America.

Parcel 8 is 254.5-acre parcel located northeast of State Highway 36. This parcel is also utilized as a grazing pasture but does not show signs of being overgrazed as parcel 9. There are two stock ponds vegetated with common arrowhead, Walteri millet, rattle bush, Seacoast sumpweed, and Chinese tallow. An

additional wetland exists in the southern portion of the parcel between SH 36 and a barbed wire fence. The wetland is vegetated with knotroot bristlegrass, Gulf cordgrass, Carolina wolfberry, seashore paspalum, sea-ox daisy eye, frog fruit, and marsh elder. This wetland swale which has 100 percent vegetative cover conveys runoff to Tobey Ditch. Tobey Ditch is a tidally influenced ditch which parallels the Brazos River and drains into the Gulf Intracoastal Water Way. The margins of Tobey Ditch are vegetated with Gulf cordgrass, marshhay cordgrass, smooth cordgrass, saltglass, saltwort, sea-ox daisy eye, and coastal saltgrass.

Wetland swales such as these provide important feeding and cover habitat for amphibians, reptiles, and small mammals and feeding habitat for the for predator bird species such as Marsh Hawks (Northern harrier) and Black-shouldered Kites. Shallow vegetated swale wetlands also provide feeding habitat for numerous wading birds such as yellow-crowned and black-crowned night herons, American bitterns, great blue herons, and great egrets. The wetlands and adjacent upland provided feeding, breeding, and cover habitat for resident and migrating waterfowl and prairie songbirds. They also protect and improve water quality by retaining freshwater runoff and associated pollutants from adjacent areas. This particular wetland improves the quality of runoff from the adjacent cow pastures before discharging into Tobey Ditch and eventually the GIWW.

For years dredge material, particularly maintenance dredge material, was considered to be a useless by-product of dredging projects and stockpiled in dredged spoil areas. But today dredge material is considered to be a resource that, if suitable, can be used beneficially to restore and enhance fish and wildlife habitat. Texas Parks and Wildlife Department advocates and supports the beneficial use of dredge material. If stored in an upland disposal unit, this particular project will require approximately 300-350 acres.

Texas Parks and Wildlife Departments first recommends, if suitable material exists, the Corps and local sponsor consider the beneficial use of the dredge material to restore and enhance fish and wildlife habitat.

If the material is not suitable TPWD does not object to the upland disposal on parcel 8 or 9 but recommends that the entire wooded areas on Parcel 9 and 2.29-acre wooded area directly adjacent described above be avoided. Additionally we recommend the wetlands swale on Parcel 8 with an upland buffer component also be avoided. An appropriate upland buffer for this wetland would be the upland between the wetland and SH 36 and the uplands between the wetland and the barbed wire fence dividing the pasture.

As always, Texas Parks and Wildlife Department is willing to assist in the protection and restoration of fish and wildlife habitat. If additional assistance,

including technical guidance regarding fish and wildlife habitat, its restoration, or beneficial use of dredge material please don't hesitate to contact us.

We appreciate the opportunity to provide comments and to be involved in the planning and selection of potential disposal for the Freeport Harbor.

Questions can be directed to Cherie O'Brien in Dickinso n at 281-534-0132.

Sincerely,

Jarrett (Woody) Woodrow
Coastal Conservation Program Director

JOW:COB

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue S
St. Petersburg, Florida 33701-5511

May 3, 2006

Ms. Lisa Vitale
PBS&J
6504 Bridge Point Parkway
Austin, Texas 78730

Dear Ms. Vitale:

The NOAA's National Marine Fisheries Service (NMFS) has received two information requests from you concerning essential fish habitat (EFH) occurring within the Freeport Channel area. One of the projects is a permit application by Brazos River Harbor Navigation District to widen the Freeport Harbor Ship Channel and the other is a proposed Corps of Engineers federal project with the Brazos River Harbor Navigation District to widen and deepen the Freeport Harbor Ship Channel. The information requested is to be used in the preparation of an Environmental Impact Statement.

EFH potentially impacted by the proposed navigation projects include, estuarine emergent wetlands, estuarine mud and sand substrates, estuarine water column, marine column and marine non-vegetated bottoms. Additional information on EFH and associated fisheries may be found in the Gulf of Mexico Fishery Management Council's Final Environmental Impact Statement[1] and Final Generic Amendment[2] to the fishery management plans for the Gulf of Mexico and the highly migratory pelagic fishery management plan[3] developed by NMFS.

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1 Gulf of Mexico Fishery Management Council. 2004. Final environmental impact statement for the generic amendment to the following fishery management plans of the Gulf of Mexico: Shrimp Fishery of the Gulf of Mexico, United States Water; Red Drum Fishery of the Gulf of Mexico; Reef Fish Fishery of the Gulf of Mexico; Coastal Migratory Pelagic Resources (Mackerels) in the Gulf of Mexico and South Atlantic; Stone Crab Fishery of the Gulf of Mexico; Spiny Lobster in the Gulf of Mexico and South Atlantic; Coral and Coral Reefs of the Gulf of Mexico. Gulf of Mexico Fishery Management Council. Tampa, FL.

2 Gulf of Mexico Fishery Management Council. 2005. Final generic amendment number 3 for addressing Essential Fish Habitat requirements, Habitat Areas of Particular Concern, and adverse effects of fishing in the following fishery management plans of the Gulf of Mexico: Shrimp Fishery of the Gulf of Mexico, United States Waters; Red Drum Fishery of the Gulf of Mexico; Reef Fish Fishery of the Gulf of Mexico; Coastal Migratory Pelagic Resources (Mackerels) in the Gulf of Mexico and South Atlantic; Stone Crab Fishery of the Gulf of Mexico; Spiny Lobster in the Gulf of Mexico and South Atlantic; Coral and Coral Reefs of the Gulf of Mexico. Gulf of Mexico Fishery Management Council. Tampa, FL.

3 National Marine Fisheries Service. 1999. Fishery management plan for Atlantic tunas, swordfish, and sharks. National Marine Fisheries Service. Silver Spring, MD. 2 vols.

Thank you for the opportunity to provide you the requested information on EFH. If we may be of further assistance, please contact Mr. Rusty Swafford of our Galveston Facility at (409) 766-3699.

Sincerely,

for Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF

July 30, 2008

Environmental Section

Jane B. Watson, Ph.D.
Chief, Ecosystems Protection Branch
U.S. Environmental Protection Agency – Region 6
1445 Ross Avenue
Dallas, Texas 77202-2733

Dear Dr. Watson:

This letter is in reference to our proposed deepening and widening improvements to the Freeport Harbor Channel, located in Brazoria County, Texas. We propose to conduct ocean disposal of new work and maintenance dredged material from the Freeport Harbor Entrance and Jetty Channels into two existing Ocean Dredged Material Disposal Sites (ODMDSs), located within the project area. The balance of new work and maintenance material from the proposed project will be placed in confined, upland placement areas. No feasible beneficial uses were identified for the material.

The two existing ODMDSs were designated by EPA for the Freeport Harbor Channel 45-Foot Project (FH-45). One site is presently used for maintenance dredged material from the existing federally maintained FH-45, and the other was used for disposal of virgin material when the FH-45 was initially constructed. EPA has also approved new work and maintenance disposal activities into these sites for the Freeport Harbor Channel Widening Project (USACE Permit Application 23752).

The Galveston District seeks EPA's concurrence that dredged material from the proposed deepening and widening project is suitable for disposal at the two ODMDSs, and that disposal activities would be in compliance with all ocean dumping criteria in accordance with the provisions of the Marine Protection, Research and Sanctuaries Act (33 U.S.C. 1401, *et seq.*). The Galveston District is currently preparing a DEIS for the proposed action. Appendix-B of the DEIS contains a thorough regulatory and environmental evaluation of ocean disposal issues, modeling of proposed disposal activities to include associated height of mounding and dredged material dispersal patterns, and Site Management and Monitoring Plans (SMMPs) for the maintenance and new work ODMDSs. During our conference call with Mr. Stephen Bainter on July, 25, 2008, the Galveston District agreed to forward Appendix-B for EPA's review in formulating a response to our request for concurrence for use of the existing ODMDSs. A copy of Appendix-B is enclosed with this correspondence.

We appreciate your cooperation in assisting us with this request. If you have any questions, please contact George Dabney at 409-766-6345, or by email at george.dabney@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

August 7, 2008

Carolyn Murphy
Chief, Environmental Section (CESWG-OD-N)
Galveston District Corps of Engineers
P.O. Box 1229
Galveston, TX 77553-1229

Re: Freeport Harbor Channel Widening Project

Dear Ms. Murphy:

This is written in response to your July 30, 2008 correspondence requesting the Agency's concurrence that dredged material from the proposed deepening and widening project is suitable for disposal at the two Ocean Dredged Material Disposal Sites. The District also requests the Agency's concurrence that disposal activities will be in compliance with all ocean disposal criteria, in accordance with the provisions of the Marine Protection, Research, and Sanctuaries Act (33 U.S.C. 1401, *et seq.*).

Our review of Appendix-B of the Draft EIS, included in your correspondence, has provided sufficient documentation and evaluation of alternatives to allow Region 6, Environmental Protection Agency to independently make a determination of the project's compliance with the provisions of the Marine Protection, Research, and Sanctuaries Act (MPRSA). Information found in Appendix-B includes a proposed Site Management and Monitoring Plan, also referred to as a Site Management Plan, MDFATE modeling of dredged material dispersion and a regulatory and environmental evaluation; all of which were reviewed by this Office.

Therefore, based on the information provided, we concur with your determination and conclude that the work and activities described in the Draft EIS complies with the MPRSA and applicable subparts of 40 CFR 220-229.

Should you have any questions, please contact Stephen Bainter, of my staff, by telephone at (214) 665-8081, or by e-mail at bainter.stephen@epa.gov .

Sincerely,

Susan Spalding
Acting Chief,
Ecosystems Protection Branch (6WQ-E)

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 15, 2010

Environmental Section

SUBJECT: Draft Environmental Impact Statement for the Proposed Freeport Harbor Channel Improvement Project, Brazoria County, Texas.

Ms. Kate Zultner
Texas General Land Office
Coastal Management Program
P.O. Box 12873
Austin, Texas 78701-2873

Dear Ms. Zultner:

Enclosed please find a paper copy and CD of the Draft Environmental Impact Statement for the Proposed Freeport Harbor Channel Improvement Project, Brazoria County, Texas. This draft report is provided for your review of the Consistency Determination pursuant to §506.20, Consistency Determination for Federal Agency Activities and Development Projects of the Texas Coastal Management Program.

The public comment period closes on February 5, 2010, and we would appreciate receipt of your comments by that date. If you have any questions, or if you would like additional copies, please contact Ms. Janelle Stokes at the letterhead address, by telephone at 409-766-3039, or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

CF:
Mr. Tom Calnan
Texas General Land Office
Coastal Management Division
P.O. Box 12873
Austin, Texas 78701-2873

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 15, 2010

Environmental Section

SUBJECT: Draft Environmental Impact Statement for the Proposed Freeport Harbor Channel Improvement Project, Brazoria County, Texas.

Mr. Miles Croom
Assistant Regional Administrator
National Marine Fisheries Service
Habitat Conservation Division
263 13th Avenue South
St. Petersburg, Florida 33701-5511

Dear Mr. Croom:

Enclosed please find a paper copy and CD of the Draft Environmental Impact Statement for the Proposed Freeport Harbor Channel Improvement Project, Brazoria County, Texas. This draft report is provided for your agency review and concurrence of the evaluation of essential fish habitat (EFH) in accordance with the Magnuson-Stevens Fishery Conservation and Management Act. Sections 3.14.2 and 4.12.2 of the DEIS provide information regarding the existing environment and potential EFH impacts, respectively.

The results of your review are requested by February 5, 2011. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Janelle Stokes at the letterhead address, by telephone at 409-766-3039, or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 15, 2010

Environmental Section

SUBJECT: Draft Environmental Impact Statement for the Proposed Freeport Harbor Channel Improvement Project, Brazoria County, Texas.

Mr. Rusty Swafford
National Marine Fisheries Service
Habitat Conservation Division
4700 Avenue U
Galveston, Texas 77551-5997

Dear Mr. Swafford:

Enclosed please find a paper copy and CD of the Draft Environmental Impact Statement for the Proposed Freeport Harbor Channel Improvement Project, Brazoria County, Texas. This draft report is provided for your agency review and concurrence of the evaluation of essential fish habitat (EFH) in accordance with the Magnuson-Stevens Fishery Conservation and Management Act. Sections 3.14.2 and 4.12.2 of the DEIS provide information regarding the existing environment and potential EFH impacts, respectively.

The results of your review are requested by February 5, 2011. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Janelle Stokes at the letterhead address, by telephone at 409-766-3039, or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 15, 2010

Environmental Section

SUBJECT: Draft Environmental Impact Statement for the Proposed Freeport Harbor Channel Improvement Project, Brazoria County, Texas.

Mr. Charles Maguire
Director, Water Quality
Texas Commission on Environmental Quality
12100 Park 35 Circle, Mail Code 150
Austin, Texas 78753

Dear Mr. Maguire:

Enclosed please find a paper copy and CD of the Draft Environmental Impact Statement for the Proposed Freeport Harbor Channel Improvement Project, Brazoria County, Texas. This draft report is provided for your agency review under Section 401 of the Clean Water Act. The U.S. Army Corp of Engineers is requesting a §401 State Water Quality certification from Texas for this action. The §404(b)(1) Evaluation is provided in Appendix G of the DEIS.

The results of your review are requested by February 5, 2011. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Janelle Stokes at the letterhead address, by telephone at 409-766-3039, or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 15, 2010

Environmental Section

SUBJECT: Draft Environmental Impact Statement for the Proposed Freeport Harbor Channel Improvement Project, Brazoria County, Texas.

Ms. Susana M. Hildebrande, P.E.
Texas Commission on Environmental Quality
P.O. Box 13087, Mail Code 168
Austin, Texas 78711-3087

Dear Ms. Hildebrande:

Enclosed please find a paper copy and CD of the Draft Environmental Impact Statement for the Proposed Freeport Harbor Channel Improvement Project, Brazoria County, Texas. This draft report is provided for your agency review and concurrence with the Draft General Conformity Determination (DGCD) in accordance with the Clean Air Act. The DGCD and air emission estimates are provided in Appendix C of the DEIS.

The results of your review are requested by February 5, 2011. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Janelle Stokes at the letterhead address, by telephone at 409-766-3039, or by email at Janelle.S.Stokes@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

Appendix A-5

Fish and Wildlife Coordination Act

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
17629 El Camino Real #211
Houston, Texas 77058-3051
281/286-8282 / (FAX) 281/488-5882

April 5, 2007

Colonel David C. Weston
U.S. Army Corps of Engineers, Galveston District
P.O. Box 1229
Galveston, Texas 77553

Dear Colonel Weston:

This Draft Fish and Wildlife Service (Service) Planning Aid Letter (PAL) provides Service analysis of impacts and mitigation for important fish and wildlife resources related to the proposed land disposal plan for the Freeport Channel Deepening and Widening Project. It is in fulfillment of our joint Scope of Work (SOW) on this project dated August 2005.

We analyzed existing resources at terrestrial disposal sites Placement Area (PA) 9 and PA 8, which lie immediately north of the State Highway (SH) 287 and immediately west of the Brazos River at the SH 287 bridge. We have also provided a recommended mitigation plan for unavoidable damages to wet coastal prairie and riparian forest habitat at these sites, and have quantified damages and habitat compensation values using Habitat Evaluation Procedure (HEP) methodology. Data for HEP procedures were gathered during joint agency field trip by Galveston District Corps of Engineers (COE), Texas Parks and Wildlife Department (TPWD), and Service biologists in September and December 2006. This Draft PAL and recommendations are also being reviewed by Texas Parks and Wildlife Department (TPWD).

PA 9 lies immediately north of State Highway 36 and west of the Brazos River (Figure 1). The portion within the proposed PA boundaries is approximately 168 acres. It is lightly grazed pastureland bisected by a shallow wetland swale and at least three manmade or altered semi-permanent ponds. Total wetland acreage, as estimated using GIS data from 2004, 1:24:000 aerial quads, was 100 acres. However, field inspections during our December, 2006 interagency field trip showed this to be an overestimate. Although drier than previously categorized, for purposes of the HEP analysis, the Service considered the entire tract as wet coastal prairie. The species list (primarily native herbaceous species), vegetation type, and wildlife observed support this classification.

TAKE PRIDE IN AMERICA

Prairie identified during our two interagency field trips included Gulf cordgrass (*Spartina spartinae*), marsh-hay cordgrass (*Spartina patens*), sedges (*Juncus* sp.), Indian blanket (*Gaillardia* sp.), false indigo (*Baptisia australis*), wooly croton (*Croton capitatus*), marsh fimbry (*Fimbristylis* sp.), saltgrass (*Distichls spicata*), and groundsel bush (*Iva spicata*). Wetland plants found in the ponds and swale included common arrowhead (*Sagttaria latifolia*), sedges (*Juncus* sp.), spikerush (*Echinocholoa* sp.), smartweed (*Polygonum* sp.), rattlebox (*Sesbania drummondi*), seacoast sumpweed (*Iva annua*), bulrush (*Juncus californicus*), narrowleaf cattail (*Typha augustafolia*).

Prospective PA 8 lies immediately north of the small county road bisecting the two PA's and west and south of the Brazos River. The 254-ac. tract was classified as having 21 acres of riparian forest and 229 acres of wet coastal prairie, including 16 wetland acres, in our original GIS assessment. Field inspection showed the site to be drier and more heavily overgrazed than previously thought, which is reflected by the HEP analysis. Herbaceous plants identified were similar to PA 9 but ground cover was more sparse. Invasive non-native pasture grasses were also present though they were not dominant.

The 21-acre forested portion of PA 9 consists of second-growth woods and is contiguous with a larger woodland to its north. It is a mixed-species woodlot, approximately 40 years in age, somewhat open with a grazed understory. Primary tree and brush species are sugar hackberry (*Celtis laevigata*), cedar elm (*Ulmus crassifolia*), Chinese tallow (*Sapium sabiferum*), red mulberry (*Morus rubra*), honey locust (*Gliditsia triacanthos*), pecan (*Carya illinoiensis*), toothache tree (*Xanthoxylum fracineum*), gum bumelia (*Sideroxylon lanuginosum*) , yaupon holly (*Ilex vomitorum*), and palmetto (*Serenoa repens*). Primary understory shrubs and vines are, palmetto, greenbriar (*Smilax* sp.), peppervine (*Ampelopsis brevipedunculata*), trumpet creeper (*Campsis radicans*), poison ivy (*Toxicodendron radicans*), dewberry (*Rubus eubatus*), blackberry (*Rubus* sp.), ironweed (*Iva* sp.), and turk's cap (*Malvaviscus arboreus*). The height of this mixed species canopy reaches 35 feet. Its density, maturity, diversity, and location (along the Brazos River very near the Gulf of Mexico) add to its values as a Neotropical migrant songbird "fallout" site.

Wildlife species identified at one or both prairie sites included the northern bobwhite (*Colinus virginianus*), marsh harrier (*Circus aeruginosus*), black-shouldered kite (*Elaenus axillaris*), great egret (*Egretta alba*), snowy egret (*Egretta garzetta*), great blue heron (*Ardea herodias*), eastern meadowlark (*Sturnella magna*), red-winged blackbird (*Aegelaeus phoenicius*), and others. Species seen in the forested portion include the red-shouldered hawk (*Buteo lineatus*), black-crowned night heron (*Nycticorax nycticoras*), northern mockingbird (*Mimus polyglottos*), northern cardinal (*Cardinalis cardinalis*), white-eyed vireo (*Vireo griseus*), tufted titmouse (*Baelophus bicolor*), and common blackbird (*Euphagus cyanocephalus*).

The Service has developed a hypothetical Project Mitigation Plan for purposes of comparing project impacts and compensation. Criteria used were: 1) practicability (proximity, availability, etc.), 2) habitat type (high-priority, i.e. wetlands, prairie, riparian forested, etc.), and 3) habitat quality/value. In this case, we selected the immediately-adjacent partially wooded tract immediately north of PA 9, lying between the proposed northern levee alignment and the Brazos River (Figure 1). Preliminary calculations (which have not been thoroughly reviewed by COE and TPWD) indicate that approximately 172 acres may be available in this tract, approximately 140 of which are lightly forested and 32 of which could be classified as wet prairie/grazed pasture (Figure 1). In terms of general value to native fish and wildlife populations, the Service considers the riparian forest portion of the study area to be of higher value than the wet coastal prairie portion, because of its potential as high-quality Neotropical migrant songbird habitat. While coastal prairie is considered a valuable and declining wildlife resource, the overgrazed condition (particularly of PA 9) and its fragmentation diminish its value.

Potential management measures for the hypothetical mitigation habitats are outlined as follows. These management measures are reflected in assumptions made in the hypothetical HEP Mitigation Area runs. Habitat improvements are assumed to manifest themselves by altering habitat variables in years 1 – 15 and to accelerate in years 16 – 50 for the prairie and wetland components (of both the prairie and forest) and for the forest.

Prairie. Disk the area, plant/mulch native prairie seed, and treat invasive plants (herbicide, burning, cutting, or a combination). Follow-up invasive plant treatment at one, three, and 10 years, and mow or burn every five years. Create three 1.5-ac. ephemeral depressions, planted in native-prairie/wetland mix.

Forest. Initial invasive tree/brush removal and a follow-up invasive removal at five years. Plant a 7-species riparian/bottomland hardwood seedling mix at 10 stems/ac. at year 1, follow-up re-planting at year 3 to insure 70% survival to 5 ft. height. Create three, 1-acre ephemeral depressions in selected (poorly-forested) sites within or at edge of forest, plant with flood-tolerant hardwoods such as green ash, planar tree, water hickory, bald-cypress, and willow oak.

Appendix I shows the results of the HEP runs, including the hypothetical Mitigation Plan runs. According to the HEP results:

1. Losses to coastal wet prairie habitat in PA's 8 and 9 are only partially recouped in the mitigation area under the hypothetical mitigation plan.
2. Losses to riparian forest in PA 9 are recouped, plus substantial habitat gains, in the mitigation area under the hypothetical mitigation plan.

We consider Neotropical migrant songbird habitat in the upper Texas coastal zone to be of highest conservation priority, and because the existing wet coastal prairie habitat is of medium to low quality, we have determined that this type and amount of compensation for the project is acceptable.

Thank you for the opportunity to provide input to assist the Corp of Engineers in planning projects which protect and restore these important native Texas coastal fish and wildlife habitats. Please contact me or Phil Glass at 281/286-8282 if you have questions concerning these recommendations.

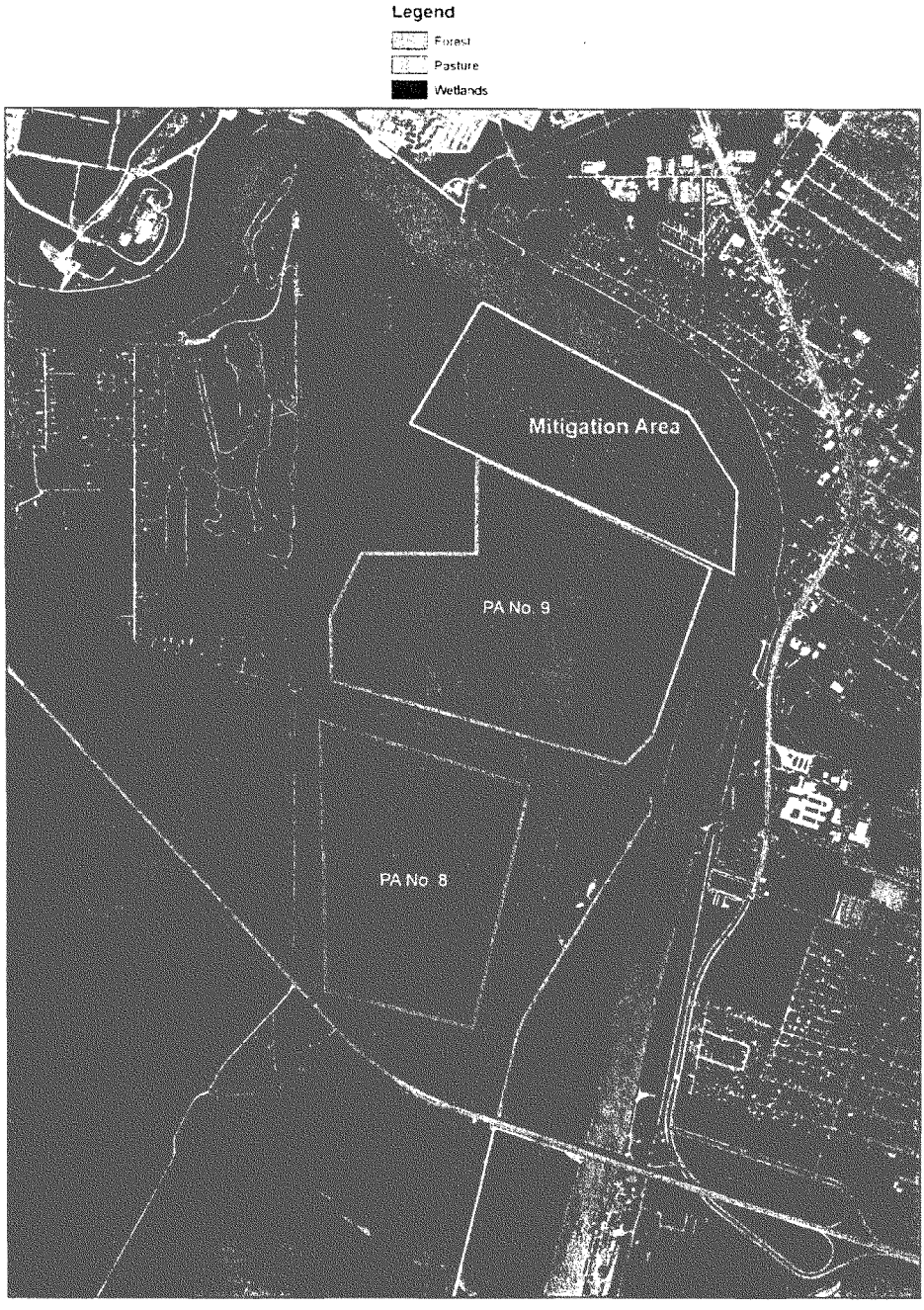
Sincerely,

Stephen D. Parris

Stephen D Parris
Field Supervisor, Clear Lake Ecological Services

Enclosures

cc:
Woody Woodrow, Texas Parks and Wildlife Dept, Dickinson, Texas
Gary McMahon, Texas General Land Office, LaPorte, Texas
Mark Fisher, Texas Commission On Environmental Quality, Austin, Texas
Jim Herrington, Environmental Protection Agency, Dallas, Texas



Freeport Study: Proposed Placement Areas No. 8 & 9 and Mitigation Area

Appendix I. HEP Tables for Freeport Harbor Deepening and Widening Land Disposal Plan

Mottled Duck HEP. Freeport Harbor, Dec 2006

1(N) PA9	*COE*	*TPWD*	*FWS*	AVG	SI	COMPONENTS
V1	0	0	0	0	1	NHC = .1
V2	0	3	2	1.7	.95	HBC = 0
V3	-	.55	.14	.35	.35	CS = 0
V4	0	0	0	0	0	CR = 0
V5	0	0	0	0	0	C = 0
V6	100	100	100	100	0	
V7	0	0	0	0	0	F = 0
V8	.7	.7	.7	.7	.7	O = .7
						HSI (1N) = 0

2(N) PA9	*COE*	*TPWD*	*FWS*	AVG	SI	COMPONENTS
V1	0	0	0	0		
V2	4	2	6	4		
V3						
V4						
V5						
V6	100	100	100	100		
V7	0	0	0	0	0	F = 0
V8	.7	.7	.7	.7		O = .7
						HSI (2N) = 0

Avg. HSI for mottled duck, PA 9 = 0
0 (HSI) X 50 (proj. yr.) X 229 (hab. ac.) = 0 HU's in PA9

3(S) PA8	*COE*	*TPWD*	*FWS*	AVG.	SI	COMPONENTS
V1	5	3	4	4	.95	NHC = .77
V2	25	10	15	17	.5	HBC = .35
V3	.45	.49	.47	.47	.47	CS = .35
V4	50	50	50	50	1	CR = .1
V5	.13	-	.11	.12	.12	
V6	97	95	96	96	.1	C = .23
V7	65	50	60	58	.58	F = .58
V8	.7	.75	.8	.75	.75	O = .75
						HSI (3S) = .23

5(S) PA8	*COE*	*TPWD*	*FWS*	AVG.	SI	COMPONENTS
V1	1	1	3	1.7	.96	NHC = .67
V2	1	1	5	2.3	.98	HBC = .4
V3	.36	.26	.35	.32	.32	CS = .4
V4	50	70	50	57	1	CR = .1
V5	.13	-	.18	.16	.16	C = .25
V6	.97		.96	.96	.1	F = .7
V7	85	80	50	72	.7	O = .7
V8	.8	.7	.9	.8	.8	**HSI (5S) = .25**

Avg. HSI for mottled duck, PA 8 = .24
.24 (HSI) X 50 (proj. yr.) X 168 (hab. ac.) = 2016 HU's in PA 8

2,016 (HU's in PA 8) + 0 (HU's in PA 9) = **2,016 TOTAL HU's, mottled duck**

GREAT EGRET HEP, Freeport Harbor Dec. 2006

1(N) PA9	*COE*	*TPWD*	*FWS*	Avg.	SI	COMPONENTS
V1	0	0	0	0	0	F = .05
V2	.1	.1	.1	.1	.1	**HSI (1N) = .05**

2(N) PA9	*COE*	*TPWD*	*FWS*	Avg.	SI	COMPONENTS
V1	0	0	0	0	0	F = .05
V2	.1	.1	.1	.1	.1	**HSI (2N) = .05**

Avg. HSI for great egret, PA 9 = .05
.05 (HSI) X 50 (proj. yr.) X 229 (hab. ac.) = 572 HU's in PA 9

3(S) PA8	*COE*	*TPWD*	*FWS*	Avg.	SI	COMPONENTS
V1	.03	.02	.04	.03	.03	F = .52
V2	60%	50%	50%	53%	1	
						HSI 3 (S) = .52

5(S) PA8	*COE*	*TPWD*	*FWS*	Avg.	SI	COMPONENTS
V1	.03	.02	.04	.03	.03	F = .52
V2	70%	40%	60%	57%	1	**HSI 5 (S) = .52**

Avg. HSI for great egret, PA 8 = .52
.52 (HSI) X 50 (proj. yr.) X 168 (hab. ac.) = 4,368 HU's in PA 8

4,368 (HU's in PA 8) + 572 (HU's in PA 9) = **4,940 TOTAL HU's, great egret**

EASTERN MEADOWLARK HEP, Freeport Harbor, December 2006

1(N)	*COE*	*TPWD*	*FWS*	Avg.	SI	COMPONENTS
V1	86%	100%	91%	92%	1	F/R = .39
V2	80%	61%	85%	75%	.5	
V3	2.7"	2.2"	3.3"	2.7"	.3	
V4	150'	26'	27'	67'	1	
V5	3%	2%	4%	3%	1	**HSI 1(N) = .39**

2(N)	*COE*	*TPWD*	*FWS*	Avg.	SI	COMPONENTS
V1	32%	95%	86%	71%	.65	F/R = .50
V2	61%	80%	80%	74%	.79	
V3	3.3"	2.2"	4"	3.2"	.5	
V4	100'	28'	35'	54'	1	
V5	3%	2%	6%	3.7%	1	**HSI (2N) = .42**

Avg. HSI eastern meadowlark, PA 9 = .40
.40 (HSI) X 50 (proj. yr.) X 229 (hab. ac.) = 4,580 in HU's PA 9

3(S)	*COE*	*TPWD*	*FWS*	Avg.	SI	COMPONENTS
V1	83%	87%	83%	84%	.95	F/R = .60
V2	87%	86%	62%	78%	.98	
V3	18"	11"	15"	15"	1	
V4	45'	38'	44'	42'	.6	
V5	5%	10%	14%	10%	.8	**HSI 3(S) = .60**

4(S)	*COE*	*TPWD*	*FWS*	Avg.	SI	COMPONENTS
V1	72%	87%	80%	80%	.82	F/R = .25
V2	33%	43%	52%	43%	.38	
V3	13"	8.7"	20.2"	14"	1	
V4	200'	148'	450'	266'	.2	
V5	1%	1%	5%	2.3%	1	**HSI 4(S) = .25**

5(S)	*COE*	*TPWD*	*FWS*	Avg.	SI	COMPONENTS
V1	35%	67%	58%	53%	.43	F/R = .25
V2	27%	47%	60%	45%	.4	
V3	11"	10"	12"	11"	1	
V4	100'	177'	246'	174'	.38	
V5	1%	1%	5%	2.3%	1	**HSI 5(S) = .25**

Avg. HSI eastern meadowlark, PA 8 = .37
37 (HSI) X 50 (proj. yr.) X 168 (hab. ac.) = 3,108 HU's in PA 9

4,580 (HU's in PA8) + 3,108 (HU's) in PA9) = **7,688 TOTAL HU's, eastern meadowlark**

GRAY SQUIRREL HEP, Freeport Harbor, December 2006

	COE	*TPWD*	*FWS*	Avg.	SI	COMPONENTS
V1	0%	0%	3%	1%	.1	Fw = .11
V2	1	1	2	1.3	.12	CR = .5
V3	50%	80%	60%	63%	1	
V4	10"	8"	7"	8.3"	.25	
V5	20%	40%	25%	28%	1	**HSI (1F) = .11**

2(F)	*COE*	*TPWD*	*FWS*	Avg.	SI	COMPONENTS
V1	8%	2%	10%	6.7%	.2	Fw = .32
V2	2	2	2	2	.5	CR = .62
V3	55%	75%	65%	65%	1	
V4	10"	8"	9"	9"	.39	
V5	30%	50%	25%	35%	1	**HSI (2F) = .32**

Avg. HSI gray squirrel, PA 9 forest = .22
.22 (HSI) X 50 (proj. yr.) X 21 (hab. ac.) = **231 TOTAL HU's gray squirrel (all in PA 9)**

Veery HEP, Freeport Harbor, January 2007

1 (F)	*COE*	*TPWD*	*FWS*	Avg.	SI	Components
V1	5%	---	6%	6%	.98	C/R(nw) = .5
V2	b	b	b	b	.5	*or* = .4
V3	8%	30%	15%	18%	0	
V4	3'	9'	6'	6"	1	
V5	70%	90%	70%	77%	.8	
V6	12"	6"	12"	10"	.8	**HSI 1(F) = .4**

2(F)	*COE*	*TPWD*	*FWS*	Avg.	SI	Components
V1	5%	---	5%	5%	.96	C/R(nw) = .5
V2	b	b	b	b	.5	*or* = .71
V3	5%	50%	25%	27%	.1	
V4	4'	10'	5'	6.3'	1	
V5	50%	98%	60%	69%	.61	
V6	24"	4"	10"	13"	1	**HSI 2(F) = .5**

Average HSI veery, PA9 = .45

.45 (HSI) X 50 (proj. yr.) X 21 (hab. ac.) = **472 HU's (all in PA9)**

MOTTLED DUCK HEP. Freeport Harbor, Mitigation Run *, January 2007

Mitigation (wet prairie)	*FWS* (est.)	SI	COMPONENTS
V1	0	1	NHC = .78
V2	15%	.8	HBC = .77
V3	.3	.6	CS =.77
V4	40%	1	CR = .3
V5	3	.6	C = .56
V6	14%	.3	F = .85
V7	85%	.85	O = .7
V8	3.5	.7	**HSI = .56**

HSI for mottled duck, hypothetical mitigation run = .56
.56 (HSI) X 50 (proj. yr.) X 32 (hab. ac.) = **896 HU's mottled duck, hypothetical mitigation area**

* Note: Hypothetical mitigation area = 32-ac. wet prairie and forest edge with three (3) 1.5-ac. shallow wetland swales

---

GREAT EGRET HEP, Freeport Harbor, mitigation run, Jan. 2007

Mitigation (wet prairie)	*FWS* (est.)	SI	COMPONENTS
V1	16%	.13	F = .56
V2	50%	1	**HSI = .56**

HSI for great egret, hypothetical mitigation run = .56
.56 (HSI) X 50 (proj. yr.) X 32 (hab. ac.) = **896 HU's great egret, hypothetical mitigation area**

EASTERN MEADOWLARK HEP, Freeport Harbor, mitigation run, January 2007

Mitigation (wet prairie)	*FWS* (est.)	SI	COMPONENTS
V1	83%	.95	F/R = .60
V2	75%	.98	
V3	15"	1	
V4	44'	.6	
V5	14%	.8	**HSI = .60**

HSI for eastern meadowlark, hypothetical mitigation run wet prairie = .60
.60 (HSI) X 50 (proj. yr.) X 32 (hab. ac.) = **960 HU's eastern meadowlark, hypothetical mitigation area**

GRAY SQUIRREL HEP, Freeport Harbor, mitigation run, January 2007

Mitigation (forest, years 1-15)	*FWS* (est.)	SI	COMPONENTS
V1	15%	.22	Fw = .26
V2	1.5	.3	CR = .55
V3	65%	1	
V4	10"	.3	
V5	20%	1	**HSI = .26**

.26 (HSI) X 15 (proj. yr) X 140 (hab. ac.) = 546 HU's, gray squirrel, hypothetical mitigation run, years 1-15

Mitigation (forest, years 16-50)	*FWS*	SI	COMPONENTS
V1	50%	1	Fw = 1
V2	4	1	CR = 1
V3	75%	1	
V4	15"	1	
V5	20%	1	**HSI = 1**

1 (HSI) X 35 (proj. yr.) X 140 (hab. ac.) = 4,900 HU's gray squirrel, hypothetical mitigation run years 16-50

546 (HU's years 1-15) + 4,900 (HU's years 16-50) = **5,446 HU's gray squirrel, hypothetical mitigation run**

Veery HEP, Freeport Harbor, mitigation run, January 2007

Mitigation (forest, years 1-15)	*FWS*	SI	Components
V1	8%	.96	C/R(nw) = .75
V2	a/b	.75	*or* = 1
V3	30%	.15	
V4	6'	1	
V5	70%	.8	
V6	12"	1	**HSI (years 1-15) = .75**

.75 (HSI) X 15 (proj yr.) X 140 (hab. ac.) = 1,575 HU's veery, hypothetical mitigation run years 1-15

Mitigation (forest, years 16-50)	*FWS*	SI	Components
V1	8%	.96	C/R(nw) = .8
V2	a/b	.8	*or* = 1
V3	40%	.4	
V4	6'	1	
V5	65%	.5	
V6	12"	1	**HSI (years 16-50) = .8**

.8 (HSI) X 35 (proj. yr.) X 140 (hab. ac.) = **3,920 HU's veery, hypothetical mitigation run**

HEP Habitat Units (HU's) Summary for all species. With and Without Project Impacts and With Hypothetical Mitigation Plan

	HU's PA8	**HU's PA9**	**Total HU's lost**	**HU's gained, Hypo. Mitig. Plan**	**Hypo. Mitig. Plan net change**
Mottled duck	2,016	0	2,016	896	-1,120
Great egret	4,368	572	4,940	896	-4,044
Eastern meadowlark (weighted X .2)	916	620	1,536	192	-1,344
Total wet coastal prairie HU's			**8,492**	**1,984**	-6,508
Gray squirrel		231	231	5,446	+5,215
Veery		472	472	3,920	+3,448
Total forest HUs			**703**	**9,366**	+8,663
HU Totals			**9,195**	**11,350**	+2,155

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
17629 El Camino Real #211
Houston, Texas 77058-3051
281/286-8282 FAX 281/488-5882

March 20, 2008

Colonel David C. Weston
U.S. Army Corps of Engineers, Galveston District
P.O. Box 1229
Galveston, TX 77553

Dear Colonel Weston:

This Fish and Wildlife Coordination Act Report (CAR) provides the U. S. Fish and Wildlife Service's analysis of impacts and mitigation for important fish and wildlife resources related to the proposed land disposal plan for the Freeport Channel Deepening and Widening Project. It is in fulfillment of our joint Scope of Work on this project, dated August 2005. The Fish and Wildlife Coordination Act (Public Law 85-624; 16 U.S.C. 661 - 666) requires that the U.S. Army Corps of Engineers (Corps) coordinate with the Department of Interior U.S. Fish and Wildlife Service (Service) to give equal consideration to fish and wildlife resources, and requires that measures to conserve these resources be taken.

Our previous Planning Aid Letter, submitted April 5, 2007, provided an initial analysis of important native fish and wildlife resources potentially affected by the proposed land disposal plans and furnished a draft mitigation plan based on a Habitat Evaluation Procedures (HEP) analysis. The plan was developed following coordination with Corps and Texas Parks and Wildlife Department (TPWD) staff and Port of Freeport (Port) environmental personnel. The present CAR finalizes the Service's recommendations following our review of the Corp's *Preliminary Draft Environmental Impact Statement for the Freeport Harbor Deepening and Widening Channel Improvement Project Brazoria County, Texas* (PDEIS). This document provided the Service with the Corps's draft mitigation plan for review. It must be noted that we are presently unsure whether Alternative Plan A1B0C0 alone, as proposed in Appendix C-2 of the PDEIS constitutes the recommended mitigation plan.

We analyzed existing resources at proposed terrestrial disposal sites Placement Areas (PA) 9 and PA 8. We have also provided a recommended mitigation plan for unavoidable damages to wet coastal prairie and riparian forest habitat at these sites, and have quantified damages and habitat compensation values using HEP methodology. Data for HEP analysis were gathered during joint agency field trip(s) by the Corps, TPWD, and Service biologists in September and December 2006. The Service's Draft PAL and mitigation recommendations were reviewed by TPWD and Corps environmental personnel.

TAKE PRIDE IN AMERICA

PA 8 lies immediately north of State Highway 36 and west of the Brazos River (Figure 1). The portion within the proposed PA boundaries is approximately 168 acres. It is lightly grazed pastureland bisected by a shallow wetland swale and at least three manmade or altered semi-permanent ponds. Total wetland acreage, as estimated using GIS data from 2004, 1:24:000 aerial DOQQ's, was 100 acres. However, field inspections during our December, 2006 interagency field trip showed this to be an overestimate. Although drier than previously categorized, for purposes of the HEP analysis, the Service still considered the entire tract as wet coastal prairie. The species list (primarily native herbaceous species), vegetation type, and wildlife observed support this classification. Corps Environmental Branch biologists categorized most of the site as grazed pasture.

Prospective PA 9 lies immediately north of the small county road bisecting the two PAs and is west and south of the Brazos River. The 254-acre tract was classified as having 21 acres of riparian forest and 229 acres of wet coastal prairie, including 16 wetland acres, in our original GIS assessment. Field inspection showed the site to be drier and more overgrazed than previously thought, which is reflected by the HEP analysis. Herbaceous plants identified were similar to PA 8, but ground cover was sparser. Invasive non-native pasture grasses were also present, though they were not dominant.

The 21-acre forested portion of PA 9 consists of second-growth woods and is contiguous with a larger woodland to its north. It is a mixed-species woodlot, approximately 40 years in age, somewhat open with a grazed understory. The height of this mixed species canopy reaches 35 feet. The density, maturity, diversity, and location (along the Brazos River very near the Gulf of Mexico) of the forested area add to its' value as a neotropical migrant songbird "fallout" site.

The plant and wildlife components of these sites and the table of HEP assumptions and computed values were provided in our April 5, 2007 PAL. In the present CAR, we summarize these findings and recommendations, again show the proposed PAs and mitigation site(s) (Figure 1), and summarize the Corps' HEP analysis and assumptions. We also summarize the differences between the Corps' and the Service's HEP and mitigation analyses.

Criteria we used in developing a hypothetical mitigation plan were: 1) practicability (proximity, availability, etc.), 2) habitat type (high-priority, i.e. wetlands, prairie, riparian forested, etc.), and 3) habitat quality/value. We selected, following discussions with TPWD, Corps, and Port personnel, the adjacent, partially wooded tract immediately north of PA 9, lying between the proposed northern levee alignment and the Brazos River (Figure 1) as a hypothetical mitigation site. Preliminary calculations indicated that approximately 172 acres were available in this tract, approximately 140 of which are lightly forested and 32 of which could be classified as wet prairie/grazed pasture (Figure 1). In terms of value to native fish and wildlife populations, the Service considers the riparian forest portion of the study area to be of higher value than the wet coastal prairie portion because of its potential as high-quality neotropical migrant songbird habitat. While coastal prairie is a valuable and declining wildlife resource, the overgrazed condition, particularly of PA 9, and its fragmentation diminish its value. The results of the Service's HEP analysis of project impacts and of the mitigation plan are presented in Table 1.

Potential management measures for the hypothetical mitigation habitats were outlined in the PAL. These management measures were reflected in assumptions made in the hypothetical HEP Mitigation Area runs. Habitat improvements were assumed to manifest themselves by altering habitat variables in years 1 – 15 and to accelerate in years 16 – 50 for the prairie and wetland components (of both the prairie and forest) and for the forest. However, it was emphasized throughout the planning process that the Service considered the ENTIRE 132-acre semi-wooded tract north of PA 9 (Site 1 in the EIS) as the mitigation tract for HEP computation purposes.

According to Service HEP results:

1. Losses to coastal wet prairie habitat in PA 8 and PA 9 are only partially recouped in the mitigation area under the Service's mitigation plan, even considering values gained by habitat conservation and restoration in the "prairie" portion of Site 1.
2. Losses to riparian forest in PA 9 are not only recouped, there are additional habitat gains in the mitigation area under the Service's mitigation plan.

According to Corps HEP results:

1. Losses to forest ("woodlands") at PA 9 would be recouped by planting 150 tree seedlings on 21 acres at Site 1 and by maintaining invasive plant control over this (21-acre ?) site over the project life.
2. Losses to wetlands at PAs 8 and 9 would be recouped by creating two 1.5 acre shallow wetland ponds, for a total of 3 acres of "wetland" mitigation.

Corps mitigation results in the PDEIS were based on different assumptions made on both habitat values and slightly different methodology during the Corps' planning process. Also, the Corps uses a "Best Buy Plan" methodology in evaluating combinations of potential mitigation scenarios. As stated earlier, the Service is presently unsure whether Alternative Plan A1B0C0 alone, as proposed in Appendix C-2 of the PDEIS, constitutes the recommended mitigation plan.

While the Service and TPWD considered all of PA 8 and most of PA 9 to be "wet coastal prairie," the Corps considered only the wetlands portion as mitigable habitat. The Service agreed with the Corps that much of the "prairie" area, particularly in PA 9, was of marginal quality due to existing grazing pressure. Nevertheless, it did constitute coastal prairie habitat with good management potential due to its location along the Brazos River within 6 miles of the Gulf of Mexico. In addition, its unaltered topography would facilitate restoration. It should be emphasized that PA 9's existing, degraded condition was reflected in diminished HEP values for the prairie species. Therefore, the hypothetical mitigation requirements were lessened.

The Service considers neotropical migrant songbird habitat in the upper Texas coastal zone to be of highest conservation priority. Therefore, though technically "out of kind" in some respects according to calculated HEP values alone, we find the type and magnitude of compensation for project impacts originally proposed in the PAL appropriate. Likewise, the plan proposed by the

Corps in the PDEIS would be acceptable to the Service provided that the entire 132-acre (semi) wooded tract within which the habitat measures are located is included in a permanent conservation easement, to be held in perpetuity by a recognized conservation entity. The 21-acre woodland improvement and 3 acre wetland creation feature(s) alone would not compensate for present and potential future native wildlife and wetland benefits lost on these two sites totaling 422-acres in size, and thus are unacceptable to the Service.

Thank you for the opportunity to provide input to assist the Corps of Engineers in planning Federal projects which protect and restore these important Texas coastal habitats. Please contact me or Phil Glass, staff biologist at 281/286-8282 if you have questions concerning these recommendations.

Sincerely,

Stephen D. Parris

Stephen D. Parris
Field Supervisor, Clear Lake ES Field Office

cc:
Cherie O'Brien, Texas Parks and Wildlife Department, Dickinson, TX
Gary McMahon, Texas General Land Office, LaPorte, TX
Mark Fisher, Texas Commission on Environmental Quality, Austin, TX
Jim Herrington, Environmental Protection Agency, Dallas, TX

Table 1. Summary of Service Habitat Evaluation Procedures (HEP) Results
Habitat Units With and Without Project Impacts and With Hypothetical Mitigation Plan

	HU's PA8	**HU's PA9**	**Total HU's lost**	**HU's gained, Hypo. Mitig. Plan**	**Hypo. Mitig. Plan net change**
Mottled duck	2,016	0	2,016	896	-1,120
Great egret	4,368	572	4,940	896	-4,044
Eastern meadowlark (weighted X .2)	916	620	1,536	192	-1,344
Total wet coastal prairie HU's			**8,492**	**1,984**	-6,508
Gray squirrel		231	231	5,446	+5,215
Veery		472	472	3,920	+3,448
Total forest HUs			**703**	**9,366**	+8,663
HU Totals			**9,195**	**11,350**	+2,155

Freeport Study: Proposed Placement Areas No. 8 & 9 and Mitigation Area

Appendix A-6

General Correspondence

PORT FREEPORT℠
THE COAST IS CLEAR
200 W. SECOND ST., 3rd FL. • FREEPORT, TX 77541
(979) 233-2667 • 1 (800) 362-5743 • FAX: (979) 233-5625

DEC 24 2009

DW 23 DEC 2009

December 21, 2009

Colonel David Weston
U. S. Army Corps of Engineers
Galveston District
P. O. Box 1229
Galveston, Texas 77553-1229

TO P.E.R.

Re: Freeport Harbor Improvement Project Feasibility Study
Proposed Conservation Easement

Dear Colonel Weston,

As part of the Freeport Harbor Improvement Project, environmental mitigation will be required to offset for the loss of habitat in the area of the proposed Upland Confined Dredged Material Placement Site Nos. 8 and 9 as shown in the Draft Environmental Impact Statement. It is the Port's intention that should the project proceed into the Construction Phase to grant a conservation easement for the portion of the lands used for mitigation to one of the regulatory agencies (probably Texas Parks & Wildlife Services) or a recognized nature conservancy.

Sincerely,

Phyllis Saathoff
Managing Director
Port Freeport

PS/dmk

PORT COMMISSION

JAMES F. BROWN, JR., CHAIRMAN; THOMAS S. PERRYMAN, VICE CHAIRMAN; RAVI K. SINGHANIA, SECRETARY; BILL TERRY, ASSISTANT SECRETARY; J.M. "MIKE" LOWREY, COMMISSIONER; PAUL KRESTA, COMMISSIONER; GEORGE T. WOMMACK, JR., COUNSEL; A.J. REIXACH, JR., EXECUTIVE PORT DIRECTOR/CEO

Appendix A-7

Comments and Responses for the DEIS

Public Meeting Comments

FREEPORT, TEXAS

CHANNEL IMPROVEMENT PROJECT

PUBLIC MEETING

JANUARY 13, 2011

Electronically signed by Lana Sholders (101-225-766-0482) 26f59dc8-5c65-455c-98fb-4e0486ed1251

1 MR. REIXACH: We want to welcome
2 everybody out to this event tonight. This has been a
3 long time coming. We appreciate you coming out in the
4 beautiful Freeport weather and hopefully we can get
5 through this tonight and get out of here at a decent
6 hour. We embarked on this journey with the Corps a
7 little over eight years ago. It started with a
8 strategic meeting of port personnel and at the time we
9 were at a cross roads of what kind of port did we want
10 to be 25 years from now. Did we want to continue to
11 be a niche port with minimum impact on the local
12 economy and minimal job creation? We looked at our
13 assets, over 7,000 acres of land, close to the open
14 sea, 50 miles from a major commercial zone but yet
15 within a stone's throw of a major petrochemical
16 complex with rail service and adequate highway
17 infrastructure. We knew we had something special but
18 most of all we had a supportive constituency from both
19 industry and the public. Containerization was at an
20 all time high. We asked ourselves did we want to play
21 a role in that segment of the shipping industry? The
22 overwhelming answer to that question was yes. Like an
23 artist with a canvas, the future began to take shape.
24 We needed a multipurpose terminal on deep water and
25 that could handle both general cargo as well as

1 containers, hence Velasco Terminal. Deep water was
2 next. Would containers stand alone and support deep
3 water? Probably, to come degree but we visited with
4 our petrochemical industry leaders and crude industry
5 leaders and the answer from them after some
6 investigations was also yes. The next question was
7 how deep? From local industry we were told 55 feet.
8 From the container industry, we were told 55 feet.
9 Next stop, the U.S. Army Corps of Engineers and a
10 recon to determine if there was a federal interest in
11 taking our channel down to 55 feet. The answer came
12 back yes. Seven and a half and almost eight years
13 later and some $4.7 million later, here we are tonight
14 for public's input and comment. The painting is about
15 half complete with many more steps and hurdles to go.
16 We appreciate the hard work the Corps has put into
17 this project and we thank our consultants Younger &
18 Associates, Steinberg's up in Washington D.C., our
19 economist John Martin of Martin & Associates for all
20 of their hard work to get us this far. And now I
21 would like to introduce Colonel Christopher Sallese,
22 District Commander, Galveston, Texas, U.S. Army Corps
23 of Engineers.
24 Colonel Sallese.
25 COL. SALLESE: Thanks, Mr. Reixach. I

1 appreciate that. Good evening, Ladies and Gentlemen.
2 I want to thank y'all for being here tonight. As Pete
3 laid out, this is an important event in our process as
4 we go through this study for this project. As he
5 said, I am Colonel Christopher Sallese. I'm the
6 commander of U.S. Army Corps of Engineers, Galveston
7 District. And, again, I want to welcome y'all to the
8 public meeting concerning the Freeport Harbor Channel
9 Improvement Project. Specifically, we are presenting
10 information and accepting public comment on the
11 following draft documents that were released for
12 public review on the 23rd of December, 2010. The
13 Draft Feasibility Report for the Freeport Harbor
14 Channel Improvement Project, Texas; the Draft
15 Environmental Impact Statement for the Freeport Harbor
16 Channel Improvement Project, Texas. For the record
17 let me state that this public meeting is being
18 convened at 7:00 p.m. on 13, January, 2011 at the
19 Freeport Community House in Freeport, Texas.
20 As you know, the Corps of Engineers in
21 Freeport have been performing a study analyzing
22 potential modifications to the Freeport Harbor Channel
23 that serves the Port of Freeport, Texas. Two
24 objectives were identified for the study. They were,
25 number one, improving navigation efficiency along the

1 Freeport Harbor Channel and, number two, maintaining
2 the ecological value of costal and estuarine resources
3 within the project area. A cost effective plan has
4 been identified by the study team that meets these
5 objectives. The plan which we refer to as the
6 tentatively recommended and locally preferred plan
7 will be described by study team members in some
8 following presentations. We are specifically seeking
9 input concerning the plan and associated environment
10 impacts that are described in these documents. I hope
11 that all of you have had an opportunity to read the
12 announcement of the public meeting either on the
13 Galveston District's website or in individual
14 announcements that were mailed to individuals,
15 agencies, organizations, and news media believed to
16 have an interest in these proceedings this evening.
17 The meeting notice was also published in Brazosport
18 Facts. An additional fact sheet is also available at
19 the entrance where you signed in this evening. The
20 announcement, mailing list, and a list of those
21 present will be made a part of the record for this
22 meeting. A court reporter is here who will transcribe
23 these proceedings and all public comments.
24 Before we begin the presentations, I'd
25 like to introduce the public officials who are

1 attendant tonight. As I call your name, could you
2 please stand up or raise your hand? Ms. Gloria Milsap
3 representing State Senator John Huffman.
4 Larry Davison, mayor of Surfside. Ravi Singhania,
5 port commissioner. Bill Terry, port commissioner.
6 Are there any other state or public officials that I
7 may have missed?
8 MR. MASTERS: I just came in. I'm a
9 city councilman.
10 COL. SALLESE: Your name, sir?
11 MR. MASTERS: Jerry Masters.
12 COL. SALLESE: Jerry masters.
13 Councilman for City of Freeport?
14 MR. MASTERS: Quintana.
15 COL. SALLESE: For the City of
16 Quintana. Thank you very much, sir. Now I'd like to
17 introduce my people who are here tonight from the
18 Corps of Engineers. My deputy district engineer
19 Art Janecka, who a lot of people in this room could
20 not make it this evening. He was feeling a little bit
21 ill. So in his place tonight I have Bill Wise. He's
22 the chief of project management. Ms. Diana Laird,
23 chief planning and environmental branch.
24 Mr. Robert Heinly, chief planning section way in the
25 back at the table. Ms. Carolyn Murphy, chief

environmental section in the back. Ms. Sharon Tirpak, project manager for the Freeport Harbor Study. Mr. Robert Van Hook, he's the planning lead for this effort. Ms. Janelle Stokes, she's our environmental lead for this effort. Mr. Carlos Tate, he's the project engineer. Ms. Samantha Lambert, she's from our hydrology and hydraulics engineering. And Ms. Sandra Arnold, she's our public affairs officer.

And now I'll turn this meeting over to Ms. Sharon Tirpak who will describe the ground rules for tonight's meeting.

MS. TIRPAK: Thank you. Hope everyone completed an attendance card when they entered the meeting tonight. If not, I ask that you do so now. If you'll raise your hand, someone will bring you a card if you need one. The attendance card is used to record the participants at this meeting and to inform us of your desire to make an oral comment. If you indicated on the attendance card that you want to make a comment, you will be given an opportunity to do so after the project presentations. If you prefer not to speak tonight, you may submit your comments in writing using one of the comment cards we have available for you tonight. Those cards are also available at the entrance or you can raise your hand now and someone

will bring you one. You can return your completed card tonight in the basket identified for that purpose in the back of the room or you can mail it to the address that's indicated on the bottom of the form.

The purpose of tonight's meeting is that we would like to emphasize the meeting is not a voting contest that would simply determine the number of people for or against the project. The purpose of this meeting is to present information and provide you with the opportunity to present your views, opinions, and recommendations concerning the tentatively recommended and locally preferred plan. Let me discuss the format for tonight's meeting. First Mr. Pete Reixach from Port Freeport will make a few comments. Then the Corps of Engineers study team will present details of the planning and environmental studies. Mr. Robert Van hook from planning will provide an overview of the study, the tentatively recommended plan, and an overview of the environmental impact assessment, the plan impacts and proposed mitigation plan. After these presentations, Colonel Sallese will open the floor for public comments. He will first recognized those federal and state officials that have requested to make a statement. Then the federal and state resource

1 agencies if any present will be called upon next if
2 they wish to make a statement. Finally,
3 Colonel Sallese will recognize each individual from
4 the registration cards that has indicated that they
5 wish to make a comment. Anyone who has indicated a
6 desire to comment will have that opportunity. Please
7 remember that this will not be a question and answer
8 session. This meeting is to provide everyone with an
9 opportunity to publicly comment on the plan.
10 Is there anyone else who needs to turn
11 in a card expressing your desire to comment? Do we
12 have everyone's comments who wants to comment?
13 MR. MASTERS: I didn't see where you
14 check off the comment?
15 MS. TIRPAK: Well, you turned in a
16 card. Are you going to speak?
17 MR. MASTERS: I got here late. I
18 apologize.
19 MS. TIRPAK: That's okay. Please give
20 all the speakers the courtesy of not making any
21 comments during their presentation and turn off your
22 cell phones and hold all applause or other reactions
23 so that we can have an ordinarily meeting and to be
24 respectful of everyone's time. All individuals have
25 an equal right to be heard and now I'd like to

1 introduce Mr. Pete Reixach, Port Freeport for any
2 additional comments he may have.
3 MR. REIXACH: Thank you, Sharon. As I
4 said in my openings remarks, Port Freeport and the
5 Corps embarked on this journey some eight years ago.
6 A lot of ink has hit a lot of pages, a lot of meetings
7 and exchange of e-mails. So here we are tonight to
8 get the public's input into our long awaited project.
9 As we go through the process, I can see any number of
10 things coming together to create not the perfect storm
11 but the perfect port. We are building the port of the
12 future, not saddled with the flaws of the past.
13 Velasco Terminal when completed will be a state of the
14 art terminal capable of handling 780,000 TEU's
15 annually. Highway infrastructure improvements will
16 make access to the port more efficient. A new rail
17 bridge over the Old Brazos River will improve rail
18 service to and from the port and probably the most
19 important, the Panama Canal should be completed by
20 2014 allowing the larger container ships access to the
21 gulf and quite possibly and hopefully Port Freeport.
22 The final piece to our puzzle or our portrait will be
23 a 55-foot channel. It will improve navigation for our
24 port which is always an important factor. It will
25 allow four two-way traffic for certain class of

1 vessels. Allow the larger crude carriers to discharge
2 their crude at a safe and secure berth versus the
3 lightering that goes on now out in the open sea. It
4 will allow the larger vessels access to Velasco
5 Terminal. All of these are good things. It will make
6 our channel safer and with Velasco Terminal at its
7 full potential, our economist tells us it will
8 generate approximately 1700 direct jobs and over $24
9 million in state and local taxes. That's Velasco
10 Terminal and once again thanks to all the Corps from
11 headquarters division in Dallas and the district in
12 Galveston, thanks to all the hard work you've put in
13 into developing these documents and now I believe I
14 turn it over to Robert Van Hook.
15 MR. VAN HOOK: Good evening. I'm
16 Robert Van Hook, the planning lead for the Freeport
17 Harbor Channel Improvement Project. This study is
18 authorized by Section 216 of the Flood Control Act of
19 1970. This section allows us to restudy existing
20 projects. As Pete Reixach has stated Port Freeport is
21 a nonfederal sponsor for this study and the resulting
22 project.
23 As shown on this slide, we have
24 coordinated with the shown agencies for environmental
25 issues and concerns with. The EPA, U.S. Fish and

1 Wildlife, National Marine Fisheries, the Texas General
2 Land Office, Texas CEQ, and the Texas Parks and
3 Wildlife.
4 This slide shows the study area. This
5 area includes the Freeport Harbor Channel from the
6 offshore end of the Outer Bar to the Stauffer Channel
7 Turning Basin. The study area encompasses
8 approximately 70 square miles including Brazoria
9 County, Freeport, Surfside Beach, Quintana, the lower
10 Brazos River, portions of the GIWW, the shoreline on
11 either side of the Freeport Harbor Channel, and the
12 channel area approximately 10 miles offshore into the
13 Gulf of Mexico.
14 This is an aerial view of the port
15 including Brazos Harbor, Conoco Phillips, Seaway, Dow,
16 the Stauffer Channel, et cetera.
17 The authorized dimensions of the
18 existing 45-foot project are shown on this slide.
19 This slide here shows the study
20 concerns for Freeport Harbor. As noted, the existing
21 channel is restricted to a large portion of the
22 current world fleet due to its size. These
23 restrictions include both channel width and depth.
24 These restrictions also include one-way traffic and
25 daylight only transits. Port Freeport is one of the

1 nation's most important ports for the petrochemical
2 industry. We also consider the potential impacts of
3 the proposed project on human and environmental
4 resources to be key concerns. As part of the deep
5 draft navigation project, an important issue is
6 disposal of the dredged material. Thus, we have to
7 develop a management plan for the material both new
8 work and maintenance.
9 The problems and opportunities
10 identified were navigation and commerce, and the
11 environmental concerns and social and economic
12 factors.
13 The objectives for the study were
14 improvements of navigational efficiency and safety of
15 the Freeport Harbor Channel and maintenance,
16 protection, and/or restoration of the terrestrial,
17 cultural, estuarine, and coastal resources.
18 As shown here, the existing maximum
19 loaded draft for vessels entering Freeport Harbor is
20 42 feet. This restriction is to allow sufficient
21 under keel clearance for vessels. However, the pilots
22 do allow larger vessels to transit on a case-by-case
23 basis dependent on the tide, longshore currents, and
24 wind conditions. As shown, Port Freeport is the
25 sixteenth largest port in regards to foreign imports

1 and exports and is the nations twenty-sixth largest
2 waterway in regards to tonnage. Port Freeport also
3 supports the nation's strategic oil reserves at Bryan
4 Mound.
5 Environmental concerns identified for
6 the study were contaminated sediments in the project
7 area, regional air quality, shoreline erosion along
8 the Gulf in the area, and the cumulative environmental
9 effects of the project.
10 The social and economic factors for the
11 study include the effects of reduced transportation
12 efficiency, and national and regional economical
13 benefits.
14 Early in the study process, a no action
15 alternative was developed. The no action alternative
16 from which all project benefits are measured is what
17 the Freeport Channel would look like if nothing was
18 done to improve the existing project. The project
19 study basis is a 50-year period of analysis.
20 Nonstructural alternatives were also investigated.
21 These included the relaxation of the Pilot rules and
22 alternative modes of commodity transportation. TOPS
23 was not carried forward because it was considered to
24 not be viable at this time.
25 Structural alternatives were the

1 primary point of investigation. As shown more than 50
2 combinations of different channel depths and widths
3 were initially analyzed based on benefits over costs.
4 Depths from 50 to 60 feet were analyzed in combination
5 with widths from 400 to 600 feet. Deepening and
6 widening would allow existing vessels to more fully
7 utilize the channel. These combinations were
8 initially investigated and screened down to nine
9 channel alternatives for more detailed analysis. Five
10 alternatives looked at the Gulf to the Upper Turning
11 Basin reach and four alternatives were investigated
12 for the Stauffer Channel. The Brazos Harbor Channel
13 was dropped from detailed plan formulation due to
14 limited opportunities for future expansion due to the
15 high density of docks and landside facilities.
16 Various technical identical studies
17 were performed during the feasibility study as shown
18 on this slide.
19 Two plans were ultimately developed:
20 The National Economic Development or NED Plan and the
21 Locally Preferred Plan. The NED Plan is the plan that
22 shows the maximum net access annual benefits over
23 annual cost and represents the best federal interest.
24 Thus, the NED is the base recommended plan. The
25 Locally Preferred Plan can be recommended if the local

1 sponsor agrees to pay any excess costs over the NED.
2 As a result of the feasibility study, a
3 tentatively recommended plan was developed. The
4 tentatively recommended plan is the LPP and is a
5 55-foot channel project. A dredged material
6 management plan for the project was also developed.
7 This slide here shows the various
8 components of the tentatively recommended plan.
9 The dredged material management plan
10 components are shown on this slide.
11 This tentatively recommended plan has a
12 $308.7 million first cost. The benefit to cost ratio
13 is 1.3.
14 The environment in the project area
15 consists primarily of developed lands and upland
16 grasslands with small fragmented areas of riparian and
17 upland forest and freshwater wetlands. There are no
18 beds of submerged aquatic vegetation, estuarine
19 wetlands, tidal flats or beach and dune habitat in the
20 area to be affected by the project construction.
21 Important environment concerns in the overall study
22 area include high erosion along the Gulf shoreline,
23 averaging 9 to 10 feet per year, and high ozone levels
24 during certain times of the year.
25 The primary project impacts would be

1 the destruction of 39 acres of wetlands and 21 acres
2 of riparian forest by construction of placement areas
3 8 and 9. On this slide, the locations of wetland
4 impacts are shown in blue and forest impacts in
5 green. Threatened and endangered sea turtles could be
6 adversely affected during offshore hopper dredging.
7 Our air conformity analysis has determined that
8 nitrous oxide or NOX emissions would comply with the
9 state implementation plan. There would be negligible
10 increases in the tidal range and tidal surge and in
11 Gulf shoreline erosion. No salinity, water,
12 elutriate, and sediment quality impacts are expected
13 and the project would not result in significant
14 cumulative impacts.
15 Mitigation has been proposed to
16 compensate for unavoidable wetland and riparian forest
17 impacts. We proposed to preserve 131 acres of
18 riparian forest located just north of placement area
19 9. Within this area, tallows would be removed and 12
20 acres of new forest would be created at the six sites
21 shown in gray. A new 3-acre wetland pond would also
22 be created. Consultation with the National Marine
23 Fisheries Service is ongoing regarding the sea turtle
24 impacts, but we believe that potential incidental
25 takes during hopper dredging can be minimized by the

1 adoption of reasonable and prudent measures.
2 In summary, the project environmental
3 impacts would be minimal and all project impacts would
4 be mitigated. We thoroughly investigated
5 opportunities for the beneficial use of dredged
6 material but none were identified due to the
7 unsuitable material and cost.
8 The estimated completion schedule for
9 the study is shown here. Comments on the draft
10 environmental impact statement are due by February 5th
11 and we expect to issue the final feasibility report
12 and the environment impact statement in July of this
13 year. The Chief of Engineers Report is scheduled for
14 completion in September.
15 I would like to thank all of you for
16 your attendance this evening, and I would turn the
17 meeting back to Colonel Sallese.
18 COL. SALLESE: At this time we're going
19 to take statements from our special guests, elected
20 officials, and resource agencies. I believe based
21 on the cards that I have in front of me that
22 Mr. Jerry Masters will be the first person to speak.
23 MR. MASTERS: I was the last one in.
24 My concern we're going to dredge another 600 feet
25 wide, a few feet deeper. What happens I don't know if

any of y'all ever been to the beach or not but if you dig a hole in the beach what happens and you pile the sand up over here or wherever you pile it, the tides come in, and it washes off this side over here and that side over there. And my concern is not just Quintana but Surfside. My question is why we don't use as they did in the Twin Towers the slush walls. We need because y'all dig it up every year and take it out there and it's my island and it's their island and so my question is: Why don't we protect? We have the jetties protecting that part. Why don't we protect the rest of it where we dig out for the port? It's not for my benefit. I gain nothing from it. I lose every year off my island and off their island. I didn't create the island. So that is my question. Why not think of something to protect the rest of the shore besides just the jetties and the interest of the port? I know there's no answer to that by the way.

COL. SALLESE: Thank you, sir.

Are there any other elected officials or resource agencies here this evening that wish to provide comments?

At this time I will now call on members of the general public who wish to make a statement. I remind you that I ask you to limit your oral statement

to no more than five minutes so that everyone will have an opportunity to speak. I will not permit speakers to yield their time to others. I've asked Ms. Tirpak to assist me in keeping time. She will inform you when you have 30 seconds left to speak and when your time has expired, I ask that you stop speaking after five minutes have elapsed. When you are called upon, please come forward and speak into the microphone. Please identify yourself by name. I would like to remind you that the purpose of this public meeting is to provide you with the opportunity to present your views and opinions concerning the tentative recommended and locally preferred plan for modifications to the Freeport Channel as Robert just laid out to you in the little presentation that we had.

I now call on Melanie Odom Lantrip to speak.

MS. LANTRIP: Good evening. My name is Melanie Odom Lantrip, and I'm a resident of Brazoria County, a licensed physical therapist, and a trained public health advocate. I understand the importance and the need for this project. However, after reading the Port Freeport proposal for the deepening project, the DEIS, and the nonconformity report, I feel the air

1 sections in the proposal is very inadequate to show
2 the need to use clean marine vessels, clean fuels, and 4
3 best management practices to significantly decrease
4 NOX emissions during this project. In the reports, 5
5 which I will include, toxic pollution and health and
6 Brazoria County and air toxic, it states our county is
7 the fourth in the U.S. for air and water releases of
8 carcinogens. Brazoria County as you know is listed as
9 severe nonattainment for ozone. The American Lung
10 Association in 2010 stated the air report again gave
11 Brazoria County an "F" for ozone. Also, in the report
12 about said health impacts, it states that the cancer
13 risk for a resident of Brazoria County is 1 in 3,036.
14 This risk is 320 times greater than EPA's acceptable
15 cancer level of 1 in a million. And by the way, the
16 county no longer monitors PM or particles.
17 And also we do not have a long time
18 ozone monitor in Clute, Texas that was put there in
19 1974. It's a historical ozone monitor, but it was
20 moved to Dow property several years ago. TCEQ,
21 David Brimer, and Suzanne Hillebrand, the head of air
22 stated a while back it should be moved from the Dow
23 land to northeast of there to get an accurate picture
24 of our actual ozone design value of Brazoria County.
25 On 01-08-11, last Friday, I spoke by

1 phone to Rubin Velasquez who is the PE for PBS & J who
2 did the air section report for the DEIS in general
3 conformity who commented that his NOX emission 6
4 estimates and assumptions are based on using typical
5 marine vessels not necessarily with new retrofitted
6 engines, clean fuel best management practices. He 7
7 agreed that there needs to be additional research
8 study added to clearly illustrate to stake holders the
9 possible NOX emission reductions that would be
10 possible.
11 I've included two studies found on the
12 Internet. One is done at the Port of Oakland, a
13 program to encourage and offer financial incentives
14 which is expected to decrease particulate matter, PM,
15 by over 70 percent and NOX by over 30 percent and the
16 2006/2007 Port of Houston Authority with its
17 environmental management system used a NOX calculator
18 for contractors to determine the optimal combination
19 of newer heavy equipment, electric equipment, lower
20 emissions fuel, and construction techniques to
21 minimize the NOX generation, and meet the Port's air
22 quality goals.
23 Recently David Brimer of TCEQ who I
24 spoke with today and Tom Diggs for the EPA have
25 verbally expressed the need to encourage using

1 construction contractors that participate in the TERP
2 grant program and through provisions, criteria in the
3 construction contracts which the Corps I understand
4 will be taking the bids, implement best management
5 practices related to NOX and DOC which is from ozone.
6 The estimated NOX emissions for this project is
7 estimated to produce at peek 780 tons per year while
8 any amount over just 25 tons per year is required to
9 be justified in the general conformity report.
10 The estimated emissions from this Port
11 Freeport proposed project must be well illustrated and
12 quantified to all state holders and not exceed the NOX
13 emissions budget in the HGB SIB.
14 My question is: Does this proposed
15 plan meet all these criteria to reduce minimized NOX
16 during this project in order to protect our human 8
17 health and the environment? Thank you for your time
18 and I've included some reports in the folder that I 9
19 referred to. Thank you.
20 COL. SALLESE: Please insure that we
21 get copies of that data with your comments.
22 MS. LANTRIP: Can I give it to you
23 after the meeting?
24 COL. SALLESE: Yes, please. You can
25 give it to myself or to one of my folks here. I want

1 to make sure that we have the data -- the references
2 that you quoted.
3 Next I'd like to call on
4 Ms. Sharon Stewart from the Galveston Bay Foundation.
5 MS. STEWART: Thank you. I'm
6 Sharon Stewart. I co-chair the permit review
7 committee for the Galveston Bay Foundation. We have
8 already put together our comments, and they will be
9 submitted in writing. So tonight I'm just Sharon
10 Stewart from Lake Jackson. Dave Knuckey is the only
11 person who will remember this because it happened just
12 before Pete came on board and may be why Pete came on
13 board. But in the mid Eighties, I went to Washington
14 to testify before Congress for the Port of Freeport's
15 need for 50 feet. We accomplished that, and I was
16 able to show the Department of Defense and the Coast
17 Guard that there was a national interest because I
18 just happened to have information about the strategic
19 petroleum reserve site adjacent to the Port in my
20 briefcase. Now, the Port made the decision after they
21 got congressional approval to seek 50 feet of water to
22 go for 45 because that was also at the time that there
23 was a change in the proportion of funding between the
24 Corps and the Port which is why Pete may be on board.
25 It was a very bad decision. Nobody in the country had

1 50 feet at that time. And there's a good reason why
2 that was. Port of Freeport is the only port on the
3 entire Gulf Coast that has no bay margin to cross. To
4 dig that depth, you do incredible damage to an
5 estuarine ecosystem. And the Port of Freeport does
6 not have that problem.
7 For 15 years I chaired a task force for
8 Texas Environmental Coalition on all port and dredging
9 projects and I read those suckers. And this is the
10 only one that that task force endorsed, and nothing
11 about that has changed. However, there are always
12 dabbles in the details. This isn't the only project
13 that's going to be seeking that depth in Texas.
14 You're just the first. There are more problems with
15 the others but some of the issues like the SIP air
16 quality things need to be addressed now with clean
17 dredges, clean fuels, best practices, and I don't 10
18 think the EIS addressed that. As Melanie pointed out,
19 there hasn't been an appropriate study mechanism. I
20 would suspect that because the Port of Houston is so
21 proud of their green efforts they would share them
22 with you. They do have a report out on them, but I
23 think they would even share their NOX methodology with
24 you. And I think the Corps should require that the 11
25 bids go out for clean dredges and clean fuels. If

there aren't any available in the Gulf, it's because the Corps doesn't demand it but we are in the worst SIP in the country. There's a good reason for that, and we are as much a part of that as the whole ship channel area.

You know, 50 percent of the nations petrochemical refining capacity exists in four counties around Galveston Bay including us. We just are the most rural. Doesn't mean we are the least polluter. I have one other basic point and that's the dredging sites. There is contaminated dredged material, one at Dow. There is a plume under the harbor and you can get that information from Dow. You can get it from TCEQ, probably Marker would be the 12
quickest way. It's all been in the papers. It's just unique to know it. It's heavy metals and the same material on the other side of the channel at Gulf Chemical and Metallurgical. They were just fined this fall for illegally discharging directly into the harbor. You know, you've got to address that and make sure that all that contaminated spoil goes into appropriate upland sites and is treated as a hazardous waste. Thank you.

COL. SALLESE: Thank you, Ms. Stewart.

I now call on Toby Davenport.

1 MR. DAVENPORT: Good evening. My name
2 is Toby Davenport. I live at 201 East Park Avenue in
3 beautiful downtown Freeport. I had the esteem
4 pressure and honor of serving on the Port Commission
5 for 18 years. A lot of what's going on today was
6 started probably on my watch. I've always supported
7 the channel project. Spent a lot of time in
8 Washington and visiting with folks about improving the
9 channel. And I'm certainly not opposed to improving
10 the channel. It's been a goal of this area for as
11 long as I can remember. My grandfather was one of the
12 first port commissions when they diverted the Brazos
13 River, and that was quite a feet. So we understand
14 things like that. It inconveniences people but the
15 point of my comment tonight is that I echo
16 Ms. Stewart's concern about the quality of the dredged 13
17 material. I know that there are some areas that we
18 avoided during my time on the board, and I'm wondering
19 how we're going to accomplish this without disturbing
20 some of that material. There was some dredged
21 material disposal sites. It took me a long time to
22 learn how to say that but it's easier to say something
23 else but we don't use that word around here.
24 I would urge this project to include
25 better management of the dredge disposal sites with

1 regard to sluffing and the contaminated contents and 14
2 the effect that they have on the surrounding areas as
3 far as drainage and what happens to the surrounding
4 areas after the spoil -- oh, there it went -- the
5 dredged material is placed in these areas.
6 Also, when I was chairman, I signed a
7 contract with Freeport LNG, and some of the channel 15
8 modification I'm sure is probably directed to help
9 facilitate LNG ships to get into their slip there at
10 Quintana. And before they bring anymore ships in
11 there or any larger ships in there as a result of this
12 project, something needs to be done to monitor their
13 economic environmental impact on the Village of
14 Quintana as far as noise and vibration of their
15 engines and continual worrying and just generally
16 disrupting the Quintana County Park and the folks that
17 live in the vicinity of the Quintana Terminal which is
18 also owned by the Port. I'm hoping that this project
19 can be completed and environmentally sensitive and in
20 a way that has the least negative impact on those
21 people who adjoin the ship channel at Surfside and
22 Quintana. I thank Pete and I thank the Colonel and
23 everyone who's worked hard on this project and those
24 who are on the commission now and I just hope you'll
25 consider my comments. Thank you for your time.

1 COL. SALLESE: Thank you,
2 Mr. Davenport.
3 That was the last of the public comment
4 cards that I had. Was there anybody else who wished
5 to come forward and make a public comment?
6 MR. MASTERS: How many minutes are
7 there left?
8 COL. SALLESE: Okay. Well, then, in
9 conclusion written comments on the Draft Feasibility
10 Report and Draft Environmental Impact Statement must
11 be received on or before 5, February, 2011, the
12 conclusion of the 45-day comment that began on the
13 23rd of December, 2010. I would like to thank the
14 Port of Freeport for their efforts and their
15 assistance for this meeting tonight and I would like
16 to thank the attendants and the interests y'all have
17 shown. These meetings are important to us. It gives
18 us a chance to -- as we go through our process, it
19 gives a chance to, one, show you what we've been doing
20 and it gives us -- it gives you the opportunity to
21 provide the comments for us to take into consideration
22 as we move forward to a final report. Very valuable.
23 Your comments tonight have been -- have been well
24 received and they will all be addressed and I thank
25 you again for making it here this evening. Thank

you. Myself and members of my staff will be here to answer your questions if anybody wants to come up.

(Public Meeting concluded.)

Electronically signed by Lana Sholders (101-225-766-0482) 26f59dc8-5c65-455c-98fb-4e0486ed1251

1 THE STATE OF TEXAS)
2 COUNTY OF HARRIS)
3
4 I, LANA SHOLDERS, a Certified Shorthand
5 Reporter in and for the State of Texas, do hereby
6 certify that the facts as stated in the caption hereto
7 were recorded verbatim, by me, and were reduced to
8 typewriting under my direction.
9 To all of which I certify on this the
10 1st day of February, 2011.
11
12
13 Lana Sholders
14 LANA SHOLDERS, Texas CSR 5215
Expiration Date: 12-31-12
15 Firm Registration # 530
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Public Meeting Response Comments

RESPONSE TO COMMENTS

Commentor	Comment No.	Response
Masters	1	We note your concern that channel widening will result in shoreline erosion along the current ship channel. However, widening of the Jetty and Entrance Channels is not proposed as part of the FHCIP. Widening is authorized under the previously-permitted Port Freeport Widening Project.
Masters	2	Hydrodynamic modeling was conducted for this study and is reported in Feasibility Report Section 8.2.1.2. Based on these studies, no significant change is expected in tides, currents, and circulation between the existing and proposed plan. Therefore, no increase in erosion of the ship channel shorelines is expected. See FEIS Section 4.1 for a discussion of expected project effects to the physiography of the project area.
Masters	3	No shore protection is needed because the FHCIP does not result in significant impacts to the area's shorelines.
Lantrip	4	FEIS Section 4.4 has been revised to include recommended emissions reduction measures.
Lantrip	5	The following printed materials were provided to USACE by Ms. Lantrip during the meeting. They have been reviewed for information potentially useful to the FHCIP. 1. Cassady, A. and A Fidis. 2007. Toxic Pollution and Health: An Analysis of Toxic Chemicals Released in Communities Across the United States. U.S. PIRG Education Fund, Washington, D.C., pages 1-10 (Incomplete). 2. Brazoria County and Air Toxics. No date. Sierra Club, 1 page. 3. Air Toxics from Diesel Exhaust. No date. Publisher/author not identified, 1 page. 4. What You Can Do to Reduce Air Toxics. No date. Public Citizen, Austin, Texas, 1 page. 5. Air Toxics: What you don't know CAN hurt you. No date. Public Citizen, Austin, Texas, 1 page. 6. APWL1201 (Map of Freeport) - Arsenic, Cobalt, Nickel, Vanadium. No date. Publisher/author not identified, 1 page. 7. State of the Air 2010. 2010. Statistics for Brazoria County. American Lung Association. http://www.stateoftheair.org/2010/states/texas/brazoria-48039.html, 1 page. 8. Diesel Soot Health Impacts: Where You Live - Brazoria County, Texas. 2010. Clean Air Task Force, http://www.catf.us/projects/diesel/dieselhealth/county.php?c=48039&site=0, 2 pages 9. Clean Ports USA. 2011. Case Studies - Technologies. U.S. Environmental Protection Agency, http://www.epa.gov/diesel/ports/casestudies.htm, 4 pages. 10. Letter from Ms. Susana Hildebrande, Director, Air Quality Division, U.S. EPA, Region 6 to Mr. Sam Watson, Department of the Army, Galveston District, Corps of Engineers. Dated January 10, 2007. Comments

Commentor	Comment No.	Response
		on the Draft General Conformity Determination for the Port of Freeport Channel Widening Project, dated November 7, 2006, 2 pages. 11. Letter from Lisa McMichael, Environmental Coordinator, Brazos River Harbor Navigation District to Ms. Susana Hildebrand, Director, Air Quality Division, U.S. EPA, Region 6. Dated March 15, 2007. Response to EPA letter dated January 10, 2007, regarding air quality impacts of proposed Port of Freeport Channel Widening Project, 1 page. 12. Partial letter from Texas Commission on Environmental Quality to Mr. Sam Watson, Department of the Army, Galveston District, Corps of Engineers. Dated January 9, 2007. Comments on the Draft General Conformity Determination for the Port of Freeport Channel Widening Project, dated November 7, 2006, First page of letter of unknown length. 13. FHCIP DEIS Appendix C, U.S. Army Corps of Engineers, Galveston District: page 1-7, Section 1.3 General Conformity,1 page marked with question marks; pages 4-4 and 4-5, Sections 4.2 and 4.3, no remarks; page 5-1, Section 5.0, 1 page with asterisks and question mark. 14. FHCIP Draft Feasibility Report, U.S. Army Corps of Engineers, Galveston District: page 1-5, Sections 1.3.1 and 1.3.2, 1 page marked with question marks; page 10-5, Sections 10.1.11 through 10.5; page 12-17, Sections 12.11 and 12.11.1, 1 page with no marks; page 15-4, 1 page with no remarks; Section 14.2, 1 page with no remarks. 15. Map of Brazoria County Commissioner Precincts. No date. Publisher/author not identified, 1 page.
Lantrip	6	Preparation of NO_X emission estimates and assumptions using typical marine vessels is in accordance with generally accepted methodology. This provides a high estimate of potential impacts, and ensures that all potential impacts are addressed.
Lantrip	7	We believe that PBS&J comments were misinterpreted; no additional research was recommended.
Lantrip	8	FEIS Section 4.4 has been revised to include recommended emissions reduction measures.
Lantrip	9	See Response 5 for list of materials provided.
Stewart	10	FEIS Section 4.4 has been revised to include recommended emissions reduction measures.
Stewart	11	USACE contracts would encourage the use of efficient dredges and clean fuels.
Stewart	12	USACE will research this issue in preparation for the PED phase. Water, elutriate and sediment testing conducted for this study and described in DEIS Sections 3.4, 3.5, 4.2 and 4.3 have determined that there is no contamination of the system as a whole, and that sediments are suitable for placement in upland PAs and ODMDSs. However, during the PED phase we will investigate this information to determine if localized contaminated sediments are present in areas proposed for dredging. If contaminated sediments are found, the project will be modified to avoid disturbing these sediments or properly dispose of them, in accordance with all applicable state and Federal regulations.
Davenport	13	See Response 12, above.
Davenport	14	Water, elutriate and sediment testing conducted for this study and described

Commentor	Comment No.	Response
		in DEIS Sections 3.4, 3.5, 4.2 and 4.3 have not identified any contaminated sediments that would be placed in upland PAs or in the ODMDSs in conjunction with the FHCIP. Additional investigations will be conducted during the PED phase and prior to construction. If contaminated materials are identified and removal is necessary, all applicable state and Federal regulations will be followed in their avoidance or removal.
Davenport	15	None of the channel modifications proposed for the FHCIP are designed to benefit the LNG ships. Channel modifications benefiting LNG are addressed by the previously-permitted Port Freeport Widening Project Final Environmental Impact Statement.

Resource Agency Comments

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
1001 Indian School Road NW, Suite 348
Albuquerque, New Mexico 87104

TAKE PRIDE IN AMERICA

ER 11/27
File 9043.1

February 7, 2011

Janelle Stokes
U.S. Army Corps of Engineers
Galveston District
PO Box 1229
Galveston, Texas 77553-1229

Dear Ms. Stokes:

The U.S. Department of the Interior has reviewed the Draft Environmental Impact Statement for the Brazos River Harbor Navigation District's (Port Freeport) proposed Freeport Harbor Channel Improvement Project (FHCIP) in Brazoria County, Texas and offers the following comments.

The U.S. Fish and Wildlife Service has worked closely with the U.S. Army Corps of Engineers, Galveston District during the development of the FHCIP. On April 5, 2007, and March 20, 2008, we provided a Planning Aid Letter and a Fish and Wildlife Coordination Act Report, respectively. The Planning Aid Letter included our management recommendations for the 32-acre grassland site. The Coordination Act Report summarized unavoidable project impacts to coastal wet prairie and riparian-forested habitats and provided recommendations for appropriate compensation. To date, both the Corps and Port Freeport have incorporated most of our recommendations, but two issues remain.

First, most of the 32-acre grassland located north of the proposed Placement Area 9 is of marginal quality due to existing grazing pressures. However, we believe this habitat can be improved with proper management because of its key location within the migratory bird flyway, along the Brazos River and within 6 miles of the Gulf of Mexico. Coastal prairies provide important nesting and foraging habitat for a suite of grassland birds and raptors. Therefore, the FWS recommends implementing appropriate management actions to improve habitat conditions at this site. Our management recommendations for this site are included in the Planning Aid Letter, and we can provide additional technical assistance, if necessary. 1

Second, the Corps and Port Freeport's proposed mitigation provide forested habitat along the upper Texas coast for neotropical migrant songbirds. The FWS continues to recommend that the entire mitigation site be placed in a permanent conservation easement held in perpetuity by a recognized conservation entity. 2

We appreciate the opportunity to provide comments on this project in the pre-planning stages. If you have any questions, or require further assistance, please contact Donna Anderson, Fish and Wildlife Biologist, FWS Ecological Services Field Office, Clear Lake, Texas, at 281-286-8282 extension 225.

Sincerely,

Stephen R. Spencer
Regional Environmental Officer

Stephen R. Spencer
Regional Environmental Officer
United States Department of the Interior
Office of the Secretary
Office of Environmental Policy and Compliance
1001 Indian School Road NW, Suite 348
Albuquerque, NM 87104

RESPONSE TO COMMENTS

Comment No.	Response
1	Virtually all of the land in Tract 9 north of PA 9 is riparian habitat (DEIS Appendix H-1, Figure 1), which is why it was selected for riparian mitigation efforts. Prairie restoration in this area would require destruction of riparian habitat. Open lands northwest of PA 9 have not been made available by the non-Federal sponsor for use in conjunction with the FHCIP.
2	By correspondence dated December 21, 2009, Port Freeport has committed to placing all mitigation lands under a conservation easement to a resource agency like Texas Parks and Wildlife Department or a recognized nature conservancy in the event the project is constructed.

From: Murphy, Carolyn E SWG
To: Stokes, Janelle S SWG
Subject: FW: Freeport Harbor DEIS (UNCLASSIFIED)
Date: Tuesday, February 08, 2011 12:23:31 PM

Classification: UNCLASSIFIED
Caveats: NONE

-----Original Message-----
From: MacFarlane.John@epamail.epa.gov [mailto:MacFarlane.John@epamail.epa.gov]
Sent: Monday, February 07, 2011 3:46 PM
To: Murphy, Carolyn E SWG
Cc: Smith.Rhonda@epamail.epa.gov; Jansky.Michael@epamail.epa.gov
Subject: Freeport Harbor DEIS

Ms. Murphy,

Your letter dated December 15, 2010 requested a review of the DEIS by February 5, 2011. However, we are requesting a 10 day extension so we can more thoroughly review the proposed project and its impacts. 1

We appreciate the opportunity to review and comment on the DEIS.

Thank you,
John MacFarlane
NEPA Specialist
EPA, Region 6
Office of Planning and Coordination (6EN-XP)
214-665-7491

Classification: UNCLASSIFIED
Caveats: NONE

From: Murphy, Carolyn E SWG
To: MacFarlane.John@epamail.epa.gov
Cc: Smith.Rhonda@epamail.epa.gov; Jansky.Michael@epamail.epa.gov; Stokes, Janelle S SWG
Subject: RE: Freeport Harbor DEIS (UNCLASSIFIED)
Date: Monday, February 07, 2011 8:21:31 PM

Classification: UNCLASSIFIED
Caveats: NONE

Mr. MacFarlane - we will not extend the comment period; however, we will accept, include, and respond to your comments submitted in the time-frame identified below. Thank you - Carolyn

-----Original Message-----
From: MacFarlane.John@epamail.epa.gov [mailto:MacFarlane.John@epamail.epa.gov]
Sent: Monday, February 07, 2011 3:46 PM
To: Murphy, Carolyn E SWG
Cc: Smith.Rhonda@epamail.epa.gov; Jansky.Michael@epamail.epa.gov
Subject: Freeport Harbor DEIS

Ms. Murphy,

Your letter dated December 15, 2010 requested a review of the DEIS by February 5, 2011. However, we are requesting a 10 day extension so we can more thoroughly review the proposed project and its impacts.

We appreciate the opportunity to review and comment on the DEIS.

Thank you,
John MacFarlane
NEPA Specialist
EPA, Region 6
Office of Planning and Coordination (6EN-XP)
214-665-7491

Classification: UNCLASSIFIED
Caveats: NONE

John MacFarlane
NEPA Specialist
EPA, Region 6
Office of Planning and Coordination

RESPONSE TO COMMENTS

Comment No.	Response
1	Email request from EPA was responded to via email. The Corps declined to formally extend the public comment period but agreed to receive, incorporate, and respond to all comments received within 2 weeks of the formal comment period.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

February 11, 2011

Janelle Stokes
U.S. Army Corps of Engineers,
Galveston District
P.O. Box 1229
Galveston, Texas 77553-1229

Dear Ms. Stokes:

In accordance with our responsibilities under Section 309 of the Clean Air Act (CAA), the National Environmental Policy Act (NEPA), and the Council on Environmental Quality (CEQ) regulations for implementing NEPA, the U.S. Environmental Protection Agency (EPA) Region 6 office in Dallas, Texas, has completed its review of the Draft Environmental Impact Statement (DEIS) prepared by the Galveston District, U.S. Army Corps of Engineers for the Freeport Harbor Channel Improvement Project, Brazoria County, Texas. The Brazos River Harbor Navigation District (also known as Port Freeport) proposes to deepen and widen the Freeport Harbor Channel and associated turning basins (except Brazos Harbor), up to and including the Stauffer Turning Basin to eliminate existing operational constraints.

EPA rates the DEIS as "**EC-2**" i.e., EPA has "Environmental Concerns and Requests Additional Information in the Final EIS (FEIS)". Detailed comments are enclosed with this letter which more clearly identifies our concerns and the informational needs requested for incorporation into the FEIS.

EPA appreciates the opportunity to review the DEIS. Please send our office five copies of the FEIS when it is sent to the Office of Federal Activities, EPA (Mail Code 2252A), Ariel Rios Federal Building, 1200 Pennsylvania Ave, N.W., Washington, D.C. 20004. Our classification will be published on the EPA website, www.epa.gov, according to our responsibility under Section 309 of the CAA to inform the public of our views on the proposed Federal action. If you have any questions or concerns, please contact Michael Jansky of my staff at jansky.michael@epa.gov or 214-665-7451 for assistance.

Sincerely,

Rhonda Smith
Chief, Office of Planning
and Coordination

Enclosure

Recycled/Recyclable • Printed with Vegetable Oil Based Inks on 100% Recycled Paper (40% Postconsumer)

DETAILED COMMENTS ON THE
U.S. ARMY CORPS OF ENGINEERS
GALVESTON DISTRICT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE
FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT
BRAZORIA COUNTY, TEXAS

BACKGROUND: The U.S. Army Corps of Engineers (USACE), Galveston District, under the authority of Section 216 of the 1970 Flood Control Act, proposes to widen and deepen the Freeport Channel system. The USACE has prepared a DEIS to satisfy the Federal requirements established by the National Environmental Policy Act (NEPA).

COMMENTS: The following are offered for your agency's consideration in completing the FEIS:

Alternatives

The channel is currently authorized for 45-ft. The DEIS considers a range of depths from 50 to 60-ft. This section should clearly describe how the 55-ft project was chosen. EPA recommends that the rationale behind choosing the 55-ft project be stated clearly and concisely by summarizing the benefit cost ratios (BCRs), ship draft requirements, environmental impacts, and other pertinent reasons. Please include a detailed summary of the alternatives screening analysis found in the Draft Feasibility Report, including a comparison of alternatives and reasons why alternatives were eliminated or carried forward for detailed analysis. In addition, the FEIS should address if there was consideration of developing nonstructural alternatives that would utilize offshore terminals for both crude oil and/or liquefied natural gas (LNG) off loading. 1 2 3

Air Quality

The proposed project is federally funded and will be located in the Houston/Galveston/Brazoria ozone nonattainment area (HGB), and is therefore potentially subject to Federal and State General Conformity Regulations. Your analysis of nitrogen oxide (NOx) and volatile organic compound (VOC) emissions indicates that NOx emissions from this project will exceed the de minimis threshold of 25 tons per year for all years of construction (2011 – 2016) for both the National Economic Development (NED) Plan alternative and the Locally Preferred Plan (LPP) alternative. VOC emissions have been demonstrated to not exceed de minimis levels. As a result, a General Conformity determination for NOx emissions is required pursuant to 41 CFR Part 51. A General Conformity analysis was included as Appendix C to the DEIS.

We have reviewed the documents and find the estimated emissions from the proposed project to be well illustrated and quantified. These emissions, together with all other emissions in the nonattainment area, would not exceed the NOx emissions budget in the HGB State Implementation Plan (SIP) allocated to construction activities.

However, any demolition, construction, rehabilitation, repair, dredging, or filling activities have the potential to emit air pollutants and we recommend best management practices be implemented to minimize the impact of any air pollutants. Furthermore, construction and waste disposal activities should be conducted in accordance with applicable local, state and Federal statutes and regulations. We offer the following comments:

- The DEIS and appendices do not indicate plans for this project to use cleaner, newer equipment with lower NOx emissions. EPA encourages the use of clean, lower-emissions equipment and technologies to reduce pollution. Further, EPA's final Highway Diesel and Nonroad Diesel Rules mandate the use of lower-sulfur fuels in non-road and marine diesel engines beginning in 2007. The General Conformity Determination in Volume II – Draft Environmental Impact Statement states that Texas Low-Emission Diesel (TxLED) is expected to be available for use in non-road equipment such as bulldozers and dump trucks. Please include a discussion of additional measures the project will incorporate to reduce emissions and the anticipated reductions in emissions. Initiatives such as the EPA Voluntary Diesel Retrofit Program, the EPA Diesel Emission Reduction Program (DERA), and the Texas Emissions Reduction Plan (TERP) on the State level offer the opportunity to apply for resources for upgrading or replacing older equipment to reduce NOx emissions. 4

- In the Air Quality Analysis Results discussions for the NED and LPP alternatives (Volume I – Draft Environmental Impact Statement, Sections 4.4.3.1 and 4.4.4.1, respectively), it is suggested that the high moisture content of the dredged material should prevent any particulate matter emissions from upland placement areas. Please clarify if the dredged materials will remain in place during the 50 year life of the project, or if disposal/relocation of the materials may occur. Disposal or relocation activities may present fugitive dust concerns that are not addressed within the scope of this analysis. 5

It is ultimately the responsibility of the TCEQ to make the final general conformity determination for this project per 30 TAC 101.30, and find that the HGB State Implementation Plan budget can accommodate emissions associated with this project

Water Quality

Ocean Dredged Material Disposal Site

In 2006 and 2007, EPA worked with the USACE, the Port, and an interagency Dredged Material Management Team on a related non-Federal proposal by the Brazos River Harbor Navigation District to widen the same channel. The current Federal project is largely a deepening and channel extension project, though alternatives related to various outcomes of the widening project are also analyzed. During our review of the earlier non-Federal project, several significant issues related to the use of two EPA-designated Ocean Dredged Material Disposal Sites (ODMDS) for Freeport Harbor were addressed. For the most part, those issues were resolved in a manner applicable to both the non-Federal and the Federal project proposals. However, three EPA actions remain with regard to dredged material management of this Federal channel deepening project.

First, we concur with the findings presented in the DEIS with regard to the suitability of the dredged material for disposal at the two ODMDS and with the application of the ocean dumping criteria (40 CFR 220-227). Though we see no issues of concern with regard to the sediment testing and evaluation performed to date, additional sediment sampling from the Stauffer Channel and from the Outer Bar Channel extension area is proposed to be conducted during the Preconstruction, Engineering, and Design phase of the project. We request an opportunity to review that data and to coordinate further with the Corps, depending on the testing results. 6

Second, the Galveston District of the USACE has proposed to use their authority under Section 103(b) of the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA) to place approximately 12.7 million cubic yards of the new construction material that was dredged from the Channel Extension, Outer Bar, and Jetty channel into the existing, but inactive, 45-foot project "New Work ODMDS". EPA

has reviewed the designation proposal, as outlined in the DEIS and associated modeling and sediment testing studies, and makes the following stipulations: 1) the disposal and evaluation requirements of MPRSA Section 102 continue to be met by the USACE; 2) the maximum disposal mound height not exceed 12 feet, as monitored by the USACE; and 3) the material does not stack up more than 0.3 feet outside the boundary of the ODMDS, as monitored by the USACE. 7

Third, a Site Management and Monitoring Plan covering both the "New Work ODMDS" and the "Maintenance ODMDS" has been coordinated with EPA and will require approval by both EPA Region 6 and the USACE prior to disposal of the material and preferably in time for publication in the FEIS. Consequently, EPA will continue to coordinate with the USACE on formal adoption of that plan, as documented in the DEIS, Volume II, Appendix B. A modification will be considered to add a site management goal to encourage continued interagency reviews prior to each maintenance event in order to evaluate the potential for beneficial use of the dredged material. 8

Socioeconomics and Environmental Justice

The DEIS provides a somewhat limited analysis of the environmental justice implications regarding the implementation of this project; however, it does make clear that the benefits of the project will be enjoyed by all the residents, regardless of income levels. The need for the improvements in the harbor channel are clearly laid out, and the DEIS shows that the benefits to the entire community and to the nation far outweigh any negative aspects detailed in the document in general.

The DEIS took the average of the demographics of the entire county of Brazoria into account in its analysis, rather than emphasizing those of the communities that will be most impacted by this project. The DEIS concludes that there will be no disproportionate and adverse impacts on any community. In light of the huge difference between the demographics of Freeport, the city that will be most impacted by both the construction activity and the implementation of this improvement project, it appears that more care should have been taken to carefully analyze possible negative impacts on this community in particular. As of the 2008 Census figures, Texas has a 53.4% minority population, Brazoria County has a 44.9% minority population, and the city of Freeport has 81.8% minority. Texas has a 15.8% poverty level, Brazoria County has only a 9.6% poverty level, and Freeport has a 19.6% poverty level. Clearly Freeport cannot be compared with most of Brazoria County. 9

The entire county will reap much of the increased employment and business opportunities brought about by the project, but one possible impact was not really analyzed. In the event of oil spills, hazardous material spills, LNG explosions, or collisions of vessels in the harbor or channel, the entire area would be impacted, but the city of Freeport would probably be the most affected. This low-income community would have less resources and be less resilient to overcome such a disaster than would higher-income communities in the area. EPA recommends the FEIS discuss the possibility of catastrophic events and measures that would be taken to decrease the likelihood of impacts from such catastrophes. 10

Executive Order (EO) 13045-Protection of Children from Environmental Health Risks and Safety Risks

EPA recommends the FEIS consider the April 1997 Executive Order (EO) 13045 - Protection of Children from Environmental Health Risks and Safety Risks when evaluating project impacts. This EO requires that all Federal agencies "(a) shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children, and (b) shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks." Multiple schools and residences are located within one mile of the harbor channel. EPA recommends the FEIS discuss possible catastrophic events and the measures that would be taken to minimize the impact to children. 11

Cumulative Impacts

As stated in the DEIS, cumulative impacts are those impacts "on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or persons undertake such actions." EPA suggests that additional projects listed elsewhere in the DEIS be included in this section if appropriate. These projects may include highway expansions, industrial complex expansions (AirLiquide), and land purchases and annexations (and subsequent development). 12

Greenhouse Gas Emissions and Climate Change

By statutes, Executive Orders, and agency policies, the Federal government is committed to the goals of energy conservation, reducing energy use, and eliminating or reducing greenhouse gas (GHG) emissions. Although the proposed project's annual GHG emissions are projected to be less than 25,000 metric tons per year, due to the long-term utility and location, EPA recommends the DEIS include a discussion of GHG emissions and climate change. Please see CEQ's "Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions" for guidance. 13

General

EPA recommends construction staging areas and the dredge material transport pipeline be analyzed for both direct and indirect impacts. Although the actions may be temporary, the impacts require analysis. 14

Rhonda Smith
Chief, Office of Planning and Coordination
U.S. Environmental Protection Agency, Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

RESPONSE TO COMMENTS

Comment No.	Response
1	Additional information from the Feasibility Report (FR) has been added to the FEIS Chapter 2 (section 2.6.1) to more clearly describe the rationale for selection of the LPP.
2	Additional information from the Feasibility Report (FR) has been added to the FEIS Chapter 2 (sections 2.2 and 2.3) to document in greater detail the screening of alternatives.
3	Utilization of the Texas Offshore Oil Port System (TOPS) was considered as an alternative (FR Section 9.19.2). Additional information regarding this alternative was added to FEIS Chapter 2 (section 2.2.3). TOPS is a proposed offshore terminal project that would provide feedstock to Texas City, Houston, and Port Arthur. TOPS would not provide connections to Cushing, Oklahoma, which the Freeport refineries serve. The proposed FHCIP does not provide benefits for the LNG ships or terminal; LNG use of the channel will occur without the proposed FHCIP. Therefore, evaluation of a LNG offshore terminal as a project alternative is not needed or appropriate.
4	By letter dated March 1, 2011, TCEQ provided general conformity concurrence for the proposed FHCIP and determined that emissions would not exceed the emissions budgets specified in the most recent state implementation plan. TCEQ recommended that USACE adopt pollution prevention and/reduction measures in conjunction with this project. USACE will: 1) encourage construction contractors to apply for Texas Emission Reduction Plan grants, the EPA's Voluntary Diesel Retrofit Program, or the EPA's Diesel Emission Reduction Plan offering the opportunity to apply for resources for upgrading or replacing older equipment to reduce NO_X emissions, 2)encourage contractors to use cleaner, newer equipment with lower NO_X emissions), 3) direct contractors and operators that will use non-road diesel equipment to use clean, low-sulfur fuels, 4) direct contractors that will use tugboats during construction to use clean, low-sulfur fuels, 5) direct operators of the assist tugboats used in maneuvering dredge vessels to use clean, low-sulfur fuels, and 6) direct operators of the dredging vessels to use clean, low-sulfur fuels.
5	The dredged material placed in upland Placement Areas (PA) 1, 8 and 9 will remain in place for the 50 year life of the project. PAs are managed to control blowing dust should it become an issue.
6	EPA concurred with the DEIS findings that the FHCIP dredged material is suitable for disposal at the two ODMDS. As requested, USACE will provide EPA an opportunity to review sediment data collected during the PED phase of this project, and will coordinate further depending upon the testing results.
7	In a teleconference with USACE on March 8, 2011, EPA agreed that the maximum disposal mound heights for the New Work ODMDS, as originally proposed in the draft SMMP (e.g. less than 15 ft above the existing bottom elevation for Tier C1 and less than 20 feet above the existing bottom elevation for Tier C2), are acceptable. The primary biological impact from use of the ODMDS is burial of the benthos, which occurs with 1 foot or more of mounding; therefore, there is no biological reason to restrict mound height. The maximum height was set to ensure adequate clearance for vessels expected to traverse the area.
8	USACE does not believe that a modification is needed because the SMMP already addresses this issue. Section VII of the SMMP states that it is Galveston District policy to require implementation of the beneficial use (BU) of dredged material, wherever practicable. Further, the SMMP explains that resource agencies were consulted in an effort to identify a BU plan for the FHCIP; however, it was determined that identified alternatives were either economically prohibitive or geotechnically incompatible.
9	Additional, detailed EJ analysis has been conducted and included in FEIS Chapter 4. However, the

	evaluation will not include an evaluation of the impacts associated with potential LNG accidents. The proposed FHCIP does not provide benefits for the LNG ships or terminal; LNG use of the channel will occur without the proposed FHCIP. The previously-permitted Port Freeport Channel Widening Project addresses the needs of the LNG industry and terminal.
10	The Environmental Justice section in FEIS Chapter 4 has been revised to discuss the risk of catastrophic events and existing emergency plans. Risks of catastrophic events associated with the LNG ships or terminal were not be included in this analysis for reasons explained in response 9, above.
11	USACE evaluated project-related environmental health and safety risks to children in accordance with the EO, and included this evaluation in FEIS Chapter 4 (Environmental Consequences) and Chapter 8.0 (Consistency with Other State and Federal Regulations). An evaluation of how existing catastrophic event response plans would minimize the impacts to children's health and safety is included.
12	The cumulative impacts section of the FEIS (Chapter 6) has been revised to address additional projects listed originally in the DEIS.
13	Additional analysis has been conducted and greenhouse gas and climate change has been addressed in the FEIS. USACE evaluated GHG emission impacts of the Preferred Alternative and related these impacts to global climate change in accordance with the Council on Environmental Quality's "Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions". This discussion was incorporated as an attachment to FEIS Appendix C (General Conformity Determination and Air Emissions Estimates). A summary of this analysis was also included in the air quality section of FEIS Chapter 4.
14	All staging areas and pipeline corridors would fall within the project area footprint identified for the project and have already been taken into account in the DEIS. A more explicit discussion of these impacts were included in the physiography/geology, water exchange/inflows/quality, vegetation, terrestrial and aquatic wildlife, endangered species, and cultural resources sections of FEIS Chapter 4.

TEXAS GENERAL LAND OFFICE

JERRY PATTERSON, COMMISSIONER

February 3, 2011

Colonel Christopher W. Sallese
U.S. Army Corps of Engineers
Galveston District
P.O. Box 1229
Galveston, TX 77553-1229

Dear Colonel Sallese:

The Texas General Land Office has reviewed the Draft Environmental Impact Statement (DEIS) for the proposed Freeport Harbor Channel Improvement Project. We are in the process of composing comments in response to the DEIS; however, additional time is needed for us to finalize our comments and submit them for inner agency review. I respectfully request that we be granted an extension to February 15, 2011 to submit our comments. Your consideration of this request would be greatly appreciated. 1

Please contact me by phone at (512) 463-5338 or by email at helen.young@glo.texas.gov if you need any additional information regarding this request.

Sincerely,

for Helen Young

Helen Young
Deputy Commissioner for Coastal Resources
Texas General Land Office

cc: Janelle Stokes, USACE Galveston

Stephen F. Austin Building • 1700 North Congress Avenue • Austin, Texas 78701-1495
Post Office Box 12873 • Austin, Texas 78711-2873
512-463-5001 • 800-998-4GLO
www.glo.state.tx.us

Helen Young
Deputy Commissioner for Coastal Resources
Texas General Land Office
1700 North Congress Avenue
Austin, TX 78701-1495

RESPONSE TO COMMENTS

Comment No.	Response
1	Request from GLO was responded to telephonically. The Corps declined to formally extend the public comment period but agreed to receive, incorporate, and respond to all comments received within 2 weeks of the formal comment period.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
101 South Main Street
Temple, Texas 76501-7602

January 18, 2011

Ms. Janelle Stokes
U.S. Army Corps of Engineers, Galveston District
P. O. Box 1229
Galveston, Texas 77553-1229

Re: COMMENT: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT, BRAZORIA COUNTY, TX

Dear Ms. Stokes:

We have reviewed the Draft Environmental Impact Statement (DEIS) regarding the referenced project. Please accept our comments below.

Placement Area 8 (PA-8)

Depositing dredge material in PA-8 may constitute a wetland conversion according to the Food Security Act of 1985, as amended, if the activity has the effect of making possible the production of an agricultural commodity. Such a conversion would render the landowner ineligible for certain USDA benefits associated with all their operations and may affect the USDA benefits of any affiliated persons. 1

According to Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx), PA-8 is planned in an area where the soils are mapped as Surfside and Velasco clays. Both are saline soils found in the marshes of Brazoria County. The county Hydric Soils list describes both soils as completely hydric, including inclusions, due to the fact that they are poorly drained and a water table can be found one foot or less below the surface during the growing season.

Considering its position on the landscape and the inherent characteristics of the mapped soils, there is a good chance that significant portions of PA-8 could be considered wetlands according to the Food Security Act of 1985, as amended. 2

Placement Area 9 (PA-9)

According the Web Soil Survey, all soils mapped in PA-9 are considered *Prime Farmland.* As part of our DEIS review, we examined the prime farmland calculations associated with PA-9 and presented in Appendix A-4.

Ms. Janelle Stokes
Page 2

According to our analysis, the Land Evaluation Criterion Relative Value of Farmland to be "Converted" to be entered in Part V of the Farmland Conversion Impact Rating (Form AD-1006) should be 96. Our calculations are presented below. Also, we noticed in Part VI that the Total Site Assessment Points sum should have been 65 as opposed to the 60 reported. A Land Evaluation Criterion Relative Value, in this case 96, added to the Total Site Assessment Points, in this case 65, gives PA-9 a Farmland Conversion Impact rating of 161 which makes the site subject to the Farmland Protection Policy Act (FPPA). 3

Thank you for the opportunity to comment.

Soils mapped in FHCIP placement area 9

Soil map unit		Acres in		
Symbol	Name	AOI	NIRR	Score
10	Brazoria clay, 0-1 % slopes	150.9	100	15,090
12	Clemville scl	16.3	90	1,467
33	Norwood silt loam, 0-1 % slopes	41.5	90	3,735
36	Pledger clay	40.9	90	3,681
	Total	249.6		23,973
	Land evaluation criterion relative value	→	**96**	

Thank you for the opportunity to comment. If we can be of further assistance do not hesitate to contact Susan Baggett at 254-742-9805 or susan.baggett@tx.usda.gov.

Sincerely

Salvador Salinas

SALVADOR SALINAS
Acting State Conservationist

cc: Susan Baggett, SRC, NRCS, Temple, TX

Salvador Salinas
Acting State Conservationist
NRCS
101 South Main Street
Temple, TX 76501-7602

RESPONSE TO COMMENTS

Comment No.	Response
1	The 168 acres in PA 8 are owned by Port Freeport. The area would be converted to a placement area, and would be used for the long-term confinement of dredged materials. There is no plan to convert the area to agricultural use.
2	Wetlands in PA 8 were delineated by USACE with assistance and input from USFWS and TPWD. A total of 23 acres of wetlands were identified in the area to be impacted by construction of PA 8, and a mitigation plan has proposed to compensate for these impacts.
3	The text of the FEIS has been revised to acknowledge that the revised Farm Conversion Impact Rating of 161 makes this site subject to the FPPA. The FEIS evaluated detailed alternatives and identified no other practicable alternatives for the placement of dredged material from this project.

Life's better outside.®

Commissioners

Peter M. Holt
Chairman
San Antonio

T. Dan Friedkin
Vice-Chairman
Houston

Mark E. Bivins
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Margaret Martin
Boerne

S. Reed Morian
Houston

Lee M. Bass
Chairman-Emeritus
Fort Worth

Carter P. Smith
Executive Director

January 28, 2011

Ms. Janelle Stokes
U.S. Army Corps of Engineers
Galveston District
P.O. Box 1229
Galveston, Texas 77553-1229

TCEQ 401 Coordinator
Mail Code 150
TCEQ
P.O. Box 13087
Austin, Texas 73711-3087

Re: Draft Environmental Impact Statement (DEIS) for the Proposed Freeport Harbor Channel Improvement Project

Texas Parks and Wildlife Department (TPWD) has reviewed the DEIS for the proposed Freeport Harbor Channel Improvement Project (FHCIP). TPWD has participated in two site visits to the proposed project area and in a letter dated October 6, 2005 provided comments regarding the functions and values of the habitat, made recommendations regarding the beneficial use (BU) of the dredge material, and the use of two potential disposal areas for the placement of dredge material. Additionally, in a letter dated February 22, 2008 TPWD provided comments regarding the document entitled Freeport Harbor Channel Improvement Project- Environmental Mitigation for Habitat Impacts on Proposed Placement Areas 8 & 9 dated November 15, 2007.

In various locations of the DEIS it states, "Coordination with U.S. Fish and Wildlife Service (USFWS) and the Texas Parks and Wildlife Department (TPWD) regarding these [vegetation and wetlands] impacts has resulted in proposed mitigation that includes creation and maintenance of forested habitat and creation of wetland areas adjacent to impact areas." While this statement is correct, the coordination did not result in a mitigation plan that adequately compensates for the proposed project's impacts to habitat.

Appendix H-1, Mitigation and HEP/Cost Analysis Report located in Volume II of the DEIS, does acknowledged that "agencies [USFWS and TPWD] made a number of recommendations we [the U.S. Army Corps of Engineers] could not concur with for project mitigation." Particularly, "TPWD requested preservations in perpetuity of a 5-acre ephemeral wetland swale located between PA 8 and SH 36 as a mitigation feature. However, the Port does not wish to make this property available for project mitigation. The resource agencies also requested mitigation for the 358 acres of pasture impacted by PA's 8 and 9. The agencies classify these pastures as wet-coastal prairie. We [the U.S. Army Corps of Engineers] do not concur with this classification. Although the land may have at one time been coastal prairie, it is now degraded grassland primarily consisting of non-native pasture grasses limited of wildlife habitat value that does not merit mitigation."

As stated from our letter dated February 22, 2008, "TPWD disagrees with the Corps classification of the habitat present at the proposed disposal areas and their assessment of it as not significant. The Service also considers this habitat as wet 1

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512.389.4800
www.tpwd.state.tx.us

coastal prairie and provided a species list of vegetation and wildlife observed to support this classification in their PAL [Planning Aid Letter] dated April 5, 2007. In the same letter the Service describes coastal prairie as a valuable and declining wildlife resource." The information (species list of vegetation and wildlife observed) provided in the PAL contradicts the Corps classification of the habitat present at the proposed disposal areas.

The DEIS states, "Mitigation refers to the avoidance, minimization, and rectification, reduction, or compensation of impacts resulting from implementation of an action. For the proposed FHCIP, the majority of the potential project-related impacts were avoided. Thus, mitigation would be required only for impacts to forested and wetland habitat at the proposed new upland PA's." It is unclear how or why the U.S. Army Corps of Engineers (Corps) determined that "the majority of the potential project-related impacts were avoided." Even though the Corps does not concur with the USFWS and TPWD regarding the habitat value of the wet coastal prairie that is proposed to be impacted by PA 8 and 9, the proposed project will still impact 358 acres of habitat and does merit mitigation (the avoidance, minimization, and rectification, reduction, or compensation of impacts resulting from implementation of an action). 2

As proposed, the project would impact 358 acres of coastal prairie, 39 acres of freshwater wetlands, and 21 acres of riparian forest. The Corps mitigation plan would improve 12 acres of exiting forest, a 0.57 to 1.0 compensation ratio, create 3.0 acres of freshwater wetlands, a 0.077 to 1 compensation ratio, and no mitigation is proposed to compensate for impacts to coastal prairie. The Corps proposed mitigation plan is inadequate and does not compensate for the majority of the proposed impacts at the project site. 3

Texas Parks and Wildlife Department is not opposed to the widening and deepening of the Freeport Harbor Channel system, but recommends that all impacts to habitat associated with the proposed action be appropriately compensated for. Specifically, TPWD continues to recommend that, if suitable dredge material exists, the Corps and local sponsor consider the beneficial use of the dredge material to restore and enhance fish and wildlife habitat. If the material is not suitable, TPWD does not object to the upland disposal on PA-8 or PA-9, but recommends that the entire 21-acre wooded areas on PA-9 and 117-acre wooded area directly to adjacent PA-9 be avoided. TPWD continues to recommend the wetland swale on PA-8 with an upland buffer component also be avoided and included as mitigation for the impacts to freshwater wetlands. An appropriate upland buffer for this wetland would be the upland between the wetland and SH 36 and the uplands between the wetland and the barbed wire fence dividing the area. Additionally, TPWD recommends all impacts to the coastal prairie be assessed and be compensated for appropriately. Due to the 4 5 6

inadequacy of the mitigation plan presented in this DEIS, TPWD does not concur with the findings of the DEIS.

Questions can be directed to Cherie O'Brien in the Dickinson Field Office at 281-534-0132.

Sincerely,

Rebecca Hensley
Regional Director, Ecosystem Resources Program
Science and Policy Branch
TPWD Coastal Fisheries Division

RH:COB

Rebecca Hensley
Regional Director, Ecosystem Resources Program
Science and Policy Branch
TPWD Coastal Fisheries Division
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, TX 78744-3291

RESPONSE TO COMMENTS

Comment No.	Response
1	Information supporting the USACE classification of the area as degraded grassland, primarily consisting of non-native pasture grasses of limited wildlife habitat value, is provided in FEIS Appendix H, Section 6.0.
2	DEIS Section 5.0 refers to "potential" project-related impacts. The statement refers to the fact that USACE and the non-Federal sponsor worked to develop a plan that minimizes and avoids environmental impacts to the greatest extent possible. USACE recognizes that the proposed project would result in significant impacts, for which compensatory mitigation has been proposed.
3	The amount of compensatory mitigation was determined by HEP modeling, and was not based on ratios. USACE policy requires the use of a habitat-based methodology to evaluate impacts and quantify necessary mitigation. The HEP methodology quantifies habitat quality and quantity, and as such evaluates the functional habitat suitability of the mitigation sites.
4	The potential for beneficial use of dredged material was thoroughly investigated during this study, as described in FEIS Section 2.5.
5	As shown in the FEIS, Appendix H-1 (Figures 1 and 2), the 117 acres of riparian forest are contained within the 131-acre area that would be preserved as part of the mitigation plan, thus adverse impacts will be avoided. The wetland swale and upland buffers, located adjacent to State Highway 36, are being avoided by PA 8. The 21 acres of riparian forest are located within the proposed boundaries of PA 9, and thus impacts cannot be avoided. The boundaries of the PA were drawn to avoid as much of the riparian forest as possible; mitigation has been proposed to compensate for the unavoidable forest impacts.
6	Please see FEIS, Appendix H-1, Section 2. USACE does not concur with your classification of this degraded grassland as coastal prairie. The area consists primarily of non-native pasture grasses of limited wildlife value that does not merit mitigation.

Bryan W. Shaw, Ph.D., *Chairman*
Buddy Garcia, *Commissioner*
Carlos Rubinstein, *Commissioner*
Mark R. Vickery, P.G., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

December 20, 2010

Ms. Janelle Stokes
Department of the Army
Galveston District, Corps of Engineers
P.O. Box 1229
Galveston, TX 77553-1229

Re: TCEQ Grant and Texas Review and Comment System (TRACS) #2010-570, Brazoria County – Proposed Freeport Harbor Channel Improvement Project

Dear Ms. Stokes:

The Texas Commission on Environmental Quality (TCEQ) has reviewed the above-referenced project and offers following comments:

We look forward to reviewing environmental assessment documents as they become available. 1

We do not anticipate significant long term environmental impacts from this project as long as construction and waste disposal activities associated with it are completed in accordance with applicable local, state, and federal environmental permits and regulations. We recommend that the applicant take necessary steps to insure that best management practices are utilized to control runoff from construction sites to prevent detrimental impact to surface and ground water. 2

Thank you for the opportunity to review this project. If you have any questions, please call Ms. Tangela Niemann at (512) 239-3786.

Sincerely,

Jim Harrison, Director
Intergovernmental Relations Division

Jim Harrison, Director
Intergovernmental Relations Division
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, TX 78711-3087

RESPONSE TO COMMENTS

Comment No.	Response
1	USACE spoke with Ms Tangela Niemann on January 5, 2010, who confirmed TCEQ had received the documents.
2	Best management practices will be incorporated into construction contracts to control runoff and prevent impacts to surface and ground water.

Bryan W. Shaw, Ph.D., *Chairman*
Buddy Garcia, *Commissioner*
Carlos Rubinstein, *Commissioner*
Mark R. Vickery, P.G., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

March 1, 2011

Ms. Janelle Stokes
Regional Environmental Specialist
United States Army Corps of Engineers, Galveston District
P.O. Box 1229
Galveston, Texas 77553-1229

Re: General Conformity Concurrence for the Freeport Harbor Channel Improvement Project

Dear Ms. Stokes:

This letter provides general conformity concurrence for the proposed Freeport Harbor Channel Improvement Project. The Texas Commission on Environmental Quality (TCEQ) reviewed the project in accordance with Title 40 Code of Federal Regulations Part 93, and Title 30 Texas Administrative Code (TAC) § 101.30. The proposed project is located in the Houston-Galveston-Brazoria (HGB) area, which is classified as severe nonattainment for the 1997 eight-hour ozone standard, and emissions are expected to be above the 25 tons per year *de minimis* threshold. This threshold amount is specified in the table found in § 101.30(c)(2)(A). Therefore, a general conformity analysis is required.

The TCEQ has determined, pursuant to 30 TAC §101.30(h)(1)(E)(i)(I), that emissions from the proposed project will not exceed the emissions budgets specified in the most recent state implementation plan (SIP) revision approved by the United States Environmental Protection Agency (EPA). The most recently approved SIP revision, the HGB Reasonable Further Progress SIP adopted by the Commission on May 23, 2007, was approved by the EPA on March 29, 2010. This general conformity determination is based upon information provided in a December 2010 Draft General Conformity Determination prepared for the United States Army Corps of Engineers (USACE).

In support of the ozone National Ambient Air Quality Standard, the TCEQ suggests the USACE adopt pollution prevention and/or reduction measures in conjunction with this and future projects, such as the following:

- encourage construction contractors to apply for Texas Emission Reduction Plan grants;
- establish bidding conditions that give preference to clean contractors;
- direct construction contractors to exercise air quality best management practices;
- direct contractors that will use tugboats during construction to use clean fuels;
- direct operators of the assist tugboats used in maneuvering dredge vessels to use clean fuels;
- select assist tugs based on lowest nitrogen oxides (NO_X) emissions instead of lowest price; or
- purchase and permanently retire surplus NO_X offsets prior to commencement of operations.

Thank you for providing the necessary information and staff assistance for our review. We would also appreciate update(s), as appropriate, as this project moves forward. I look forward to working with you in the future on any upcoming projects you may have that affect air quality in your district. If you require further assistance on this matter, please contact Mrs. Amy Muttoni at (512) 239-6351 or Amy.Muttoni@tceq.texas.gov.

Sincerely,

David Brymer, Director
Air Quality Division
Texas Commission on Environmental Quality

DB/KH/kb

David Brymer, Director
Air Quality Division
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, TX 78711-3087

RESPONSE TO COMMENTS

Comment No.	Response
1	By this letter, USACE notes that TCEQ has provided general conformity concurrence for the proposed FHCIP, and that TCEQ has determined that emissions will not exceed the emissions budgets specified in the most recent state implementation plan.
2	TCEQ recommended that USACE adopt pollution prevention and/reduction measures in conjunction with this project. USACE will: 1) encourage construction contractors to apply for Texas Emission Reduction Plan grants, the EPA's Voluntary Diesel Retrofit Program, or the EPA's Diesel Emission Reduction Plan offering the opportunity to apply for resources for upgrading or replacing older equipment to reduce NO_X emissions, 2)encourage contractors to use cleaner, newer equipment with lower NO_X emissions), 3) direct contractors and operators that will use non-road diesel equipment to use clean, low-sulfur fuels, 4) direct contractors that will use tugboats during construction to use clean, low-sulfur fuels, 5) direct operators of the assist tugboats used in maneuvering dredge vessels to use clean, low-sulfur fuels, and 6) direct operators of the dredging vessels to use clean, low-sulfur fuels.

Public Comments

BASF

The Chemical Company

January 13, 2011

To: Port of Freeport, US Army Corps of Engineers
From: BASF Freeport

RE: Widening, Deepening of Port of Freeport Ship Channel

Dear Sirs and Madams,

BASF Freeport has had a long-standing partnership with the Port of Freeport, mainly as it relates to our ammonia terminal at the Port. Ammonia is a key raw material for our BASF Freeport production site, where it is used to produce fertilizer and nylon, among other products.

BASF Freeport would like to go on public record with our support for the widening and deepening of the Port channel. With the channel as it's constructed now, there can be only one-way traffic, and its current size prohibits the Port from night shipments. The widening/deepening project will allow for two-way traffic and make the Port available for ships 24-hours-day. This means increased traffic for the Port, including allowing the access for larger tankers that can't access it now due to the size of the channel. 1

Such increased traffic leads to increased commerce. That in turn means the Port is able to continue to prosper and grow. The Port's prosperity and vitality is critical to many businesses in the area, including BASF and our other industry neighbors.

In addition, the project means more jobs, and that is good for the community. With the increased traffic and increased commerce, the general economy of the local community benefits as well.

With the project coinciding with the Panama Canal project, Freeport will have the opportunity to be competitive with some of the largest ports in the nation – a position that would enhance the greater Freeport community immensely. The barrier to the Port's gaining such a competitive advantage has always been the size of the channel; hence we see the widening/deepening project as critical to the Port's success in the future.

In addition, with the channel expansion, there would be more options than exist now for how we – companies in general – transport our products across the nation and around the world. Having more options generally means having more cost flexibility, and that's good for business, and ultimately, good for the consumer.

BASF Freeport thanks you for allowing us to voice our opinion in this matter.

On Behalf of BASF Freeport,

Christopher Witte
Sr. Vice President

BASF Corporation
602 Copper Road
Freeport, TX 77541
Tel: (979) 415-6100
www.basf.com/usa

OPEN HOUSE AND PUBLIC MEETING FOR THE
ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED
FREEPORT HARBOR, TX, CHANNEL IMPROVEMENT PROJECT

JANUARY 13, 2011
OPEN HOUSE 5:30 – 7:00 PM, PUBLIC MEETING 7:00 PM

COMMENT FORM

This form is provided for your comments regarding the issues to be addressed in the Freeport Harbor Channel Improvement Project Draft Environmental Impact Statement (EIS) for the proposed Freeport Harbor, TX Channel Improvement Project. Please use the space below, attaching additional pages if necessary. The form may be deposited in the comment box, or mailed to the address provided below. We appreciate your interest in and contributions towards, this project.

Comments:

BASF
The Chemical Company

Christopher P. Witte
Senior Vice President
Freeport Site

BASF Corporation
602 Copper Road
Freeport, TX 77541

Telephone 979-415-6111
Fax 979-415-8482
christopher.witte@basf.com
www.basf.us

Mail your comments by February 5, 2011 to:

District Engineer, Galveston District
U.S. Army Corps of Engineers
Attn: Robert Van Hook; CESWG-PE-PL
P.O. Box 1229
Galveston, Texas 77553-1229

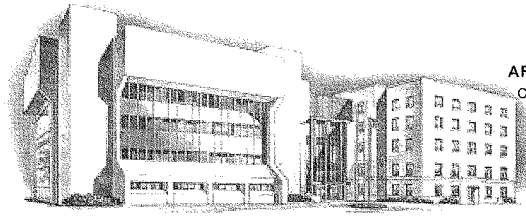
Please Print:
Your Name Chris Witte
Address 602 Copper Rd.
Freeport, TX 77541

Christopher Witte
Sr. Vice President
BASF Corporation
602 Copper Road
Freeport, TX 77541

RESPONSE TO COMMENTS

Comment No.	Response
1	Thank you for your support.

E. J. KING
BRAZORIA COUNTY JUDGE



ARTHUR VELASQUEZ
CHIEF ADMINISTRATOR

BRAZORIA COUNTY

January 25, 2011

District Engineer,
U. S. Army Corps of Engineers,
Galveston District
Attn: Robert Van Hook
Room CESWG-PEPL
P. O. Box 1229
Galveston, Texas 77553-1229

Re: Port Freeport 55ft. Project

Gentlemen:

I am writing you to express my support of the proposed 55 ft. Project for Port Freeport. It is my understanding that a draft environmental impact statement and a draft feasibility study have been completed and presented publicly for comments. It appears that the present plan adequately protects fish and wildlife in the area of the project. 1

Constructing a deeper and wider 55 foot by 600 foot channel will allow larger vessels to utilize the Port which in turn will increase tonnage going in and out of the Port. This project is the best alternative considering the relationship between benefits and the costs involved. This can only make the Port more efficient by lowering the cost of transporting petroleum and other products and materials through the harbor.

Port Freeport is a dynamic and vibrant engine which helps drive the economy of Brazoria County. I know I speak for all of our citizens in asking for the Corps' continued assistance in making this project a reality.

Sincerely,

E.J. King,
County Judge
Brazoria County

BRAZORIA COUNTY COURTHOUSE • ANGLETON, TEXAS 77515
(979) 864-1200 • (979) 388-1200 • (281) 756-1200 • Fax (979) 864-4655

E.J. King
Brazoria County Judge
Brazoria County Courthouse
Angleton, TX 77515

RESPONSE TO COMMENTS

Comment No.	Response
1	Thank you for your support.

BRAZOS PILOTS ASSOCIATION
FREEPORT, TEXAS

USACE
Galveston District
Attn: Janelle Stokes
PO Box 1229
Galveston, TX 77553-1229

January 7, 2011

Re: DEIS for the Proposed Freeport Harbor Channel Improvement Project, Brazoria County, TX

To whom it may concern:

The Brazos Pilots Association have reviewed the DEIS and DGCD for the Brazos Harbor Channel Improvements Project and we are in support of the Locally Preferred Plan (LPP) Alternative (55-x-600 foot plan).

If you have any questions about our support for this plan please feel free to contact me.

Regards,

Billy Burns

Billy Burns
President

Cc: Pete Reixach, Port Freeport
David Knuckey, Port Freeport
Keith Little, Freeport LNG

PO Box 2246 * Freeport, TX 77542 * 979-233-1120 * Fax 979-233-7071 * www.brazospilots.com

Billy Burns
President
Brazos Pilots Association
P.O. Box 2246
Freeport, TX 77542

RESPONSE TO COMMENTS

Comment No.	Response
1	Thank you for your support.

BRAZOSPORT AREA CHAMBER OF COMMERCE

Brazosport Is 2011 Open for Business

Website: www.brazosport.org
E-Mail: chamber2@sbcglobal.net

300 Abner Jackson Parkway • Brazosport, Texas 77566
979/285-2501 • FAX 979/285-2505

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DAVID WINDER
The Dow Chemical Company

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Sec. Joan Huffman's Office

JOHN HOSS
Freeport Launch Service

JIM HODGES
Shintech

Terms Expire 12/31/13
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SANDRA SHAW
President & CEO

DONNA HARGRAVES
Executive Vice President

PATRICIA DELAROSA
Administrative Assistant

EDITH FISCHER
Director of Tourism

January 31, 2011

District Engineer
U.S. Army Corps of Engineers
ATTN: Robert Van Hook
Room CESWG-PEPL
P. O. Box 1229
Galveston, Texas 77553-1229

Dear Mr. Van Hook,

The Board of Directors of the Brazosport Area Chamber of Commerce strongly support the 55 ft. project proposed by Port Freeport. 1

Due to current size, the existing Channel System is restrictive to a large portion of the current world fleet. As you are aware, Port Freeport is one of the Nation's most important Ports for the Petrochemical Industry, 16th largest port in foreign imports and exports and the Nation's 26th largest waterway in tonnage.

The deepening and widening of the existing entrance channel would improve the navigational efficiency and safety of the Freeport Harbor Channel and pave the way for future economic growth.

Again, the Chamber strongly supports this project.

Sincerely,

Patty Sayes

Patty Sayes,
2011 Chairman of the Board

Patty Sayes
Chairman of the Board
Brazosport Area Chamber of Commerce
300 Abner Jackson Parkway
Brazosport, TX 77566

RESPONSE TO COMMENTS

Comment No.	Response
1	Thank you for your support.

ConocoPhillips

Michael Nervie
Manager LNG Terminals
600 N. Dairy Ashford
Houston, TX 77079

February 1, 2011

Janelle Stokes
P.O. Box 1229
Galveston, TX 77553-1229

Dear Ms Stokes,

ConocoPhillips is in support of the ***Freeport Harbor Channel Improvement Project – Brazoria County, Texas.*** The project proposes to widen and deepen Port Freeport as described in the Draft Environmental Impact Statement (DEIS), Draft General Conformity Determination (DGCD) and Draft Feasibility Report (DFR). The Locally Preferred Plan will allow an effective, safe and efficient waterway and positively impact the following:

- Decrease transportation costs
- Reduce the potential for vessel delays
- Enhance the Port's ability to accommodate larger crude and LNG vessels
- Eliminate current operational constraints (one-way traffic and night transit restrictions)
- Improve navigation safety margins
- Attract new business which benefits the local economy

Please accept ConocoPhillips' support for this important project which affords Port Freeport a competitive global advantage. 1

Sincerely,

Michael A. Nervie
Manager, LNG Terminals

Michael Nervie
ConocoPhillips
Manager LNG Terminals
600 N. Dairy Ashford
Houston, TX 77079

RESPONSE TO COMMENTS

Comment No.	Response
1	Thank you for your support.

OPEN HOUSE AND PUBLIC MEETING FOR THE
ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED
FREEPORT HARBOR, TX, CHANNEL IMPROVEMENT PROJECT

JANUARY 13, 2011
OPEN HOUSE 5:30 – 7:00 PM, PUBLIC MEETING 7:00 PM

COMMENT FORM

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Comments:

I am against ANY sand, dirt being removed from the Freeport Texas ship channel My home is being vibrated apart when the Freeport Liquified Natural Gas ships dock My simple mind thinks more dirt would stop this. Untill my home is secure - I do not want my tax dollars being used to tear up my / only home - so no dredging please! 1

Mail your comments by February 5, 2011 to:

District Engineer, Galveston District
U.S. Army Corps of Engineers
Attn: Robert Van Hook; CESWG-PE-PL
P.O. Box 1229
Galveston, Texas 77553-1229

Please Print:
Your Name Teresa Cornelison
MAILING Address 201 E. Park Avenue
Freeport, Texas 77541
physical address: 506 East /
Quintana, Tx. 77541

Teresa Cornelison
201 E. Park Avenue
Freeport, TX 77541

RESPONSE TO COMMENTS

Comment No.	Response
1	Deepening the Freeport Harbor Channel will have no effect on the operation of the Freeport LNG Development terminal, nor will it affect foundation stability anywhere in the project area.

The Dow Chemical Company
2301 N. Brazosport Blvd.
Freeport, Texas 77541-3257

February 3, 2011

District Engineer
U.S. Army Corps of Engineers
Room CESWG-PEPL
P.O. Box 1229
Galveston, Texas 77553-1229

Attn: Robert Van Hook

Re: Port Freeport 55 Ft Project

Dear Mr. Hook:

Please accept this letter as support of The Dow Chemical Company for the proposed project to dredge and deepen the Freeport Harbor navigation channel and harbor located in Freeport, Texas. 1

Our 65-plant facility in Freeport is the largest single-company chemical complex in the Western Hemisphere, employing more than 4,200 employees and 2,800 contractors on a daily basis. We produce 15 billion pounds of product for sell externally – much of this going or could go out over Freeport Harbor docks.

Port Freeport and the Freeport Harbor navigation channel are vital to the continuing prosperity of Dow, Brazoria County and the entire Gulf Coast Region. The 55 Ft Project will enhance Dow's competitiveness and with the widening of the Panama Canal could open many future opportunities for Dow and others.

Sincerely,

Gary L. Hockstra
Vice President & Site Director
Texas Operations

cc: Pete Reixach, Executive Port Director, Port Freeport
Steve Hazlewood, Government Affairs Director, Dow Texas Operations

Gary L. Hockstra
Vice President & site Director
Texas Operations
The Dow Chemical Company
2301 N. Brazosport Blvd.
Freeport, TX 77541-3257

RESPONSE TO COMMENTS

Comment No.	Response
1	Thank you for your support.

OPEN HOUSE AND PUBLIC MEETING FOR THE ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED FREEPORT HARBOR, TX, CHANNEL IMPROVEMENT PROJECT

JANUARY 13, 2011

OPEN HOUSE 5:30 – 7:30 PM, PUBLIC MEETING 7:00 PM

COMMENT FORM

RE: Freeport Harbor Improvement Project/Comments on Draft EIS dated 12/23/10

I submit these comments in regard to the above referenced project and on behalf of my business Freeport Launch, LP. which has served the Freeport harbor for 15 years. We own and operate a private terminal facility; additionally, we provide launch services (delivery of ship's supplies) in the Brazos Harbor area extending into Gulf for a 125 mile radius as well as general marine services. As part of our services we offer lay berths to various vessels ranging in size from 65ft to 350ft with horsepower ranging from 600hp to over 6500hp. Vessels using our facility represent both U.S and foreign registry. While such vessels represent a different type of ship traffic than is associated with Port Freeport, they do represent a group of harbor users involved in both domestic and foreign trade.

Freeport Launch is aware Brazoria County is identified as a severe non-attainment zone by the EPA. As a steward of the environment, Freeport Launch strives to continually improve our operations in regard to taking a proactive approach to reducing air emissions in Freeport. As part of the effort to reduce environmental impact, and in cooperation with IMO guidelines and the state's implementation plan (SIP), we provide (and encourage) an option of electrical shore power to vessels docking at our facility. We have provided this option for 5 years to approximately 3-4 vessels per month thus reducing harmful air emissions in the Freeport area. Specifically, this effort can be directly measured by a reduction in Nitrogen Oxide and Nitrogen Dioxide (NOx), Sulfur Dioxides (SOx), Particulate Matter (PM), and Lead emissions.

Currently, we are exploring ways to improve our ability to provide this service as well as other environmentally beneficial services to Port users. However, some vessels that have attempted to use our facility find the draft restrictions inadequate – particularly to foreign vessels – thus they have been turned away resulting in lost revenue. In order to continue to effectively provide this service to a variety of vessels we must improve the ability for vessels to access our facility and the shore power. This can be achieved through extending the dredging to the old Brazos River including the area identified as the Upper Stauffer Reach. With ability to service both deeper draft vessels and more vessels we can economically justify expanding our shore power service. 1

I request that you consider my comments and assist Freeport Launch in our effort to offset the impact to air quality in the Freeport harbor. This includes the projected impact to air quality as a result of this dredging project per Section 3.6 of the Draft EIS. I will be pleased to provide any data requested in regard to my current operations and future plans.

I request that you provide copies of studies that are available on the projected increase in vessel, rail and truck traffic in our area. These studies have been conducted in an effort to plan 2

for the Freeport Harbor Improvement Project as well as the berthing/container handling facility currently under construction. This will clearly support the need to continue to provide services to Port users that will improve air quality and conform to federal and state regulatory requirements. Additionally, I request the above studies and any engineering studies addressing the impact of dredging on private facilities be made available to the public for review. 3

As an observation to the public comment process, I noted that the public was encouraged/expected to comment on a draft document at the January 13, 2011 meeting. However, the proposed document was not readily available for public viewing nor was it easily accessible. As a Port user and major stakeholder, I would have appreciated some form of direct contact with USACE. In the future, perhaps a letter directing us to a web site where copies of the drafts can be viewed, or downloaded for inspection, would be helpful. 4

As a business owner and Brazosport Chamber of Commerce Board Member, I greatly appreciate the opportunity to comment and become better informed regarding this project which is expected to have major impact on this community and economy. I support and encourage sustainable development in our region and look forward to working with Port Freeport and other Brazos Harbor stakeholders to move toward this goal.

I look forward to your response.

Thank you,

John Hoss
Freeport Launch Service, LP

Jeff Stanley
Freeport Launch Service, LP
PO Box 2905
Freeport, TX 77542

R/R/R

John Hoss and Jeff Stanley
Freeport Launch Service, LP
P.O. Box 2905
Freeport, TX 77542

RESPONSE TO COMMENTS

Comment No.	Response
1	The proposed FHCIP includes deepening the upper Stauffer Channel to 25 ft.
2	We do not have independent studies for these topics. All relevant information is presented in the FR and FEIS.
3	Engineering evaluations of the proposed FHCIP in relation to private facilities along the channel are presented in the Engineering Appendix, which is available upon request.
4	The public meeting, held on January 13, 2011, in Freeport provided an opportunity for communication with USACE. Information on how to obtain draft reports from our website was provided at that meeting.

February 3, 2011

Janelle Stokes
U.S. Army Corps of Engineers – Galveston District
P.O. Box 1229
Galveston, TX 77553-1229

Dear Ms Stokes,

Freeport LNG strongly supports the ***Freeport Harbor Channel Improvement Project***, as described in the Draft Feasibility Report (DFR) and Draft Environmental Impact Statement (DEIS) released for public comment by the Corps in December 2010. The Locally Preferred Plan would enhance the safety and efficiency of the waterway for current users, including Freeport LNG, which owns and operates an LNG import terminal at Port Freeport. The project would also attract new port users, bringing economic stimulus to the community and the region. Freeport LNG, its customers and LNG vessel operators calling at our terminal would benefit materially from the project. These benefits would include improved navigation safety margins, reduced vessel congestion during periods of inclement weather and strong longshore currents, and the enhanced potential for two-way traffic and nighttime transits. Freeport LNG is keenly interested in seeing the project implemented in the coming years. 1

Regards,

Keith Little
Vice President

Cc: Pete Reixach, Executive Director and CEO, Port Freeport

Freeport LNG Development, L.P.
333 Clay Street, Suite 5050 • Houston, Texas 77002-4173
Phone: 713-980-2888 • Fax: 713-980-2903

Keith Little
Vice President
Freeport LNG Development, L.P.
333 Clay Street, Suite 5050
Houston, TX 77002-4173

RESPONSE TO COMMENTS

Comment No.	Response
1	Thank you for your support.

2010-2011 Directors
Air Liquide America L.P.
BASF
Brazoria County
Brazosport College
Brazosport Regional Health System
CenterPoint Energy
City of Angleton
City of Clute
City of Freeport
City of Lake Jackson
City of Pearland
Concepts West of Texas
ConocoPhillips
Costello, Inc.
Dannenbaum Engineering
Edminster, Hinshaw, Russ & Associates
Freeport LNG Development
Hurst Technologies, Inc.
IDC, Inc.
INEOS Olefins & Polymers USA
Jamail & Smith Construction
Jones & Carter, Inc.
LJA Engineering & Surveying
Mammoet USA South, Inc.
Port Freeport
RiceTec
Seven Oaks Ranch
Shintech, Inc.
SouthWest Water Co.
Sweeny EDC
TDECU
TIC Energy & Chemical, Inc.
Testengeer, Inc.
The Dow Chemical Co.
URS Corporation
Wells Fargo Bank, N.A.

THE ALLIANCE™
The Economic Development Alliance for Brazoria County

January 20, 2011

District Engineer
U. S. Army Corps of Engineers
Room CESWG-PEPL
P. O. Box 1229
Galveston, Texas 77553-1229

ATTN: Robert Van Hook

RE: Port Freeport 55 Ft. Project

Dear Mr. Hook:

The purpose of this letter is to voice support for Port Freeport's 55 Ft. Project. 1

Port Freeport is vital to the continuing prosperity of Brazoria County and the entire Gulf Coast Region. The 55 Ft. Project will go a long way towards keeping the Port in a growth mode, thereby expanding the already large positive economic impact the Port has on this region.

Steadily increasing imports to and exports from Port Freeport make it imperative that the Port position itself for growth. Add in to the mix the widening of the Panama Canal and the resulting larger ships that could potentially call at Port Freeport and it makes the case for the 55 Ft. Project even stronger.

Please do all in your power to see that the Project proceeds as rapidly as possible, and thank you for your kind attention to this matter.

Sincerely,

Robert M. Worley
President/CEO

RMW/djp

cc: A. J. "Pete" Reixach, Jr., Executive Port Director, Port Freeport

4005 Technology Drive, Ste. 1010
Angleton, Texas 77515
979-848-0560 • Fax 979-848-0403
800-759-1822
info@eda-bc.com
www.eda-bc.com

Robert M. Worley
President/CEO
The Alliance
4005 Technology Drive, Suite 1010
Angelton, TX 77515

RESPONSE TO COMMENTS

Comment No.	Response
1	Thank you for your support.

From: Sandra Miller
To: Stokes, Janelle S SWG
Subject: Comment from the Village of Surfside of Freeport Harbor Modification Project
Date: Tuesday, February 01, 2011 3:16:45 PM
Attachments: 20110201145756.pdf

Please see attached. I will mail original in the morning.

Thank you

Sandra Miller
City Secretary
1304 Monument Drive
Surfside Beach, Texas 77541
Landline: 979 233-1531 x 103
Fax: 979 373-0699
Cell: 979 236-6431

This transmission may contain information that is privileged, confidential and/or exempt from disclosure under applicable law. If you are not the intended recipient, you are hereby notified that any disclosure, copying, distribution, or use of the information contained herein (including any reliance thereon) is STRICTLY PROHIBITED. If you received this transmission in error, please immediately contact the sender and destroy the material in its entirety, whether in electronic or hard copy format. Thank you.

Village of Surfside Beach
1304 Monument Drive
Surfside Beach, Texas 77541
Telephone 979-233-1531 Fax 979-230-6200

Feasibility Report
Freeport Harbor Channel Improvement Project, Brazoria County, Texas

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Comments:

Vol. I - Page xvi of Executive Summary "The tentatively Recommended Plan addresses the problems and opportunities identified during the study and satisfies the planning objectives of increasing navigation efficiency and safety along the Freeport Harbor Channel while maintaining the coastal and estuarine resources within the project area."

- ***We agree with increasing navigation efficiency and safety along the Freeport Harbor Channel*** 1
- ***We disagree that coastal and estuarine resources will be maintained within the project area***
- ***We would hope after review as per Section 216, that this modification of the channel will also include elements that will mitigate the effects of continued, if not increased, coastal erosion on adjacent shorelines, and that this mitigation effort will be part of the documentation recommended for Congressional authorization and funding***

Page 1-4, Section 1.3: ***It is erroneous to say that*** "These ancient sediments were deposited by the same natural processes that are currently active in shaping the present coastline..."

- ***There is no longer a natural process of natural sediments being deposited on the present adjacent shorelines.***
- ***It is stated on page 1-12*** "A major shoreline change factor for the Freeport area was the Brazos River diversion in 1929 to control excessive dredging requirements in Port Freeport. The relocation had the *unanticipated side of effect* of moving the main source of sediment away from the immediate project area beaches." ***and;***
- "Finally, there has been the interception of sand from the longshore system by the navigation channel and jetties. *The jetties act as groins to block longshore sediment movement*..."

Interesting that one of the objectives of this project was "The regional sediment management plan would identify projects for transportation and placement of sediment to reduce storm damages to property and protect, restore, ..."

- ***We have noted that there will be no Regional Sediment Management Plan utilizing the beneficial use of dredged material, and that the material that will be placed offshore will possibly only have benefit to a basically unpopulated area of Brazoria County.***
- ***It is also noted that*** "Alternative plans that resolve problems in one area should not create or amplify problems in other areas".
- ***Under Technical Criteria, page 3-5*** "Mitigation for project-related unavoidable impacts by minimizing, rectifying, reducing or eliminating, compensating, replacing or substituting resources."
- ***Why were*** "no ecological benefits and mitigation costs calculated"?
- "The anticipated increase of material to be dredged from the Outer Bar Channel during maintenance cycles is expected to be about 3.3 mcy per year, which is an increase of about 1 mcy over existing conditions." ***Is this additional material due to the extension of the channel another 2.6 miles?***
- ***Would not the alternative method of obtaining preliminary answers by conducting a full-fledged numerical sediment transport modeling study be better, than just a desktop study? With an***

increase of maintenance dredging increasing from 2.1 mcy per year to 5.1 mcy per year one would think a more detailed study would be warranted.

Page 8-3, 8.2.1.6 Shoreline Impact Study: "The model (GENESIS) predicts that *the greater the proposed depth alternative, the greater the shoreline change,* but for any alternative these impacts will be minor and will not extend farther than 3 to 4 miles on either side of the Freeport jetties."

- ***Why was other modeling not done?***
- ***With the accelerated rates of erosion the past 5 years (50,000 cy a year) along the eastern adjacent shoreline, we do not believe that this is a minor impact as this encompasses Surfside and Quintana within the 3 to 4 miles on either side of the jetties. This is an impact to infrastructure and private property; plus the loss of public access to beaches.***

We also disagree with the statement that the "total cumulative impacts from these projects are not expected to adversely affect human, health, socioeconomic wellbeing, or the environment of the project area."

This plan does not "address the problems and opportunities identified at the beginning of the study and satisfies the planning objectives of increasing navigation efficiency and reliability along the Freeport Harbor Channel while maintaining or enhancing terrestrial, cultural, estuarine, and coastal resources with the project area".

There is "uncertainty" ***in this DEIS as detailed hydraulic, geotechnical, and modeling have not been implemented to determine the real impact on adjacent shorelines. We do not feel the*** "most likely future" ***method is adequate in this situation.***

]

Draft Environmental Impact Statement – Document No. 070175 – Job No. 44-1901
Freeport Harbor Channel Improvement Project, Brazoria County, Texas

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Comments:

Page ES-6, Land Use, Recreation, Aesthetics, and Socioeconomics; "Minimal or no impacts to land use, recreation, aesthetics, or socioeconomics are expected to result from the proposed project. Reduced navigation restrictions and increased efficiency at the port is likely to have a positive economic benefit in the local community, which could result in increased development in the area."

- ***It is stated that the project will not have much of an economic impact locally.***
- ***We do agree that reduced navigation restrictions are necessary for increased efficiency at the port.***
- ***We disagree that this project will increase development in Surfside. If anything, with the continuing erosion issues there could be less development, and less beach for the general public to access.***

Page 1-11, Environmental Operating Principals: ***We do not feel the following are being addressed in reference to the impact of this project on adjacent shorelines; nor being integrated in the plan formulation process:***

- "2. Recognize the interdependence of life and the physical environment. Proactively consider environmental consequences of USACE programs and act accordingly in all appropriate circumstances."
- "3. Seek balance and synergy among human development activities and natural systems by designing economic and environmental solutions that support and reinforce one another."
- "5. Seeks ways and means to assess and mitigate cumulative impacts to the environment; bring systems approaches to the full life cycle of our processes and work."

We do not understand why the structural alternative such as a t-groin on the east side of the jetty, breakwaters, etc. has not been mentioned as a mitigation project to minimize the unavoidable impacts on adjacent eastern shoreline that this document states will take place. As you have noted, "A major limitation of beach nourishment in the area is the limited availability and expense of a suitable sand supply." ***In the future required beach maintenance is going to be costlier due to the limited availability of sand, and required more often due to the acceleration of the erosion rate.***

Page 6-4, Section 6.2.2 – Freeport Hurricane Flood Protection Levees: ***This section needs to be updated to reflect the issue of the de-certification of the levees and how they will be taken off of the new County Flood Maps.***

The USACE storm/surge modeling was to have been completed last month, and then given to FEMA for the wave run up modeling. The Brazosport Area will most likely be placed in an "AE" floodplain. Would it not be prudent to include the impacts of this new data?

Page 6-14, Section 6.3.5 – Surfside Beach Shoreline Protection: ***The GLO Shoreline Feasibility Study has been developed by Coast & Harbor Engineering. This study includes the outer channel and the Freeport Channel. This study has not been referenced in any of your documents as having been studied.***

Appendix F – page 8 – Tourism and Recreation:
Appendix F – page 15 – Future Development: ***These sections needs to be updated regarding local coastal projects that have been implemented.***

We encourage the Coastal Coordination Council (CCC) to review your project very careful, and note the non-mitigation efforts for impacts associated with the adjacent shorelines. As is stated in Appendix J – page 4 – Coastal Shore Areas, "Deepening and widening the channel *may slightly increase* the potential for storm damage or water quality degradation." On page 5 – Critical Erosion Areas it is stated "*Although no critical erosion areas are affected by the LLP Alternative, channel changes, associated with the LPP Alternative may indirectly affect nearby critical erosion areas by potentially altering the hydrological regime.*"

Respectfully Submitted:

Larry Davison

Mayor Larry Davison, Village of Surfside Beach

Mayor Larry Davison
Village of Surfside Beach
1304 Monument Drive
Surfside Beach, TX 77541

COMPREHENSIVE RESPONSE TO EROSION COMMENTS

Local governments, homeowners and concerned citizens from Surfside provided comments on the Draft Environmental Impact Statement for the proposed Freeport Harbor Channel Improvement Project (FHCIP) relating to the proposed project's impacts to the surrounding shorelines. Some of the key complaints submitted are summarized below:

1. Concern over effects of previous USACE projects including the diversion of the Brazos River in 1929, effects of the jetties, effects of previous channel improvement projects, and impacts from maintenance dredging
2. Concern that the proposed project will increase channel shoaling rates within the channel and that this will exacerbate adjacent shoreline erosion problems.
3. Concern that beneficial use of dredged material has not been fully investigated
4. Concern that the USACE DEIS did not reference or utilize recent studies in its analysis of project impacts

The following text briefly provides a historical context to the shoreline evolution associated with the Freeport Harbor Channel, explores concerns that the proposed project will increase shoreline erosion, provides the rationale for the use of selected modeling approaches, describes how the study took the beneficial uses of dredged material into consideration, and explains how the studies referenced by commenters were used in evaluating project impacts.

Freeport Harbor Channel – Historical Shoreline Impacts

It is generally believed that the primary impacts to the shoreline have resulted from the construction of the Freeport jetties and the diversion of the Brazos River (Morton and Pieper, 1975; Morton 1977, 1979; Watson 2003). "For example, maximum sustained rates of accretion (+75 m/yr.) and erosion (-55m/yr) documented for the Texas coast were associated with jetty construction and subsequent channel diversion at the mouth of the Brazos River" (Morton and Pieper, 1975). Construction of the Freeport jetties began in 1881 and completed in 1896. Prior to their construction, "the natural downdrift shoreline was characterized by a subaerial bar separated from the mainland by a shallow embayment. After jetty construction, this shoreline configuration persisted and in 1929 the emergent bar was near the end of the west jetty" (Morton, 1977). Statistics from 1855 to 1937 show considerable accretion of the sand fillet next to the west jetty.

Due to excessive siltation problems at Freeport, the Brazos River was diverted in 1929. According to Morton (1979), prior to the diversion "Riverine discharge was the most important

sediment source for accretion at Freeport Harbor". According to Watson (2003), "It is very likely that neither Surfside nor Quintana would be having an erosion problem today if the Brazos River was still discharging at its original, natural mouth." Thus the diversion of the Brazos River is likely the primary contributor to the current sand starved condition at Surfside. The recent Watson (2003) study is consistent with viewpoints of previous investigators in associating erosion of the old Brazos River delta primarily with the diversion channel, not the recurring deepening of the Freeport Harbor navigation channel.

Effect of Proposed Navigation Channel Impacts

Wave-induced sediment transport impacts were studied for the proposed FHCIP (ERDC, 2007). The ERDC results indicated that the erosional impacts will be so slight as to not be noticeable and will be dwarfed by the inter-annual variability in shoreline position. The background change rates are approximately 10 times the wave-induced impacts attributable to the proposed project" (ERDC, 2007).

The ERDC modeling (2007) evaluated how changes in wave-refraction due to the proposed deepening and extension of the Freeport Entrance Channel could affect the Gulf shoreline in the study area. The study concluded that the wave-induced impacts on the adjacent shorelines would be slight and limited to within a few miles of the jetties. Although there is a general erosion trend along much of the study area, the pattern is not straight forward. Individual shorelines do not maintain a fixed relationship to each other and the year-to-year change of a shoreline position is on the order of a few feet to a few tens of feet per year.

Within about 0.25 mile of each jetty, the shoreline change rate could increase by up to 1.0 feet/year with construction of the Preferred Alternative. However, the background change rates are approximately 10 times greater than the wave-induced impacts attributable to the proposed project, and thus are dramatically higher than the potential change due to the project. In addition, not all of the potential changes would result in an increase in shoreline erosion. A much larger length of shoreline could experience a slight reduction in the erosion rate. In areas from 0.5 to about 3 miles from the jetties, the modeling indicated that the shoreline erosion rate could decrease by up to 0.5 feet/year. Thus, the primary conclusion from this analysis is that impacts from project construction would be so slight that they would not be noticeable against the background changes in shoreline position.

Despite forecasted increases in dredged material for the Preferred Alternative, it is unlikely that this material would come from erosion of channel shorelines or nearby beaches. Sediment sources are primarily from overland inflows, local circulation, and from the GIWW (Parchure et al., 2005). The sediment modeling conducted for this study (Parchure et al., 2005) shows high concentrations of suspended sediment in the western GIWW that is likely due to sediment load brought by the Brazos River. Material in the channel is predominantly fine sediments and clays

which further indicate that there is little if any material from Surfside actually feeding into the entrance channel. Furthermore, the sediment modeling found that the absolute change in water velocities in the navigation channel that would occur with the project is small, and schematic flow pattern diagrams show no significant difference in the flow pattern for proposed project when compared to the existing condition.

Sedimentation and Shoreline Change Modeling

Desktop sedimentation modeling is a useful tool for predicting increases in shoaling within an inlet when the hydrodynamics and sediment properties have been characterized. In general, channel shoaling increases due to channel deepening and/or widening, increased salinity, reduced channel velocities, or wave action due to increased ship traffic. Detailed hydrodynamic studies were performed to characterize velocity and salinity changes associated with the Preferred Alternative. This data was coupled with field sediment collection and analysis to estimate additional shoaling that may result from this project. This method has been used to support feasibility level study analysis for many previous deep-draft navigation projects.

STWAVE/GENESIS numerical modeling was used to predict wave-induced impacts on the adjacent shorelines due to potential changes in wave refraction and shoaling patterns that could be caused by changes in the navigation channel. The modeling adequately and appropriately assessed the role of storms, the angle of wave approach, and frictional effects of offshore sediments. The tools (STWAVE and GENESIS) are well known, widely-used models that represent state of the practice in forecast modeling. It is important to remember that the study was primarily focused on determining the potential for shoreline change resulting from deepening of the ship channel not on quantifying the absolute magnitude of sediment transport in the study area. Consequently, quantification of the potential changes in sediment transport magnitude is of greater interest than the absolute magnitude of transport in the region. The deepening of the ship channel will not influence the overall wave climatology but it does have the potential to influence wave refraction and shoaling patterns which have been quantified.

Consideration of Beneficial Uses

The FHCIP study included an in-depth evaluation of the potential for beneficial use of dredged material for beach restoration on both sides of the jetties and for coastal marsh restoration. Several sediment samples were taken as part of the sediment analysis. The limited amount of sand in contrast to the percentage of silt and clay excludes any chance of using the material beneficially for beach restoration. The entire navigation channel consists of a very high concentration of silt plus clay (average of about 78%). The grain size is very small and the percentage of sands is very low. While soil borings indicated some sandy material, no concentrated sand lenses were identified, and the high percentage of clay could not be used for beach nourishment. Marsh restoration was also precluded because of the presence of oysters at

two of the three sites considered for restoration. The third potential site was cost prohibitive because of the pumping distance. New work and maintenance material from the offshore reaches of the ship channel would be placed in existing New Work and Maintenance ODMDSs located along the Outer Bar Channel. EPA has concurred in the use of the existing ODMDSs for proposed new construction and continued project maintenance.

Conclusion

It is important to understand that under this study authority, USACE is investigating the effects that a proposed deepening project would have on the existing shoreline conditions. Separately investigating any effects from the 1929 diversion of the Brazos River, construction of the jetties at Freeport, and previous channel improvements at Freeport are outside the scope of the existing study authorization. Any incremental increase in erosion which might be produced by the proposed deepening of the channel would be so small in contrast to the existing erosion that the effects will be indistinguishable from the long term trends. This supports the projection of minimal erosion impacts along the navigation channel banks and adjacent shorelines. Since impacts of the Preferred Alternative are negligible, mitigation for shoreline impacts (such as the T-groin, spur dykes and breakwaters mentioned by commenters) is not appropriate for this project and was not included in the project plan.

References

Coast & Harbor Engineering. 2009. Surfside Beach Shoreline Stabilization Feasibility Study Phase 2 Final Report. Prepared for the Texas General Land Office under General Work Order No. 4007, CEPRA Project No. 1509.

Engineer Research and Development Center (ERDC). 2007. Shoreline changes due to proposed deepening of the Freeport, Texas Entrance Channel. Prepared for U.S. Army Engineer District, Galveston by Coastal and Hydraulics Laboratory, U.S. Army Engineer Research and Development Center, ERDC/CHL, Vicksburg, Mississippi.

Morton, R.A., and Pieper, M.J., 1975. Shoreline Changes in the Vicinity of the Brazos River Delta (San Luis Pass to Brown Cedar Cut) An Analysis of Historical Changes of the Texas Gulf Shoreline. Geol. Circ. 75-4, Bureau of Economic Geology, The University of Texas at Austin, Austin, Texas.

Morton, R. A., December 1979, Temporal and Spatial Variations in Shoreline Changes and Their Implications, Examples from the Texas Gulf Coast. Journal of Sedimentary Petrology Vol. 49, No. 4 P. 1101—1112.

Morton, R. A., 1977, Nearshore Changes at Jettied Inlets, Texas Coast. Coastal Sediments .

Parchure, N., B. Brown, N. Raphelt, L. Vera and J. Pena. 2005. Desktop Sediment Study for Freeport Project. Draft report prepared for U.S. Army Engineer District, Galveston by Coastal and Hydraulics Laboratory, U.S. Army Engineer Research and Development Center, ERDC/CHL, Vicksburg, Mississippi.

Watson, R.L. 2003. Severe Beach Erosion at Surfside, TX Caused by Engineering Modifications to the Coast and Rivers. Unpublished report. http://texascoastgeology.com/reports

From: Beverly Bisso
To: Stokes, Janelle S SWG
Subject: Surfside Jetty
Date: Friday, February 04, 2011 6:18:09 PM

Please help the citizens of Surfside with our erosion problem. thank you, Beverly bisso 1

Beverly Bisso

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).

To: USACE - Attn. Janelle Stokes
P.O. Box 1229
Galveston, TX 77553-1229

Jan. 4th 2011

From: Russell M. Clinton III
1619 Scenic Shore Dr.
Kingwood, TX 77345
Phone and Fax 281 360 7795 - email beaches@flash.net

Subject: Comments on DIES and DGCD for Freeport Harbor Improvement Project, Brazoria County Texas.

Gentlemen:

I have reviewed the Environmental impact and General Conformity Determinations statements as well as Project Proposal for the Freeport Harbor Improvement Project, Brazoria County Texas and found them to be lacking in efforts to mitigate the most damaging consequence of both the proposed project and the cumulative historical consequences of the Freeport Harbor civil projects . 1

Shoreline Erosion and Impact:

It is now recognized that civil projects have reversed the natural accretion of the coast due to the Brazos River in the Surfside and Quintana areas to a degree that resulting erosion has caused serious loss of coastal access and private property- in deference to the "minimal" impact indicated in the proposal (no study cited). The current Project will exaggerate the problem due to the resulting deepening of the submerged costal area adjacent to the mouth of the Freeport Jetties as the sub-sea land at a natural depth of 18 to 22 ft. sloughs of into the 45 ft.- to be depened to 60 ft - depth dredged channel. The resulting increased wave action causes, scouring and littoral drift into the dredged channel as verified in bathymetric studies conducted by Coast and Harbor on Surfside Beach erosion (funded by the Texas GLO - copy attached). The Genisis models used in your analysis 4.1.3 did not include increased wave activity due to a general loss in offshore slope (already caused by previous dredging of the jetty entrance channel). The fact that you state the project will "not significantly effect " the current erosion rates (caused by the anthropogenic effects of civil projects) indicates there will be effects you have declined to quantify and that the project will worsen the conditions of which the cumulative harbor projects in total are the major contributors.

Increasing the depth and length of the dredged channel exiting the Freeport Jetties will undoubtedly worsen the impact of the wave "canyon" created and accelerate local erosion. The solution that should be included in the scope of the project to mitigate much of this effect was recommended in the Coast and Harbor study (and by myself several years ago) is to build a breakwater * perpendicular to the end of the jetties to contain the adjacent sea-floor and reduce wave action. The increased cost will be recovered, at least in part, in the reduced need for re-nourishment projects and the now excessive dredging requirements at the mouth of the Freeport jetties (although destruction of the outer bar by dredging will continue the loss of sand in the area due to by-modal littoral drift). The Coastal Coordination Council should refuse to approve and the Texas GLO refuse to permit this project unless the breakwater is included. This is not a trivial affect as glossed over in your report and along with the shallow water dredged "Sand Trap" at the mouth of the Jetties is responsible for the

accelerated local erosion and lack of "groin effect" sand accrual along the face of the jetties. It is also interesting that the study (see excerpt below) lists the projects as a "finally" footnote without quantification and ignores the wave enhancement and scouring identified from area depth reduction by more recent and focused publication than that of Morton and Gibeaut by Coast & Harbor, Dr. R. Watson and Dr. Anderson of Rice University.

*Above water and continuous where attached to the Jetties and segmented as it moves some distance away.

From Project Proposal -- 1.5

The shoreline on both the Surfside Beach (northern) and Quintana Beach (southern) areas has changed substantially over the last 150 years. Most of the Texas shoreline is now in retreat because of RSLR and a reduced supply of sand from changes to the Mississippi and Atchafalaya river systems and from reservoirs built on Texas rivers. A major shoreline change factor for the Freeport area was the Brazos River diversion in 1929 to control excessive dredging requirements in Port Freeport. The relocation had the unanticipated side effect of moving the main source of sediment away from the immediate project area beaches. Another factor has been reservoir development in the Brazos River watershed that, while essential for water supply and flood control, has greatly reduced the sand supply at the relocated Brazos River mouth. The biggest rate of shoreline change occurs with severe storms.
Other major factors are RSLR that moves the shoreline inland and a movement of sand from the beach inland by aeolian drift (wind) aggravated by beach vehicle traffic. Finally, there has been the interception of sand from the longshore system by the navigation channel and jetties. The jetties act as groins to block longshore sediment movement, but some material gets around and through the jetties and must be periodically dredged from the Freeport Harbor Outer Bar and Jetty channels.

From Environmental Impact Statement-- 6.4.2.5 Shoreline Erosion

The shoreline in the study area has been fluctuating since 1852, and none of the projects reviewed are expected to alter the ongoing pattern. Shoreline changes have been attributed to RSLR, a reduced sand supply, the Brazos River relocation in 1929, reservoir development in the Brazos River basin, tropical storm and hurricane effects, beach traffic, sand interception from navigation channels and jetties, and wave action caused by large ship traffic. Mathewson and Minter (1976) estimated that about 76 percent of the sand that historically reached the coast was not reaching it in 1975. The reduction percentage may be higher today. Efforts to offset shoreline erosion with beach nourishment have been carried out under the Texas CEPRA. These have involved both trucking in at least 950 cy of sand in one project and bringing sand from a DMPA near Baytown by barge for dune rehabilitation (Newby, 2006). A major limitation of beach nourishment in the area is the limited availability and expense of a suitable sand supply. Currently, beaches on both sides of the Freeport jetties are severely eroded. Erosion on the Quintana Beach side is threatening the stability of the Seaway PA, and erosion of Surfside Beach is threatening beachfront homes. Several projects reviewed for the cumulative impacts analysis would enhance shoreline conditions: Quintana beach nourishment (Widening Project); 14 acres of planted shoreline stabilizing grasses (Freeport LNG); and additional beach nourishment (45-foot Project Maintenance and Surfside Beach Shoreline Protection). It is not known whether channel traffic frequency will increase with the channel improvements, although the size of vessels is expected to increase. Larger vessels create greater wave action and could contribute to

the overall shoreline erosion equation. It is anticipated that erosion patterns from all sources will continue. This project, and others, are expected to contribute to the area's cumulative shoreline erosion, but also to regional restoration efforts.

From Project Proposal -- 8.2.1.6 Shoreline Impact Study
This study assessed the wave-induced impacts of deepening of the Freeport Harbor Channel in the Gulf of Mexico on the open-coastal shorelines adjacent to the project area. Based on coordination with ERDC, the plans proposed for analysis were 50-x-600-foot, 55-x-600-foot, 58-x-540-foot, and 60-x-540-foot. This study used the numerical model GENESIS to compute sediment transport rates and shoreline change rates for each of the four proposed channels. The conclusion from this analysis is that if any of the proposed deepening alternatives for the Freeport Outer Bar Channel are constructed, the wave-induced sediment transport impacts on the adjacent shorelines will be so slight as to not be noticeable and will be dwarfed by the interannual variability in shoreline position. The model predicts that the greater the proposed depth alternative, the greater the shoreline change, but for any alternative these impacts will be minor and will not extend farther than 3 to 4 miles on either side of the Freeport jetties.

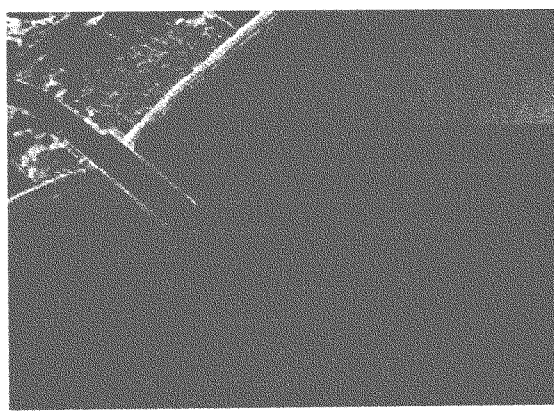
Note: The data in the Appendix indicates that no additional increase in depth adjacent to the dredged channel was included in the Genesis modeling!

The proposal and report underplay the anthropogenic causes of erosion citing RSLR (read subsidence) and sand loss from the Mississippi /Atchafalaya system and "Texas Rivers". By your own analysis the Jetties, River Displacement and Subsequent damming have been responsible, along with damming of the Brazos (not a significant factor as occurring after the river was moved) and some minor influence from RSLR (reads subsidence) for changing general area accretion to initially trapping sand and then reversing accretion to erosion in that order. Your assumptions that the erosion rates at Quintana are more severe than Surfside are not accurate, as based on data from 3.3-2 where the data at Surfside is further from the Jetties – erosion adjacent to the Jetties has been sever on both sides, resulting in property loss at Surfside. One must only look at the current beach profile including the results of more aggressive re-nourishment programs at Surfside to see the erosion is more aggressive on the north side of the jetties (see 2010 Google satellite photo below).

Table 3.1 in appendix II indicates 60 Million cubic yards of material have been dredged from the Freeport channel in the last 50 years, 40 Million since 1992 when the channel was widened and deepened, admittedly the majority was silt but the 19% to 29% sand content (appendix II B VI table 2) that no longer comes from the Brazos River but from littoral transport has resulted in significant property loss on both sides of the Jetties.

Beneficial use of Dredged Material:

An additional flaw in the project is the lack of beneficial use of dredged material, presumably to control cost. The channel and Jetty widening and deepening project of 1993, the 45' depth project, provided enough sand to re-nourish approximately 200 feet of beach for a mile (albeit with some clay and rocks which nature corrected in about 6 months). The beneficial use of 300K cubic yards in front of the" Seaway" project is mentioned but no rational on how the amount or location was chosen, presumably to protect an historical placement area that may contain hazardous materials (where a revetment would be much better suited). It appears no core samples or study was cited in the proposal indicating the submerged quantity of beach quality sand available for re-nourishment with borings only for heavy metal deposits (3.5). One would assume that the widening and deepening the channel again should provide at least as much beach quality material as the 1993 project and the use of clam shell dredges for near-shore deposits would provide additional beneficial use of silt laden material that would be naturally classified. This type of re-nourishment will become especially critical in Texas where sand sources for re-nourishment are not plentiful. In my opinion the Coastal Coordination Council should not approve this project unless this issue is addressed; again the cost will be offset with reduced re-nourishment cost especially if perpetual re-nourishment is eventually mandated. One would also assume that near-shore placement of Beach quality sand with some sediment, would become part of the dredging maintenance plan. I understand dredging logs from material at the mouth of the Jetties have exceeded 80% sand and it is safe to assume the majority of the by- lateral littoral drift from re-nourishment projects will continue to end up in the "Sand Trap" the dredged channel represents, especially if no attached breakwater project is forthcoming.



Atypical clear water photo showing onshore bars moving down jetty – offshore bars and dredged channel

From Proposal --11.6 BENEFICIAL USE PLACEMENT PLAN
One of the main interests in the consideration of a 50-year DMMP is to maximize the use of suitable quality dredged material for beneficial purposes. In coordination with the resource agencies and the public, beneficial uses were investigated to determine the feasibility of implementation. Because of the unsuitability of the dredged material, the presence of sensitive resources at sites, and the prohibitive cost of placement at one site, no beneficial use plan was developed.

From Enviornmental Impact Statement - 7.0 COMPLIANCE WITH TEXAS COASTAL MANAGEMENT PROGRAM

" The project will be reviewed by the Coastal Coordination Council (CCC) for consistency with the program. A review of potential BU of dredged material for the proposed Widening Project, which included an interagency panel review, did not identify any cost-effective BUs in the project area. This was based on the characteristics of the dredged material, cost to transport the material, impacts associated with placement and manipulation of the material, and impacts to existing resources. Thus, no BU is proposed for the FHCIP."

From Appendix 4.7.2 Dredged Materials and Potential for Beneficial Use
Results from bed sediment studies (from the *Desktop Sediment Study for Freeport Project* generated by ERDC and H&H), for bed sediment data collected between September of 1987 through May of 2000 indicate the following average percentages of bed sediments have been encountered in the channel:
1. Outer Bar – About 82 percent fine-grained sediments (silts and clays) and 18 percent sands
2. Jetty Channel – About 86 percent fine-grained sediments (silts and clays) and 14 percent sands
3. Freeport Harbor Channel – About 95 percent fine-grained sediments (silts and clays) and 5 percent sands

A review of new work materials from boring data starting at the Upper Turning Basin on out to sea indicate about 80 to 90 percent clays (of primarily stiff consistency with some traces of silts or clayey silts) and about 10 to 20 percent sands of various densities.
On a separate widening project currently pursued by the Port of Freeport, potential beneficial uses of dredge materials were considered, including marsh restoration, beach nourishment, an energy-dissipating berm, habitat berm, and feeder berm. These features are described in further detail in the "Environmental Impact Statement" document dated February 2007, that accompanies the Feasibility Report for the "Freeport Entrance and Jetty Channel Widening Project."
Based on groundwork done in the Widening Project study by Freeport, which included considering applicability and functionality of material types for particular beneficial use features, cost effectiveness, permanence of features, and other considerations explored by the Widening Project DMMP workgroup, the decision was made by PDT on the USACE's deepening and widening project to forgo pursuit of beneficial use features in the final selected dredged material management plan.

Note: No specific core sample data could be located in the Appendices and the conclusions from "average data" over 20+ years are not consistent with the previous Jetty and channel widening project which located significant quantities of beach quality sand through specific borings, not average data (more data on project employee vehicle emissions was provided than core sample compositions).

Conclusion:

The project analysis admitted that it will contribute to Shoreline erosion, but not as much as previous Freeport harbor projects have done in the past and are continuing to do (even though the current project analysis was understated). It also appears the beneficial use of dredged material has been limited in scope due to cost and lack of accurate data and the sole application is not in the public's best interest.

This is not to say the project should not proceed in the war of the upper Texas coast channel depth, but that it's time the Port Authority and Corps take the lead in responsibility for the consequences of the current and past projects and the anthropogenic erosion they have caused. This long delayed reckoning is even more important now, as the Texas Supreme Court has rightly determined the strategy of taking private property for public use without compensation under the Open Beaches Act will no longer provide public beach access in light of anthropogenic erosion. This Project should be coordinated with an action under the Rivers and Harbors Act providing for mitigation of unintended consequences of civil projects (see appendix I) to provide a breakwater at the mouth of the Jetties and a perpetual re-nourishment program for Surfside and Quintana beaches. The project should also employ additional funding under the Water Resources and Development Act (also in appendix I) to rationalize the nominal additional cost required to make the maximum use of dredged material for beach re-nourishment and begin the use of clamshell dredges to provide near- shore re-nourishment with silty sand during the winter off-season months.

I have little hope that public comments bear much weight with those determined to execute projects and/or foster legislation. However, if one or more of the agencies cc'ed on my comments would take them to heart by review the attachments they just might deny project approval until the mitigation of coastal erosion is addressed, or, if a Judge was presented with the attachments in an a injunction hearing and stays the project until mitigation is addressed we would begin to be on a path to parody with all of the other coastal States.

Respectively Submitted

Russell M Clinton III

W/attachments :
Coast & Harbor analysis of Surfside Erosion
Definitive analysis of Surfside Beach Erosion by Dr. R. Watson
Follow up of Watson's paper debunking sea level (subsidence) rise and Submerged Reef benefits, by R. Clinton
Erosion, not so natural a process, given to Texas Senate & House at the initial CEPRA hearings, by R. Clinton
Beaches 101, a tutorial with focus on the anthropogenic erosion at Surfside TX, by R. Clinton
Appendix I - Federal Coastal Beach re-nourishment Mitigation Legislation

CC: w/o attachments if previously provided, or in digital format (disk)- sent as time permits

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Senator Kay Bailey-Hutchison
U.S. Senate
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Senator John Cornyn
U.S. Senate
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Stephen Spencer
Regional Environmental Officer
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Representative Randy Webber
House District 29
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Senator Joan Huffman
Senate District 17
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David M. Knuckey
Port Freeport
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Bill Terry
Port Freeport Commissioner
618 East 2nd Street
Freeport, TX 77541

The Honorable E.J. King
County Judge
Brazoria County
111 E. Locust Street
Angleton, TX 77515-4678

Ms. Kelly Hamby
Flood Plain Administrator
Brazoria County Flood Plain Administration
111 E. Locust - Bldg. A-29; Suite 210
Angleton, TX 77515

Commissioner Donald Payne
Brazoria County
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County Courthouse Precinct 1
Angleton, TX 77515-4678

Mayor Larry Davison
Village of Surfside Beach
1304 Monument Drive
Surfside Beach, TX 77541

Commissioner Matt Sebesta
Brazoria County
Commissioner - Pct. 2
21017 CR 171
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Commissioner Mary Ruth Rhodenbaugh
Brazoria County
Commissioner - Pct. 4
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Brazoria, TX 77422

Mayor Wallace Neely
Town of Quintana
814 Lamar
Quintana, TX 77541

The Bulletin of Brazoria County
P.O. Box 2426
Angleton, TX 77516

Robert Eastman
Save our Beach Association
1304 Monument Drive
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Bridie Gensee
The Facts
720 S. Main Street
Clute, TX 77531

Val Horvath
The Facts
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The Source Weekly
223 Parking Way
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Brooks Porter
10736 Valley Hills
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Ted Hirtz, attny.
811 Rusk, Suite 721
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APPENDIX I Federal acts supporting Shoreline Mitigation and Beneficial use of Dredged Material

Rivers and Harbors Act of 1968, Pub.L. 90-483

SEC. 111. The Secretary of the Army, acting through the Chief of Shore **damage** I Engineers, is authorized to investigate, study, and construct projects prevention for the prevention or mitigation of shore damages attributable to Fed- study* era1 navigation works. The cost of installing, operating, and maintnining such projects shall be borne entirely by the United States. No such project shall be constructed without specific authorization by Congress if the estimated first cost exceeds $1,000,000.

As amended in 1996

SEC. 227. SHORE PROTECTION.
(a) DECLARATION OF POLICY.—Subsection (a) of the 1st section of the Act entitled "An Act authorizing Federal participation in
the cost of protecting the shores of publicly owned property", approved August 13, 1946 (33 U.S.C. 426e), is amended—
(1) by striking "damage to the shores" and inserting "damage to the shores and beaches"; and (2) by striking "the following provisions" and all that follows through the period at the end of such subsection and inserting the following: "this Act, to promote shore protection projects and related research that encourage the protection, restoration, and enhancement of sandy beaches, including beach restoration and periodic beach nourishment, on a comprehensive and
coordinated basis by the Federal Government, States, localities, and private enterprises. In carrying out this policy, preference shall be given to areas in which there has been a Federal investment of funds and areas with respect to which the need for prevention or mitigation of damage to shores and beaches is attributable to Federal navigation projects or other Federal activities.".
(b) AUTHORIZATION OF PROJECTS.—Subsection (e) of such section is amended—
(1) by striking "(e) No" and inserting the following: "(e) AUTHORIZATION OF PROJECTS.— "(1) IN GENERAL.—No";
(2) by moving the remainder of the text of paragraph (1) (as designated by paragraph (1) of this subsection) 2 ems
to the right; and
(3) by adding at the end the following: "(2) STUDIES.— "(A) IN GENERAL.—The Secretary shall— "(i) recommend to Congress studies concerning shore protection projects that meet the criteria established under this Act (including subparagraph (B)(iii)) and other applicable law; "(ii) conduct such studies as Congress requires under applicable laws; and "(iii) report the results of the studies to the Committee on Environment and Public Works of the Senate and the Committee on Transportation and Infrastructure of the House of Representatives. Reports. 33 USC 2239 note. PUBLIC LAW 104–303—OCT. 12, 1996 110 STAT. 3699 "(B) RECOMMENDATIONS FOR SHORE PROTECTION PROJECTS.— "(i) IN GENERAL.—The Secretary shall recommend to Congress the authorization or reauthorization of shore protection projects based on the studies conducted
under subparagraph (A). "(ii) CONSIDERATIONS.—In making recommendations, the Secretary shall consider the economic and
ecological benefits of the shore protection project. "(C) COORDINATION OF PROJECTS.—In conducting project under this paragraph, the Secretary shall— "(i) determine whether there is any other project being carried out by the Secretary or the head of another Federal agency that may be complementary to the shore protection project; and "(ii) if there is such a complementary project, describe the efforts that will be made to coordinate the projects. "(3) SHORE PROTECTION ROJECTS.—
"(A) IN GENERAL.—The Secretary shall construct, or cause to be constructed, any shore protection project authorized by Congress, or separable element of such a project, for which funds have been appropriated by Congress. "(B) AGREEMENTS.—
"(i) REQUIREMENT.—After authorization by Congress, and before commencement of construction, of a shore protection project or separable element, the Secretary shall enter into a written agreement with a non-Federal interest with respect to the project or separable element. "(ii) TERMS.—The agreement shall— "(I) specify the life

of the project; and "(II) ensure that the Federal Government and the non-Federal interest will cooperate in carrying out the project or separable element
"(C) COORDINATION OF PROJECTS.—In constructing a shore protection project or separable element under this paragraph, the Secretary shall, to the extent practicable, coordinate the project or element with any complementary project identified under paragraph (2)(C).". (c) REQUIREMENT OF AGREEMENTS PRIOR TO REIMBURSEMENTS.— (1) SMALL SHORE PROTECTION PROJECTS.—Section 2 of the Act entitled "An Act authorizing Federal participation in the cost of protecting the shores of publicly owned property", approved August 13, 1946 (33 U.S.C. 426f), is amended— (A) by striking "SEC. 2. The Secretary of the Army" and inserting the following: **"SEC. 2. REIMBURSEMENTS.** "(a) IN GENERAL.—The Secretary"; (B) in subsection (a) (as designated by subparagraph (A) of this paragraph)— (i) by striking "local interests" and inserting "non- Federal interests"; 110 STAT. 3700 PUBLIC LAW 104–303—OCT. 12, 1996 (ii) by inserting "or separable element of the project" after "project"; and (iii) by inserting "or separable elements" after "projects" each place it appears; and (C) by adding at the end the following: "(b) AGREEMENTS.—
"(1) REQUIREMENT.—After authorization of reimbursement by the Secretary under this section, and before commencement
of construction, of a shore protection project, the Secretary shall enter into a written agreement with the non-Federal
interest with respect to the project or separable element "(2) TERMS.—The agreement shall— "(A) specify the life of the project; and "(B) ensure that the Federal Government and the non- Federal interest will cooperate in carrying out the project or separable element.". (2) OTHER SHORELINE PROTECTION PROJECTS.—Section 206(e)(1)(A) of the Water Resources Development Act of 1992 (33 U.S.C. 426i–1(e)(1)(A); 106 Stat. 4829) is amended by inserting before the semicolon the following: "and enters into a written agreement with the non-Federal interest with respect to the project or separable element (including the terms of cooperation)". (d) STATE AND REGIONAL PLANS.—The Act entitled "An Act authorizing Federal participation in the cost of protecting the shores of publicly owned property", approved August 13, 1946, is amended—
(1) by redesignating section 4 (33 U.S.C. 426h) as section 5; and (2) by inserting after section 3 (33 U.S.C. 426g) the follow**SEC. 110. BENEFICIAL USES OF DREDGED MATERIAL.** The Secretary may carry out the following projects under section
204 of the Water Resources Development Act of 1992 (33 U.S.C. 2326):

WATER RESOURCES DEVELOPMENT ACT OF 1996

SEC. 207. BENEFICIAL USES OF DREDGED MATERIAL.
Section 204 of the Water Resources Development Act of 1992 (33 U.S.C. 2326; 106 Stat. 4826) is amended— (1) by redesignating subsection (e) as subsection (f); and (2) by inserting after subsection (d) the following: "(e) SELECTION OF DREDGED MATERIAL DISPOSAL METHOD.— In developing and carrying out a project for navigation involving the disposal of dredged material, the Secretary may select, with the consent of the non-Federal interest, a disposal method that is not the least-cost option if the Secretary determines that the incremental costs of such disposal method are reasonable in relation to the environmental benefits, including the benefits to the aquatic environment to be derived from the creation of wetlands and control of shoreline erosion. The Federal share of such incremental costs shall be determined in accordance with subsection (c).".

Russell M. Clinton III
1619 Scenic Shore Dr.
Kingwood, TX 77345

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).
2	Material provided: 1. Surfside Beach Shoreline Stabilization Feasibility Study. 2009. Coast and Harbor Engineering, 6 pages; 2. Severe Beach Erosion at Surfside, Texas Caused by Engineering Modifications to the Coast and Rivers. 2003. by R. L. Watson, Ph.D., Port Aransas, Texas, 34 pages; 3. Erosion, A not so Natural Phenomenon. 2002. by R Clinton and M. Porter. Presented to initial CEPRA hearings, 2 pages; 4. Surfside Beach Erosion Analysis, Follow-up. 2006. No author, 16 pages. 5. Beaches 101, How Beaches are formed and lost, Including a case study of the anthropogenic erosion at Surfside Beach, Texas. No date. by R. Clinton, 30 pages.

From: Alexa Duke
To: Stokes, Janelle S SWG
Cc: glennrobichau@yahoo.com
Subject: In re public comment on possible permit for further expansion of Port Freeport"s ship channel
Date: Friday, February 04, 2011 6:05:19 PM

To:
Janelle Stokes
Regional Environmental Specialist
Corps of Engineers, Galveston District
P.O. Box 1229
Galveston, Texas 77553
409/766-3039

janelle.s.stokes@usace.army.mil

To whom it may concern,

Thank you for taking comments on this important issue. 1

I grew up in Brazoria County and spent every summer and many, many weekends there. My family and I still vacation there every year. While I am not a property owner at Surfside, I feel I am a stakeholder in any decisions made concerning the ongoing destruction of and possible renourishment of the beach.

I urge you, when considering whether to permit additional widening, deepening, dredging or otherwise changing in any way the topography of the Port Freeport ship channel and associated features, to consider also the dramatic and documented erosion of Surfside Beach over the years. Consider, too, the lack of action and response from the USACE relative to this erosion that many studies conclude are caused primarily by the jetties and ship channel (its widening, deepening, and constant dredging) - all planned and funded by the USACE. Your very own projects, your construction and especially the dredging have robbed Surfside Beach of millions of cubic yards of sand over the years resulting in total destruction of the beach and 40 front row beach homes. I understand that the planned expansion would result in even more dredging annually. YOU MUST ADDRESS THESE CONCERNS.

DO NOT award a permit for further expansion of Port Freeport's ship channel, unless you address the following:

1) Plans and action for mitigating current negative consequences of USACE past work on the jetties and channel resulting in aggressive erosion rates at Surfside.

2) Include in your plan a section concerning the known impacts ship channels, dredging and jetties have on neighboring beaches, especially the long-term effects of amplified wave action and higher erosion rates. See Dr. Richard Watson's report on Surfside's battle with erosion at this link:
http://gsa.confex.com/gsa/viewHandout.cgi?uploadid=256
<http://gsa.confex.com/gsa/viewHandout.cgi?uploadid=256 > >

3) Address the environmental impact of this specific project on neighboring beaches. Admit that rerouting the Brazos River seven miles downstream robbed the Surfside area of its primary sand source. Admit that a jetty and deep channel affect currents and beach erosion. Admit that jetties cause amplified wave action and higher erosion rates on neighboring beaches. Admit that dredging millions of cubic yards of material each year from ship channels affects erosion rates on neighboring beaches as the sand material is dumped so far offshore that it will never wash back onto a beach. We are the witnesses and victims of this negative impact.

4) Address how this project will employ and promote Beneficial Use of Dredged Material policies to enhance and renourish Surfside's beaches. Propose USACE's funding of on-going sand nourishment

projects for Surfside Beach given its close proximity to the jetties and ship channel.

5) Address long-term actions the USACE can take to reduce the impact of amplified wave action and strong erosion rates caused by the jetties and constant dredging. Can the USACE construct a Spur Dike on the side of the jetty to reduce sand transport into the ship channel (slow down beach erosion and reduce USACE cost of dredging).

6) Support not only the Brazoria County Shoreline Recon Study (approved in Nov. 1999 but never funded), but the recommendations of Coast & Harbor for construction of a Shoreline Breakwater System.

7) Partner with the Village of Surfside, Brazoria County, Port Freeport, Texas GLO, and the industries served by this ship channel to design and fund protective measures and nourishment projects to reduce and abate Surfside Beach's dramatic erosion.

Surfside has paid a heavy price for the expansions already made to the ship channel. From where we sit (which is right next to the jetty) we believe that the USACE needs to take responsibility - not only for the work within the jetty but also for the consequences (which may be unintentional but are real nonetheless) of that work beyond the jetty. We are not against commerce and job creation - we are for protecting the beach and the community, and rebuilding this beach as necessary. The beach on Surfside is the front line protection for the community of Surfside. Not only does it guard public infrastructure and private property, but it also guards the Intracoastal Waterway, and the billions of dollars of industry supported by Port Freeport.

For several hundred thousands of Texans each year Surfside Beach is the destination point for their vacations and weekend outings. The beach is a huge public park and we invite the USACE and Port Freeport (and their clients) to be partners in protecting and preserving it.

Thank you for your time and consideration.

Alexa Duke
306 Choctaw Trail
Henderson, Texas 75652

Alexa Duke

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).

From: Bob Eastman
To: Stokes, Janelle S SWG
Subject: RE: Permit to dredge ship channel Port of Freeport, Texas
Date: Friday, February 04, 2011 3:54:53 PM

Good afternoon Ms. Stokes. There are some issues within this permit that really disturbs me as well as the citizens of Surfside Beach. It is very disturbing to see that the "feasibility study" and the "draft of the environment impact statement" showed there would be no plan for the use of beneficial use material. Even more disturbing though was the oversight of not addressing mitigation efforts on the adjacent shorelines which is a requirement of new and improved federal projects. In my opinion the USACE did not do a thorough study of the impacts or reference more up to date studies of the impacts of the existing channel. 1

Surfside Beach as you well know is experiencing a very serious erosion problem. My neighborhoods have lost their homes to this problem and I fear more homes will be lost in the future due to the erosion, which is primarily due to the current channel. Please consider the material use in your plan as well as a beaker wall off the jetties to help SAVE Surfside Beach.

I sincerely appreciate your time and consideration.

Bob Eastman
President of Save Our Beach Association
307 Seashell
Surfside Beach, Texas 77541

Bob Eastman
President of Save Our Beach Association
307 Seashell
Surfside Beach, TX 77541

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).

From: Jennie Green-Prats
To: Stokes, Janelle S SWG
Date: Friday, February 04, 2011 4:52:08 PM

Dear Ms. Stokes,

I have been a homeowner in the Village of Surfside Beach, Texas since 1998. My husband and I own a few rental properties as well. 1

I am very concerned about the referenced project. The failure of the "feasibility study" or "draft environmental impact statement" to show any plan for the use of beneficial use material is disturbing. Even more disturbing though was the oversight of not addressing mitigation efforts for impacts on adjacent shorelines which is a requirement of new and improved federal projects. The erosion of the beach at Surfside caused mainly by the diversion of the Brazos River, the construction and re-construction, enlargement and expansions of the Freeport and Quintana Jetties, the ever-deepening and widening of the Freeport Harbor Channel have all caused tremendous erosion to Surfside's beaches to the point where the beach is entirely gone in some places, has claimed many homes, and is chewing into and destroying the roads and infrastructure of the Village. We have no protection from storm surges and even high tides in some places. The above-mentioned man-made changes have led to sand-starvation in the area which has to be mitigated on a permanent basis if the town is to survive.

It seems reasonably clear that the USACE did not do a thorough study of the impacts or reference more up to date studies of the impacts of the existing Channel. The amount of dredging is going to increase threefold in the quantity of material and the planned placement is offshore (west of the jetties) in an established area and a new area. There are also planned 3 new upland sites totaling 500 acres, of which contain some wetlands that they do plan on mitigating for.

Highly regarded Hydro Geologist Blake W. Blackwelder said it best when he recently commented on the proposed project as follows: "Surfside Beach should be entitled to millions of cubic yards of sand to mitigate the effects of engineering actions that have acted to deprive the entire Brazoria County shoreline of active sand renourishment. These are very low slope, low energy beaches that need a modest amount of sand to preserve the shoreline. Dredging, building jetties, and relocation of a major sand-source river mouth have all been detrimental to the beaches at Surfside."

For these reasons, I object to the proposed project, as does my husband Stuart L. Prats, also a homeowner in the Village. Please require that the Port and the USACE mitigate and renourish on a permanent basis the beaches at Surfside and also provide for a mechanism for permanent arrestment and abatement of the erosive effects of the already engineered conditions in the area similar to what has already been presented to Congressman Ron Paul as proposed by a professional engineering firm (see Marc Grosz's email for attachment).

The future of the entire region of beaches and improvements actually depends on the exercise of equitable and sound judgment and action and incorporation of the steps I have identified and proposed herein and in the attached instrument.

Thank you for your kind consideration of these matters. The problem we have is man made. You have a shot at helping to replace what is being taken away with every wave.

Regards,
Jennie Green-Prats

Brazos Bend, Realtors

Texas Gulf Properties Group

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Jennie Green-Prats
Brazos Bend, Realtors
Texas Gulf Properties Group

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).

From: L. Marc Grosz III
To: Stokes, Janelle S SWG
Cc: ahgrosz@sbcglobal.net
Subject: US Army Corps of Engineers and Port Freeport Prospective Ship Channel Widening/Deepening Plans and Overall project
Date: Friday, February 04, 2011 3:38:07 PM
Attachments: Surfside_DC April2010.pdf

Dear Ms. Stokes,

I have been a homeowner in the Village of Surfside Beach, Texas since 1967. I also own a recreational fishing marina in the Village. 1

I am very concerned about the referenced project. The failure of the "feasibility study" or "draft environmental impact statement" to show any plan for the use of beneficial use material is disturbing. Even more disturbing though was the oversight of not addressing mitigation efforts for impacts on adjacent shorelines which is a requirement of new and improved federal projects. The erosion of the beach at Surfside caused mainly by the diversion of the Brazos River, the construction and re-construction, enlargement and expansions of the Freeport and Quintana Jetties, the ever-deepening and widening of the Freeport Harbor Channel have all caused tremendous erosion to Surfside's beaches to the point where the beach is entirely gone in some places, has claimed many homes, and is chewing into and destroying the roads and infrastructure of the Village. We have no protection from storm surges and even high tides in some places. The above-mentioned man-made changes have led to sand-starvation in the area which has to be mitigated on a permanent basis if the town is to survive.

It seems reasonably clear that the USACE did not do a thorough study of the impacts or reference more up to date studies of the impacts of the existing Channel. The amount of dredging is going to increase threefold in the quantity of material and the planned placement is offshore (west of the jetties) in an established area and a new area. There are also planned 3 new upland sites totaling 500 acres, of which contain some wetlands that they do plan on mitigating for.

Highly regarded Hydro Geologist Blake W. Blackwelder said it best when he recently commented on the proposed project as follows: "Surfside Beach should be entitled to millions of cubic yards of sand to mitigate the effects of engineering actions that have acted to deprive the entire Brazoria County shoreline of active sand renourishment. These are very low slope, low energy beaches that need a modest amount of sand to preserve the shoreline. Dredging, building jetties, and relocation of a major sand-source river mouth have all been detrimental to the beaches at Surfside."

For these reasons, I object to the proposed project, as does my wife Anne H. Grosz, also a homeowner in the Village. Please require that the Port and the USACE mitigate and renourish on a permanent basis the beaches at Surfside and also provide for a mechanism for permanent arrestment and abatement of the erosive effects of the already engineered conditions in the area similar to what has already been presented to Congressman Ron Paul as proposed by a professional engineering firm (see attached).

The future of the entire region of beaches and improvements actually depends on the exercise of equitable and sound judgment and action and incorporation of the steps I have identified and proposed herein and in the attached instrument.

Thank you for your kind consideration of these matters.

L. Marc Grosz III
Grosz & Associates, P.C.
Attorneys at Law
440 Louisiana St., Suite 250
Houston, TEXAS 77002
713-227-2500 telephone
713-652-2500 facsimile
mgrosz@groszassociates.com

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L. Marc Grosz III
Grosz & Associates, P.C.
Attorneys at Law
440 Louisiana St., Suite 250
Houston, TX 77002

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).
2	Materials provided: 1. Presentation entitled "Village of Surfside Beach, Texas, April 2010"; 2. Fact Sheet on Surfside Beach, Texas Coastal Erosion Issues, dated April 22, 2010; 3. Surfside Beach Shoreline Stabilization Feasibility Study. 2009. Coast and Harbor Engineering, 6 pages

From: Julie Guyton
To: Stokes, Janelle S SWG
Subject: Surfside Beach
Date: Monday, February 07, 2011 8:19:21 AM

Janelle,

Please don't let them harm the Texas beaches any more than they already have. We can not replace them. 1

Thanks.

Julie

Julie Guyton
Senior Vice President/Manager
Amegy Bank - Corporate Investments
Phone 713-232-1428
Fax 713-693-7557
Cell 713-819-5509
julie.guyton@amegybank.com <mailto:julie.guyton@amegybank.com>

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Julie Guyton
Senior Vice President/Manager
Amegy Bank – Corporate Investments

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).

From: Houston Hanlons
To: Stokes, Janelle S SWG
Subject: Permit to dredge ship channel Port of Freeport Texas
Date: Friday, February 04, 2011 1:56:46 PM

Janelle,

We have been advised that the above permit request does not address mitigation efforts for impacts on adjacent shorelines which is a requirement 1
of new and improved federal projects.

If true, this is unacceptable breach of trust, and should be rectified immediately.

Thank you.

Maura Hanlon
Surfside Resident

_____ Information from ESET NOD32 Antivirus, version of virus signature database 5445 (20100912) _____

The message was checked by ESET NOD32 Antivirus.

http://www.eset.com

Maura Hanlon

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).

From: Alan Kinsey
To: Stokes, Janelle S SWG
Subject: Permit to dredge ship channel Port of Freeport Texas
Date: Friday, February 04, 2011 11:30:56 AM

Dear Mrs. Stokes:

Regarding the planned expansion of the Port of Freeport channel, it was disturbing to see that the "feasibility study" and "draft environmental impact statement" showed there would be no plan for the use of beneficial use material. Even more disturbing though was the oversight of not addressing mitigation efforts for impacts on adjacent shorelines which is a requirement of new and improved federal projects. I understand consideration of potential beneficial uses of the material are required in this process. 1

The USACE did not do a thorough study of the impacts or reference more up-to-date studies of the impacts of the existing channel. The amount of dredging is going to increase threefold the quantity of material and the planned placement is offshore (west of the jetties) in an established area and a new area. There are also planned 3 new upland sites totaling 500 acres which contain some wetlands.

All of this in plain view of the ever eroding beaches at Surfside. I am not an engineer but I see millions being spent to replenish sand at Surfside Beach while the dredge sits offshore digging it up and hauling if off. Is there no way to do the logical thing and replace the material on the beach from which it is coming.

I also think that some sort of underwater dam arcing from the end of the jetties would slow both the erosion at Surfside and the need for dredging the material from the channel.

Thank you for your attention to this matter.

Alan Kinsey

134 Belanger and

223 Seashell

Surfside Beach, Texas 77541

(V) 979-265-1911

(F) 979-265-5901

Alan Kinsey
134 Belanger
Surfside Beach, TX 77541

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).

From: Peg Llewellyn
To: Stokes, Janelle S SWG
Subject: Port of Freeport Improvement Project Comments.
Date: Saturday, February 05, 2011 4:57:52 PM

Janelle Stokes
Regional Environmental Specialist
Corps of Engineers, Galveston District
P.O. Box 1229
Galveston, Texas 77553
409/766-3039

Dear Ms. Stokes,

This letter expresses my concern about the Draft Environmental Impact Statement and Feasibility Study for the Freeport Channel Improvement. I find both studies fully inadequate in addressing shoreline erosion and sediment management as well as the overall negative economic impact widening and deepening the channel will have to the area. 1

Both the shoreline stabilization study and the sediment study were desk top studies that did not collect any actual field data. These studies relied on out dated references and did not utilize studies that collected real field data which was presented in the Texas General Land Office January 2008 Surfside Beach Shoreline Stabilization Feasibility Study which states in the Executive Summary under the Causes of Erosion:

"The cumulative effects from relocation of the Brazos River , Freeport Channel Improvement projects, and continued dredging of the navigation channel lead to the two MAIN causes of erosion: 1) an overall loss of sediment in the littoral system and 2) erosions of the relic delta which translate into shore erosion. These causes work together to form a positive (increasing) feedback loop which accelerates the erosion along Surfside. Additionally, future efforts to deepen and widen the Port of Freeport Channel are likely to have additional impact (increase) on the morphological system inertia"

The study further shows that after the 1993 Freeport Channel improvement project whereby the rate of dredging materials increased over 100 percent from approximately one million cubic yards to two million cubic yards, and during that time the rate of erosion increased from a long-term rate of 4 feet per year (TX BEG, 2004) to 11 feet a year, by 2004 (C&H, 2008). This increase in erosion is not only wave action but the loss of sediments entering the beach system through maintenance dredging.

The shoreline study conducted by the USACE (which by the way was not signed by a professional or even had a USACE title page) and stated that there was not a significant impact to the erosion, did not take into account the loss of sediments entering the beach system. Any increase in erosion is a significant impact but the 0.6 feet per year is an increase of 15% over the long-term erosion rate of 4.0 feet/year TX BEG, 2004) is statistically significant.

Add that to the information in the sediment study that shows the improvement project will remove over 5.0 million cubic yards per year from the sediment system through dredging, or a 250 percent increase in dredging over current values and erosion rates which are tied not only to wave action but loss of sediments in the beach system, erosion rates will increase much more than currently predicted.

The USACE and the Port of Freeport need to take into account the economic damages that their project are causing to the local community and region. Over 40 beach houses were lost due to ongoing erosion caused from the dredging the Freeport Channel. These houses not only provided property taxes to the area tax base including subsidizing the Port of Freeport , but they provided hotel/motel taxes to the state and community.

The Village of Surfside Beach is vibrant economic community that contributes approximately 12 million dollars a year to the area economy through tourism in the Village of Surfside alone, and millions more in neighboring communities of Clute and Lake Jackson who support tourists that visit the beach.

There is over $112 million dollars in property located in the Village of Surfside Beach that is at risk if rapid erosion continues. Surfside pays approximately 3 million dollars a year in property taxes to Brazoria County and over $750,000 in sales and hotel/motel taxes a year to the city and the State of Texas . The best case potential net financial benefit of $11 million a year to widen and deepen the channel to 60 foot deep (Table 36 of the USACE Draft Feasibility Study) doesn't even begin to replace the tourism dollars Surfside adds to the region.

The Port of Freeport is currently being subsidize by property taxes, does not pay most property taxes on property they own and now wants more tax payer money that will cause damage to tax paying and revenue generating properties.

The USACE and Port of Freeport need to partner with the Village of Surfside to address the erosion caused by the Port's dredging and utilize dredge materials to re-nourish the beach and help build a permanent solution to the damage the Port and the Freeport Channel have and will cause with this project.

Sincerely,

Peggy Llewellyn, PE

614 Sea Shell

Surfside Beach Texas

Peg Llewellyn
614 Sea Shell
Surfside Beach, TX

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).

From: Peg Llewellyn
To: Stokes, Janelle S SWG
Subject: Comments on the Port of Freeport Improvement Project
Date: Friday, February 04, 2011 9:09:51 PM

To: U.S. Corps of Engineers

Whereas, the Port of Freeport has submitted a Draft Environmental Impact Report and is requesting permit from the Corps of Engineers to widen and deepen the Freeport Channel and public comments are due on Feburary 5, 2011, and we the undersigned do hereby believe that the widening and deepening of Freeport Channel is determental to the Community of Surfside Beach Texas, we are here by requesting that US Corps of Engineers require mitigation measures and benificial reuse of dredge materials to re-nourish Surfside Beach and address erosion caused by the Freeport Channel. 1

Whereas, the Village of Surfside Beach is a coastal community offering recreational opportunities to the greater Houston Metropolitan Area and the Citizens of the State of Texas with over 200,000 visitors a year.

Whereas, the Village of Surfside Beach is vibrant economic community that contributes approximately 12 million dollars a year to the area economy through tourism and pays approximately 3 million dollars a year in property taxes to Brazoria County and over $750,000 in sales and hotel/motel taxes a year to the county and the State of Texas.

Whereas, engineering studies conducted by the State of Texas General Land Office (Coast and Harbors, 2008), the Village of Surfside Beach and the Port of Freeport have shown that the rerouting of the Brazos river and the continued and future deepening and widening of the Freeport Channel is contributing to the rapid man-made erosion in Surfside Beach.

Whereas, the rapid man-made erosion caused by the Freeport Channel has contributed to the loss of in over 40 income producing and taxable properties in the Village of Surfside Beach.

Whereas, the Port of Freeport is exempt from paying most property taxes and requires property tax subsidies to be economically viable.

Whereas, federal law requires the beneficial use of dredge materials and the Port of Freeport is discharging dredge materials off-shore rather than beneficially using these materials to re-nourish beaches caused by erosion from the Freeport Channel.

Whereas, federal law mandates that mitigation measures be implemented for any federally funded project that causes economic or environmental damage and the area.

Whereas, the July, 19, 2010, Executive Order--Stewardship of the Ocean, Our Coasts, and the Great Lakes, requires federally funded project to 2(ii) improve the resiliency of ocean, coastal, and Great Lakes ecosystems, communities, and economies; and that any further deepening or widening of the Freeport Channel would be detrimental to the economy of the coastal community of Surfside Beach.

We the undersigned do hereby request that the United States Corps of Engineers deny the permit for widening and deepening of the Freeport channel, unless their project includes:

- Mitigation measures to address current and future erosion directly resulting from the Freeport channel, and
- Beneficial reuse of dredge materials through re-nourishing Surfside Beach on an annual basis.

Sincerely,
The Undersigned <http://www.petitiononline.com/mod_perl/signed.cgi?stoperos>

	Name	Comments	Address
67.	Rhonda O'Neill		
66.	John M. Murphy	I suggest a class action lawsuit naming the Army Corps of Engineers, the Port of Freeport and any other entities or individuals cooperating with these agencies in the operation of the	

Freeport Shipping Channel which is causing the erosion of Follet's Island. Swordfish Lane, Surfside Beach
65. Carlton Greer PO Box 935
64. Stephen cagle
63. Venita Brown Please consider the negitive impact this will have in the future for Surfside. We are a economic community, help us to recover and restore the beach. Do not turn your back on us Please!
62. John H Burke This seems the only fair equitable solution for all involved.
61. Jan Burke We need the Corps of Engineers to leave our channel just like it is. It has already caused enough problems for our beach
60. Erin Marzouki
59. Ernest Cagle 722 Beach Drive, Surfside, Tx 77541
58. Fawn Kostal 215 Spoonbill Place
57. Joe Kostal 215 Spoonbill Place

56. Bobby Myers
55. franky ward We should have done this a long time ago thank you
54. Kristin Perrine
53. ANN GASCHLER 212 SEASHELL DRIVE SURFSIDE BEACH TX
52. Bob Eastman 307 Seashell
51. Lester Wallace
50. Brian VanWinkle
49. Sandi VanWinkle
48. Kirk L. Brannan PO Box 4085 Lake Jackson, TX 77566
47. Christopher Eric Cagle
46. AnnPierce Arnett please stop the erosion of Surfside Beach
45. Donna Stacey I fail to see how you can continue to engineer the destruction of the Village of Surfside Beach. It is time for you to take responsibility for your actions! 427 Swordfish Lane, Surfside Beach
44. John Imperatore Please address the Surfside errosion
43. Marie Imperatore Surfside is our summer home and the erosion has threatened our family's three homes on the island 5214 Cottonwood Creek Lane, League City, TX 77573
42. Bruce Norman 1211 Fort Velasco Drive
41. Lynelle Thompson
40. Kelly Greer
39. Becky C agle Please Help Us
38. Amira S. Van Winkle 308 Surf Drive
37. Jathan E. Van Winkle
36. Suzan Zachariah Thank you for quick actions and thoughtful solutions. 551 Thunder Surfside Beach, TX 77541
35. Melinda wilhelm 314 seashell Dr.
34. Debbie Sager
33. william d perry business owner
32. Alexa Duke There will not be a beach or a village to be concerned about unless remediation measures begin immediately.
31. Wanda Petree 996 Bluewater Hwy, Surfside, TX
30. Henry Petree 996 Bluewater Hwy, Surfside, TX
29. Scott McCracken 210 Fort Velasco Surfside Beach TX 77541
28. Robin Robichau The Corps of Engineers and the Port ought to adopt Surfside Beach for at least two miles from the jetty and maintain it with dredged sand and/or purchased sand as needed. This is only right since study after study have concluded that the number one cause of Surfside's erosion is due to MAN-MADE Engineering (i.e., jettys, deep ship channels, rerouting the Brazos, etc.) If you can fund billions in ship channel and port expansions, you can afford a few million per year to protect the beach from the erosion your work causes. Be a good neighbor! 523 Seashell
27. MaryAnn Lecher We need your help and cooperation in fixing the problems created by the installation of the Intercoastal Waterway entrance. Beach Drive, Surfside, Texas 77541
26. Sarah Hall Surfside Beach, TX
25. Philip Guyton
24. debbie reitz 527 Seashell Drive
23. Gordon Aust 419 Sea Shell Dr. Surfside Beach,Texas

22. Beverly Bisso 306 Beach Drive
21. Susan Taylor Surfside Beach, TX
20. Jason Little
19. C. T. Boone 319 Coral Ct., Sufrside Beach,TX. 77541
18. Tommy Cooman
17. gilbert garcia

Name Comments Address
17. gilbert garcia
16. Susan Cooman
15. Calvin Mann Jr
14. Marc Grosz Port Freeport: Please help mitigate against the documented negative and damaging effects of deepening and widening the already very deep and very wide channel to benefit the Port and its consitutents. It makes good sense for good neighbors!
13. Johanna Hefley please give us the sand for our beach 422 surf surfside texas
12. MARSHALL HEFLEY SR help 422 surf surfside texas
11. Alan Kinsey 223 Seashell and 134 Belanger, Surfside Beach
10. Blake Blackwelder Surfside Beach should be entitled to millions of cubic yards of sand to mitigate the effects of engineering actions that have acted to deprive the entire Brazoria County shoreline of active sand renourishment. These are very low slope, low energy beaches that need a modest amount of sand to preserve the shoreline. Dredging, building jetties, and relocation of a major sand-source river mouth have all been detrimental to the beaches at surfside.
9. Adam DeVaney
8. Diana Mann
7. Vanda Mathis No more destructive action resulting in depleting our beach.

6. Glenn Robichau USACE and Port Freeport and their clients need to partner with Surfside to protect the beach. If one cup of beach sand ends up at the bottom of the channel - then there is a negative environmental impact. 523 Seashell Dr.
5. Gregg D. Bisso 306 Beach Dr. Surfside Tx. 77541
4. Pat Layne 403 Fort Velasco, Surfside Beach, Texas
3. Jennifer Huisman 123 Pampano
2. Eric Younkin Hey Corp, we are only requesting you to help undo the damage you have already caused.
1. Peggy Llewellyn Please require the Port to follow the benificial dredge material laws 614 Sea Shell, Surfside Beach TX

From: Peg Llewellyn
To: Stokes, Janelle S SWG
Subject: Freeport Channel Improvement Project
Date: Saturday, February 05, 2011 5:08:13 PM

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http://www.petitiononline.com/mod_perl/petition-sign.cgi?stoperos
<http://www.petitiononline.com/mod_perl/petition-sign.cgi?stoperos>
Ms. Stokes,

More signatures are being added to the petion against the Improvement Project without mitigation measures and benificial reuse of dredge materials to renourish the beaches.

Please see the online petition:

http://www.petitiononline.com/mod_perl/petition-sign.cgi?stoperos
<http://www.petitiononline.com/mod_perl/petition-sign.cgi?stoperos>

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Require Port of Freeport to Address Erosion at Surfside Beach

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To: U.S. Corps of Engineers

Whereas, the Port of Freeport has submitted a Draft Environmental Impact Report and is requesting permit from the Corps of Engineers to widen and deepen the Freeport Channel and public comments are due on Feburary 5, 2011, and we the undersigned do hereby believe that the widening and deepening of Freeport Channel is determental to the Community of Surfside Beach Texas, we are here by requesting that US Corps of Engineers require mitigation measures and benificial reuse of dredge materials to re-nourish Surfside Beach and address erosion caused by the Freeport Channel.

Whereas, the Village of Surfside Beach is a coastal community offering recreational opportunities to the greater Houston Metropolitan Area and the Citizens of the State of Texas with over 200,000 visitors a year.

Whereas, the Village of Surfside Beach is vibrant economic community that contributes approximately 12 million dollars a year to the area economy through tourism and pays approximately 3 million dollars a year in property taxes to Brazoria County and over $750,000 in sales and hotel/motel taxes a year to the county and the State of Texas.

Whereas, engineering studies conducted by the State of Texas General Land Office (Coast and Harbors, 2008), the Village of Surfside Beach and the Port of Freeport have shown that the rerouting of the Brazos river and the continued and future deepening and widening of the Freeport Channel is contributing to the rapid man-made erosion in Surfside Beach.

Whereas, the rapid man-made erosion caused by the Freeport Channel has contributed to the loss of in over 40 income producing and taxable properties in the Village of Surfside Beach.

Whereas, the Port of Freeport is exempt from paying most property taxes and requires property tax subsidies to be economically viable.

Whereas, federal law requires the beneficial use of dredge materials and the Port of Freeport is discharging dredge materials off-shore rather than beneficially using these materials to re-nourish beaches caused by erosion from the Freeport Channel.

Whereas, federal law mandates that mitigation measures be implemented for any federally funded project that causes economic or environmental damage and the area.

Whereas, the July, 19, 2010, Executive Order--Stewardship of the Ocean, Our Coasts, and the Great Lakes, requires federally funded project to 2(ii) improve the resiliency of ocean, coastal, and Great Lakes ecosystems, communities, and economies; and that any further deepening or widening of the Freeport

Channel would be detrimental to the economy of the coastal community of Surfside Beach.

We the undersigned do hereby request that the United States Corps of Engineers deny the permit for widening and deepening of the Freeport channel, unless their project includes:
• Mitigation measures to address current and future erosion directly resulting from the Freeport channel, and
• Beneficial reuse of dredge materials through re-nourishing Surfside Beach on an annual basis.

Sincerely,

The Undersigned

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The Require Port of Freeport to Address Erosion at Surfside Beach Petition to U.S. Corps of Engineers was **created by and written by Peggy Llewellyn** (pllewellyn2002@yahoo.com). This petition is hosted here at www.PetitionOnline.com as a public service. There is no endorsement of this petition, express or implied, by Artifice, Inc. or our sponsors. For technical support please use our simple Petition Help form.

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Require Port of Freeport to Address Erosion at Surfside Beach

We endorse the Require Port of Freeport to Address Erosion at Surfside Beach Petition to U.S. Corps of Engineers.

Read the Require Port of Freeport to Address Erosion at Surfside Beach Petition

Sign the Require Port of Freeport to Address Erosion at Surfside Beach Petition

	Name	Comments	Address
32.	Alexa Duke	There will not be a beach or a village to be concerned about unless remediation measures begin immediately.	
31.	Wanda Petree		996 Bluewater Hwy, Surfside, TX
30.	Henry Petree		996 Bluewater Hwy, Surfside, TX
29.	Scott McCracken		210 Fort Velasco Surfside Beach TX 77541
28.	Robin Robichau	The Corps of Engineers and the Port ought to adopt Surfside Beach for at least two miles from the jetty and maintain it with dredged sand and/or purchased sand as needed. This is only right since study after study have concluded that the number one cause of Surfside's erosion is due to MAN-MADE Engineering (i.e., jettys, deep ship channels, rerouting the Brazos, etc.) If you can fund billions in ship channel and port expansions, you can afford a few million per year to protect the beach from the erosion your work causes. Be a good neighbor!	523 Seashell
27.	MaryAnn Lecher	We need your help and cooperation in fixing the problems created by the installation of the Intercoastal Waterway entrance.	Beach Drive, Surfside, Texas 77541
26.	Sarah Hall		Surfside Beach, TX
	Philip		

25.	Guyton		
24.	debbie reitz		527 Seashell Drive
23.	Gordon Aust		419 Sea Shell Dr. Surfside Beach,Texas
22.	Beverly Bisso		306 Beach Drive

Port Aransas Events Events and activties in Port Aransas, TX. www.portaransasevents.com
Beach Front Condos Luxury Condos in Padre Islands. Choose from Over 50 Properties. www.VacationPadre.com
Hotels in Surfside Beach Get our Best Price Guarantee on All Surfside Beach Hotels at Hotels.com www.Hotels.
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21.	Susan Taylor		Surfside Beach, TX
20.	Jason Little		
19.	C. T. Boone		319 Coral Ct., Sufrside Beach,TX 77541
18.	Tommy Cooman		
17.	gilbert garcia		
16.	Susan Cooman		
15.	Calvin Mann Jr		
14.	Marc Grosz	Port Freeport: Please help mitigate against the documented negative and damaging effects of deepening and widening the already very deep and very wide channel to benefit the Port and its consitutents. It makes good sense for good neighbors!	
13.	Johanna Hefley	please give us the sand for our beach	422 surf surfside texas
12.	MARSHALL HEFLEY SR	help	422 surf surfside texas
11.	Alan Kinsey		223 Seashell and 134 Belanger, Surfside Beach
10.	Blake Blackwelder	Surfside Beach should be entitled to millions of cubic yards of sand to mitigate the effects of engineering actions that have acted to deprive the entire Brazoria County shoreline of active sand renourishment. These are very low slope, low energy beaches that need a modest amount of sand to preserve the shoreline. Dredging, building jetties, and relocation of a major sand-source river mouth have all been detrimental to the beaches at surfside.	

9.	Adam DeVaney		
8.	Diana Mann		
7.	Vanda Mathis	No more destructive action resulting in depleting our beach.	
6.	Glenn Robichau	USACE and Port Freeport and their clients need to partner with Surfside to protect the beach. If one cup of beach sand ends up at the bottom of the channel - then there is a negative environmental impact.	523 Seashell Dr.
5.	Gregg D. Bisso		306 Beach Dr. Surfside Tx. 77541
4.	Pat Layne		403 Fort Velasco, Surfside Beach, Texas
3.	Jennifer Huisman		123 Pampano
2.	Eric Younkin	Hey Corp, we are only requesting you to help undo the damage you have already caused.	
1.	Peggy Llewellyn	Please require the Port to follow the benificial dredge material laws	614 Sea Shell, Surfside Beach TX

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The Require Port of Freeport to Address Erosion at Surfside Beach Petition to U.S. Corps of Engineers was **created by and written by Peggy Llewellyn** (pllewellyn2002@yahoo.com). The petition is hosted here at www.PetitionOnline.com as a public service. There is no endorsement of this petition, express or implied, by Artifice, Inc. or our sponsors. For technical support please use our simple Petition Help form.

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Require Port of Freeport to Address Erosion at Surfside Beach

We endorse the Require Port of Freeport to Address Erosion at Surfside Beach Petition to U.S. Corps of Engineers.

Read the Require Port of Freeport to Address Erosion at Surfside Beach Petition

Sign the Require Port of Freeport to Address Erosion at Surfside Beach Petition

	Name	Comments	Address
82.	Bonnie Smith		
81.	Randy Gillis	Help to maintain Surfside beaches	322 Driftwood Ct. Surfside, Texas
80.	Jeffrey Melland		
79.	Melissa Rezsutek		
78.	Kevin West		
77.	Gayle	Be mindul that barrier islands are neccessary and very fragile!	
76.	Peter Lecher		Beach Drive, Surfside Beach, Texas 77541
75.	Henry Pekar		606 Fin Aly,Surfside Beach,TX
74.	Crystal Gallo	How come this erosion doesnt happen anywere else? The Port of Freeport is the only answer.	
73.	Jeff Robichau	SAVE OUR BEACH. FOR MY KIDS SAKE!!!!!!!!	523 seashell dr. Surfside, Tx.
72.	Eric Slanis	I grew up vacationing on surfside with my family and have had many amazing memories. Please take care of the beach!!!	

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71.	Mark Slanis	Don't mess with my beach. I want it for my grandkids to enjoy just as much as we always have!	
70.	Joseph Clayton		

	Medve		
69.	Barbara Slanis	Born and raised in the surfside area, while I recognize the need for commerce, I want to see the beach both cared for and well preserved.	
68.	Michelle Slanis	I love my beach and would love to have it there for my children to enjoy	
67.	Rhonda O'Neill		
66.	John M. Murphy	I suggest a class action lawsuit naming the Army Corps of Engineers, the Port of Freeport and any other entities or individuals cooperating with these agencies in the operation of the Freeport Shipping Channel which is causing the erosion of Follet's Island.	Swordfish Lane, Surfside Beach
65.	Carlton Greer		PO Box 935
64.	Stephen cagle		
63.	Venita Brown	Please consider the negitive impact this will have in the future for Surfside. We are a economic community, help us to recover and restore the beach. Do not turn your back on us Please!	
62.	John H Burke	This seems the only fair equitable solution for all involved.	
61.	Jan Burke	We need the Corps of Engineers to leave our channel just like it is. It has already caused enough problems for our beach	
60.	Erin Marzouki		
59.	Ernest Cagle		722 Beach Drive, Surfside, Tx 77541
58.	Fawn Kostal		215 Spoonbill Place
57.	Joe Kostal		215 Spoonbill Place
56.	Bobby Myers		
55.	franky ward	We should have done this a long time ago thank you	
54.	Kristin Perrine		
53.	ANN GASCHLER		212 SEASHELL DRIVE SURFSIDE BEACH TX
52.	Bob Eastman		307 Seashell
51.	Lester Wallace		
50.	Brian VanWinkle		
49.	Sandi VanWinkle		
			PO Box 4085

48.	Kirk L. Brannan		Lake Jackson, TX 77566
47.	Christopher Eric Cagle		
46.	AnnPierce Arnett	please stop the erosion of Surfside Beach	
45.	Donna Stacey	I fail to see how you can continue to engineer the destruction of the Village of Surfside Beach. It is time for you to take responsibility for your actions!	427 Swordfish Lane, Surfside Beach
44.	John Imperatore	Please address the Surfside errosion	
43.	Marie Imperatore	Surfside is our summer home and the erosion has threatened our family's three homes on the island	5214 Cottonwood Creek Lane, League City, TX 77573
42.	Bruce Norman		1211 Fort Velasco Drive
41.	Lynelle Thompson		
40.	Kelly Greer		
39.	Becky C agle	Please Help Us	
38.	Amira S. Van Winkle		308 Surf Drive
37.	Jathan E. Van Winkle		
36.	Suzan Zachariah	Thank you for quick actions and thoughtful solutions.	551 Thunder Surfside Beach, TX 77541
35.	Melinda wilhelm		314 seashell Dr.
34.	Debbie Sager		
33.	william d perry	business owner	
32.	Alexa Duke	There will not be a beach or a village to be concerned about unless remediation measures begin immediately.	

View Signatures : 82 32

PetitionOnline.com has disabled the display of email addresses for signatories who chose to make their address public. We have done this to reduce the spread of harmful Windows viruses which harvest email addresses from the web cache of infected computers. This also prevents spammers from harvesting email addresses from this site.

The Require Port of Freeport to Address Erosion at Surfside Beach Petition to U.S. Corps of Engineers was **created by and written by Peggy Llewellyn** (pllewellyn2002@yahoo.com). The petition is hosted here at www.PetitionOnline.com as a public service. There is no endorsement of this petition, express or implied, by Artifice, Inc. or our sponsors. For technical support please

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Peg Llewellyn
Petition
614 Sea Shell
Surfside Beach, TX

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).

From: Billy Lofgren
To: surfsideproperties@suzanzachariah.com
Cc: Stokes, Janelle S SWG
Subject: Re: [FWD: Petition to US Army Corps of Engineers and Port Freeport]
Date: Monday, February 07, 2011 3:02:28 PM

To whom it may concern,
I'm seeing this petition (and deadline) for the first time today, three days after the deadline 1
for action unfortunately.
I fully agree with the petition content and would have supported it fully, had I been aware sooner.
Was it the US Army Corps of Engineers idea to allocate a one day deadline notice of this significant event? It certainly reminds me of the 12 hour unofficial notification I recall
during my attachment with the 97th Engr Battalion for a three week field excercise.
The "unofficial" notification served as a reminder for the base clubs to close earlier in order to try to ensure some sobriety at 300 hrs the following morning.
Memories are made of this. I could not hardly wait to see my demob date up on the board.
A one second notice would have sufficed for me then.
I only hope if there are any more petitions coming around in the future, I'll get a chance to more actively participate.
Billy

-- On Fri, 2/4/11, surfsideproperties@suzanzachariah.com <surfsideproperties@suzanzachariah.com> wrote:

From: surfsideproperties@suzanzachariah.com <surfsideproperties@suzanzachariah.com>
Subject: [FWD: Petition to US Army Corps of Engineers and Port Freeport]
To: antoinette.spurlin@fortbend.k12.tx.us, Jabkoeger@aol.com, "Charles Emola" <cemola@rencon.cc>, "Molly Lartigue" <molly23@sbcglobal.net>, "Rick Lartigue" <Rick.Lartigue@kbr.com>, "David Devaney" <dldevaney@warehouseassociates.com>, MWeas55387@aol.com, "Charles Spurlin" <Charles.Spurlin@fortbend.k12.tx.us>, "Charles Spurlin Jr" <charles.spurlin@gmail.com>, slwslw77@comcast.net, "Billy Lofgren" <billylofgren@sbcglobal.net>, "Wendy Christensen" <wenchr@gmail.com>, "Jimmy Wynn" <jrwynn@hotmail.com>, "Barbara" <stairtown@yahoo.com>, "Jan Gonzales" <thumperk@swbell.net>, "David Rowton" <David.Rowton@rotork.com>, "Troy Yamaguchi" <texasyama@yahoo.com.au>, "Zachariah" <zachshack@earthlink.net>, deannadenise@yahoo.com, "Johnathan Diver" <dohdoor@hotmail.com>, jdfkostal@yahoo.com, "Jozina Dirkzwager" <Jozina.Dirkzwager@chevron.com>, WEESTIMATE@aol.com
Date: Friday, February 4, 2011, 5:06 PM

All, please consider sending a direct email to janelle.s.stokes@usace.army.mil <http://us.mc836.mail.yahoo.com/mc/compose?to=janelle.s.stokes@usace.army.mil> expressing your concerns. Deadline is TODAY! Below is an example.

To:
Janelle Stokes
Regional Environmental Specialist

Corps of Engineers, Galveston District
P.O. Box 1229
Galveston, Texas 77553
409/766-3039
janelle.s.stokes@usace.army.mil

I am sending a copy of Glenn Robichau's email again expressing my concern as well. I own a home on Beach Drive. Thank you for your time in considering our urgent request.

Dear USACE,

Thank you for taking comments on this important issue.

Attached is a document that a group of Surfside citizens presented to Cong. Ron Paul's office and the management of USACE in Washington and Galveston during 2010. Of concern is the dramatic and documented erosion of Surfside Beach over the years and the lack of action and response from the USACE relative to this erosion that many studies conclude are caused primarily by the jetties and ship channel (its widening, deepening, and constant dredging) - all planned and funded by the USACE. Your very own projects, your construction and especially the dredging have robbed Surfside Beach of millions of cubic yards of sand over the years resulting in total destruction of the beach and 40 front row beach homes. We understand that the planned expansion would result in even more dredging annually. YOU MUST ADDRESS THESE CONCERNS.

DO NOT award a permit for further expansion of Port Freeport's ship channel, unless you address the following:

1) Plans and action for mitigating current negative consequences of USACE past work at on the jetties and channel resulting in aggressive erosion rates at Surfside.

2) Include in your plan a section concerning the known impacts ship channels, dredging and jetties have on neighboring beaches, especially the long-term effects of amplified wave action and higher erosion rates. See Dr. Richard Watson's report on Surfside's battle with erosion at this link:
http://gsa.confex.com/gsa/viewHandout.cgi?uploadid=256
<http://gsa.confex.com/gsa/viewHandout.cgi?uploadid=256>
<http://gsa.confex.com/gsa/viewHandout.cgi?uploadid=256 > >

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4) Address how this project will employ and promote Beneficial Use of Dredged Material policies to enhance and re nourish Surfside's beaches. Propose USACE's funding of on-going sand nourishment projects for Surfside Beach given its close proximity to the jetties and ship channel?

5) Address long-term actions the USACE can take to reduce the impact of amplified wave action and strong erosion rates caused by the jetties and constant dredging. Can the USACE construct a Spur Dike on the side of the jetty to reduce sand transport into the ship channel (slow down beach erosion and reduce USACE cost of dredging).

6) Support not only the Brazoria County Shoreline Recon Study (approved in Nov. 1999 but never funded), but the recommendations of Coast & Harbor for construction of a Shoreline Breakwater System (see details in attached pdf document).

7) Partner with the Village of Surfside, Brazoria County, Port Freeport, Texas GLO, and the industries served by this ship channel to design and fund protective measures and nourishment projects to reduce and abate Surfside Beach's dramatic erosion.

Surfside has paid a heavy price for the expansions already made to the ship channel. From where we sit (which is right next to the jetty) we believe that the USACE needs to take responsibility - not only for the work within the jetty but also for the consequences (which may be unintentional but real nonetheless) of that work beyond the jetty! We are not against commerce and job creation - we are for protecting the beach and the community, and rebuilding this beach as necessary. The beach on Surfside is the front line protection for the community of Surfside. Not only does it guard public infrastructure and private property, but it also guards the Intracoastal Waterway, and the billions of dollars of industry supported by Port Freeport.

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Thank you for your time and consideration.

Anthony L. Startz
Lamons | Human Resources Director | Houston
7300 Airport Blvd. | Houston, TX 77061
Sealing Global - Servicing Local
Direct: 713-547-9569 | Toll Free: 800-231-6906 | Fax: 713-982-5638
Email: anthony.startz@lamons.com <http://us.mc836.mail.yahoo.com/mc/compose?to=anthony.startz@lamons.com> | Web: www.lamons.com <http://www.lamons.com/>

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http://www.petitiononline.com/mod_perl/petition-sign.cgi?stoperos

Folks,

We are running out of time to send a message to the US Army Corps of Engineers and Port Freeport that we expect them to include in their ship channel widening/deepening plans some effort and funding for mitigating, stopping, and reversing the serious erosion issues on Surfside Beach - that study after study has attributed to their jettys, their deep channel, their yearly dredging, and their rerouting of the Brazos River. The port and their clients benefit from the wider and deeper channel and the 3,000 + vessels that visit them each year. The property owners of Surfside have alone paid the

price for this commerce with the destruction of the sandy beach over time and the loss of the front row of houses. Let's demand that the Corps and Port and their clients partner with Surfside to maintain a sandy beach all the way to the county line. We are not against industry and expansion - we are against loosing public and private property to the worst erosion rates in the state caused by USACE engineered projects. By the way, per the engineering studies of the USACE, all this dredging and widening of the ship channel reportably has NO Environment Impact!!! I would strongly disagree with that conclusion. In fact, I say if one bucket of beach sand drifts along the current, around the jetty and into the ship channel where it sinks to the bottom of the 50ft. channel (to be lost forever to wave action until it gets dredged and carried offshore by another USACE dredging project) - then that to me constitutes a negative environmental impact because that sand cannot be deposited on a beach where it belongs. We would be much happier to read that the Corps and Port would agree to support Beneficial Use of Dredged Material for beach replenishment, and funding for periodic renourishment projects to maintain beach levels that protect public and private property. "but this will cost too much money"!! Charge the port clients an annual beach nourishment fee. Add a fee per vessel for beach nourishment! Add these dollars in the Federal appropriations requests that you lobby for and get every year. The federal government paid for these engineering projects - they can pay to remedy the negative consequences they have caused.

We are beating each other's heads in over these damn houses in the water. We should all be on the same side - the side that is fighting to save Surfside and her beaches with a permanent solution to fight this man-made erosion.

Look at the attached petition - please sign it tonight (and put in your personal comment)!

Best Regards,

Glenn

Billy Lofgren

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).

From: Linda
To: Stokes, Janelle S SWG
Subject: Surfside
Date: Friday, February 04, 2011 5:10:05 PM

Ms Stokes,
I think a thorough study of the impacts to our beach is necessary and should be up to date. Out-dated studies of the impacts are not going to help Surfside. 1
The amount of dredging is going to increase and the quantity of material will increase and these materials should be placed on Brazoria county beaches.Why take our materials to other locations? We need the dredged materials to be put right here where they originated from.
I am not against trade but I am against destroying Island property by eating away at the channel with no regards to the damages it is causing and without any attempt to help fix the destruction..
I have owned a home here since 1986 and it is easy to see the damages. I think we should be given ongoing help since these man-made changes are the main culprits.We need a proposal and commitment from you at he Corp and the Port to as to how you plan to remedy these damages and how you plan to stop your destruction.
Thank you.
Linda Manning-Bedward

Linda Manning-Bedward

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).

From: Linda
To: Stokes, Janelle S SWG
Subject: Surfside
Date: Friday, February 04, 2011 3:37:26 PM

Ms Stokes,
We are very concerned about the swift loss of property near the jetties. We wish to express our concerns and ask for any help that may be offered to Surfside. 1
Please help us by considering any and all means you have to prevent this problem from growing any larger.Thank you for taking a close look at our situation,
Linda Manning/ Jim Bedward

Linda Manning/Jim Bedward

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).

From: Dick Petree
To: Stokes, Janelle S SWG
Cc: hepetree@aol.com
Subject: Surfside Texas Beach Issues and Comments
Date: Friday, February 04, 2011 5:10:19 PM

Dear Ms. Stokes - USACE,

Thank you for taking comments on this important issue.

I trust you are aware of a document that a group of Surfside citizens presented to Cong. Ron Paul's office and the management of USACE in Washington and Galveston during 2010. Of concern is the dramatic and documented erosion of Surfside Beach over the years and the lack of action and response from the USACE relative to this erosion that many studies conclude are caused primarily by the jetties and ship channel (its widening, deepening, and constant dredging) - all planned and funded by the USACE. Your very own projects, your construction and especially the dredging have robbed Surfside Beach of millions of cubic yards of sand over the years resulting in total destruction of the beach and 40 front row beach homes. We understand that the planned expansion would result in even more dredging annually. PLEASE ADDRESS THESE CONCERNS. 1

Surfside has paid a heavy price for the expansions already made to the ship channel. From where Surfside sits (which is right next to the jetty) we believe that the USACE needs to take responsibility - not only for the work within the jetty but also for the consequences (which may be unintentional but real nonetheless) of that work beyond the jetty! We are not against commerce and job creation - we are for protecting the beach and the community, and rebuilding this beach as necessary. The beach on Surfside is the front line protection for the community of Surfside. Not only does it guard public infrastructure and private property, but it also guards the Intracoastal Waterway, and the billions of dollars of industry supported by Port Freeport.

For several hundred thousands of Texans each year Surfside Beach is the destination point for their vacations and weekend outings. The beach is a huge public park and we invite the USACE and Port Freeport (and their clients) to be partners in protecting and preserving it.

Also, Glenn Robichau has just recently contacted you via email again expressing concern about the channel dredging and other issues described above. Mr. Robichau has also introduced a petition that will be presented to the Corps describing additional requested actions. I own a home on on Bluewater Hwy right on the beach. There are many property owners in Surfside who have investment homes or vacation homes. There is not a professional lobbying group representing these owners or the Surfside residents due to lack of funds. Surfside is a very small local government with limited budgets and manpower. But concerned property owners are trying to use grass root communications of our concerns with requested beginning solutions to beach issues. Help is desperately needed for this historic region of Texas. It is also a beach that has been recognized nationally for its raw beauty. Help us make and keep Surfside as a viable Gulf beach before the beach is lost even further. Thank you for your time in considering our urgent request.

Thank you for your time and consideration.

Regards,

Henry & Wanda Petree
996 Bluewater Hwy
Surfside, Tx

Henry & Wanda Petree
996 Bluewater Highway
Surfside, TX

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).

From: Glenn Robichau
To: Stokes, Janelle S SWG
Cc: Sallese, Christopher W COL SWG; Murphy, Carolyn E SWG; Laird, Diana J SWG
Subject: Port Freeport Ship Channel Expansion
Date: Friday, February 04, 2011 2:08:08 PM
Attachments: Surfside_DC April2010.pdf

Dear USACE,

Thank you for taking comments on this important issue.

Attached is a document that a small group of Surfside citizens presented to Cong. Ron Paul's office and the management of USACE in Washington and Galveston during 2010. Of concern is the dramatic and documented erosion of Surfside Beach over the years and the lack of action and response from the USACE relative to this erosion that many studies conclude are caused primarily by the jetties, ship channel (its widening, deepening, and constant dredging) - all planned and funded by the USACE. Your very own projects, your construction and especially the dredging have robbed Surfside Beach of millions of cubic yards of sand over the years resulting in total destruction of the beach and 40 front row beach homes. We understand that the planned expansion would result in even more dredging annually. YOU MUST ADDRESS THIS. 1

DO NOT award a permit for further expansion of Port Freeport's ship channel, unless you address teh following:

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2) Include in your plan a section concerning the known affects ship channels, dredging and jetties have on neighboring beaches, especially the long-term effects of amplified wave action and higher erosion rates. See Dr. Richard Watson's report on Surfside's battle with erosion at this link:
http://gsa.confex.com/gsa/viewHandout.cgi?uploadid=256
<http://gsa.confex.com/gsa/viewHandout.cgi?uploadid=256>
Address the environmental impact of this specific project on neighboring beaches. Admit that rerouting the Brazos River seven miles downstream robs the Surfside area of its primary sand source. Admit that a jetty and deep channel affect currents and beach erosion . Admit that jetties cause amplified wave action and higher erosion rates on neighboring beaches. Admit that dredging off millions of cubic yards each year from ship channels affects erosion rates on neighboring beaches as the sand material is dumped so far offshore that it will never wash back up to a beach. We are the witnesses and victims of this negative impact.

4) Address how this project will employ and promote Beneficial Use of Dredged Material policies to enhance and re nourish Surfside's beaches. Address the USACE's funding of on-going sand nourishment projects for Surfside Beach given its close proximity to the jetties and ship channel?

5) Address long-term actions the USACE can take to reduce the impact of amplified wave action and strong erosion rates caused by the jetties and constant dredging. Can the USACE construct a Spur Dike on the side of the jetty to reduce sand transport into the ship channel (slow down beach erosion and reduce USACE cost of dredging).

6) Support not only the Brazoria County Shoreline Recon Study (approved in Nov. 1999 but never funded), but the recommendations of Coast & Harbor for construction of a Shoreline Breakwater System (see details in attached pdf document).

7) Partner with the Village of Surfside, Brazoria County, Port Freeport, Texas GLO, and the industries served by this ship channel to design and fund protective measures and nourishment projects to reduce and abate Surfside Beach's dramatic erosion.

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Thank you for your time and consideration.

Glenn Robichau
713-721-5626

Glenn Robichau

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).
2	Materials provided: 1. Presentation entitled "Village of Surfside Beach, Texas, April 2010"; 2. Fact Sheet on Surfside Beach, Texas Coastal Erosion Issues, dated April 22, 2010; 3. Surfside Beach Shoreline Stabilization Feasibility Study. 2009. Coast and Harbor Engineering, 6 pages

From: Anthony Startz
To: Stokes, Janelle S SWG
Cc: Glenn Robichau (glennrobichau@yahoo.com)
Subject: Erosion Beach Drive Surfside Beach, Texas
Date: Friday, February 04, 2011 3:19:29 PM

To:

Janelle Stokes

Regional Environmental Specialist

Corps of Engineers, Galveston District

P.O. Box 1229

Galveston, Texas 77553

409/766-3039

I am sending a copy of Glenn Robichau's email again expressing my concern as well. I own a home on Beach Drive. Thank you for your time in considering our urgent request. 1

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Thank you for your time and consideration.

Anthony L. Startz
Lamons | Human Resources Director | Houston

7300 Airport Blvd. | Houston, TX 77061
Sealing Global - Servicing Local
Direct: 713-547-9569 | Toll Free: 800-231-6906 | Fax: 713-982-5638
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Anthony L. Startz
Lamons Human Resources Director
7300 Airport Blvd.
Houston, TX 77061

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).

From: dkwood@aol.com
To: Stokes, Janelle S SWG
Subject: Surfside Beach and Port of Freeport channel
Date: Friday, February 04, 2011 4:31:00 PM

Dear Mrs. Stokes:
>
>
>
> Regarding the planned expansion of the Port of Freeport channel, it was 1
> disturbing to see that the "feasibility study" and "draft environmental
> impact statement" showed there would be no plan for the use of beneficial
> use
> material. Even more disturbing though was the oversight of not addressing
> mitigation efforts for impacts on adjacent shorelines which is a > requirement
> of new and improved federal projects. I understand that consideration of
> potential beneficial uses of the material are required in this process.
>
>
>
> The USACE did not do a thorough study of the impacts or reference more
> up-to-date studies of the impacts of the existing channel. The amount of
> dredging is going to increase threefold the quantity of material and the
> planned placement is offshore (west of the jetties) in an established area
> and a new area. There are also planned 3 new upland sites totaling 500
> acres
> which contain some wetlands.
>
>
>
> All of this in plain view of the ever eroding beaches at Surfside. I am > not
> an engineer but I see millions being spent to replenish sand at Surfside
> Beach while the dredge sits offshore digging it up and hauling if off. > Is
> there no way to do the logical thing and replace the material on the beach
> from which it is coming?
>
>
>
> I also think that some sort of underwater dam arcing from the end of the
> jetties would slow both the erosion at Surfside and the need for dredging
> the
> material from the channel.
>
>
>
> Thank you for your attention to this matter.
>
>
> Kenneth and Deborah Wood

114 Skimmer Ct
Surfside Beach
TX 77541
>

Kenneth & Deborah Wood
114 Skimmer Ct.
Surfside Beach, TX 77541

RESPONSE TO COMMENTS

Comment No.	Response
1	See the comprehensive response to the Village of Surfside (comments 2-1-11).

Appendix B

Ocean Dredged Material Disposal Site Analysis

Document No. 070281
Job No. 441901

OCEAN DREDGED MATERIAL DISPOSAL SITE ANALYSIS

October 2010

Printed on recycled paper

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1.0 INTRODUCTION

The existing Freeport Harbor Project was authorized by the River and Harbor Acts of May 1950 and July 1958, providing for an Outer Bar Channel of 38-foot depth and 300-foot width from the Gulf of Mexico to a point inside the jetties and for inside channels of 36-foot depth and 200-foot width up to and including the Upper Turning Basin. In 1970, Congress passed Section 101 of the River and Harbors Act of 1970 (PL 91-611; House Document 289, 93rd Congress – 2nd Session, December 31, 1975), and in 1974, the president authorized the relocation and deepening (Freeport Harbor Channel 45-Foot Project [45-foot Project]) of the Jetty Channel to 45-foot depth and 400-foot width and the Outer Bar Channel to 47-foot depth and 400-foot width, with an extension of approximately 4.6 miles into the Gulf of Mexico.

The Brazos River Harbor Navigation District (BRHND), or Port Freeport, of Brazoria County, Texas, submitted an application to the U.S. Army Corps of Engineers (USACE), Galveston District, for a Clean Water Act Section 404 permit and River and Harbor Act Section 10 permit for dredge and fill and other construction activities to widen portions of the Freeport Harbor Channel (the Widening Project). Proposed activities include dredging in navigable waters to widen portions of the Freeport Harbor Jetty Channel and all of the Freeport Harbor Outer Bar Channel to 600 feet, with placement of some of the new work dredged material at Quintana Beach and the remainder at the existing 45-foot Project New Work Ocean Dredged Material Disposal Site (ODMDS). The widening of the Jetty and Outer Bar channels at Freeport Harbor will generate a total of 3.2 million cubic yards (mcy) of new work dredged material, with 2.9 mcy placed at the existing 45-foot Project New Work ODMDS.

1.1 PROPOSED FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT

As a concurrent effort, USACE and Port Freeport (non-Federal sponsor) propose to improve the Widening Project navigation channels servicing Freeport Harbor as a Federal action by deepening and extending the current channel alignment, starting approximately 3 miles offshore at the 60-foot depth contour, and terminating at the Stauffer Channel Turning Basin. This proposed Freeport Harbor Channel Improvement Project (FHCIP) will also provide for the creation of two new upland confined placement areas (PAs 8 and 9), adjacent to the Brazos River. The port's Widening Project under permit would occur prior to Federal construction of the other proposed channel improvements. As such, the appropriate future to compare FHCIP alternatives to is the Widening Project, which is the logical Future without-Project Alternative (FWOP-1). The Locally Preferred Plan (LPP) has been adopted by the USACE and Port Freeport as the proposed project plan. Channel dimensions for the LPP can be found in Table 1-1. In general, the LPP Alternative proposes to widen the Entrance and Jetty channels up to 600 feet and deepen to 55 feet, to deepen the Main Channel to 55 feet from the Lower Turning Basin to

Table 1-1
Channel Dimensions for Proposed Plan (LPP)

LPP Plan					
Channel Reach and Station	**Dredged Depth**		**Dredged Over-depth[b]**	**Maximum Maintained Depth (feet)[c]**	**Width (feet)**
	Proposed	*Required Template[a]*	*Allowable*		
Future Channel Extension Sta. –300+00 to Sta. –370+00	57	59	2	55+4+2	600
Outer Bar Channel Sta. 0+00 to Sta. –300+00	57	59	2	55+4+2	600
Jetty Channel Sta. 71+52 to Sta. 0+00	55	57	2	55+2+2	600
Lower Turning Basin Sta. 78+52 to Sta. 71+52	55	57	2	55+2+2	750-ft diam.
Channel to Brazosport Turning Basin Sta. 101+00 to Sta. 78+52	55	57	1	55+2+1	existing[1]
Brazosport Turning Basin Sta. 115+00 to Sta. 101+00	55	57	1	55+2+1	1,200-ft diam.
Channel from Brazosport Turning Basin Sta. 132+66 to Sta. 115+00	55	57	1	55+2+1	existing[1]
Channel to Upper Turning Basin Sta. 174+00 to Sta. 132+66	52	54	1	52+2+1	existing[1]
Upper Turning Basin Sta. 184+20 to Sta. 174+00	52	54	1	52+2+1	existing[2]
Stauffer Channel, Lower Reach (3,700 feet) Sta. 222+00 to Sta. 184+20	50	52	1	50+2+1	300
Stauffer Channel, Upper Reach (*includes Turning Basin*) Sta. 260+00 to 222+00	25	27	1	Redredge, 25-x-200-ft (Redredge, 25-x-500-ft diam.)	

[a]Proposed Depth + 2-foot Advanced Maintenance.
[b]Box-Cut Below Template. Overdepth is an additional 2 feet from Sta. 82+66 towards Gulf and 1 foot from 82+66 to end of Stauffer.
[c]Authorized Depth + 2-foot Advanced Maintenance + 2-foot Overdraft + 2-foot Wave (Offshore).
[1] Channel width varies between 350 and 400 feet.
[2] Upper Turning Basin diameter is 1,200 feet.

above the Brazosport Turning Basin, and to 50 feet upchannel through the Upper Turning Basin, to deepen the Lower Stauffer Channel to 50 feet and widen it to 300 feet, and to redredge Upper Stauffer Channel to a 25-foot depth. Associated turning basins would also be deepened and widened.

The USACE proposes to place new work (construction) dredged material from the present Entrance Channel and its extension into the existing 45-foot Project New Work ODMDS and future maintenance dredged material from these channels into the existing Maintenance ODMDS (Figure 1-1). It is estimated that approximately 17.3 mcy of new work material would be generated by dredging the LPP project, with 12.7 mcy of the new work material to be placed at the existing 45-foot Project New Work ODMDS, and the remainder to be placed at the existing upland PA (PA 1) and at two newly designated upland PAs (PA 8 and PA 9). Also, on the average, a total of 3.2 mcy/year of future maintenance dredged material will be placed in the existing Maintenance ODMDS, and 0.04 mcy, 0.12 mcy, and 0.19 mcy would be placed in PAs 1, 8, and 9, respectively, on a 3-year cycle.

1.1.1 Project Purpose and Need

Presently, under existing conditions, the maximum ship dimensions permitted by the Brazos Pilots Association at Freeport Harbor are 825 feet length overall (LOA), 145-foot maximum beam, and 42-foot draft. The existing channel configuration operationally constrains ship movement within the Outer Bar and Jetty channels to (a) one-way traffic, (b) daylight-only operations for larger vessels, and (c) restrictions that do not allow the larger vessels to enter the port when winds exceed 20 knots or crosscurrents exceed 0.5 knot. These problems are discussed in more detail below.

- **Lightering and Lightening.** Since the completion of the 45-foot Project, the size of the vessels navigating the waterway has steadily increased so that many vessels currently have to be light-loaded to traverse the channel. The current channel depth requires that large crude carriers remain offshore and transfer their cargo into smaller crude tankers for navigating the channel. This lightering operation takes place in the Gulf where two ships, the mother ship and the lightering ship, come together so that a cargo transfer can occur. Lightening operations are similar except that cargo is transferred to another ship so that both ships can enter port. Although these operations have occurred frequently in the past, the possibility for a collision, oil spill, fire, or other adverse environmental and/or safety consequences is always present. Current projections indicate that crude imports will increase in the near future. As these imports increase, the number of lightering vessels and product carriers will also increase, adding to shipping delays, congestion, and the risk of collision or spill.

  LOA Restriction. The length limitation of 825 feet is enforced because crosswinds and crosscurrents force tankers to "crab" at an angle through the Entrance Channel. Ships of greater length than 825 feet are not able to clear the jetties under adverse wind and current conditions. Waivers on ship length are granted on a case-by-case basis for ships

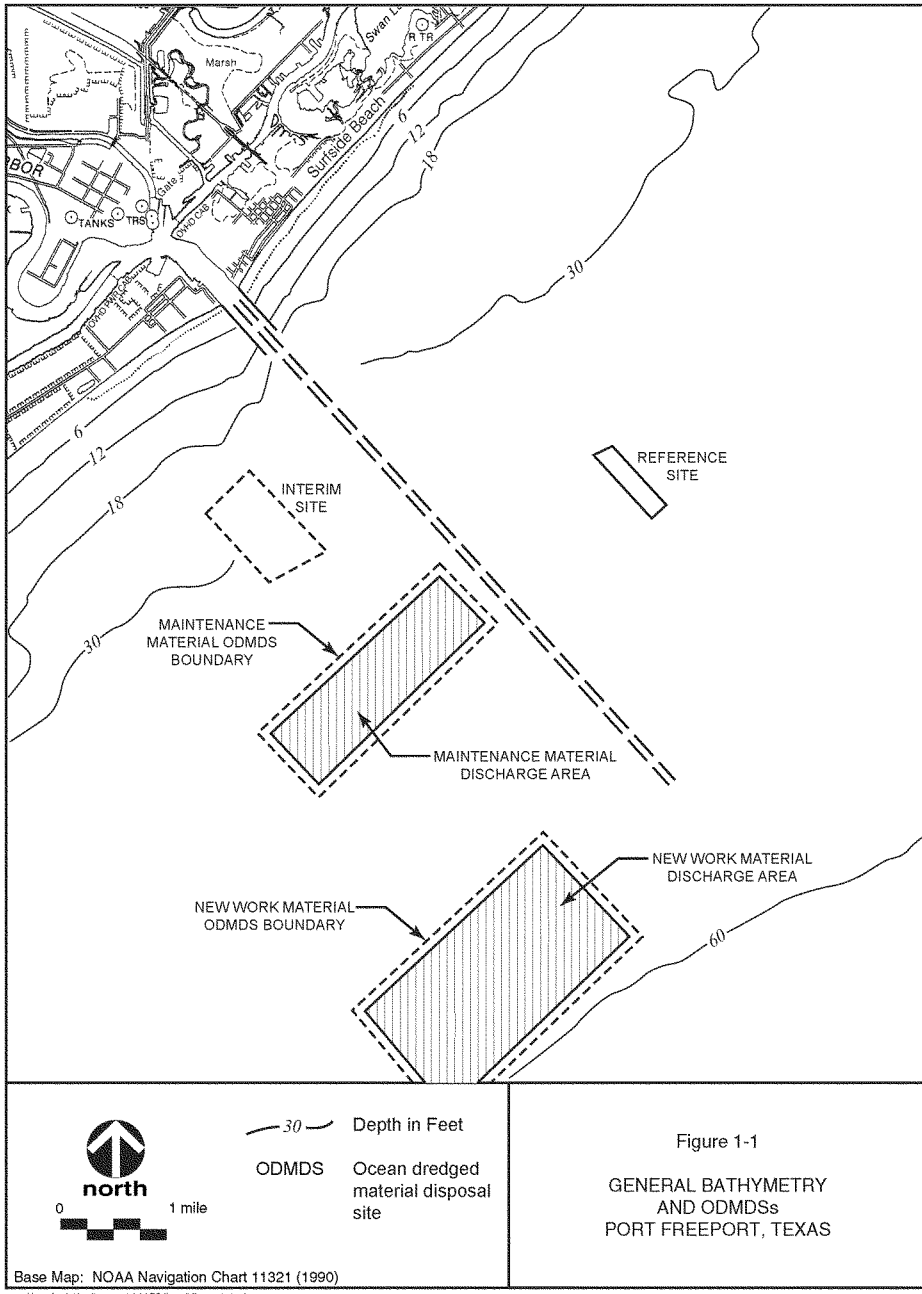

Figure 1-1

GENERAL BATHYMETRY AND ODMDSs PORT FREEPORT, TEXAS

I:\projects\hc1\usace\441591\cad\figure1-1.ai

as large as 900 feet LOA and 160-foot beam to transit the Freeport Harbor Channel, provided that winds are less than 20 knots and that there is no more than a 0.5-knot crosscurrent at the mouth of the jetties. About three to four ships per month are granted these waivers. Numerous requests have been submitted for ships in the 920- to 950-foot LOA range to transit the channel, and these requests have been denied. When denied access to Freeport Harbor, these ships normally divert to Corpus Christi or New Orleans.

- **Beam Restriction**. The maximum beam permitted under normal operations is 145 feet. Vessels with larger beams require waivers to enter port.
- **One-Way Traffic Restriction**. Because of the 400-foot width of the Entrance and Main channels, one-way ship traffic is always in effect in the Freeport Harbor Channel. This can result in delays when ship schedules coincide.
- **Daylight-Only Operation Restriction**. Because of channel dimensions as well as the nature of the cargo of ships calling at Freeport Harbor, daylight-only operation is enforced on all vessels greater than 750 feet LOA or over 107-foot beam. This can result in delays when ship schedules coincide.

Under FWOP-1, the Freeport Harbor Outer Bar and Jetty channels will be widened from 400 to 600 feet, thus eliminating many of the aforementioned operational constraints associated with vessel LOA and beam widths.

However, since the completion of the 45-foot Project, the drafts of ships using Freeport Harbor's waterway has steadily increased so that many vessels currently have to be lightered or lightened to allow for the transport of cargo through the channel. The ship lightering process at Freeport Harbor involves the ship-to-ship transfer of crude oil cargo in the Gulf from extremely large tankers, e.g., Very Large Crude Carriers (VLCC) and Ultra Large Crude Carriers (ULCC), onto one or more smaller tanker (service ship). With lightering, the VLCC or ULCC does not enter Freeport Harbor, but relies on the service ship to transport all or a portion of its crude cargo from a designated lightering zone within the Gulf (approximately 80 miles from Freeport Harbor) to a receiving facility at Port Freeport. Ship lightening is similar to the lightering process with the exception that under the lightening process only enough crude cargo is offloaded from a larger tanker to service ships to permit the larger lightened tanker to transit through a confined channel system. Although lightering and lightening operations have been going on for years at Freeport Harbor, the possibility for a collision, oil spill, fire, or other adverse environmental consequences is always present, along with adding to the costs of shipping.

Port Freeport has experienced significant tonnage growth over the past decade. Review of USACE national statistics shows Port Freeport ranking 24th in the nation in terms of total tonnage in 2002, up from 38th in the early 1990s. Although Port Freeport handles general cargo and containerized cargo, crude petroleum imports account for the majority of throughput. Current projections suggest that crude imports will increase in the future at Port Freeport. As the imports increase, the number of lightering and lightening vessels and product carriers will also increase, adding to shipping delays, congestion, and risk of collision, unless the Freeport Harbor

Channel is deepened. The proposed FHCIP entails deepening the channels at Freeport Harbor, which will provide opportunities for service ships to be more fully loaded and will also allow larger lightened tankers to transit within the channel at greater drafts. The results will be improvements to transportation safety and improvements to transportation savings in the form of reduced shipping costs, stemming from improved navigation efficiency by decreasing the number of lightering and lightening operations, which ultimately translates into economic benefits to the nation.

1.1.2 Project Alternatives

The No Action Alternative is the existing project. The 45-foot Project depth would be maintained throughout the Freeport Harbor Outer Bar and Jetty channels. The remainder of the Freeport Harbor Main Channel, turning basins, and Stauffer Channel would remain as described in Section 1.3 and Table 1.3-1 of the Final Environmental Impact Statement (FEIS). Shoal material would continue to be dredged from the channel during maintenance cycles and placed in the designated ODMDS for the Jetty and Outer Bar channels and in PA 1 for the channel inshore of the Jetty Channel.

As noted above, the Widening Project is the FWOP-1, and it is to this alternative that all FHCIP impacts will be compared, not the No Action Alternative, as is usual.

During its feasibility analysis, the USACE identified two improvement plans for Freeport Harbor. These two plans consisted of the National Economic Development (NED) Plan and the LPP, noted above. Design parameters for channel dimensions are normally based on the channel width versus the maximum vessel beam allowed to transit the channel. Studies (Fugro Consultants, Inc. [Fugro], 2005) showed that the maximum channel width should not exceed 600 feet to maintain jetty stability (550 feet inside Channel Station 38+00); therefore, the USACE did not evaluate alternative plans consisting of a channel width greater than 600 feet. An analysis of the two plans indicates the NED Plan Alternative resulted in the most economic benefits; however, Port Freeport prefers the smaller and less-costly LPP Alternative. Therefore, USACE has selected the LPP as the tentatively Recommended Plan for implementation.

The FHCIP (LPP Alternative) would generate approximately 12.7 mcy of new work dredged material from the Extension, Outer Bar, and Jetty channels that is targeted for disposal at the existing 45-foot Project New Work ODMDS. It is estimated that the new work dredged material to be placed at the existing 45-foot Project New Work ODMDS will consist of 72 percent clay, 21 percent silt, and 7 percent sand/shell.

Based on review of potential beneficial uses (BUs) of dredged material for the proposed Freeport Entrance and Jetty Channel Widening Project, which included an interagency panel review, no cost-effective BUs were identified in the project area, except beach nourishment from a shallow layer of construction material. This decision was made based on the characteristics of the

material, cost to transport the material, impacts associated with placement and manipulation of the material, and impacts to existing resources. However, beach-quality material has not been identified for the FHCIP. Thus, no BU is proposed for the FHCIP.

Following completion of the proposed project, future maintenance of the channel (from the Outer Bar Entrance Channel to the Lower Turning Basin) is expected to be performed on an annual cycle, by dredging 3.53 mcy of maintenance material per year. Since 1992, maintenance dredging has occurred on the channel an average of every 10.3 months, with an average of 1.90 mcy dredged per maintenance cycle, or equivalent to 2.21 mcy per year. The existing Maintenance ODMDS designated by the U.S. Environmental Protection Agency (EPA) for placement of maintenance material from the Freeport Harbor Channel will continue to be used for placement of future maintenance dredged material, provided the EPA concurs that the designnation criteria are still being met.

1.2 ODMDS AUTHORIZATION

Ocean disposal of dredged material was not specifically regulated in the United States until passage of the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA). Limited regulation was provided by the Supervisors' Act of 1888 and the Refuse Act of 1899. Under these acts, transportation and navigation factors, rather than environmental considerations, guided selection of placement locations by the USACE and the issuance of permits for ocean disposal.

Although the Fish and Wildlife Coordination Act of 1958 initially referred to inland tidal waters, it included consideration of the effects of dredged material on commercially important marine species. This Act, together with subsequent judicial decisions, empowered the USACE to refuse permits if the dredging or filling of a bay or estuary would result in significant, unavoidable damage to the marine ecosystem.

MPRSA and the Federal Water Pollution Control Act (FWPCA), later amended by the Clean Water Act of 1977, both passed in 1972 and specifically addressed waste disposal in the aquatic and the marine environment. The FWPCA and the Water Quality Improvement Act of 1970 set up specific water-quality criteria to be used as guidelines in controlling discharges into marine and aquatic environments. These water-quality criteria applied to placement of dredged material only in cases where fixed pipelines were used to transport and discharge dredged material into the environment at discrete points. MPRSA, however, specifically regulates the transport and ultimate disposal of waste materials in the ocean. Under Title I of MPRSA, the primary regulatory vehicle of the Act, a permit program for the disposal of dredged and nondredged materials, was established that mandates determination of impacts and provides for enforcement of permit conditions.

The August 1975 London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (Convention) is the principal international agreement governing ocean dumping. The Convention specifies that contracting nations will regulate disposal in the marine environment within their jurisdiction, disallowing all disposal without permits. The nature and quantities of all waste material and the circumstances of disposal must be periodically reported to the International Maritime Organization (formerly the Inter-Governmental Maritime Consultative Organization), which administers the Convention.

In October 1973, the EPA issued the final Ocean Dumping Regulations and Criteria (the Regulations or Ocean Dumping Regulations), revised in January 1977 (40 CFR Parts 220 to 229). These regulations established procedures and criteria for review of ocean disposal permit applications (Part 227); assessment of impacts of ocean disposal and alternative disposal methods; enforcement of permits; and designation and management of ocean disposal sites (Part 228). They also established procedures by which the EPA is authorized to designate ODMDSs and times for ocean disposal of acceptable materials under Section 102(c) of the MPRSA and the criteria for site designation, including general and specific criteria for site selection.

The EPA is mandated with the authority to regulate ocean dumping and with the responsibility for site designation, monitoring, and management by Congress as stated specifically in 40 CFR 228.4(e)(1). Site designation by the EPA does not authorize any dredging project nor does it permit disposal of any dredged material. Sites are designated in areas where a need for ocean disposal has been indicated, based on past dredging demands and/or projected demands associated with new or expanded projects. However, site designation does not in and of itself preclude the consideration of other placement options, including BU options or the No Action Alternative. Once designated as an approved ocean disposal site, the appropriateness of ocean disposal is determined on a case-by-case basis in accordance with the ocean dumping criteria.

Although the EPA is responsible for designating ocean dumping sites according to Section 102 of the MPRSA and such sites may be necessary for construction and maintenance of the proposed improvement project, the USACE may, with concurrence of the EPA, authorize a site in accordance with MPRSA 103(b). For the purpose of the proposed project, the USACE is seeking concurrence from the EPA to place the new construction material dredged from the Extension, Outer Bar, and Jetty channels within the existing 45-foot Project New Work ODMDS and placing the future maintenance dredged material in the existing Maintenance ODMDS. This placement would be implemented by the USACE under the authority of MPRSA Section 103, provided the EPA concurs that Section 102 (MPRSA) requirements continue to be met in regards to the proper evaluation of the criteria and that the approach taken to evaluate the site was appropriate.

The existing designated maintenance material ODMDS is bounded by:

28° 54′ 00″ N, 95° 15′ 49″ W; 28° 53′ 28″ N, 95° 15′ 16″ W;

28° 52′ 00″ N, 95° 16′ 59″ W; 28° 52′ 32″ N, 95° 17′ 32″ W.

Water depth ranges from 31 to 38 feet and the site is 3 miles from shore at its closest point (see Figure 1-1). The area of the site equals 2.02 square statute miles.

The existing designated new work (or construction) material ODMDS, designated for the construction material from the 45-foot Project in 1990, is bounded by:

28° 50′ 51″ N, 95° 13′ 54″ W; 28° 51′ 44″ N, 95° 14′ 49″ W;

28° 50′ 15″ N, 95° 16′ 40″ W; 28° 49′ 22″ N, 95° 15′ 45″ W.

Water depth ranges from 54 to 63 feet and the site is 6 miles from shore at its closest point (see Figure 1-1). The area of the site equals 3.50 square statute miles.

1.2.1 ODMDS Authorization Purpose and Need

The EPA's action resulting from this analysis is to concur with the USACE's proposal to place approximately 12.7 mcy of new work material dredged to improve Freeport Harbor's navigation channels at the existing 45-foot Project New Work ODMDS under the authority of MPRSA Section 103(b), and to concur with annual placement of 3.2 mcy of future maintenance dredged material at the existing Maintenance ODMDS. An FEIS for the new construction and maintenance dredging of the Freeport Harbor Channel (for the authorized 45-foot Project) was prepared by the EPA (1990). The Maintenance ODMDS was designated by the EPA for the continued placement of dredged material removed from the Freeport Harbor Channel, and the New Work ODMDS for construction material was designated for indefinite use during construction of the 45-foot Project in 1990. Offshore dredged material placement under the authority of MPRSA Section 103(b) will provide an environmentally acceptable and economically and physically feasible area for the disposal of the new construction dredged material generated from the deepening and widening of the Freeport Harbor Extension, Outer Bar, and Jetty channels, and disposal of future maintenance material from the extended Outer Bar and Jetty channels.

1.2.2 ODMDS Authorization Alternatives

The EPA (1990) examined a suite of alternatives for the location of the new work material ODMDS and the maintenance material ODMDS. These included the No Action Alternative, upland placement, and offshore. The offshore alternatives included mid-shelf, continental slope, and nearshore, including the interim-designated, historically used site. The alternative analysis concluded that only the nearshore alternative was feasible, and the most appropriate sites were selected by eliminating unfeasible areas. The New Work ODMDS and the Maintenance ODMDS

resulted from the selection process and were designated. The need to identify and evaluate new nearshore alternative sites was obviated by the fact that the previous ODMDS designation analyses (EPA, 1990) are still deemed to be valid and thorough.

2.0 PROPOSED USE OF THE ODMDSs

Predominantly southward longshore transport has caused shoaling of the existing channel at a current rate of approximately 1.90 mcy at approximately 10.3-month intervals, or 2.21 mcy/year. It is anticipated that under the improved conditions, the annual maintenance dredged material volume within the extended Outer Bar and Jetty channels will increase by 1.24 mcy/year, to a total of 3.47 mcy/year.

The proposed use of the existing maintenance material ODMDS is for future maintenance material. The existing site was sized based on a 2.1-mcy discharge (EPA, 1990); however, as discussed below, modeling was conducted to ensure that it is large enough to contain future maintenance dredged material volumes.

The existing New Work ODMDS was designated for indefinite use for the 45-foot Project (EPA, 1990), based on receiving an anticipated 5.1 mcy of construction material. It is proposed that this site be used for the placement of an additional 12.7 mcy of new work construction material from the FHCIP.

3.0 CHARACTERIZATION OF THE ODMDSs

Based on information provided by the USACE, Table 3-1 provides dredging dates and volumes dredged from the Freeport Harbor Outer Bar and Jetty channels from 1951 through 2009. However, only the dredging history in the period since deepening to 45 feet, 1992 through 2009, is included in the frequency and volume calculation. For that period, the average time between the beginnings of each dredging operation is approximately 10.3 months, and the average amount of maintenance material dredged is approximately 1.90 mcy. This does not mean that all of the Outer Bar and Jetty channels are dredged every 10.3 months, on average, but it does indicate the average frequency of use of the Maintenance ODMDS.

Chemical data have been collected on ODMDS sediments from the Maintenance ODMDS at intervals since 1974. Additionally, a study was conducted by Battelle (2004) for the EPA in 2003. The USACE and EPA/Battelle data (Battelle, 2004) are presented in Tables 3-2 and 3-3, respectively. The data as discussed in Section 3.5 of the EIS to which this document is attached, and the ODMDS and Reference Site data, as shown in Table 3-2, indicate no cause for concern. The range of concentrations is similar for the USACE and the EPA/Battelle (Battelle, 2004) data. Relative to the data in Table 3-3, Battelle (2004) states:

Table 3-1
Dredging History

Start	Finish	Dredge Work Type	Total Yards
Nov-51	Nov-51	Maintenance	474,788
Oct-71	Dec-71	Maintenance	957,085
Nov-70	May-71	Maintenance	1,614,436
Oct-71	May-72	Maintenance	1,161,215
Nov-72	May-73	Maintenance	868,540
Sep-73	Jan-74	Maintenance	1,089,540
Dec-73	Jan-74	Maintenance	743,610
Nov-74	Dec-74	Maintenance	1,010,361
Sep-75	Dec-75	Maintenance	2,095,572
Aug-78	Oct-78	Maintenance	966,648
Aug-80	Jan-81	Maintenance	1,098,920
Jun-82	Aug-82	Maintenance	1,388,226
Jun-83	Oct-83	Maintenance	1,109,789
Oct-84	Nov-84	Maintenance	1,186,135
Oct-84	Nov-84	Maintenance	212,799
Jul-86	Aug-86	Maintenance	925,709
May-87	Jul-87	Maintenance	1,241,905
Sep-87	Sep-87	Maintenance	213,773
Aug-88	Sep-88	Maintenance	843,940
Aug-89	Sep-89	Maintenance	999,961
Aug-92	Nov-92	Maintenance	2,884,532
Jul-93	Sep-93	Maintenance	1,415,742
Aug-94	Nov-94	Maintenance	2,599,267
Sep-95	Jan-96	Maintenance	2,674,026
Jul-96	Aug-96	Maintenance	579,500
Jan-97	Apr-97	Maintenance	2,489,108
Nov-97	Dec-97	Maintenance	1,053,157
Oct-98	Dec-98	Maintenance	2,334,436
Sep-99	Jan-00	Maintenance	1,555,615
Jul-00	Nov-00	Maintenance	1,859,847
Oct-00	Jan-01	Maintenance	2,202,288
Jun-01	Sep-01	Maintenance	2,479,249
May-02	Aug-02	Maintenance	1,996,354
Aug-03	Oct-03	Maintenance	1,726,186
Sep-04	Nov-04	Maintenance	1,908,831
Dec-05	Feb-06	Maintenance	1,911,091
May-06	May-06	Maintenance	200,511
Oct-06	Feb-07	Maintenance	2,516,000
Oct-07	Dec-07	Maintenance	1,415,421
Oct-08	Dec-08	Maintenance	1,577,096
Oct-09	Nov-09	Maintenance	2,420,755[a]

[a] 7,500 cy dredged in January 2010.

TOTAL					
No. years	59	years/cycle	1.44	Total cy	60,001,964
No. dredgings	41	months/cycle	17.3	cy/cycle	1,463,463
				cy/year	1,016,982
SINCE 1992					
No. years	18	years/cycle	0.86	Total cy	39,799,012
No. dredgings	21	months/cycle	10.3	cy/cycle	1,895,191
				cy/year	2,211,056

> There were no elevated concentrations of metals in sediments from the active discharge quadrants (Q1 and Q2), the inactive quadrants (Q3 and Q4), the Down Current site, or the Reference site. No measurements exceeded ER-L guidelines (Long et al., 1995) and all concentrations were similar to those reported for the earth's crust, indicating only natural input (Krauskopf, 1967).

The Battelle Sampling Plan included two stations in the discharge area of the Maintenance ODMDS (see Figure 1-1), two in the downcurrent area of the Maintenance ODMDS (where placement does not occur), a station located 1,000 feet downcurrent of the Maintenance ODMDS, and a reference station (see Reference Site, Figure 1-1). All stations were a composite of samples collected at three substations. It should be noted that sediment had recently been placed in the Maintenance ODMDS, and so there was some mounding in the actual disposal area, but none in the nonplacement areas of the Maintenance ODMDS. Battelle calculated that enough maintenance material had been placed in the site since it was designated to create a mound 33.4 feet high, had it remained in place. However, because it is a dispersive site, mounding of only 2 to 4 feet in the northeastern third of the Maintenance ODMDS, probably from the recently placed material, was observed. Battelle (2004) also found that the majority of benthic macroinfaunal indicators were negatively correlated to percent fines, which could lead to a short-term impact on the infauna since maintenance material averaged 8.9 percent (Project EIS Table 3.4-2) sand versus 24.9 percent and 17.3 percent average sand for the Maintenance ODMDS and Reference site, respectively, based on the data in Tables 3-2 and 3-3.

Conversely, USACE studies (Espey, Huston & Associates, Inc. [EH&A, now PBS&J], 1991, 1993a, 1993b, 1994) demonstrated that impacts from construction material placement at the New Work ODMDS were not detected 6 months after cessation of dredging. Sand content near the New Work ODMDS averaged 11 percent during the predredging survey in 1990 versus 38 percent for the reference sediment. Six months after placement, the sand content increased to 48 percent near the New Work ODMDS versus 54.6 percent at the reference site. In the preconstruction benthic invertebrates survey, only one of the eight monitoring stations surrounding the New Work ODMDS had a greater number of taxa than the reference station. Six months after construction, only one station had fewer. Similar results were found for total number of individuals and mean density. By 18 months after construction, the sand content at the reference site was generally higher than at the monitoring stations surrounding the New Work ODMDS, and benthic metrics were also higher, confirming the results found by Battelle (2004).

Table 3-2
Detected Parameters
Freeport Harbor Entrance Channel ODMDS and Reference Stations

		Station:				FH-88-DA1			FH-88-REF1			FH-89-DA1			FH-89-REF1		
		Date:				3/15/1988			3/15/1988			4/7/1989			4/7/1989		
		Channel Station:															
Parameter	Liquid Media Unit	Solid Media Unit	WQC	TWQS	ERL	Water	Elutriate	Sediment	Water	Elutriate	Sediment	Water	Elutriate	Sediment	Water	Elutriate	Sediment
Sand		%						46.8			23.6						56.2
Silt		%						34.7			64.2						40.3
Clay		%						18.5			12.2						3.5
D50		mm						0.07									0.08
Percent Solids		%															
Arsenic	µg/L	mg/kg	69	149	8.2	<2.0		2.27	<2.0	<2.0	3.14	<2.0		<1.0	<2.0	<2.0	<1.0
Barium	µg/L	mg/kg	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
Cadmium	µg/L	mg/kg	40	45.4	1.20	4.40		<0.1	2.60	2.70	<0.1	<2.0		<0.1	<2.0	<2.0	<0.1
Chromium	µg/L	mg/kg	1,100	1,090	81.0	<10.0		8.68	<10.0	<10.0	10.11	<10.0		4.60	<10.0	<10.0	3.90
Copper	µg/L	mg/kg	4.8	13.5	34.0	4.0		4.20	<1.0	<1.0	4.79	<1.0		5.90	<1.0	<1.0	2.60
Lead	µg/L	mg/kg	210	133	46.7	<5.0		5.60	<5.0	<5.0	6.38	<5.0		1.20	<5.0	<5.0	<1.0
Mercury	µg/L	mg/kg	1.8	2.1	0.15	<0.20		<0.1	<0.20	<0.2	<0.1	<0.20		<0.1	<0.20	<0.2	<0.1
Nickel	µg/L	mg/kg	74	118	20.9	24.2		7.00	25.6	27.8	9.04	<5.0		7.10	<5.0	<5.0	4.90
Selenium	µg/L	mg/kg	290	564	N/A	<2.0		<1.0	<2.0	<2.0	<1.0	<2.0		<0.5	<2.0	<2.0	<0.5
Silver	µg/L	mg/kg	1.9	2.0	1.00	N/A		N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
Thallium	µg/L	mg/kg	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
Zinc	µg/L	mg/kg	90	92.7	150	**98.6**		27.45	39.2	<5.0	30.32	<5.0		14.8	<5.0	<5.0	18.1
TOC	mg/L	%	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
Total PCB	µg/L	µg/kg	N/A	N/A	N/A	<0.5		<5.0	<0.5	<0.5	<5.0	<0.5		<5.0	<0.5	<0.5	<5.0
Ammonia	mg/L	mg/kg	Var	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

Table 3-2 (Continued)

Parameter	Liquid Media Unit	Solid Media Unit	WQC	TWQS	ERL	FH-93-DA1 7/20/1993 Water	Elutriate	Sediment	FH-93-REF1 7/20/1993 Water	Elutriate	Sediment	FH-95-DA1 2/2/1995 Water	Elutriate	Sediment	FH-95-REF1 2/2/1995 Water	Elutriate	Sediment
		Station: Date: Channel Station:															
Sand		%						12.7			21.8			5.4			6.0
Silt		%						63.2			46.8			66.4			75.2
Clay		%						24.1			31.4			28.2			18.8
D50		mm						0.02			0.04			0.06			0.06
Percent Solids		%															
Arsenic	µg/L	mg/kg	69	149	8.2	<1.0		<0.10	<1.0	<1.0	<0.10	<1.0		<0.10	<1.0	<1.0	<0.10
Barium	µg/L	mg/kg	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
Cadmium	µg/L	mg/kg	40	45.4	1.20	<0.10		1.10	<0.10	<0.10	1.00	14.90		**329.10**	15.30	**42.30**	**145.50**
Chromium	µg/L	mg/kg	1,100	1,090	81.0	<1.0		11.70	<1.0	<1.0	12.00	<1.0		<0.10	<1.0	<1.0	<0.10
Copper	µg/L	mg/kg	4.8	13.5	34.0	<1.0		4.70	<1.0	<1.0	4.60	<1.0		36.04	<1.0	<1.0	27.86
Lead	µg/L	mg/kg	210	133	46.7	<1.0		5.10	<1.0	<1.0	4.70	<1.0		15.38	<1.0	<1.0	16.04
Mercury	µg/L	mg/kg	1.8	2.1	0.15	<0.20		<0.02	<0.20	<0.2	<0.02	<0.20		**15.40**	<0.20	<0.2	**8.95**
Nickel	µg/L	mg/kg	74	118	20.9	<1.0		16.30	5.2	<1.0	8.10	<1.0		<0.10	<1.0	<1.0	<0.10
Selenium	µg/L	mg/kg	290	564	N/A	<2.0		<0.20	<2.0	<2.0	<0.20	<2.0		23.07	<2.0	<2.0	20.16
Silver	µg/L	mg/kg	1.9	2.0	1.00	N/A		N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
Thallium	µg/L	mg/kg	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
Zinc	µg/L	mg/kg	90	92.7	150	<1.0		30.4	<1.0	52.3	29.7	<1.0		<0.10	<1.0	<1.0	<0.10
TOC	mg/L	%	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
Total PCB	µg/L	µg/kg	N/A	N/A	N/A	<0.5		<50.0	<0.5	<0.5	<50.0	<0.5		88.51	<0.5	<0.5	67.62
Ammonia	mg/L	mg/kg	Var	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

Table 3-2 (Continued)

Parameter	Liquid Media Unit	Solid Media Unit	WQC	TWQS	ERL	FH-97-PA1A 1/25/1997 Water	Elutriate	Sediment	FH-97-REF1 1/25/1997 Water	Elutriate	Sediment	FH-97A-PA1A 9/30/1997 Water	Elutriate	Sediment	FH-97A-REF1 9/30/1997 Water	Elutriate	Sediment
		Station: Date: Channel Station:															
Sand		%						18.1			18.7			6.7			8.8
Silt		%						24.7			33.2			48.8			38.5
Clay		%						57.2			48.1			44.5			52.7
D50		mm						0.00			0.01			0.01			0.00
Percent Solids		%															
Arsenic	µg/L	mg/kg	69	149	8.2	<1.0		<0.10	<1.0	<1.0	<0.10	<1.0	8.0	2.96	<1.0	8.0	3.66
Barium	µg/L	mg/kg	N/A	N/A	N/A	25.7		110.0	25.1	17.4	217.0	24.7	56.0	231.0	17.6	28.0	208.0
Cadmium	µg/L	mg/kg	40	45.4	1.20	<0.1		<0.10	<0.1	<0.1	<0.10	<0.1	<0.1	<0.10	<0.1	<0.1	<0.10
Chromium	µg/L	mg/kg	1,100	1,090	81.0	<1.0		33.9	<1.0	<1.0	22.1	<1.0	<1.0	16.1	<1.0	<1.0	22.9
Copper	µg/L	mg/kg	4.8	13.5	34.0	<1.00		19.3	1.80	4.36	13.6	<1.00	<1.00	9.77	<1.00	<1.00	11.3
Lead	µg/L	mg/kg	210	133	46.7	<1.0		45.0	<1.0	<1.0	25.3	1.07	<1.0	3.26	<1.0	<1.0	3.23
Mercury	µg/L	mg/kg	1.8	2.1	0.15	<0.20		<0.02	<0.20	<0.2	<0.02		<0.20	0.02		<0.20	0.02
Nickel	µg/L	mg/kg	74	118	20.9	<1.0		**23.1**	<1.0	<1.0	18.9	<1.0	1.0	15.6	<1.0	1.0	18.9
Selenium	µg/L	mg/kg	290	564	N/A	<2.0		<0.20	<2.0	<2.0	<0.20	<1.0	<1.0	<0.20	<1.0	<1.0	<0.20
Silver	µg/L	mg/kg	1.9	2.0	1.00	<1.0		<0.10	<1.0	<1.0	<0.10	<1.0	<1.0	<0.10	<1.0	<1.0	<0.10
Thallium	µg/L	mg/kg	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	µg/L	mg/kg	90	92.7	150	<1.0		62.4	<1.0	4.3	52.3	<1.0	10.3	55.4	6.1	14.4	70.0
TOC	mg/L	%	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total PCB	µg/L	µg/kg	N/A	N/A	N/A	<0.01		<1.0	<0.01	<0.01	<1.0	<0.01	<0.01	<1.00	<0.01	<0.01	<1.00
Ammonia	mg/L	mg/kg	Var	N/A	N/A	<0.03		6.58	<0.03	0.64	6.74	<0.03	<0.03	4.10	<0.03	<0.03	3.84

Table 3-2 (Continued)

Parameter	Liquid Media Unit	Solid Media Unit	WQC	TWQS	ERL	FH-98-PA1A 9/30/1997 Water	Elutriate	Sediment	FH-98-REF1 9/30/1997 Water	Elutriate	Sediment	FH-OB-00-PA1A 5/23/2000 Water	Elutriate	Sediment	FH-OB-00-REF1 5/23/2000 Water	Elutriate	Sediment
		Station: Date: Channel Station:															
Sand		%						1.6			21.9			28.2			6.1
Silt		%						44.3			41.0			41.6			33.4
Clay		%						54.1			37.1			30.2			60.5
D50		mm						0.00			0.02			0.05			0.00
Percent Solids		%															
Arsenic	µg/L	mg/kg	69	149	8.2	<1.00		5.77	<1.00	<1.00	3.94	<1.00		3.43	<1.00	<1.00	4.92
Barium	µg/L	mg/kg	N/A	N/A	N/A	23.7		151	22.2	57.9	122	31.7		76.0	26.2	47.5	81.2
Cadmium	µg/L	mg/kg	40	45.4	1.20	0.17		0.14	<0.10	<0.10	<0.10	0.60		<0.10	0.90	0.40	0.10
Chromium	µg/L	mg/kg	1,100	1,090	81.0	<1.0		17.9	<1.0	<1.0	13.5	<1.00		6.00	<1.00	<1.00	8.91
Copper	µg/L	mg/kg	4.8	13.5	34.0	<1.00		12.10	<1.00	<1.00	9.83	<1.00		7.53	<1.00	<1.00	9.34
Lead	µg/L	mg/kg	210	133	46.7	<1.0		4.58	<1.0	<1.0	3.41	<1.00		11.1	<1.00	<1.00	16.1
Mercury	µg/L	mg/kg	1.8	2.1	0.15	<0.20		0.02	<0.20	<0.20	0.05	<0.20		0.04	<0.20	<0.20	0.04
Nickel	µg/L	mg/kg	74	118	20.9	<1.00		15.4	<1.00	<1.00	12.1	4.00		8.04	<1.00	<1.00	12.50
Selenium	µg/L	mg/kg	290	564	N/A	<1.00		<0.20	<1.00	<1.00	<0.20	<1.00		0.20	<1.00	<1.00	0.27
Silver	µg/L	mg/kg	1.9	2.0	1.00	<1.0		0.23	<1.0	<1.0	<0.10	<1.00		<0.10	<1.00	<1.00	<0.10
Thallium	µg/L	mg/kg	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
Zinc	µg/L	mg/kg	90	92.7	150	20.5		51.8	10.6	1.1	44.2	10.7		31.2	47.1	5.2	34.3
TOC	mg/L	%	N/A	N/A	N/A	<1.00		7350	<1.00	<1.00	6880	<1.0		10100	<1.0	<1.0	15500
Total PCB	µg/L	µg/kg	N/A	N/A	N/A	<0.01		<1.00	<0.01	<0.01	<1.00	<0.01		<1.00	<0.01	<0.01	<1.00
Ammonia	mg/L	mg/kg	Var	N/A	N/A	<0.03		11.8	<0.03	5.70	5.70	<0.03		29.0	<0.03	0.36	3.05

Table 3-2 (Concluded)

Parameter	Liquid Media Unit	Solid Media Unit	WQC	TWQS	ERL	FH-EC-04-REF 4/29/2004 Water	Elutriate	Sediment	FH-EC-05-REF 6/29/2005 Water	Elutriate	Sediment
		Station: Date: Channel Station:									
Sand		%						12.9			7.5
Silt		%						28.2			5.7
Clay		%						58.9			86.8
D50		mm						0.00			0.00
Percent Solids		%						47.2			47.4
Arsenic	µg/L	mg/kg	69	149	8.2			6.93			7.53
Barium	µg/L	mg/kg	N/A	N/A	N/A			N/A			N/A
Cadmium	µg/L	mg/kg	40	45.4	1.20			0.13			0.2
Chromium	µg/L	mg/kg	1,100	1,090	81.0			19.6			23.8
Copper	µg/L	mg/kg	4.8	13.5	34.0			12.2			15.4
Lead	µg/L	mg/kg	210	133	46.7			17.6			16.8
Mercury	µg/L	mg/kg	1.8	2.1	0.15			<0.20			<0.20
Nickel	µg/L	mg/kg	74	118	20.9			18.8			20.8
Selenium	µg/L	mg/kg	290	564	N/A			<0.50			<0.50
Silver	µg/L	mg/kg	1.9	2.0	1.00			<0.20			<0.20
Thallium	µg/L	mg/kg	N/A	N/A	N/A			0.21			0.38
Zinc	µg/L	mg/kg	90	92.7	150			25.4			17.9
TOC	mg/L	%	N/A	N/A	N/A			10300			13300
Total PCB	µg/L	µg/kg	N/A	N/A	N/A			N/A			N/A
Ammonia	mg/L	mg/kg	1.7	N/A	N/A			71.0			12.2

Chromium = CrIII and Total Cr
Var = varies based on pH, salinity, and temperatures
N/A means that no analyses were conducted for a particular parameter in a particular year
WQC = EPA Acute, Marine Water Quality Criterion; TWQS = Texas Acute, Marine Water Quality Standard; ERL = Effects Range Low
µg/L = micrograms per liter; µg/kg = micrograms per kilogram; mg/kg = milligrams per kilogram; mm = millimeters

Table 3-3
Metal Concentrations in Sediments*
(mg/kg dry weight)

Metal	Site						ER-L [1]	Earth Crust [2]
	Q1	Q2	Q3	Q4	DC	Reference		
Antimony	0.025	0.025	0.025	0.025	0.025	0.06	-	0.2
Arsenic	5.1	5.1	5.4	3.8	4	5.3	8.2	1.8
Beryllium	0.83	0.84	0.54	0.54	0.59	0.97	-	2.8
Cadmium	0.064	0.083	0.039	0.046	0.043	0.116	1.2	0.2
Chromium	20.7	16.1	11.8	10.6	11.7	16.4	81	100
Copper	8.65	10	5.68	6.17	6.66	13.5	34	55
Lead	14.2	14.4	10.2	9.79	11	14.1	46.7	12.5
Mercury	0.03	0.03	0.02	0.02	0.02	0.02	0.15	0.08
Nickel	16.1	16.5	11.7	11.4	12.3	19.7	20.9	75
Selenium	0.4	0.4	0.5	0.4	0.4	0.6	-	0.05
Silver	0.04	0.05	0.03	0.03	0.03	0.04	1	0.07
Zinc	54.3	50.4	41.8	39.6	43.3	45.5	150	70

[1] = Long et al. (1995).

[2] = Krauskopf (1967)

* Verbatim from Battelle (2004)

4.0 CHARACTERIZATION OF THE MATERIAL EXPECTED TO BE DREDGED

4.1 CONSTRUCTION (NEW WORK) MATERIAL

Throughout this document, it is assumed that information relative to the construction material dredged for the 45-foot Project and presented in EPA (1990) is valid for the proposed FHCIP, since the FHCIP is an expansion of the 45-foot Project by widening and deepening. The data included in EPA (1989, 1990) are included in this document by reference. However, the standards and criteria to which the sample concentrations are compared have changed since the New Work ODMDS was designated in 1990. Therefore, where pertinent, the data from EPA (1989) is discussed. Additionally, chemical analyses were conducted on material from core samples taken from within the proposed FHCIP (Fugro, 2005; PBS&J, 2006). Those data are included in Table 4-1.

There were six exceedances of effects range low (ERLs) in the Fugro (2005) data (see Table 4-1), all by nickel, with an ERL of 20.9 milligrams per kilogram (mg/kg). The exceedance values ranged from 23.8 mg/kg (114 percent of the ERL) to 35.3 mg/kg (170 percent of the ERL). However, for the Sabine-Neches Waterway Channel Improvement (SNWW CIP) contaminant assessment study (PBS&J, 2004), a proposed project within geographic proximity to the proposed FHCIP, concentrations in some instances had exceeded ERL, but no toxicity was exhibited by sensitive water column or benthic organisms, during bioassays conducted on the sediments according to procedures provided in EPA/USACE (1991). The results of the bioassays and several other factors lead to the conclusion that the nickel ERL exceedances do not lead to a cause for concern at Freeport Harbor and vicinity. The other factors are (1) there is no way to determine whether nickel was the causative factor in the data that led to the nickel ERL (see 45-foot Project Environmental Impact Statement (EIS) Section 3.3.1); (2) toxicity data from the SNWW CIP have demonstrated that nickel concentrations in the same range as those found in the Freeport Harbor samples did not cause toxicity; (3) the Freeport Harbor concentrations are less than a factor of two of the ERL; (4) the Port Freeport concentrations are below the Effects Range Medium (ERM) concentration (51.6 mg/kg) and well below the Apparent Effects Threshold values, of which 110.0 mg/kg (for echinoderm larvae) is the lowest value (Buchman, 1999); and (5) there are no Action Levels established by the Food and Drug Administration for poisonous or deleterious substances in human food and animal feed (which includes fish and shellfish) for nickel. Based on this information and the fact that no other ERLs were exceeded at the Freeport Harbor Outer Bar and Jetty channels, there would appear to be no cause for concern relative to placing these soils in the Gulf of Mexico.

A reexamination of the data presented in EPA (1989) determined that the concentration of no parameter in the elutriates exceeded the EPA Water Quality Criteria (WQC) (Table 4-2), except

Table 4-1
Concentrations of Detected Constituents in Soils (dry weight)
Freeport Harbor Channel Improvement Project

Date Sampled: February 2005

Parameter	Units	NOAA ERL*	B-1,E,26' 0211038	B-2,E-1,24' 0211039	B-2,E-2,46' 0211040	B-3,E-1,26' 0211041	B-3,E-2,35' 0211042	B-4,E-1,35' 0211043	B-4,E-2,40' 0211044	B-5,E-1,34' 0211045	B-5,E-2,59' 0211046	B-6,E-2,32-34' 0211047
Antimony	mg/kg	N/A	< 0.0986	< 0.0934	< 0.0971	< 0.0948	< 0.0977	< 0.0977	< 0.0971	< 0.0878	< 0.0910	< 0.0966
Arsenic	mg/kg	8.2	2.7	2.4	1.4	0.700	8.2	2.0	4.1	0.600	2.0	1.6
Beryllium	mg/kg	N/A	1.15	1.18	1.46	0.274	1.46	0.743	1.16	0.142	0.983	0.433
Chromium, Total	mg/kg	81.0	28.1	46.0	59.9	7.8	46.8	15.3	23.2	4.1	20.2	9.9
Copper	mg/kg	34.0	25.8	19.1	19.9	3.6	26.1	10.1	19.5	1.6	12.2	4.6
Lead	mg/kg	46.7	14.9	27.6	29.9	5.1	39.9	7.0	15.6	2.8	10.7	6.8
Manganese	mg/kg	N/A	257.7	184.7	214.1	130.2	723.2	157.2	489.6	85.2	290.1	311.9
Mercury	mg/kg	0.150	< 0.00794	< 0.00664	< 0.00663	< 0.00613	< 0.00647	< 0.00597	< 0.00647	< 0.00602	0.0111	0.0129
Nickel	mg/kg	20.9	**30.2**	**26.8**	**33.3**	6.0	**35.3**	17.6	**29.8**	3.3	**23.8**	10.6
Thallium	mg/kg	N/A	0.294	0.284	0.340	< 0.190	0.324	< 0.195	0.285	< 0.176	0.214	< 0.193
Zinc	mg/kg	150	61.7	63.1	73.5	38.0	64.5	34.8	58.9	10.5	50.4	40.6
Fluoranthene	ug/kg	600	< 635	< 531	< 265	534	< 259	< 239	< 259	< 241	< 237	< 259
Percent Solids	%	N/A	63.0	75.3	75.4	81.5	77.3	83.8	77.3	83.0	84.5	77.1

ERL = Effects Range Low for Marine Sediments. There are no ERLs for soils.
Bold indicates exceedance of an ERL.

perhaps copper in 1976, and nickel in one boring station (Station 12, 0–6 feet) of 19 in 1974. The concentration of copper (<10 micrograms per liter [μg/L]) may exceed the WQC, but since the detection limit (10 μg/L) was higher than the Criterion, this cannot be determined. However, the WQC for copper has been raised from 2.9 to 4.8 μg/L, so the likelihood of an exceedance is no greater than when the New Work ODMDS was designated.

Table 4-2
Range of Values for Elutriate Samples with Channel New Work Sediment

Parameter	Water Quality Criteria[a]	1974[b]	1976[b]
Metal (μg/L)			
Arsenic	69	–	0.1–4
Cadmium	40	<1	2–3
Chromium	1,100	–	10–20
Copper	4.8	–	10
Lead	210	–	10–20
Mercury	1.8	–	0.36–0.73
Nickel	74	40–130	10–20
Selenium	290	–	0.1–1.9
Zinc	90	–	10–20

[a]EPA (2006).
[b]USACE (1978).

4.2 MAINTENANCE MATERIAL

As noted above, the characteristics of the maintenance material are discussed in Section 3.5 of the Project EIS to which this document is appended and are not repeated here.

5.0 MODELING OF DREDGED MATERIAL DISTRIBUTION

The placement of dredged material was simulated using an updated version (Multiple Dump Fate [MDFATE]; USACE/EPA, 1991) of a 1976 model, Dredged Material Fate (DMF), developed for the USACE through the Dredged Material Research Program by Tetra Tech., Inc. (Brandsma and Divoky, 1976). The modifications to this model were made under the supervision of Dr. Billy H. Johnson of the Engineer Research and Development Center (formerly the Waterways Experiment Station) of the USACE. The purpose of the modeling was to determine whether the previously designated New Work ODMDS and the existing Maintenance ODMDS were of sufficient size to contain the new work (construction) and future maintenance dredged material from the FHCIP.

This program models the initial behavior and final disposition of dredged material deposited "instantaneously" at the site of interest through the doors of a hopper dredge. The MDFATE model assumes that this procedure may be broken into three phases: (1) convective descent, during which the discharge cloud falls under the influence of gravity; (2) dynamic collapse, occurring when the descending cloud impacts the bottom or arrives at a level of neutral buoyancy, at which point the descent is retarded and horizontal spreading dominates; and (3) long-term passive dispersion, commencing when the material transport and spreading are determined more by ambient currents and turbulence than by the dynamics of the disposal operation (Johnson and Holliday, 1978). The model also includes the settling of suspended solids.

The model was run for the size of hopper dredge that is anticipated to be used for this project, a 3,600-cubic yard (cy) hopper dredge (19.5-foot loaded draft, 9.5-foot light draft, 27-inch suction pipe, 11 knots loaded, 12 knots light, 4 knots during discharge, 4 minutes to empty hoppers). Model runs were made for both the previously designated New Work ODMDS and the existing Maintenance ODMDS. Based on EPA (1989), it was anticipated that a 0.5-knot surface current and a 0.25-knot bottom current would be used in the modeling. However, the model will accept only one current velocity, so a 0.38-knot current, parallel to the long axis of the ODMDSs, was entered into the model.

5.1 NEW WORK MATERIAL

The percentage of the various soil particle types anticipated in the new work sediment to be dredged was estimated using the information from EPA (1989) and confirmed by Fugro (2005) to be 2.5 percent shell, 4.5 percent sand, 21.0 percent silt, and 72 percent clay (as clayballs).

Output from the MDFATE model simulates the results of randomly depositing the entire amount of dredged material on the ocean floor at predetermined grid points. For a dredged material volume of 10.65 mcy, MDFATE simulated the mound height at its highest peak within the New Work ODMDS as 12 feet. As can be seen in Attachment A, there are a few streaks of build up outside the New Work ODMDS boundaries, but it appears the maximum height for that build up is not more than 0.3 foot (less than the 1-foot threshold that is proposed in the ODMDS Site Management Plan). Given the upslope ambient depth at the site is 52 feet, there should not be any interference to navigation associated with formation of the new work dredged material disposal mound. Subsequent to the MDFATE modeling effort, the new work dredged material volume for offshore placement was reforecasted from 10.65 to 7.75 mcy. This change in new work volume was a result of changing the assumption that Port Freeport would implement the widening of the Outer Bar and Jetty channels prior to construction of the FHCIP. Given the new work volume for offshore disposal has been reduced, it has been safely assumed that the maximum disposal mound height within the New Work ODMDS will not exceed 12 feet, nor will the material build up more than 0.3 foot outside the boundaries of the ODMDS.

5.2 MAINTENANCE MATERIAL

The MDFATE model program was also run on the maintenance material using a 3,600-cy hopper dredge. The percentage of the grain sizes anticipated in the maintenance material to be dredged from the extended Outer Bar and Jetty channels was based on the grain size of past maintenance material, using historical information from analyses of maintenance material from the existing channel dating from 1988 through 2005 (USACE Galveston District Dredging Histories Data Base). The MDFATE simulations for future maintenance dredged material placement utilized the historic maintenance material grain-size data as input. The total volume of maintenance material modeled for placement was 3.74 mcy. As with the new work simulation, minor streaks of maintenance dredged material can be seen building up outside of the Maintenance ODMDS boundaries. However, these streaks resulted in a height of less than 1 foot; therefore, adverse impacts to the benthic community outside of the ODMDS boundaries should not be experienced (EPA/USACE, 1996). Attachment A shows the simulated maximum mound height within the boundaries of the Maintenance ODMDS is approximately 8.5 feet. Given the ambient water depths within the Maintenance ODMDS range from 31 to 38 feet, there should be sufficient clearance with the disposal mound in place for the larger supply boats (15-foot draft) that may transverse through the area.

Subsequent to the MDFATE modeling effort, the future maintenance material volume for offshore placement was reforecasted from 3.74 to 4.05 mcy/yr. However, it is anticipated that this additional 310,000 cy/yr of maintenance-dredged material will not translate in a disposal mound height exceeding 10 feet, the threshold established in the Site Management Plan.

6.0 ENVIRONMENTAL CONSEQUENCES

As required by the Ocean Dumping Regulations (40 CFR 220–229) promulgated to interpret the MPRSA, the previously designated New Work ODMDS will be examined relative to the 5 general criteria and the 11 specific factors (40 CFR 228.5 and 40 CFR 228.6(a), respectively). Since the maintenance material to be dredged from the proposed deepened and widened channel should be the same as existing maintenance material, except for volume, the existing routine Maintenance ODMDS will be examined to determine whether it is of sufficient size to receive the greater quantity of material. This information will be included in the examination relative to the 5 general criteria and the 11 specific factors, where pertinent. In the following section, the criteria and factors are presented in italics, followed by the statement indicating compliance.

Other environmental regulations, which are pertinent to ODMDS designation, are addressed in the Freeport Harbor Channel Improvement Project EIS to which this ODMDS analysis is attached: Coastal Zone Management (Project EIS Section 8.7 and Appendix J), Endangered Species Act (Project EIS Section 4.13 and Appendix I), Magnuson-Stevens Fishery Conservation and Management Act or Essential Fish Habitat (Project EIS Section 4.12), cultural and historic

resources (Project EIS Section 4.14), and Section 404(b)(1) Water Quality Certification (Project EIS Section 8.2 and Appendix G).

6.1 REGULATORY CHARACTERIZATION

6.1.1 Five General Criteria

6.1.1.1 40 CFR 228.5(a)

The dumping of materials into the ocean will be permitted only at sites or in areas selected to minimize the interference of disposal activities with other activities in the marine environment, particularly avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation.

The New Work and Maintenance ODMDSs, like the other nonexcluded areas in EPA (1989), were selected, including appropriate buffer zones, to avoid sport and commercial fishing activities, as well as other areas of biological sensitivity. The excluded areas include a white shrimp breeding area, a sport and commercial fishing harvest area, two reef areas, and the jetties, all with buffer zones; platforms; submerged shipwrecks; and several single oil and/or gas platforms. The buffer zones were sized on the basis of the physical movement of the disposal material, since sediment analysis in EPA (1989) and PBS&J (2006) concluded that the quality of the material proposed for discharge met the criteria of 40 CFR 227. The preferred sites are outside the channel, including the navigation channel buffer zone, and they avoid known navigational obstructions.

6.1.1.2 40 CFR 228.5(b)

Locations and boundaries of disposal sites will be so chosen that temporary perturbations in water quality or other environmental conditions during initial mixing caused by disposal operations anywhere within the site can be expected to be reduced to normal ambient seawater levels or to undetectable contaminant concentrations or effects before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shellfishery.

The results of the analyses and studies (EH&A, 1989, 1991, 1993a, 1993b, 1994; PBS&J, 2006), as discussed above, indicate that the construction material dredged for the 45-foot Project was acceptable for ocean disposal under 40 CFR 227. The biota of the area near the New Work and Maintenance ODMDSs is healthy (EH&A, 1994). While toxicity tests have not been conducted for the new work sediments, there is no evidence to suggest that they would not meet the criteria of 40 CFR 227, and chemical analysis at the Freeport Channel, as noted in Section 4.1 of this ODMDS assessment, and experience with other Texas Gulf Coast areas, including the nearby Galveston Harbor channels, support an expectation that the new work and future maintenance sediments would be acceptable for ocean disposal. The appropriate sizes for the buffer zones and

for the preferred sites are based on the sediment transport information and the physical oceanographic characterization of the Freeport area. These, combined with the information on the expected quality of the material to be dredged, as discussed above, and recent modeling with MDFATE, ensure that perturbations caused by disposal would be reduced to ambient conditions at the boundaries of the New Work and Maintenance ODMDSs.

6.1.1.3 40 CFR 228.5(c)

If at any time during or after disposal site evaluation studies, it is determined that existing disposal sites presently approved on an interim basis for ocean dumping do not meet the criteria for site selection set forth in 228.5–228.6, the use of such sites will be terminated as soon as suitable alternative disposal sites can be designated.

Although included in the General Criteria, this item is not really a criterion for site designation, and, in fact, information presented in EPA (1990) was designed to answer the question raised by 40 CFR 228.5(c). A suitable alternative to the interim site was designated and extensive monitoring and surveillance programs, including bathymetric scans; water, sediment, and elutriate chemistry; bioassays; bioaccumulation studies; and benthic infaunal analyses (EH&A, 1991, 1993a, 1993b, 1994), do not indicate that any problems are apparent at the New Work ODMDS or the Maintenance ODMDS.

6.1.1.4 40 CFR 228.5(d)

The sizes of ocean disposal sites will be limited in order to localize for identification and control any immediate adverse impacts and to permit the implementation of effective monitoring and surveillance programs to prevent adverse long-range impacts. The size, configuration, and location of any disposal site will be determined as a part of the disposal site evaluation or designation study.

The size of the New Work ODMDS was as small as possible to meet reasonably the criteria stated at 40 CFR 228.5 and 228.6(a) for the 45-foot Project. The determined size for the construction (new work) material site is 3.49 square statute miles (2.64 square nautical miles), while that for the future maintenance material site is 2.02 square statute miles (1.53 square nautical miles) versus 0.53 square statute mile for the interim-designated site. The monitoring program included in EPA (1989) determined no adverse long-range impacts. Modeling with MDFATE was conducted to determine whether the size of the New Work ODMDS and Maintenance ODMDS is sufficient for construction of the proposed FHCIP and subsequent maintenance. The size of the sites was not increased for the project, since the MDFATE modeling results suggest the existing sizes are sufficient to receive the proposed new work and future maintenance dredged material volumes.

6.1.1.5 40 CFR 228.5(e)

EPA will, wherever feasible, designate ocean dumping sites beyond the edge of the continental shelf and other such sites that have been historically used.

It was determined in EPA (1989) that cost, safety, and time factors, plus difficulties with monitoring and surveillance, dictated that the distance to the edge of the continental shelf at Freeport precluded the use of any ODMDS off the shelf. Additionally, the lack of resilience of the deep-ocean benthic community and the grain-size disparity between the material to be discharged and the deep-ocean sediments off Freeport indicated that an off-shelf disposal site would cause severe impacts to the off-shelf benthic community. No advantage to an off-shelf site was noted. The New Work ODMDS was historically used for the 45-foot Project.

6.1.2 Eleven Specific Factors

40 CFR 228.6(a) states that the factors included below as sections 6.1.2.1 through 6.1.2.11 will be considered in the selection process for site designation.

6.1.2.1 40 CFR 228.6(a)(1)

Geographical position, depth of water, bottom topography, and distance from coast.

The preferred site for the construction (new work) material disposal, as determined in EPA (1990), is bounded by the following coordinates (see Figure 1-1):

28° 50′ 51″ N, 95° 13′ 54″ W; 28° 51′ 44″ N, 95° 14′ 49″ W;

28° 50′ 15″ N, 95° 16′ 40″ W; 28° 49′ 22″ N, 95° 15′ 45″ W.

The water depth at the preferred site ranges from 54 to 63 feet (see Figure 1-1), the bottom topography is flat, and the preferred New Work ODMDS is approximately 6 miles from the coast at its closest point.

The existing maintenance ODMDS, as determined in EPA (1990), is bounded by the following coordinates (see Figure 1-1):

28° 54′ 00″ N, 95° 15′ 49″ W; 28° 53′ 28″ N, 95° 15′ 16″ W;

28° 52′ 00″ N, 95° 16′ 59″ W; 28° 52′ 32″ N, 95° 17′ 32″ W.

The water depths at the maintenance ODMDS range from 31 to 38 feet, and the site is 3 miles from shore at its closest point (see Figure 1-1).

6.1.2.2 40 CFR 228.6 (a)(2)

Location in relation to breeding, spawning, nursery, feeding, or passage areas of living resources in adult or juvenile phases.

EPA (1989) reports a white shrimp breeding area, a sport and commercial fishing harvest area, and a reef area, approximately 5 miles southwest of the New Work and Maintenance ODMDSs. EPA (1989) also reports a small collection of coral heads (reefs), approximately 5 miles east of the New Work and Maintenance ODMDSs, and the jetties are approximately 6 miles north-northeast. There appear to be no oil and/or gas platforms within 5 miles of the end of the jetties and only nine within 10 miles of the end of the jetties (National Oceanic and Atmospheric Administration, 2004), and none are in the New Work and Maintenance ODMDSs. The *George Vancouver*, a Liberty ship, which is part of the Texas Parks and Wildlife Department's artificial reef program, is located about 10.5 miles southwest of Freeport.

6.1.2.3 40 CFR 228.6(a)(3)

Location in relation to beaches or other amenity areas.

The New Work ODMDS and the Maintenance ODMDS are roughly 6 miles and 3 miles, respectively, from beaches and other amenity areas.

6.1.2.4 40 CFR 228.6(a)(4)

Types and quantities of wastes proposed to be disposed of and proposed methods of release, including methods of packaging the waste, if any.

Construction (new work) material (17.3 mcy) will be primarily discharged into the New Work ODMDS (12.7 mcy), with the remainder placed at two new upland PAs, PA 8 (1.9 mcy) and PA 9 (2.8 mcy). The Maintenance ODMDS will receive most future maintenance dredged material (approximately 3.2 mcy/year), but PAs 1, 8, and 9 would also receive on average 0.04 mcy, 0.12 mcy, and 0.19 mcy, respectively, on a 3-year cycle. Historically, the New Work ODMDS was designated for the 5.1 mcy of material to be removed in connection with the 45-foot Project, for an indefinite period of time. Based on chemical analyses of the new work material, which indicated no problems with the acceptability of these materials for ocean disposal, EPA (1989) concluded that no special location or precautions would be necessary for the disposal of the materials to be dredged except for grain size. The New Work and Maintenance ODMDSs were sited in the silty-clay regime, with which it was most compatible.

6.1.2.5 40 CFR 228.6(a)(5)

Feasibility of surveillance and monitoring.

Both the New Work ODMDS and Maintenance ODMDS are amenable to surveillance and monitoring, as is evidenced by EH&A (1991, 1993a, 1993b, 1994).

6.1.2.6 40 CFR 228.6(a)(6)

Dispersal, horizontal transport, and vertical mixing characteristics of the area, including prevailing current velocity, if any.

These physical oceanographic parameters were used (1) to develop the necessary buffer zones for the exclusion analysis, and (2) to determine the minimum size of the preferred site in EPA (1989). Predominant longshore currents, and thus predominant longshore transport, is to the southwest. Steady longshore transport and occasional storms, including hurricanes, should remove the placed material from the site. The size of the ODMDSs was modeled using MDFATE, which includes vertical mixing, to ensure that it was large enough to prevent significant mounding (see Section 5.0).

6.1.2.7 40 CFR 228.6(a)(7)

Existence and effects of current and previous discharges and dumping in the area (including cumulative effects).

The information from EH&A (1994) plus chemical analyses of water from the area concluded that there were no indications of water or sediment quality problems near the New Work ODMDS or the Maintenance ODMDS. Studies of the benthos near the New Work and Maintenance ODMDSs (EH&A, 1994) did not indicate any significant decrease or change in composition of the benthos at the ODMDSs.

6.1.2.8 40 CFR 228.6(a)(8)

Interference with shipping, fishing, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance, and other legitimate uses of the ocean.

The items from the above list that are pertinent to the FHCIP ODMDSs are shipping, mineral extraction, commercial and recreational fishing, recreational areas, and historic sites. The location of the ODMDSs was selected so that its use would not interfere with other legitimate uses of the ocean (EPA, 1990). Disposal operations in the past have not interfered with other uses.

6.1.2.9 40 CFR 228.6(a)(9)

Existing water quality and ecology of the site as determined by available data or by trend assessment or baseline surveys.

Monitoring studies have shown only short-term water column perturbations of turbidity, and perhaps chemical oxygen demand, which resulted from disposal operations. No short-term sediment quality perturbation could be directly related to disposal operations. In general, the water and sediment quality and benthic macroinvertebrate matrices are good throughout the vicinity of the ODMDSs (EH&A, 1994; EPA, 1989). This indicates that there have been no long-term impacts on water and sediment quality or on the benthos at the ODMDSs.

6.1.2.10 40 CFR 228.6(a)(10)

Potentiality for the development or recruitment of nuisance species in the disposal site.

With a disturbance to any benthic community, initial recolonization will be by opportunistic species. However, these species are not nuisance species in the sense that they would interfere with other legitimate uses of the ocean or that they are human pathogens. EH&A (1993a, 1993b, 1994) determined that the placement of new work material in the New Work ODMDS and maintenance material in the Maintenance ODMDS have not, and placement of the proposed material should not, attract or promote the development or recruitment of nuisance species.

6.1.2.11 40 CFR 228.6(a)(11)

Existence of or in close proximity to the site of significant natural or cultural features of historical importance.

The nearest site of historical importance to the ODMDSs is approximately 0.5 mile away from the edge of this site in a crosscurrent direction (EPA, 1989: Figure 6-1). Monitoring has determined no movement of material out of the ODMDSs that would impact sites of historical importance.

7.0 SITE MONITORING AND MANAGEMENT PLAN

One of the ODMDS management responsibilities cited in 40 CFR 228.3 is "developing and maintaining effective ambient monitoring programs," although this is tempered somewhat by 40 CFR 228.9(a), which states, "The monitoring program, if deemed necessary by the Regional Administrator or the District Engineer, as appropriate, may include baseline or trend assessment surveys. . . ." Since 40 CFR 229(c) states that "EPA will require the full participation of permittees . . . in the development and implementation of disposal monitoring programs," a

monitoring program and Site Monitoring and Management Plan (SMMP) are included in this ODMDS Analysis Report as Attachment B.

There are two approaches that may be applied to determining unfavorable trends. One is to conduct monitoring surveys on the ecosystem at and near the ODMDSs at regular intervals. The other approach is to determine the quality of the material to be discharged at the site, from a chemical and biological perspective, and thereby determine expected impacts. The testing requirements specified in 40 CFR 227.13, as applied by the USACE, Galveston District, satisfy parts of both of the above-mentioned approaches.

Attachment B (SMMP) details the protocol and requirements to properly monitor and manage the maintenance and construction (new work) ODMDSs for the FHCIP.

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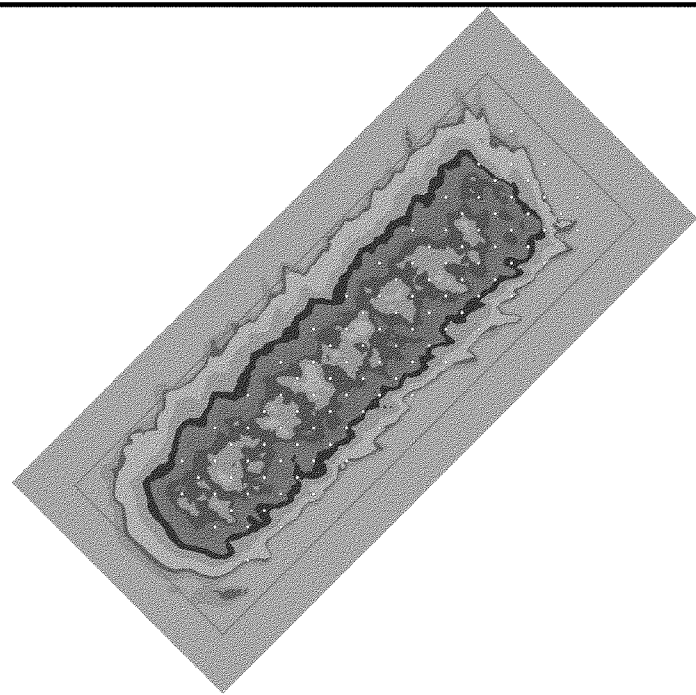
Attachment A

MDFATE Modeling Results



N

5,000 2,500 0 Feet

Legend

Discharge points

ODMDS Boundary

Mound height

8 - 9

7 - 8

6 - 7

5 - 6

4 - 5

3 - 4

2 - 3

1 - 2

0.3 - 1

0.2 - 0.3

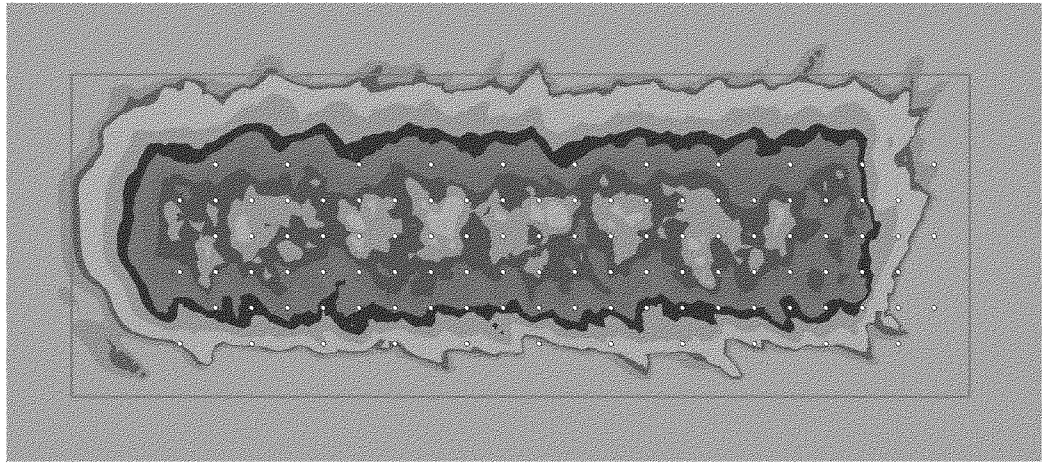
0.1 - 0.2

0.004 - 0.1

PBSJ
6504 Bridge Point Pkwy, Ste. 200
Austin, Texas 78730
Phone: (512) 329-8342 Fax: (512) 327-2453

Freeport Federal Maintenenace Material ODMDS

Prepared for:
Job No.: Scale:
Prepared by: Date:
File:



Legend

- Discharge points
- ODMDS Boundary

Mound height

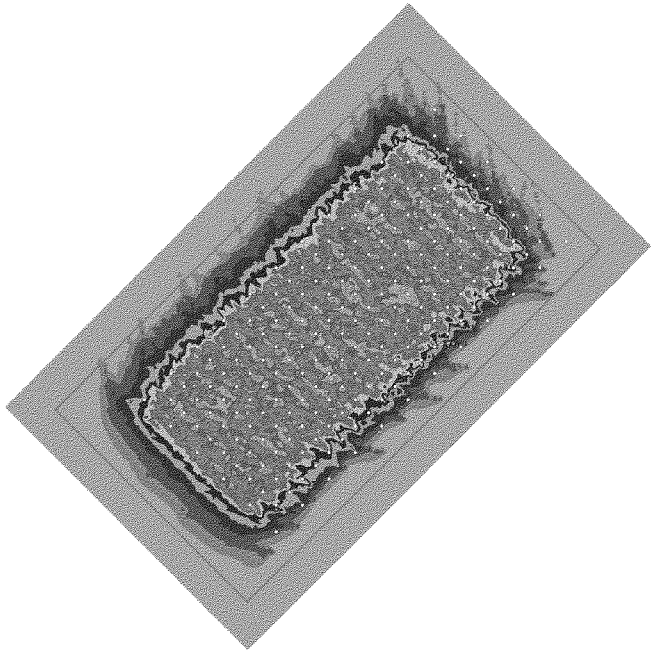
8 - 9	6 - 7	3 - 4	0.3 - 1
7 - 8	5 - 6	2 - 3	0.2 - 0.3
	4 - 5	1 - 2	0.1 - 0.2
			0.004 - 0.1

N

4,000 2,000 0 Feet

Freeport Federal Maintenenace Material ODMDS

Prepared for:
Job No.: Scale:
Prepared by: Date:
File:



N

5,000 2,500 0 Feet

Legend

- Discharge points
- ODMDS Boundary

Mound height

- 12 - 12.091
- 11 - 12
- 10 - 11
- 9 - 10
- 8 - 9
- 7 - 8
- 6 - 7
- 5 - 6
- 4 - 5
- 3 - 4
- 2 - 3
- 1 - 2
- 0.3 - 1
- 0.2 - 0.3
- 0.1 - 0.2
- 0.007 - 0.1

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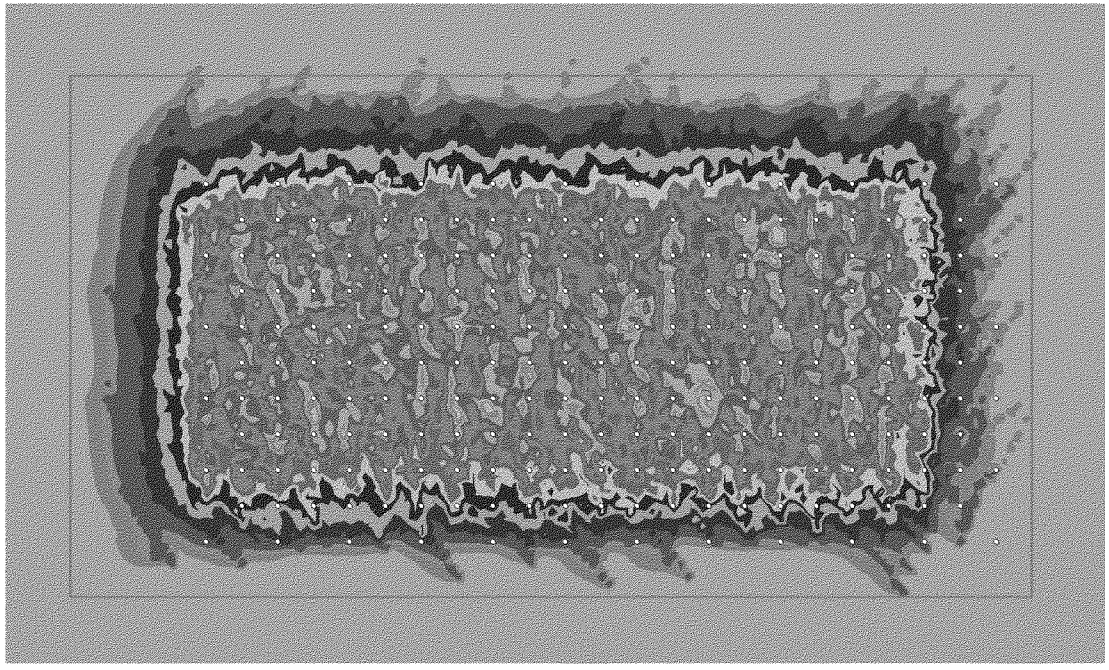
Freeport Federal
New Work Material ODMDS

Prepared for:	
Job No.:	Scale:
Prepared by:	Date:
File:	



4,000 2,000 0 Feet

Legend

- Discharge points
- ODMDS Boundary

Mound height

- 12 - 12.091
- 11 - 12
- 10 - 11
- 9 - 10
- 8 - 9
- 7 - 8
- 6 - 7
- 5 - 6
- 4 - 5
- 3 - 4
- 2 - 3
- 1 - 2
- 0.3 - 1
- 0.2 - 0.3
- 0.1 - 0.2
- 0.007 - 0.1

Freeport Federal
New Work Material ODMDS

Prepared for:	
Job No.:	Scale:
Prepared by:	Date:
File:	

Attachment B

Site Management and Monitoring Plan

US Army Corps of Engineers
Galveston District

FREEPORT HARBOR DEEPENING AND WIDENING CHANNEL IMPROVEMENT PROJECT, BRAZORIA COUNTY, TEXAS

ODMDS SITE MANAGEMENT AND MONITORING PLAN

AS REQUIRED BY

SECTION 102 OF THE

MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT

SITE MANAGEMENT AND MONITORING PLAN

FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT, BRAZORIA COUNTY, TEXAS OCEAN DREDGED MATERIAL DISPOSAL SITE

I. General

The Marine Protection, Research, and Sanctuaries Act (MPRSA) of 1972 (33 U.S.C. Section 1401, *et seq.*) is the legislative authority regulating the disposal of dredged material into ocean waters, including the territorial sea. The transportation of dredged material for the purpose of placement into ocean waters is permitted by the U.S. Army Corps of Engineers (USACE) or, in the case of Federal projects, authorized for disposal under MPRSA Section 103(e), applying environmental criteria established by the Environmental Protection Agency (EPA) in the Ocean Dumping Regulations (40 CFR Parts 220–229).

Section 102(c) of the MPRSA and 40 CFR 228.4(e)(1) authorize the EPA to designate Ocean Dredged Material Disposal Sites (ODMDSs) in accordance with requirements at 40 CFR 228.5 and 228.6. Section 103(b) of MPRSA requires that the USACE use dredged material sites designated by EPA to the maximum extent feasible. Where use of an EPA-designated site is not feasible, the USACE may, with concurrence of EPA, select an alternative site in accordance with MPRSA 103(b).

Section 228.3 of the Ocean Dumping Regulations established disposal site management responsibilities; however, the Water Resources Development Act of 1992 (WRDA 92; Public Law 102-580) included a number of amendments to the MPRSA specific to ODMDS management. Section 102(c) of MPRSA as amended by Section 506 of WRDA 92 provides that:

1. Site management and monitoring plans (SMMPs) shall be developed for each ODMDS designated pursuant to Section 102(c) of MPRSA.
2. After January 1, 1995, no ODMDS shall receive a final designation unless a SMMP has been developed.
3. For ODMDSs that received a final designation prior to January 1, 1995, SMMPs shall be developed as expeditiously as practicable, but no later than January 1, 1997, giving priority to sites with the greatest potential impact on the environment.
4. Beginning on January 1, 1997, no permit or authorization for dumping shall be issued for a site unless it has received a final designation pursuant to Section 102(c) MPRSA or it is an alternate site selected by the USACE under Section 103(b) of MPRSA.

This SMMP for the Freeport Harbor Channel Improvement Project (FHCIP), Brazoria County, Texas, Ocean Dredged Material Disposal Sites was developed jointly by EPA, Region 6 and USACE, Galveston District (USACE-SWG). In accordance with Section 102(c)(3) of the MPRSA, as amended by WRDA 92, the plan includes the following:

1. A baseline assessment of conditions at the site;
2. A program for monitoring the site;

3. Special management conditions or practices to be implemented at the site that are necessary for protection of the environment;

4. Consideration of the quantity of dredged material to be discharged at the site, and the presence, nature, and bioavailability of the contaminants in the material;

5. Consideration of the anticipated use of the site over the long term, including the anticipated closure date for the site, if applicable, and any need for management of the site after the closure; and

6. A schedule for review and revision of the plan.

II. Site Management Objectives

The purpose of ODMDS management is to ensure that placement activities do not unreasonably degrade the marine environment or interfere with other beneficial uses (e.g., navigation) of the ocean. The specific objectives of management of the FHCIP ODMDSs are as follows:

1. Ocean discharge of only that dredged material that satisfies the criteria set forth in 40 CPR Part 227 Subparts B, C, D, E, and G and Part 228.4(e) and is suitable for unrestricted placement at the ODMDS.

2. Avoidance of excessive mounding either within the site boundaries or in areas adjacent to the site, as a direct result of placement operations.

These objectives will be achieved through the following measures:

1. Regulation and administration of ocean dumping permits;

2. Development and maintenance of a site monitoring program;

3. Evaluation of permit compliance and monitoring results.

III. Roles and Responsibilities

In accordance with Section 102(c) of the MPRSA and with the Regional Memorandum of Understanding between USACE-SWG and EPA, Region 6 on Management of ODMDSs signed August 13, 1993, EPA is responsible for designation of ODMDSs. Where use of an EPA-designated site is not feasible, the USACE-SWG may, with concurrence with EPA, Region 6 select an alternative site in accordance with Section 103(b) of the MPRSA as amended by Section 506 of WRDA 92.

Development of SMMPs for ODMDSs within USACE-SWG is the joint responsibility of EPA, Region 6 and the USACE-SWG. Both agencies are responsible for assuring that all components of the SMMPs are implementable, practical, and applicable to site management decision-making.

IV. Funding

Physical, chemical, and biological effects-based testing of dredged material prior to placement at the ODMDS will be undertaken and funded by the permittee if the project is permitted or USACE-SWG for Federal projects. The permittee or USACE-SWG, as appropriate, shall also be responsible for costs associated with placement site hydrographic monitoring. Should monitoring indicate that additional studies and/or tests are needed at the ODMDSs, the cost for such work would be shared by the permittee or USACE-SWG and EPA, Region 6.

Physical, chemical, and biological effects-based testing at the ODMDS, or in the site environs after discharge that is not required as a result of hydrographic monitoring, shall be funded by EPA, Region 6. Federal funding of all aspects of the SMMP is contingent on availability of appropriated funds.

V. Baseline Assessment

A. Site Characterization (Existing Maintenance ODMDS). The Freeport Harbor Maintenance ODMDS is located approximately 3 miles offshore, and about 1,000 feet southwest of the centerline of the Outer Bar Channel. The site is rectangular in shape with corner coordinates located at:

28°54′00″N, 95°15′49″W; 28°53′28″N, 95°15′16″W;
28°52′00″N, 95°16′59″W; 28°52′32″N, 95°17′32″W.

This site occupies an area of approximately 1.53 square nautical miles (2.02 square statute miles), with depths ranging from 31 to 38 feet. The sediment reference area is located northeast of the channel with vertices at the following coordinates:

28°54′28″N, 95°13′40″W; 28°54′35″N, 95°13′28″W;
28°55′07″N, 95°14′01″W; 28°54′60″N, 95°14′13″W.

B. Site Characterization (Existing New Work ODMDS). The Freeport Harbor New Work ODMDS is located approximately 6 miles offshore, with its area bounded by the following coordinates:

28°50′51″N, 95°13′54″W; 28°51′44″N, 95°14′49″W;
28°50′15″N, 95°16′40″W; 28°49′22″N, 95°15′45″W

The site occupies an area of approximately 2.64 nautical square miles (3.49 square statute miles), with depths ranging from 54 to 63 feet.

Baseline conditions at the Freeport Harbor Maintenance and New Work ODMDSs were assessed during the site designation process. Details of baseline conditions, including descriptions of the marine environment in the site vicinity and the physical, chemical, and biological characteristics of the sediments and the water column at the site, are contained in the Final Environmental Impact Statement (EIS), Freeport Harbor 45-Foot Project (45-foot Project), Ocean Dredged Material Disposal Site Designation prepared by EPA, Region 6, in January 1990.

C. Historical Use of Site

1. Maintenance ODMDS. The Freeport Harbor Maintenance ODMDS received final designation on March 27, 1990 (55 FR 59). Historical use of the site is depicted in Table 1.

Table 1
Dredging History

Start	Finish	Dredge Work Type	Total Yards
Aug-92	Nov-92	Maintenance	2,884,532
Jul-93	Sep-93	Maintenance	1,415,742
Aug-94	Nov-94	Maintenance	2,599,267
Sep-95	Jan-96	Maintenance	2,674,026
Jul-96	Aug-96	Maintenance	579,500
Jan-97	Apr-97	Maintenance	2,489,108
Nov-97	Dec-97	Maintenance	1,053,157
Oct-98	Dec-98	Maintenance	2,334,436
Sep-99	Jan-00	Maintenance	1,555,615
Jul-00	Nov-00	Maintenance	1,859,847
Oct-00	Jan-01	Maintenance	2,202,288
Jun-01	Sep-01	Maintenance	2,479,249
May-02	Aug-02	Maintenance	1,996,354
Aug-03	Oct-03	Maintenance	1,726,186
Sep-04	Nov-04	Maintenance	1,908,831
Dec-05	Feb-06	Maintenance	1,911,091
May-06	May-06	Maintenance	200,511
Oct-06	Feb-07	Maintenance	2,516,000
Oct-07	Dec-07	Maintenance	1,415,421
Oct-08	Dec-08	Maintenance	1,577,096
Oct-09	Nov-09	Maintenance	2,420,755 [a]

[a] 7,500 cy dredged in January 2010.

SINCE 1992

No. years	18	years/cycle	0.86	Total cy	39,799,012
No. dredgings	21	months/cycle	10.3	cy/cycle	1,895,191
				cy/year	2,211,056

2. New Work ODMDS. The New Work ODMDS was designated (EPA, 1990) originally for the 45-foot Project for placement of 5.1 million cubic yards (mcy) of new work material. This site has been inactive since completion of the 45-foot Project, but has been designated for period of use for an indefinite period of time.

VI. Quantity of Material and Level of Contamination

A. Summary of information used to determine size of the site. Historically, since 1992, the dredging frequency for this navigation project is slightly less than 1 year or approximately 10.3 months, with an average of approximately 1.90 mcy of material excavated per dredging cycle placed at the Maintenance ODMDS. The excavated channel sediments can be characterized as clayey-sandy-silts. The channel sediment may contain a slightly higher percentage of sand than the placement area, and slightly less than the reference area; however, the percentage of silt is similar for all three locations. Average particle-size distribution is described in Table 2.

Table 2
Average Particle-size Distribution

Location	% Sand	% Silt	% Clay
Channel	19.6	52.0	28.4
ODMDS	5.4	66.4	28.2
Reference Area	26.9	56.6	16.5

As described in the site designation EIS, the sizes of the Maintenance ODMDS and New Work ODMDS were determined by simulations run on a computer model. These simulations assumed an average of 3.74 mcy of future maintenance dredged material to be placed during each maintenance cycle and 10.65 mcy of new work dredged material to be placed as part of the improvement project. The 10.65 mcy of new work material is greater than the 5.1 mcy of new work material originally simulated during the designation process for the historic New Work ODMDS (EPA, 1990). Both sites can be described as dispersive; therefore, the dredged material deposited there is expected to erode, especially due to the high percentage of fine-grained components.

Subsequent to the New Work ODMDS MDFATE modeling effort, the future new work material volume for offshore placement was reforecasted from 10.65 to 7.75 mcy. Given the reforecasted new work volume is less than the modeled volume, it is anticipated the disposal mound height will not exceed 15 ft, the Tier C1 threshold established in the SMMP.

Subsequent to the Maintenance ODMDS MDFATE modeling effort, the future maintenance material volume for offshore placement was reforecasted from 3.74 mcy/yr to 4.05 mcy/yr. However, it is anticipated that the additional 310,000 cy/yr of maintenance-dredged material will not translate in a disposal mound height exceeding 10 ft, the Tier M1 threshold established in this SMP.

B. Summary of testing requirements per Regional Implementation Agreement (RIA) and summary of past dredged material evaluations. On September 24, 1992, a RIA was executed between EPA Region 6 and SWG. The RIA was revised and updated, and a new RIA (EPA/USACE, 2003) issued November 3, 2003. This RIA described protocols for evaluating the quality of the dredged material and implementation of the "GREEN BOOK." These protocols describe chemical parameters to be analyzed, as well as required detection limits. It also specifies how toxicity testing and bioaccumulation assessments are to be conducted, as well as organisms to be utilized. Since that time, all sediment evaluations have been conducted in accordance with the RIA. Since the mid-1970s, before development of the RIA, dredged material from the Freeport Harbor Project had been evaluated numerous times to determine suitability for offshore

placement. This testing was performed to determine levels of metals and organic constituents, as well as toxicity and bioaccumulation assessments. Testing performed for this project is summarized in Table 3.

Table 3
Testing of Dredged Material, 1975–2006

Date	Type of Testing
September 17, 1975	Predredging Bulk Analyses
October 6, 1975	During-dredging Bulk Analyses
December 2, 1975	After-dredging Bulk Analyses
April 1978	Toxicity and Bioaccumulation Assessment*
October 1978	Toxicity and Bioaccumulation Assessment*
July 1980	Toxicity and Bioaccumulation Assessment*
January 14, 1982	Predredging Bulk Analyses
February 22, 1983	Predredging Bulk Analyses
July 3, 1984	Predredging Bulk Analyses
February 1985	Toxicity and Bioaccumulation Assessment*
May 15, 1985	Predredging Bulk Analyses
March 28, 1986	Predredging Bulk Analyses
March 18, 1987	Predredging Bulk Analyses
March 15, 1988	Predredging Bulk Analyses
April 7, 1989	Predredging Bulk Analyses
July 20, 1993	Predredging Bulk Analyses
September 1994	Toxicity and Bioaccumulation Assessment*
February 2, 1995	Predredging Bulk Analyses
January 25, 1997	Predredging Bulk Analyses
March 3, 1998	Predredging Bulk Analyses
July 8, 1998	Predredging Bulk Analyses
April 29, 1999	Toxicity and Bioaccumulation Assessment*
May 23,2000	Predredging Bulk Analyses
April 29, 2004	Toxicity and Bioaccumulation Assessment*
June 29, 2005	Toxicity and Bioaccumulation Assessment*
August 22, 2006	Predredging Bulk Analyses

*Also includes predredging bulk analyses.

The results of the above testing indicated that the material was suitable for offshore placement without special management conditions.

VII. Anticipated Site Use

The maintenance dredging frequency for the deepening and widening project is estimated to generate an average of approximately 3.19 mcy of maintenance dredge material to be placed at the existing Maintenance ODMDS. Presently, the Maintenance ODMDS receives on the average of 1.90 mcy of maintenance-dredged material at a frequency of once every 10.3 months.

The new work construction project will generate approximately 12.7 mcy of new work material from the Entrance Channel to be placed within the existing New Work ODMDS previously designated by EPA for indefinite placement of construction (new work) dredged material for the 45-foot Project.

Currently, no beneficial use of material dredged from Freeport Harbor is practiced. It is the policy of the Galveston District to require implementation of beneficial uses of dredged material, wherever practicable. Therefore, resource agencies were consulted during coordination to identify a beneficial uses plan for the FHCIP. However, it was determined that the likely beneficial use of the dredged material to create marsh or nourish adjacent shorelines would either be economically prohibitive or geotechnically incompatible. Therefore, a beneficial use plan is not proposed for the FHCIP.

VIII. Special Management Conditions or Practices

Currently, no special management conditions or practices related to placement of dredged material into the designated ODMDS have been required. As previously discussed, evaluations of sediment quality have indicated that the material from the channel is suitable for offshore placement without such requirements. However, all operations shall be conducted such that the dredged material remains within the bounds of the ODMDS immediately following descent to the ocean floor.

A seasonal restriction has been recommended by the National Marine Fisheries Service (NMFS), during formal consultation undertaken pursuant to the Endangered Species Act (NMFS, 2007) for maintenance dredging activities. This restriction was based on potential impacts of hopper dredging operations on several species of threatened and endangered sea turtles. The recommendation is to restrict hopper dredging to the period from December 1 through March 31, during which turtle abundance is at a minimum. This recommendation pertains, however, only to actual dredging operations, and not placement of the material into the ODMDSs. While it may not be practical to observe this restriction for all dredging cycles, it will be practiced when feasible. It is anticipated that a Biological Opinion addressing the proposed new work dredging will be issued by NMFS to define restrictions to avoid or minimize impacts to threatened and endangered species that may result from hopper dredging operations.

IX. Monitoring Program

The primary purpose of the Site Monitoring Program is to evaluate the impact of the placement of dredged material on the marine environment.

The evaluations will be used for making decisions, preventing unacceptable adverse effects beyond the site boundary, and ensure regulatory compliance over the life of the ODMDSs. Emphasis will be placed on determining physical impacts, since, to date, dredged material from the FHCIP and from the future maintenance of the navigation channels have been determined to be acceptable for ocean placement, without special conditions; however, consideration of contaminants will also be included.

Testing of dredged material is conducted based on "GREEN BOOK" and RIA procedures; however, it is necessary to verify the decisions made regarding suitability of the dredged material are correct and that the material is not having an adverse impact to the environment. In the event that the material persists in the ODMDSs, there may be potential for long-term contaminant effects on benthos.

The size and location of the Freeport Harbor New Work and Maintenance ODMDSs were determined pursuant to the General Criteria as listed in 40 CFR 228.5, and the Specific Criteria at 40 CFR 228.6(a). There are no significant environmental resources delineated within or immediately outside of the designated ODMDSs. Since these sites are dispersive in nature, the primary concern of the use of the sites is the potential short-term build up of dredged material, such that a hazard to navigation is presented. Another concern is whether there is significant short-term transport of the dredged material beyond the ODMDSs boundaries; specifically, the benthic community can be impacted if significant rapid movement of material off the site occurs, resulting in burial of benthic populations outside the sites. Studies have shown that benthic organisms can burrow through 6–9 inches of dredged material without significant impacts on the community (EPA/USACE, 1996).

The Site Monitoring Program is designed as a tiered program. If initial tier results fail predetermined limits, then a more complex set of tests is invoked at the next tier to determine the extent of impact. The tiers are used to facilitate rapid, accurate, and economical collection of information for use by the EPA, Region 6 and the USACE-SWG. The tiered hypothesis testing for these factors is described below.

CONSTRUCTION MATERIAL

While the literature on maintenance material disposal on the Gulf Coast indicates only minor short-term and negligible long-term mounding from placement activities, little information is available for new work material ODMDSs. Mounding from the construction material, while acceptable, is higher and of firmer material than is true for the maintenance material. Additionally, construction placement is expected to last for only a period of 2 years or less and more-frequent monitoring would be expected than would be necessary for the periodic, but short-term placement that occurs with maintenance dredging. The following monitoring and surveillance program is proposed for the FHCIP ODMDSs during construction. The monitoring is discussed in detail below.

A major consideration in the acceptability of the size of the ODMDSs was the location of the dredge when each discharge occurs. To prevent excessive mounding, it is necessary that a method be utilized to record the location of each discharge to ensure that the dredge distributes material uniformly over the ODMDS while it avoids approaching the edges of the ODMDS too closely. The following is the scheme used in the modeling to avoid excessive mounding and dispersal of material outside the ODMDS: two discharges at all exterior placement points (one should a larger dredge be used), followed by one discharge at each of the interior placement points in a given sequence until each has been utilized. Continue repeating the sequence with one discharge at each interior placement point until construction is complete.

TIER C1

Bathymetric Surveys

Routine bathymetric scans shall be conducted for the ODMDS to determine that there is no excessive mounding; e.g., to heights greater than 15 feet (threshold) above the existing bottom elevation (unless an alternate height is determined in agreement between the EPA and USACE on a case-by-case basis), and that there is no short-term transport of material beyond the limits of the ODMDS. Therefore, an accumulation of 1 foot of sedimentation along the ODMDS

boundary will be considered the threshold level for movement of material outside of the designated ODMDS. These determinations will be based on a comparison of the results with predisposal surveys.

Bathymetric surveys shall be obtained before the start of disposal operations, and monthly thereafter until operations are complete. Additional surveys shall then be performed after 6 months and 1 year.

Hydrographic surveys shall be conducted along transects within the ODMDS. These transects shall be oriented perpendicular to the channel in the direction of sediment transport (i.e., southwest). Transect intervals shall be every 1,000 feet extending 1,000 feet outside each boundary. In addition, a depth profile shall be obtained along the boundary.

Surveys shall be obtained using a USACE, or contract, survey vessel equipped with electronic surveying capabilities. The vessel must be equipped with positioning equipment with a horizontal precision of 1 foot. The fathometer, which shall display real-time depth on real-time location, must have a precision of 0.5 foot. All data shall be collected using methodology described in Engineer Manual 1110-2-1003, dated January 1, 2002.

Data Analysis

- If the surveys indicate deposited dredged material is not mounding to heights greater than the threshold elevation above the existing bottom elevation, and there is no short-term movement of material beyond the limits of the ODMDS, then the management objectives are being met. Further monitoring shall be conducted as scheduled.
- If the monthly surveys indicate movement of material outside of the designated limits, then the disposal operation will be reviewed to determine if the disposal sequence is being properly followed. The disposal sequence shall be adjusted as necessary to compensate for the movement.
- If the after-disposal surveys indicate mounding to heights greater than the threshold elevation, and/or movement of material out of the ODMDS has occurred, then the monitoring program shall proceed to Tier C2.

Sediment Chemistry

The New Work ODMDS is expected to receive most of the construction material and is selected as worst case for the monitoring described below. Monitoring stations, which consist of a control station, stations located immediately outside the ODMDS, and stations located some distance downcurrent from the site should be sampled for the items noted in the following paragraph to determine if impacts are occurring outside of the ODMDS. EPA (1989) describes two stations on each side of the ODMDS, roughly 300 feet from the ODMDS edges (stations B1 through B8), a control site located upcurrent of the ODMDS, and two stations located 10,000 feet downcurrent (southwest) of the downcurrent edge of the ODMDSs (Figure 1).

These stations shall be sampled before and at the completion of disposal operations. Postdisposal sampling shall occur 6 months and 1 year after the cessation of discharge of new work material at the site.

Samples shall be collected for (1) grain-size analysis, and (2) chemical characterization of sediments. The analytes and protocols described in the RIA shall apply to this testing. Sediment chemistry results shall be compared to the before-disposal results of samples from the sites and control sample. Data from previously collected sediments in the vicinity can also be considered. Significantly elevated sediment concentrations are defined as concentrations above the range of contaminant levels in dredged sediments that the Regional Administrator and the District Engineer found to be suitable for disposal at the ODMDS.

Data Analysis

- If contaminant concentrations are not significantly different from before-disposal data, then the management objectives are being met. Further monitoring shall be conducted as scheduled.
- If significant increases in levels of contaminants are observed, but bathymetric monitoring indicates that there is no short-term transport of material beyond the limits of the ODMDS, as determined in Bathymetric Surveys Tier C1, then this is an indication that the increase is not a result of dredged material placement. Further monitoring shall be conducted as scheduled.
- If significant increases in levels of contaminants are observed, and bathymetric monitoring indicates that there is short-term transport of material beyond the limits of the ODMDS, as determined in Bathymetric Surveys Tier C1, then bioassay/bioaccumulation testing shall be conducted to determine effects to the benthic communities. This testing is described in Tier C2.

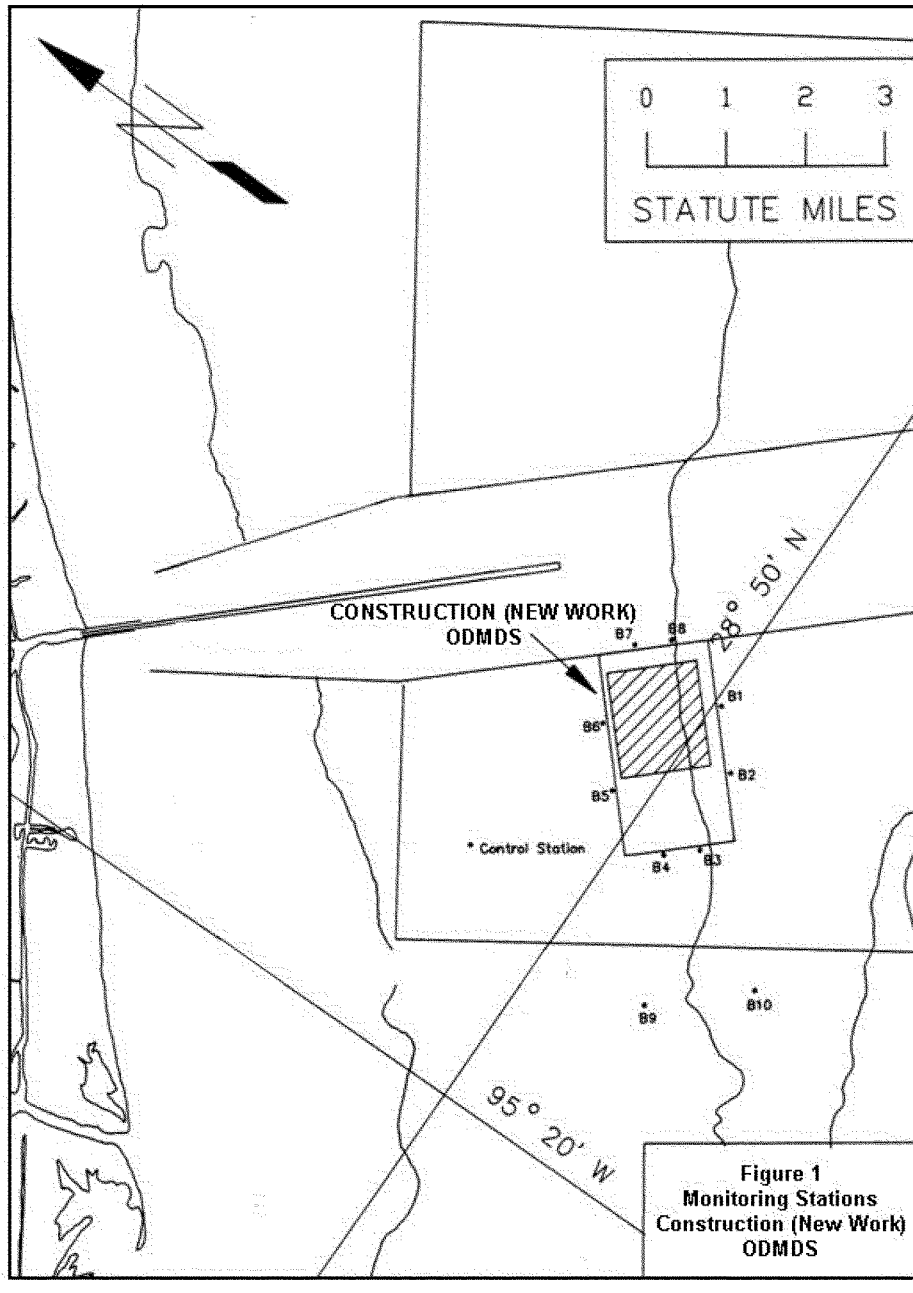


Figure 1
Monitoring Stations
Construction (New Work)
ODMDS

Benthos

Monitoring stations, which consist of a control station, stations located immediately outside the ODMDS, and stations located some distance downcurrent from the site should be sampled for the items noted in the following paragraph to determine if impacts are occurring outside of the ODMDS. EPA (1989) describes two stations on each side of the ODMDS, roughly 300 feet from the ODMDS edges (stations B1 through B8), a control site located upcurrent of the ODMDS, and two stations located 10,000 feet down current (southwest) of the downcurrent edge of the ODMDS (stations B9 and B10). These should be the same stations used for sediment chemistry (see Figure 1). Substrate elevation should also be determined at each sampling station during each sampling event.

These stations shall be sampled before and at the completion of disposal operations. Postdisposal sampling shall occur 6 months and 1 year after the cessation of discharge of new work material at the site. Samples shall be collected for macrobenthic invertebrates (in triplicate). Macrobenthic community structure during each sampling event shall be compared to the control sample to eliminate effects of potential seasonal variation. Significant changes are defined as statistically significant differences in community structure or population density.

Data Analysis

- If macrobenthic community structure is not significantly different than the control, then the management objectives are being met. Further monitoring shall be conducted as scheduled.
- If significant changes are observed, then further analysis shall be conducted under Tier C2.

TIER C2

Bathymetric Surveys

If deposited dredged material mounds to heights above the threshold value, then monitoring shall continue as scheduled, and could possibly be extended. A Notice to Mariners shall be posted as appropriate.

If transport of material from the site is occurring, hydrographic surveys shall be expanded to include the impacted areas to determine the changes in dispersion of the material. An accumulation of more than 1 foot of sedimentation along the ODMDS boundary will be considered the threshold level for significant movement of material outside of the designated ODMDS.

Data Analysis

- During Dredging – If deposited dredged material is mounding to heights above the threshold value, but less than 20 feet above the existing bottom elevation, and there is no significant short-term transport of material beyond the limits of the ODMDS, then monitoring shall continue as scheduled. A Notice to Mariners shall be issued as appropriate.

- During Dredging – If deposited dredged material is mounding to heights greater than 20 feet above the existing bottom elevation, and there is no significant short-term transport of material beyond the limits of the ODMDS, then bathymetric monitoring shall continue as scheduled. A Notice to Mariners shall be posted as appropriate. If mounding is considered to be excessive, alterations to the placement operations may be warranted.
- During Dredging – If significant movement of material out of the ODMDS is occurring, bathymetric monitoring shall be expanded to include the impacted areas to determine the changes in dispersion of the material. Following completion of disposal operations, surveys shall continue on a quarterly basis for 1 year, or until agreement is reached between the EPA and USACE-SWG to discontinue monitoring. Findings shall be documented for future reference.
- After Dredging – If deposited dredged material has mounded to heights above the threshold value, but less than 20 feet above the existing bottom elevation, and there is no significant short-term transport of material beyond the limits of the ODMDS, then bathymetric monitoring shall continue at predetermined 6-month intervals for 1 year, or until agreement is reached between the EPA and USACE-SWG to discontinue monitoring. Findings shall be documented for future reference, and a Notice to Mariners shall be issued as appropriate.
- After Dredging – If deposited dredged material is mounding to heights greater than 20 feet above the existing bottom elevation, and there is no significant short-term transport of material beyond the limits of the ODMDS, then bathymetric monitoring shall continue at predetermined 6-month intervals for 1 year, or until agreement is reached between the EPA and USACE-SWG to discontinue monitoring. Findings shall be documented for future reference, and a Notice to Mariners shall be issued as appropriate.
- After Dredging – If significant movement of material out of the ODMDS has occurred, bathymetric monitoring shall be expanded to include the impacted areas to determine the changes in dispersion of the material, and shall continue on a quarterly basis for a 1-year period, or until agreement is reached between the EPA and USACE-SWG to discontinue monitoring. Findings shall be documented for future reference.

Sediment Chemistry

If the results of the Tier C1 sediment chemistry evaluation indicate the need for additional testing, then solid-phase bioassay and bioaccumulation testing shall be conducted in accordance with the procedures described in the RIA. Funding for work under this Tier shall be provided by EPA, Region 6 as described in Section IV, Funding.

Data Analysis

- If significant toxicity is not found, testing shall continue as described in Tier C1. However, subsequent sampling shall continue on a quarterly basis for the 1-year period following completion of disposal operations, or until agreement is reached between the EPA and USACE-SWG to discontinue monitoring. Findings shall be documented for future reference.
- If significant toxicity is found, the USACE-SWG together with EPA Region 6 will consider various management options to rectify the situation. Because the ODMDS is a

dispersive site, potential sources of toxicity other than dredged material must also be considered. A decision must also be made whether to allow continued use of this site. Findings shall be documented for future reference.

Benthos

A significant change in community structure or population density may be an indication that the substrate has changed. This could be a result of natural redistribution of sediments or the dredged material may be moving beyond the ODMDS at a faster rate than anticipated. A change in community structure could also indicate that toxicity has occurred. Monitoring the macrobenthic community shall continue on a quarterly basis until 1 year following completion of discharge operations has elapsed, or until agreement is reached between the EPA, Region 6 and USACE-SWG to discontinue monitoring.

Data Analysis

- If significant changes are observed, but bathymetric monitoring indicates that there is no short-term transport of material beyond the limits of the ODMDS, as determined in Bathymetric Surveys Tier C1, then this is an indication that the changes are not a result of dredged material placement. Further monitoring shall be conducted as scheduled.
- If significant changes are observed, and bathymetric monitoring indicates that there is short-term transport of material beyond the limits of the ODMDS, as determined in Bathymetric Surveys Tier C1, then this is an indication that the changes may be a result of dredged material placement. Further monitoring shall be conducted as scheduled.
  - If significant changes are observed 1 year following completion of disposal operations, then the monitoring shall continue on a quarterly basis for 1 additional year. If significant changes are observed after the second year, further monitoring plans will be developed based on the degree of impact.
- If significant changes are observed, and there is an indication that the sediments are toxic, as determined in Sediment Chemistry Tier C2, then this is an indication that the changes may be a result of dredged material placement. Further monitoring shall be conducted as scheduled.
  - If significant changes are observed 1 year following completion of disposal operations, then the monitoring shall continue on a quarterly basis for 1 additional year. If significant changes are observed after the second year, further monitoring plans will be developed based on the degree of impact.

MAINTENANCE MATERIAL

TIER M1

Physical and chemical evaluations of the ODMDS material shall be conducted to characterize possible effects from the placement of dredged material occurring at the site. Physical analyses of the sediment can assist in assessing the impact of disposal practices on the benthic environment at the disposal site and determine if dredged material is migrating offsite. Chemical analyses of the sediment shall be conducted to establish whether contaminants of concern are suspected to be affecting the benthic environment at the disposal site.

Bathymetric Surveys

The ODMDS is located outside of the safety fairway for large vessel traffic; therefore, the mounding will be considered in regard to shallow-draft vessels only. Considering the grain-size characteristics of typical maintenance dredged material from this channel, significant mounding is not expected subsequent to discharge operations. The threshold elevation for mounding of dredged material within the ODMDS will be 10 feet, or other mutually agreed-upon height, above the existing bottom elevation.

Since the sites are dispersive, movement of material from the sites is expected to occur after disposal operations cease. In order to detect if short-term movement of the material out of the designated ODMDS is occurring at a significant rate, hydrographic surveys of the ODMDS shall be obtained before the start of disposal operations, and soon after completion of disposal operations. An accumulation of 1 foot of sedimentation along the ODMDS boundary will be considered the threshold level for movement of material outside of the designated ODMDS. This determination shall be based on a comparison of the results of these before and after surveys.

Hydrographic surveys shall be conducted along transects within the ODMDS. These transects shall be oriented perpendicular to the channel in the direction of sediment transport (i.e., southwest). Transect intervals shall be every 1,000 feet extending 1,000 feet outside each boundary. In addition, a depth profile shall be obtained along the boundary.

Surveys shall be obtained using a USACE or contract survey vessel equipped with electronic surveying capabilities. The vessel must be equipped with positioning equipment with a horizontal precision of 1 foot. The fathometer, which shall display real-time depth on real-time location, must have a precision of 0.5 foot. All data shall be collected using methodology described in Engineer Manual 1110-2-1003, dated January 1, 2002.

Data Analysis

- If deposited dredged material is not mounding to heights greater than the threshold height above the existing bottom elevation, and there is no short-term movement of material beyond the limits of the ODMDS, then the management objectives are met. No further postdisposal monitoring will be required.
- If mounding to heights greater than the threshold height, and/or movement of material out of the ODMDS has occurred, as determined by the postdredging survey, then the monitoring program shall proceed to Tier M2.

Sediment Chemistry

Sediment chemistry analyses shall be conducted in conjunction with the dredged material evaluations from samples collected in the navigation channel. Collecting samples from both the navigation channel and ODMDS during the same sampling event has been determined to be the most efficient use of resources. Because most ODMDSs lie directly adjacent to the navigation channels, there are relatively short distances between the two areas. As described in the RIA, sediment testing in the navigation channels generally occurs on a 5-year cycle. Sediment chemistry results from the ODMDSs should be compared to the results collected from the navigation channel. Significantly elevated sediment concentrations are defined as concentrations above the range of contaminant levels in dredged sediments that the Regional Administrator and the District Engineer found to be suitable for disposal at the ODMDS.

Data Analysis

- If contaminant concentrations are not significantly different than navigation channel concentrations then no further testing is needed.
- If significant increases in levels of contaminants are observed at the ODMDS, then a bioassay/bioaccumulation study shall be conducted to determine effects to the benthic community. The studies are described below as Biological Testing under Tier M2.

TIER M2

Bathymetric Surveys

If transport of material from the sites is occurring, hydrographic surveys shall be expanded to include the impacted areas and shall be performed on a semiannual basis to determine the changes in dispersion of the material until the impacts are no longer observed. An accumulation of more than 1 foot of sedimentation along the ODMDS boundary will be considered the threshold level for significant movement of material outside of the designated ODMDS.

Data Analysis

- If deposited dredged material is mounding to elevations above the threshold value, but less than 15 feet above the existing bottom elevation, and there is no significant short-term transport of material beyond the limits of the ODMDS, then semiannual postdisposal monitoring shall occur as described.
- If at 6 months after disposal, deposited dredged material remains mounded to elevations greater than half the postdisposal elevations, then bathymetric surveys shall be continued.
- If deposited dredged material is mounding to heights greater than 15 feet and/or significant movement of material out of the ODMDS has occurred, the USACE-SWG together with EPA, Region 6 will consider various management options to rectify the situation. Such options could include, but are not limited to, expansion of the ODMDS or relocation of the ODMDS within the zone of siting feasibility described in the designation EIS.

Biological Testing

If the results of the Tier M1 sediment chemistry evaluation indicate the need for additional testing, then solid-phase bioassay and bioaccumulation testing shall be conducted in accordance with the procedures described in the RIA. Funding for work under this Tier shall be provided by EPA, Region 6 as described in Section IV, Funding.

Data Analysis

- If toxicity is not indicated, then no further testing is needed and disposal activities can continue at the ODMDS.
- If toxicity is indicated at the ODMDS, the USACE-SWG together with EPA, Region 6 will consider various management options to rectify the situation. Because the ODMDS is a dispersive site, potential sources of toxicity other than dredged material must also be considered. If planned use of the ODMDS is imminent, a decision must also be made whether to allow continued use of this site.

X. SMMP Review and Revision

Pursuant to Section 102(c) of the MPRSA, as amended by WRDA 92, the SMMP for the FHCIP ODMDSs will be reviewed and revised, if necessary, not less frequently than 10 years after adoption and every 10 years thereafter.

Modifications or updates to the SMMP may be necessary, based on specific needs identified for specific authorized projects. Modifications or updates to the SMMP may be proposed by either the USACE-SWG or EPA, Region 6. Following a 30-day review period of the changes(s), the modifications may be incorporated into the plan by mutual consent of both agencies.

References

National Marine Fisheries Service (NMFS). 2007. Revision 2 to the November 19, 2003, Biological opinion concerning dredging of Gulf of Mexico navigation channels and sand mining ("borrow") areas using hopper dredges by U.S. Army Corps of Engineers, Galveston, New Orleans, Mobile, and Jacksonville districts (Consultation Number F/SER/2000/01287).

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———. 1990. Final environmental impact statement, Freeport Harbor (45-Foot Project), Ocean Dredged Material Disposal Site designation, EPA 906/01-90-001. U.S. EPA, Region VI, Dallas, Texas.

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———. 2003. Regional implementation agreement for testing and reporting requirements for ocean disposal of dredged material off the Louisiana and Texas coasts under Section 103 of the Marine Protection, Research and Sanctuaries Act, July 2003. U.S. EPA Region VI, Dallas, Texas; U.S. Army Corps of Engineers, Galveston District; and U.S. Army Corps of Engineers, New Orleans District.

This SMMP complies with Section 102(c)(3) of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. Sections 1401, *et seq.*) as amended by Section 506 of the Water Resources Development Act of 1992 (WRDA 92; Public Law 102-580), and has been approved by the following officials of Region 6 of the U.S. Environmental Protection Agency, and Galveston District of the U.S. Army Corps of Engineers. This plan goes into effect upon the date of the last signature:

Al Armendariz
Regional Administrator
Region 6
U.S. Environmental Protection Agency

5/6/2011
Date

Christopher W. Sallese
Colonel, Corps of Engineers
Galveston District
U.S. Army Corps of Engineers

23 MAR 11
Date

Appendix C

General Conformity Determination and Air Emissions Estimates

Document No. 070282
Job No. 441901

FINAL
GENERAL CONFORMITY DETERMINATION
FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT
BRAZORIA COUNTY, TEXAS

Prepared for:

U.S. Army Corps of Engineers
Galveston District
P.O. Box 1229
Galveston, Texas 77553-1229

Prepared by:

Atkins
6504 Bridge Point Parkway
Suite 200
Austin, Texas 78730

April 2011

PROFESSIONAL ENGINEER STATEMENT

The attached Final General Conformity Determination Document and estimate of air contaminant emissions is released on August 21, 2012 under the authority of Ruben I. Velasquez, P.E., Registration No. 69126, for the purpose of evaluation and discussion. This preliminary document is not to be used for construction, bidding, or permitting purposes.

TCEQ and USACE's determination of conformity is based on the emissions information and project schedule proposed at the time. Once a final project schedule is completed, USACE will provide an update of the General Conformity documentation to TCEQ and EPA for review and concurrence that the updated emissions and schedule will still be conformant with the currently approved Houston-Galveston area State Implementation Plan.

STATE OF TEXAS
RUBEN I. VELASQUEZ
69126
REGISTERED
PROFESSIONAL ENGINEER

8-21-2012

Ruben I. Velasquez, PE
Atkins
TBPE REG. #F-474

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Acronyms and Abbreviations

BPA	Brazos Pilots Association
BRHND	Brazos River Harbor Navigation District
CAA	Federal Clean Air Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CY	cubic yards
FEIS	Final Environmental Impact Statement
DOT	U.S. Department of Transportation
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ERDC	Engineer Research and Development Center
FHCIP	Freeport Harbor Channel Improvement Project
FEIS	Final Environmental Impact Statement
FS	Feasibility Study
HGB	Houston-Galveston-Brazoria
LOA	length overall
LPP	Locally Preferred Plan
mcy	million cubic yards
NAAQS	National Ambient Air Quality Standards
NED	National Economic Development
NEPA	National Environmental Policy Act
NO_X	nitrogen oxides
ODMDS	Ocean Dredged Material Disposal Site
PA	Placement Area
PM_{10}	particulate matter with an aerodynamic diameter equal to or less than 10 microns
SIP	Texas State Implementation Plan
SO_2	sulfur oxides
TCEQ	Texas Commission on Environmental Quality
tpy	tons per year
TxLED	Texas Low-Emission Diesel
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

1.0 INTRODUCTION

The existing Freeport Harbor Project was authorized by the River and Harbors Acts of May 1950 and July 1958, providing for an Entrance Channel of 38-foot depth and 300-foot width from the Gulf of Mexico (Gulf) to inside the jetties and for interior channels of 36-foot depth and 200-foot width up to and including the Upper Turning Basin. The relocation and deepening of the Jetty Channel to a 45-foot depth and 400-foot width and the Entrance Channel to a 47-foot depth and 400-foot width, with an extension of approximately 4.6 miles into the Gulf was authorized by Congress in 1978 with the passage of Section 101 of the River and Harbors Act of 1970 (PL 91-611; House Document 289, 93rd Congress – 2nd Session, December 31, 1975) and by the president in 1974. The construction of this existing project, referred to in this document as the Freeport Harbor Channel 45-Foot Project was completed in 1998.

The Brazos River Harbor Navigation District (BRHND) (Port Freeport), the non-Federal sponsor of the existing channel system, began consideration of additional channel improvements to alleviate navigation problems experienced at the port. A 905(b) reconnaissance study was completed in 2002 by the U.S. Army Corps of Engineers (USACE), identifying a Federal interest in a widening and deepening project because transportation savings in the form of National Economic Development (NED) benefits substantially exceed the cost of project implementation. A general screening analysis was conducted to identify structural plans, which would provide safe and efficient navigation at the least cost while minimizing environmental impacts, and included a ship simulation study conducted at Engineer Research and Development Center (ERDC) in Vicksburg, Mississippi. As a result, a Feasibility Study (FS) was begun to determine whether a Federal navigation improvements project is justified and to provide a decision document to recommend to Congress authorization and funding to construct the project. On July 7, 2003, the USACE and Port Freeport signed an agreement to conduct the FS, including an Environmental Impact Statement (EIS). The project is being led by the USACE, with the cost being shared by Port Freeport.

The District Engineer, USACE, is responsible for the overall management of this EIS. Port Freeport is the non-Federal sponsor for the study. The study is being coordinated with interested Federal, State, and local agencies and the public. There are no cooperating agencies for the Freeport Harbor Channel Improvement Project (FHCIP). In accordance with the National Environmental Policy Act (NEPA), a Draft Environmental Impact Statement (DEIS) was prepared to analyze and disclose the potential impacts of the proposed project and reasonable alternatives on the natural and human environment.

Freeport Harbor Channel provides deep-water access from the Gulf to Port Freeport (Figure 1). Specifically, the existing Freeport Harbor Channel begins approximately 4.9 miles seaward of the coastal jetty tips between Surfside and Quintana, in Brazoria County, Texas, at the 47-foot depth contour in the Gulf, continuing upstream through the Freeport Harbor Entrance and Jetty channels, and winding westward for approximately 3.5 miles into Freeport to the Stauffer Channel Turning Basin. Upland and offshore placement areas (PAs) for disposal of dredged material from the proposed improvements are also

included in the study. The Freeport Harbor Jetty and Entrance Channels are currently maintained by the USACE to a depth of –45 feet and –47 feet mean low tide, respectively, at a width of 400 feet. These existing channels are approximately 6.3 miles in length and approximately 400 feet in width.

For the preparation of the FHCIP, several alternatives were identified and suggested in the 2002 Galveston District Reconnaissance Report Section 905(b) Analysis. Based on the analysis and evaluation of these alternatives, the USACE has identified three alternatives carried through and evaluated in this EIS. The alternatives include the No-Action Alternative and the proposed action with two alternative channel configurations, as follows:

- No-Action Alternative – The No-Action Alternative is the existing project. The 45-Foot Project depth would be maintained throughout the Freeport Harbor Entrance and Jetty channels. The remainder of the Freeport Harbor Main Channel, turning basins, and Stauffer Channel would remain as described in Section 1.3 and Table 2.5-1. Shoal material would continue to be dredged from the channel during maintenance cycles and placed in the designated ocean dredged material disposal site (ODMDS) for the Jetty and Entrance channels and in PA 1 for the channel inshore of the Jetty Channel.

- Future Without Project – The FWOP is defined as the No-Action Alternative combined with permit widening. Construction of channel widening by the Port will occur before Federal construction of the FHCIP, in the event the permit is issued. Under the FWOP, the channel would be maintained at the authorized depth of 45 feet, with a permitted width of 600 feet for the Entrance and Jetty channels. The Freeport Harbor Jetty Channel from Channel Station 63+46 would be gradually widened, at the authorized depth, from 400 feet to 550 feet up to Channel Station 43+00. From that station to Channel Station 38+00, the channel width would be between 550 feet and 600 feet. The remainder of the Jetty Channel and the entire Freeport Harbor Entrance Channel (to approximately Channel Station –300+00) would be approximately 600 feet wide. The 45-Foot Project depth would be maintained throughout the Freeport Harbor Entrance and Jetty channels. The remainder of the Freeport Harbor Main Channel, turning basins, and Stauffer Channel would remain as described in Section 1.3 and Table 1.3-1. For the FHCIP, the FWOP is the condition against which all proposed project alternatives are evaluated, rather than the No-Action Alternative.

- NED Plan Alternative – In general, the NED Plan Alternative proposes to widen the Entrance and Jetty channels to 540 feet and deepen to 60 feet, to deepen the main channels to 60 feet, and to deepen the Stauffer Channel to 40 feet and widen it to 300 feet, while restoring the Upper Stauffer Channel to its authorized dimensions of 30-foot depth and 200-foot width. Associated turning basins would also be deepened and widened. Construction of the NED Plan would generate approximately 23.2 million cubic yards (mcy) of dredged material. Maintenance of the deepened and widened channel would generate a total of 190.5 mcy of maintenance dredged material over the 50-year evaluation period. Material dredged from the Entrance and Jetty

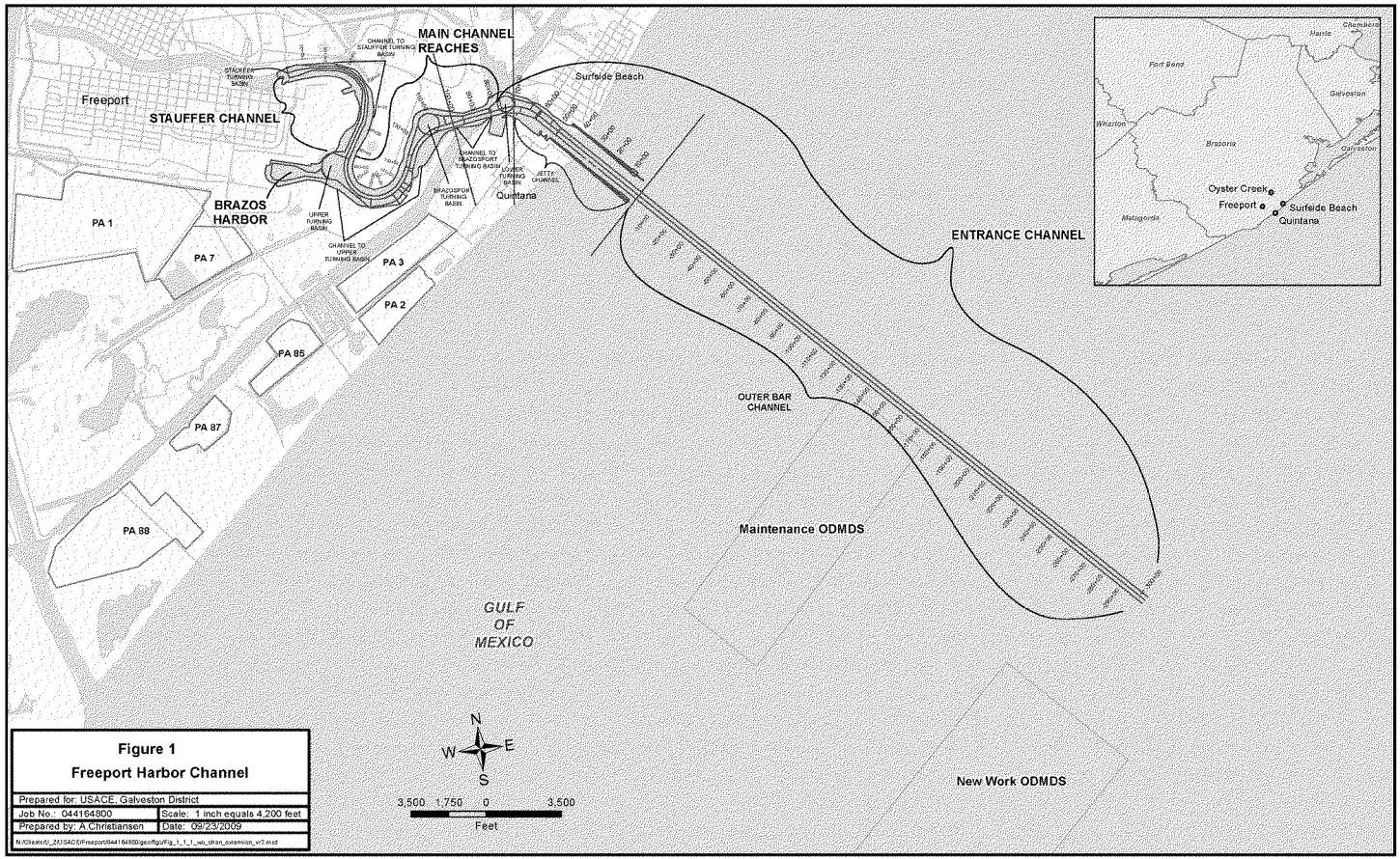

Figure 1
Freeport Harbor Channel

Prepared for: USACE, Galveston District	
Job No.: 044164800	Scale: 1 inch equals 4,200 feet
Prepared by: A.Christiansen	Date: 09/23/2009
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channels during construction would be placed in the New Work ODMDS and the remainder of the new work material would be placed in upland PAs 1, 8, and 9. Material dredged from the Entrance and Jetty channels during maintenance cycles would be placed in the maintenance material ODMDS, and material from the remainder of the channel would be placed in PAs 1, 8, and 9.

- Locally Preferred Plan (LPP) Alternative – In general, the LPP Alternative proposes to widen the Entrance and Jetty channels up to 600 feet and deepen to 55 feet, to deepen the main channels to 55 feet, and to deepen the Stauffer Channel to 50 feet and widen it to 300 feet. Associated turning basins would also be deepened and widened. Construction of the LPP would generate approximately 17.4 mcy of dredged material. Maintenance of the deepened and widened channel would generate a total of 175.9 mcy of maintenance dredged material over the 50-year evaluation period. Material dredged from the Entrance and Jetty channels during construction would be placed in the New Work ODMDS, and the remainder of the new work material would be placed in PAs 1, 8, and 9. Material dredged from the Entrance and Jetty channels during maintenance cycles would be placed in the Maintenance ODMDS, and material from the remainder of the channel would be placed in PAs 1, 8, and 9.

Additional information regarding the proposed project is presented in the FEIS.

1.1 PURPOSE

Vessel operations are currently constrained by the dimensions of the Freeport Harbor Channel. The maximum ship dimensions currently permitted by the Brazos Pilots Association (BPA) at Freeport Harbor are 825-foot length overall (LOA), 145-foot maximum beam, and 42-foot draft. The channel dimension constraints include (a) lightering and lightening, (b) LOA restrictions, (c) beam restrictions, (d) one-way traffic, and (e) daylight-only operation restrictions. These problems are discussed in more detail below.

- **Lightering and Lightening.** Since the completion of the 45-foot Project, the size of the vessels navigating the waterway has steadily increased so that many vessels currently have to be light-loaded to traverse the channel. The current channel depth requires that large crude carriers remain offshore and transfer their cargo into smaller crude tankers for navigating the channel. This lightering operation takes place in the Gulf where two ships, the mother ship and the lightering ship, come together so that a cargo transfer can occur. Lightening operations are similar except that cargo is transferred to another ship so that both ships can enter port. Although these operations have occurred frequently in the past, the possibility for a collision, oil spill, fire, or other adverse environmental consequence is always present. Current projections indicate that crude imports will increase in the near future. As these imports increase, the number of lightering vessels and product carriers will also increase, adding to shipping delays, congestion, and the potential risk of collision or spill.
- **LOA Restrictions.** The length limitation of 825 feet is enforced because crosswinds and crosscurrents force tankers to "crab" at an angle through the Entrance Channel. Ships of greater length than 825 feet are not able to clear the jetties under adverse wind and current conditions. Waivers on ship length are granted on a case-by-case basis for ships as large as

900-foot LOA and 160-foot beam to transit the Freeport Harbor Channel, provided that winds are less than 20 knots and that there is no more than a 0.5 knot crosscurrent at the mouth of the jetties. About three to four ships per month are granted these waivers. Numerous requests have been submitted for ships in the 920- to 950-foot LOA range to transit the channel, and these requests have been denied. When denied access to Freeport Harbor, these ships normally divert to Corpus Christi or New Orleans.

- **Beam Restrictions.** The maximum beam permitted under normal operations is 145 feet. Vessels with larger beams require waivers to enter the port.
- **One-Way Traffic Restriction.** Because of the 400-foot width of the Entrance and inside channels, one-way ship traffic is always in effect in the Freeport Harbor Channel. This can result in delays when ship schedules coincide.
- **Daylight-Only Operation Restriction.** Because of channel dimensions as well as the nature of the cargo, daylight-only operation is enforced on all vessels greater than 750-foot LOA or over 107-foot beam. This can result in waiting time of up to 12 hours, if ship arrival/departure occurs at dark.

Port Freeport requested that the terminus of the Federal project extend to include the Stauffer Channel. The length of the proposed channel would then extend approximately 3,700 feet from the federally authorized 45-foot Upper Turning Basin. As part of the FS, optimization of the depth for the channel extension for the Lower Stauffer Channel was determined. Depth alternatives of 30, 40, and 50 feet were initially evaluated and resulted in a more focused evaluation of a smaller range of depths. Analyses were conducted to determine any competitive advantage that Port Freeport might potentially have over competing ports. For instance, there is considerable overlap between the Houston and Freeport population centers, and a Port Freeport container terminal has the potential of capturing associated savings. In addition, Port Freeport offers an advantage over existing facilities in Houston because terminal capacity in Houston is near capacity.

The purpose of the proposed project is to improve navigation efficiency by reducing the number of lightering and lightening operations by deepening the channel, and to eliminate operational constraints by improving the channel.

1.2 NEED

The project need is the elimination of the operational constraints to allow vessels to avoid delays, thereby reducing shipping costs and logistical problems and increasing vessel safety. Freeport experienced strong tonnage growth over the past decade. Review of the USACE national statistics shows Freeport ranking 24th in the nation in terms of total tonnage in 2002, up from 38th in the early 1990s. Although Freeport handles general cargo and containerized cargo, crude petroleum imports account for the majority of throughput.

As discussed in the FEIS, the USACE has previously noted the problems mentioned above; i.e., that "the light-loading, one-way traffic, and daylight-only operation result in significantly higher costs to users of

the Port Freeport than would be experienced if the harbor were enlarged and deepened. The transportation savings that would result from improvements at Freeport Harbor would be an economic benefit to the nation." Thus the USACE has confirmed the need for the project and that the project serves the national interest.

1.3 GENERAL CONFORMITY

This project, as a Federal action, is subject to the General Conformity Rule promulgated by the U.S. Environmental Protection Agency (EPA). The rule mandates that the Federal government not engage in, support, or provide financial assistance for licensing or permitting, or approving any activity not conforming to an approved State Implementation Plan. In Texas, the applicable plan is the Texas State Implementation Plan (SIP), an EPA-approved plan for the regulation and enforcement of the National Ambient Air Quality Standards (NAAQS) in each air quality region within the state.

Based on an evaluation of air contaminant emissions associated with this project, it has been determined that a General Conformity Determination for nitrogen oxide (NO_X) emissions would be required. Emissions of volatile organic compounds (VOC) for this project are exempt from a General Conformity Determination because they are below the emissions threshold requiring such an analysis.

This document represents the Final General Conformity Determination prepared on behalf of the USACE, Galveston District, pursuant to the Clean Air Act (CAA), Section 176(c)(1), to document that emissions that would result from the proposed FHCIP are in conformity with the SIP for the HGB ozone nonattainment area.

2.0 REGULATORY BACKGROUND – GENERAL CONFORMITY

General Conformity refers to the process of evaluating plans, programs, and projects to determine and demonstrate they meet the requirements of the CAA and the SIP. The General Conformity Rule establishes conformity in coordination with and as part of the NEPA process. The rule takes into account air pollution emissions associated with actions that are federally funded, licensed, permitted, or approved, and ensures emissions do not contribute to air quality degradation, thus preventing the achievement of State and Federal air quality goals.

This rule is designed to ensure that Federal actions do not cause or contribute to air quality violations in areas that do not meet the NAAQS. The General Conformity Rule is codified at Title 40 Code of Federal Regulations (CFR) Part 51, Subpart W, and Title 40 CFR Part 93, "Determining Conformity of Federal Actions to State or Federal Implementation Plans."

The Texas Commission on Environmental Quality (TCEQ), has promulgated its own corresponding regulations under 30 TAC §101.30, "Conformity of General Federal Actions to State Implementation Plans" (TCEQ, 1999). Unless specifically exempted, this rule applies to all Federal actions except programs and projects requiring funding or approval from the U.S. Department of Transportation (DOT), the Federal Highway Administration, the Federal Transit Administration, or the Metropolitan Planning Organization. These types of programs and projects must instead comply with the conformity provisions implemented in the Transportation Conformity Rule issued by the DOT on November 24, 1993.

The CAA defines conformity to an implementation plan as the upholding of "an implementation plan's purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards and achieving expeditious attainment of such standards." Conforming activities or actions should not, through additional air pollutant emissions, result in the following:

- Cause or contribute to new violation of any NAAQS in any area;
- Increase the frequency or severity of any existing violation of any NAAQS in any area; or
- Delay timely attainment of any NAAQS or interim emission reductions or other milestones in any area.

The purpose of this General Conformity requirement is to assure Federal agencies consult with State and local air quality districts to assure these regulatory entities know about the expected impacts of a Federal action and would include expected emissions in their SIP emissions budget.

Consistent with Section 176(c)(1) of the CAA, a Federal action is generally defined as any activity engaged in or supported in any way by any department, agency, or instrumentality of the Federal government (40 CFR 51.852). 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

some aspect of a non-Federal undertaking, the relevant activity is the part, portion, or phase of the non-Federal undertaking that requires the Federal permit, license, or approval.

Pursuant to the General Conformity Rule, a Federal agency; e.g., the USACE, must make a General Conformity Determination for all Federal actions in nonattainment or maintenance areas where the total of direct and indirect emissions of a nonattainment pollutant or its precursors exceeds levels established by the regulations. For the HGB nonattainment area, the threshold level is 25 tons per year (tpy) for either NO_X or VOC. In addition, even if the total of direct and indirect emissions of VOC or NO_X does not exceed the 25 tpy threshold levels, when the total of direct and indirect emissions of any pollutant from the Federal action represents 10 percent or more of a nonattainment or maintenance area's total emissions of those pollutants, then the action is defined as a regionally significant action, and a conformity determination would still be applicable.

The general conformity regulations require the inclusion of direct and indirect impacts of the Federal action in the conformity applicability analysis if those impacts are reasonably foreseeable and subject to continuing agency responsibility. Only those air emissions of NO_X and VOC related to the Federal action should be considered in this General Conformity Determination.

3.0 APPLICABILITY

The General Conformity Rule is applicable only to nonattainment and maintenance areas. The FHCIP will be located in Brazoria County, Texas. Brazoria County is included in the eight-county HGB ozone nonattainment area, which is classified as "severe" in terms of its degree of compliance with the current 1- and 8-hour ozone standards. This classification affects facilities that generate the ozone precursors, NO_X, and VOC. As such, the project is subject to the General Conformity Rule, which applies to all nonattainment and maintenance areas.

The proposed project alternatives have been evaluated in terms of the relevant direct and indirect emissions associated with each alternative such as emissions from dredging, dredge support equipment, construction equipment used in the placement of dredged material, and employee vehicles used to commute to and from the work sites. Based on this evaluation, it has been determined that a General Conformity Determination for NO_X emissions would be required for the NED and LPP alternatives as emissions of NO_X are estimated to exceed the 25 tpy applicability threshold for each of these alternatives. Emissions of VOC for the construction activities for each of these alternatives are exempt from a General Conformity Determination because they are below the 25 tpy emissions threshold requiring such an analysis. A General Conformity Determination has been prepared for the No-Action Alternative (Widening Project) and coordination with TCEQ is ongoing.

4.0 AIR EMISSIONS INVENTORY

For the EIS and the General Conformity Determination, an air emissions inventory was prepared for project-related activities for both the NED and LPP alternatives based on the schedule and other assumptions as developed for each alternative. Air emissions estimates were calculated using techniques appropriate for a specific emissions-generating activity or source. The basis, emission factors, and summary of emissions are provided in Appendix A, NED Alternative Emissions Summary, and Appendix B, LPP Alternative Emissions Summary, of this document.

4.1 Project Emissions

The emission sources for each project alternative will consist of marine and land-based mobile sources that will be utilized as scheduled for the duration of the project. It is assumed that the marine emission sources will include two types of dredges, hydraulic and hopper, as well as support equipment such as tugboats, survey boats, and trawlers. The land-based emission sources will include both off-road equipment utilized for dredged material placement sites and on-road vehicles for employees commuting to and from the work site. The marine emission sources and off-road equipment will consist primarily of diesel-powered engines. The on-road employee vehicles will consist primarily of gas-powered vehicles.

4.1.1 Methods Used for Estimation of Air Contaminant Emissions

Emissions of NO_X and VOC were estimated in tons per year for each piece of equipment. The emissions were then categorized and totaled and broken out on an annual basis for each year for which dredging is projected to occur.

The basis for emissions included the following:

- Preliminary project description and other information, as provided for each alternative.
- Emissions from marine vessels in support of the dredging activities were estimated for the project duration; the project is expected to begin in 2011. The basis for emissions estimates consisted of the operating hours for each specific type of equipment engine, engine load factor, and engine horsepower. Emission rates (tons per hour) from dredges, dredging support equipment, and other harbor vessels were calculated for each criteria pollutant and were derived based on the following formula:

  Emission Rate = Engine Horsepower x Engine Load Factor x Emission Factor (grams per horsepower-hour) ÷ 453.59 grams per pounds ÷ 2,000 pounds per ton

  Load factors and emission factors for the different marine equipment were determined based on the EPA report "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data," February 2000. Emission amounts (tons per year) for each of the pollutants were then calculated based on the following formula:

Emission Amount (tons/year) = Emission Rate (tons/hr) x Working Hours (hrs/year)

Detailed emission calculations for the marine equipment can be found in Tables B-1 to B-7 and C-1 to C-12 in appendices A and B for each alternative.

- The EPA, NONROAD emission factor model, Final 2005 Version, was used to predict emissions resulting from land-side, off-road construction equipment used for construction and placement in upland PAs with inputs for assumed equipment usage developed for this alternative. This model may be used to predict air emissions for off-road construction equipment based on information including geographic location, equipment type, and fuel use for specific years that may be selected. It provides an estimate of emissions for different equipment based on equipment population, load factor, available horsepower, deterioration, and applicable standards.

  The NONROAD model was run to generate an emission factor for the criteria air contaminants resulting from the use of bulldozers in Brazoria County during the model year of 2010. These emission factors were then used to estimate the total emissions from the use of bulldozers in dredged material placement activities associated with the project. Detailed emission calculations for the off-road construction equipment can be found in Tables D-1 to D-5 in appendices A and B for each alternative.

- Mobile on-road emissions associated with employee vehicles were calculated with the use of the EPA MOBILE6.2 emission factor model. MOBILE6 is a model for predicting emission factors from motor vehicles under various conditions. The model accounts for general factors that may affect emission factors including changes in vehicle emission standards, changes in vehicle populations and activity, and variation in local conditions such as temperature, humidity, and fuel quality.

  A mix of light duty gasoline vehicles and light duty gasoline trucks was assumed for the makeup of the employee vehicles. An average commute of 25 miles each way was assumed for each vehicle. The total number of miles traveled equaled the number of miles per trip multiplied by the total number of days of activity times the number of vehicles. Detailed emission calculations for employee vehicles can be found in Tables E-1 and E-4 in appendices A and B for each alternative.

4.1.2 Dredging Activities

Air emissions directly related with the dredging equipment including generators used to drive the dredge pumps and emissions from support equipment such as tugs and runabouts were calculated on an annual basis based on the anticipated type of activity, engine use, horsepower, load factor, and anticipated hours of operation during the construction period.

For the NED Alternative, it was assumed that the FHCIP would include the use of the dredge equipment as follows.

- Hopper Dredge – A hopper dredge would be used to dredge 17,957,000 cubic yards (CY) of material for placement at ODMDSs.

- Cutterhead – A 30-inch hydraulic cutterhead would be used for pumping and onshore placement of 5,211,000 CY of material into new upland PAs.

For the LPP Alternative, it was assumed that the widening and deepening project would include the use of the dredge equipment as follows.

- Hopper Dredge – A hopper dredge would be used to dredge 12,733,000 CY of material for placement at ODMDSs.
- Cutterhead – A 24-inch hydraulic cutterhead would be used for pumping and onshore placement of 4,619,000 CY of material into new upland PAs.

When not dredging, air contaminant emissions were also estimated from dredging vessels when sailing as oceangoing vessels, e.g., during periods of mobilization to the dredging site or during transport and placement of the dredged material.

4.1.3 Land-side Dredged Material Placement – Nonroad Equipment

It is anticipated that land-side dredged material placement activities would occur primarily only in support of the mechanical dredging activities and would include working and compacting of the dredged material on-shore within a localized area of placement using nonroad construction equipment. It is expected that Texas Low-Emission Diesel (TxLED) will be available for use in nonroad equipment such as bulldozers, dump trucks, etc. during the proposed construction period pursuant to the TxLED requirements of the SIP. However, for conservatism, a reduction in NO_X emissions was not assumed in the final summary of emissions for this equipment in support of this project.

4.1.4 On-Road Mobile – Employee Commuter Vehicles

Mobile source emissions associated with the project construction would be generated from employee commuter vehicles to and from the work-site. It was assumed that commuter vehicles would include a mix of cars and light-duty trucks burning primarily gasoline. Mobile source emission factors were estimated using the EPA's mobile-source emissions model, MOBILE6.2, based on vehicle information and other input options specific to Brazoria County as previously provided by the TCEQ's Air Quality Planning and Implementation Division.

4.2 NED PLAN ALTERNATIVE – SUMMARY OF NO_X AND VOC EMISSIONS

For comparison with the thresholds defined in the General Conformity Rule, the estimated annual emissions of NO_X and VOC for the NED Plan Alternative are summarized in Tables 1 and 2 for each year of the anticipated construction activities. Emissions of carbon monoxide, sulfur dioxide, and particulate matter are not considered in the General Conformity evaluation as this area is in attainment with the NAAQS for each of those pollutants.

TABLE 1
NED PLAN ALTERNATIVE – SUMMARY OF NO_X EMISSIONS
(tons per year)

Activity	2011	2012	2013	2014	2015	2016
Dredging Activities	100.96	847.8	933.1	786.4	551.1	302.6
Land-side Dredged Material Placement	--	6.75	9.0	8.48	7.44	1.24
Employee Commuter Vehicles	0.16	3.36	2.50	3.35	1.78	0.65
Totals	101.1	857.9	944.6	798.2	560.4	304.5

As shown in Table 1, the estimate of NO_X emissions for the NED Plan Alternative would exceed the conformity threshold, i.e., greater than 25 tpy for all years of projected construction activity. Therefore, a General Conformity Determination for NO_X emissions is required for this alternative.

TABLE 2
NED PLAN ALTERNATIVE– SUMMARY OF VOC EMISSIONS
(tons per year)

Activity	2011	2012	2013	2014	2015	2016
Dredging Activities	1.16	9.61	10.78	9.08	6.41	3.48
Land-side Dredged Material Placement	--	0.48	0.65	0.62	0.58	0.10
Employee Commuter Vehicles	0.2	4.41	3.28	4.40	2.34	0.86
Totals	**1.36**	**14.51**	**14.71**	**14.11**	**9.33**	**4.43**

As shown in Table 2, the estimate of VOC emissions for the NED Plan Alternative would not exceed the conformity threshold of 25 tpy. Therefore, a General Conformity Determination for VOC emissions is not required for this alternative.

4.3 LPP ALTERNATIVE – SUMMARY OF NO_X AND VOC EMISSIONS

For comparison with the thresholds defined in the General Conformity Rule, the estimated annual emissions of NO_X and VOC for the LPP Alternative are summarized in Tables 3 and 4 for each year of the anticipated construction activities.

TABLE 3
LPP ALTERNATIVE – SUMMARY OF NO_X EMISSIONS
(tons per year)

Activity	2011	2012	2013	2014	2015
Dredging Activities	95.4	747.3	855.2	703.7	218.3
Land-side Dredged Material Placement	--	19.41	25.88	14.23	--
Employee Commuter Vehicles	0.11	5.65	2.43	2.90	0.90
Totals	95.5	772.4	883.5	720.9	219.2

As shown in Table 3, the estimate of NO_X emissions for the LPP Alternative would exceed the conformity threshold, i.e., greater than 25 tpy, for all years of projected construction activity. Therefore, a General Conformity Determination for NO_X emissions is required for this alternative.

TABLE 4
LPP ALTERNATIVE – SUMMARY OF VOC EMISSIONS
(tons per year)

Activity	2011	2012	2013	2014	2015
Dredging Activities	1.09	8.52	9.86	8.18	2.55
Land-side Dredged Material Placement	--	1.39	1.86	1.08	--
Employee Commuter Vehicles	0.15	7.42	3.19	3.81	1.18
Totals	1.24	17.33	14.91	13.08	3.73

As shown in Table 4, the estimate of VOC emissions for the LPP Alternative would not exceed the conformity threshold of 25 tpy. Therefore, a General Conformity Determination for VOC emissions is not required for this alternative.

5.0 ISSUANCE OF DRAFT GENERAL CONFORMITY DETERMINATION AND AGENCY RESPONSE

In December 2010, the USACE, Galveston District, issued a Draft General Conformity Determination concurrently with the Draft EIS for the proposed FHCIP. Copies of these documents were provided to various Federal and State agencies including the TCEQ and the EPA, Region VI. On December 19 and 26, 2010, the USACE published the notice of availability of the Draft General Conformity Determination in "The Facts" a daily newspaper of general circulation for the Brazoria County and published in the City of Clute. A copy of this publication and publisher's affidavit are in provided in Appendix C of this document.

In response to the issuance of the Draft General Conformity Determination in December 2010, the TCEQ provided a General Conformity Concurrence letter dated March 1, 2011. A copy of this letter is provided in Appendix D.

In its letter, the TCEQ provided its General Conformity concurrence for the proposed FHCIP and a determination that emissions from the project would not exceed the emissions budgets in the most recent SIP approved by the EPA. The most recently approved SIP revision, the "HGB Reasonable Further Progress SIP BPA Rate-of-Progress," adopted by the TCEQ on May 23, 2007, was approved by the EPA on March 29, 2010. In addition, the TCEQ suggested that the USACE adopt pollution prevention and/or reduction measures in conjunction with this and future projects including the following:

- Encourage construction contractors to apply to Texas Emission Reduction Plan grants;
- Establish bidding conditions that give preference to clean contractors;
- Direct construction contractors to exercise air quality best management practices;
- Direct contractors that will use tugboats during construction to use clean fuels;
- Direct operators of the assist tugboats used in maneuvering dredge vessels to use clean fuels;
- Select assist tugs based on lowest NO_X emissions instead of lowest price; or
- Purchase and permanently retire surplus NO_X offsets prior to commencement of operations.

The EPA also provided comments with regard to the Draft General Conformity Determination by letter dated February 11, 2011, as follows:

> "The DEIS and appendices do not indicate plans for this project to use cleaner, newer equipment with lower NO_X emissions. EPA encourages the use of clean, lower-emissions equipment and technologies to reduce pollution. Further, EPA's final

Highway Diesel and Nonroad Diesel Rules mandate the use of lower-sulfur fuels in non-road and marine diesel engines beginning in 2007. Please indicate a discussion of additional measures the project will incorporate to reduce emissions and the anticipated reductions in emissions. Initiatives such as the EPA Voluntary Diesel Retrofit Program, the EPA Diesel Emission Reduction Program (DERA), and the Texas Emissions Reduction Plan (TERP on the State level offer the opportunity to apply for resources for upgrading and replacing older equipment to reduce NO_X emissions."

In response to these suggestions USACE will:

1. Encourage construction contractors to apply for Texas Emission Reduction Plan grants, the EPA's Voluntary Diesel Retrofit Program, or the EPA's Diesel Emission Reduction Plan offering the opportunity to apply for resources for upgrading or replacing older equipment to reduce NO_X emissions;

2. Encourage contractors to use cleaner, newer equipment with lower NO_X emissions;

3. Direct contractors and operators that will use non-road diesel equipment to use clean, low-sulfur fuels

4. Direct contractors that will use tugboats during construction to use clean, low-sulfur fuels

5. Direct operators of the assist tugboats used in maneuvering dredge vessels to use clean, low-sulfur fuels; and

6. Direct operators of the dredging vessels to use clean, low-sulfur fuels.

The USACE cannot, however, give preference to bidders who use cleaner, newer equipment or who apply for TERP grants. This would interfere with competition, and it would be unfair to contractors outside of Texas who cannot apply for TERP grants.

6.0 FINAL GENERAL CONFORMITY DETERMINATION

Based on the evaluation of the proposed project description, estimated air quality emissions, and with consideration of the General Conformity concurrence letter from the TCEQ, the USACE has determined that its approval of the proposed FHCIP will meet the General Conformity requirements of TCEQ Chapter 101, §101.30(h)(1)(E)(i)(I). This section of the TCEQ's General Conformity Rule applies to an ozone nonattainment area, where the EPA has approved a revision to an area's attainment demonstration after 1990, and the TCEQ makes a determination that the estimated air contaminant emissions from a proposed Federal action will not exceed the emissions budget in the SIP.

The emissions budget for General Conformity purposes is defined in the TCEQ 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 for General Conformity purposes is the most recent revision of the SIP that has been approved by the EPA. This evaluation is based on a comparison to the 2004 Mid-Course Review SIP (TCEQ, 2004), based on attainment of the 1-hour ozone standards, and associated emissions trading programs approved by the EPA on 6 September 2006 (EPA, 2006).

6.1 NED PLAN ALTERNATIVE EMISSIONS COMPARED TO SIP EMISSIONS BUDGETS

For comparison to the SIP Area Source Emissions budget, the annual NO_X emission rates estimated for the NED Plan Alternative may be summarized in terms of tons per day and compared to the SIP emissions budget as shown on Table 5.

TABLE 5
NED PLAN ALTERNATIVE – NO_X EMISSIONS COMPARED TO SIP 2007
WEEKDAY NONROAD MOBILE SOURCE EMISSIONS BUDGET[1]

	2011	2012	2013	2014	2015	2016
Tons per Year	101.0	854.6	942.1	794.8	558.6	303.8
Tons per Day	0.39	3.29	3.62	3.06	2.15	1.17
% of Nonroad Mobile Emissions Budget (64.53 tons per day)	0.60	5.09	5.61	4.74	3.33	1.81

[1]TCEQ (2004).

As shown on Table 6, NO_X emissions for the NED Plan Alternative project nonroad mobile equipment emissions would represent about 0.6 to 5.6 percent of the SIP 2007 Nonroad Emissions Budget for NO_X.

TABLE 6
NED PLAN ALTERNATIVE – NO_X EMISSIONS COMPARED TO SIP 2008
MOBILE VEHICLE EMISSIONS BUDGET[1]

	2011	2012	2013	2014	2015	2016
Tons per Year	0.16	3.36	2.50	3.35	1.78	0.65
Tons per Day	0.0006	0.013	0.0096	0.013	0.0068	0.0025
% of Mobile Vehicle Emissions Budget (186.13 tons per day)	0.0003	0.007	0.005	0.007	0.004	0.001

[1]H-GAC (2010).

Air emissions from employee commuter vehicles would represent a maximum of about 0.007 percent of the SIP 2008 Motor Vehicle Emissions Budget.

6.2 LPP ALTERNATIVE EMISSIONS COMPARED TO SIP EMISSIONS BUDGETS

For comparison to the SIP Area Source Emissions budget, the highest annual NO_X emission rate for the LPP Alternative may be broken out as shown on Table 7.

TABLE 7
LPP ALTERNATIVE – NO_X EMISSIONS COMPARED TO SIP 2007
WEEKDAY NONROAD MOBILE SOURCE EMISSIONS BUDGET[1]

	2011	2012	2013	2014	2015
Tons per Year	95.4	766.7	881.1	717.9	218.3
Tons per Day	0.37	2.95	3.39	2.76	0.84
% of Nonroad Mobile Emissions Budget (64.53 tons per day)	0.57	4.57	5.25	4.28	1.30

[1]TCEQ (2004).

As shown on Table 7, NO_X emissions for the LPP Alternative project nonroad mobile equipment emissions would represent about 0.6 to 5.3 percent of the SIP 2007 Nonroad Emissions Budget for NO_X.

TABLE 8
LPP ALTERNATIVE – NO_X EMISSIONS COMPARED TO SIP 2008
MOBILE VEHICLE EMISSIONS BUDGET[1]

	2011	2012	2013	2014	2015
Tons per Year	0.11	5.65	2.43	2.90	0.90
Tons per Day	0.0004	0.0217	0.0094	0.0112	0.0034
% of Mobile Vehicle Emissions Budget (186.13 tons per day)	0.0002	0.012	0.005	0.006	0.002

[1]H-GAC (2010).

Air emissions from employee commuter vehicles would represent a maximum of about 0.01 percent of the SIP 2008 Motor Vehicle Emissions Budget.

6.3 TCEQ CONFIRMATION OF SIP CONFORMITY

Based on an evaluation of the proposed alternative emissions, it is believed that the total of direct and indirect emissions of NO_X resulting from the selection of either alternative would result in a level of emissions that are well within the emissions budgets in the most recently approved SIP revision. The FHCIP is not unusual in scope for an area like the HGB, and it is anticipated that emissions from each year of the project will be less than an increase of 10 percent of the VOC and NO_X emissions inventories for the entire HGB nonattainment area. Therefore, emissions from the activities subject to the USACE action are not considered regionally significant for purposes of General Conformity. Because of this, it is expected that emissions from the project construction will not:

- Cause or contribute to new violation of any NAAQS in any area;
- Increase the frequency or severity of any existing violation of any NAAQS in any area; or
- Delay timely attainment of any NAAQS or interim emission reductions or other milestones in any area.

Based on a review of the Draft General Conformity Determination, the TCEQ has determined, pursuant to 30 TAC § 101.30(h)(1)(E)(i)(I), that emissions from the proposed project will not exceed the emissions from the applicable SIP revision, the "HGB Reasonable Further Progress SIP BPA Rate-of-Progress," adopted by the TCEQ on May 23, 2007, approved by the EPA on March 29, 2010. Therefore, the USACE has determined that the proposed project complies with the requirements of the General Conformity Rule; Section 176 of the CAA, and the State regulations promulgated pursuant to this rule, and is in conformity with the currently approved HGA SIP.

The TCEQ and USACE's determination of conformity is based on the emissions information and project schedule proposed at the time. Once a final project schedule is completed, the USACE will provide an update of the General Conformity documentation to the TCEQ and EPA for review and concurrence that the updated emissions and schedule will still be conformant with the currently approved HGA SIP.

7.0 REFERENCES

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Appendix A

NED Alternative Emissions Summary

APPENDIX A

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Table A-1. Annual Project Emissions Summary
Freeport Harbor Channel Improvement Project
NED Alternative

	TONS PER YEAR					
Year 2011	**CO**	**NO_X**	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**VOC**
Dredge & Support Equipment	11.37	100.96	2.29	2.41	16.73	1.16
Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
Employee Vehicles	2.14	0.16	0.003	0.008	0.002	0.204
Subtotal	**13.51**	**101.12**	**2.29**	**2.42**	**16.73**	**1.36**
Year 2012	**CO**	**NO_X**	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**VOC**
Dredge & Support Equipment	94.81	847.82	19.21	20.26	140.46	9.61
Construction Equipment	2.80	6.75	0.47	0.48	1.07	0.48
Employee Vehicles	46.18	3.36	0.07	0.16	0.05	4.41
Subtotal	**143.78**	**857.94**	**19.75**	**20.91**	**141.58**	**14.51**
Year 2013	**CO**	**NO_X**	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**VOC**
Dredge & Support Equipment	105.45	933.05	21.15	22.31	154.67	10.78
Construction Equipment	3.74	9.00	0.62	0.64	1.42	0.65
Employee Vehicles	34.34	2.50	0.06	0.12	0.04	3.28
Subtotal	**143.53**	**944.56**	**21.82**	**23.07**	**156.13**	**14.71**
Year 2014	**CO**	**NO_X**	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**VOC**
Dredge & Support Equipment	88.85	786.35	17.82	18.80	130.35	9.08
Construction Equipment	3.76	8.48	0.60	0.62	1.32	0.62
Employee Vehicles	46.05	3.35	0.07	0.16	0.05	4.40
Subtotal	**138.66**	**798.18**	**18.50**	**19.59**	**131.72**	**14.11**
Year 2015	**CO**	**NO_X**	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**VOC**
Dredge & Support Equipment	62.48	551.13	12.49	13.18	91.37	6.41
Construction Equipment	3.80	7.44	0.57	0.58	1.12	0.58
Employee Vehicles	24.47	1.78	0.04	0.09	0.03	2.34
Subtotal	**90.75**	**560.35**	**13.10**	**13.85**	**92.51**	**9.33**
Year 2016	**CO**	**NO_X**	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**VOC**
Dredge & Support Equipment	34.10	302.55	7.53	6.86	7.23	3.48
Construction Equipment	0.63	1.24	0.09	0.10	0.19	0.10
Employee Vehicles	8.99	0.65	0.01	0.03	0.01	0.86
Subtotal	**43.72**	**304.45**	**7.64**	**6.99**	**7.43**	**4.43**
TOTAL (ALL YEARS)						
Dredge & Support Equipment	397.05	3,521.87	80.49	83.82	540.80	40.52
Construction Equipment	14.73	32.91	2.36	2.43	5.11	2.43
Employee Vehicles	162.16	11.80	0.26	0.57	0.18	15.50
	574	**3,567**	**83**	**87**	**546**	**58**

Table A-2. Summary of Annual Project Emissions From All Sources Compared to 2001 Emissions Inventory Freeport Harbor Channel Improvement Project NED Alternative

	TONS PER YEAR					
2002 EMISSION INVENTORY	**CO**	**NO_X**	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**VOC**
HGA	**1,101,693**	**357,353**	**59,155**	**325,353**	**152,017**	**214,128**
Brazoria County	**59,817**	**44,128**	**6,515**	**40,363**	**11,194**	**15,842**
ANNUAL NED ALTERNATIVE EMISSIONS	**CO**	**NO_X**	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**VOC**
Year 2011	**13.51**	**101.12**	**2.29**	**2.42**	**16.73**	**1.36**
% of HGA	0.00%	0.03%	0.00%	0.00%	0.01%	0.00%
% of Brazoria County	0.02%	0.23%	0.04%	0.01%	0.15%	0.01%
Year 2012	**143.78**	**857.94**	**19.75**	**20.91**	**141.58**	**14.51**
% of HGA	0.01%	0.24%	0.03%	0.01%	0.09%	0.01%
% of Brazoria County	0.24%	1.94%	0.30%	0.05%	1.26%	0.09%
Year 2013	**143.53**	**944.56**	**21.82**	**23.07**	**156.13**	**14.71**
% of HGA	0.01%	0.26%	0.04%	0.01%	0.10%	0.01%
% of Brazoria County	0.24%	2.14%	0.33%	0.06%	1.39%	0.09%
Year 2014	**138.66**	**798.18**	**18.50**	**19.59**	**131.72**	**14.11**
% of HGA	0.01%	0.22%	0.03%	0.01%	0.09%	0.01%
% of Brazoria County	0.23%	1.81%	0.28%	0.05%	1.18%	0.09%
Year 2015	**90.75**	**560.35**	**13.10**	**13.85**	**92.51**	**9.33**
% of HGA	0.01%	0.16%	0.02%	0.00%	0.06%	0.00%
% of Brazoria County	0.15%	1.27%	0.20%	0.03%	0.83%	0.06%
Year 2016	**43.72**	**304.45**	**7.64**	**6.99**	**7.43**	**4.43**
% of HGA	0.00%	0.09%	0.01%	0.00%	0.00%	0.00%
% of Brazoria County	0.07%	0.69%	0.12%	0.02%	0.07%	0.03%
Peak Annual Emissions	**144**	**945**	**22**	**23**	**156**	**15**
% of HGA	0.01%	0.26%	0.04%	0.01%	0.10%	0.01%
% of Brazoria County	0.2%	2.1%	0.3%	0.06%	1.4%	0.1%

Table A-3. General Conformity Emissions By Source
Freeport Harbor Channel Improvement Project
NED Alternative

Year	NO_X (tpy)				VOC (tpy)			
	Dredge & Support Equipment	Construction Equipment	Employee Vehicles	NO_X Total	Dredge & Support Equipment	Construction Equipment	Employee Vehicles	VOC Total
2011	100.96	0.00	0.16	**101.12**	1.16	0.00	0.20	**1.36**
2012	847.82	6.75	3.36	**857.94**	9.61	0.48	4.41	**14.51**
2013	933.05	9.00	2.50	**944.56**	10.78	0.65	3.28	**14.71**
2014	786.35	8.48	3.35	**798.18**	9.08	0.62	4.40	**14.11**
2015	551.13	7.44	1.78	**560.35**	6.41	0.58	2.34	**9.33**
2016	302.55	1.24	0.65	**304.45**	3.48	0.10	0.86	**4.43**

Table A-4. General Conformity Emissions By Engine Type
Freeport Harbor Channel Improvement Project
NED Alternative

		Tons per Year											
		NO_x						VOC					
		2011	2012	2013	2014	2015	2016	2011	2012	2013	2014	2015	2016
Dredging	Hopper Dredge - Propelling	59.96	350.32	428.87	367.99	188.10	172.24	0.53	3.07	3.76	3.23	1.65	1.51
	Survey Boat - Propelling	2.11	12.34	15.10	12.96	6.62	6.07	0.05	0.30	0.36	0.31	0.16	0.15
	Trawler - Propelling	4.44	25.91	31.72	27.22	13.91	12.74	0.11	0.62	0.76	0.66	0.34	0.31
	Tug - Propelling		9.74	12.97	10.25	14.41	0.77		0.23	0.31	0.25	0.35	0.02
	Crew Boat - Propelling		0.65	0.86	0.68	0.96	0.05		0.02	0.02	0.02	0.02	0.001
	Hopper Dredge - Pumping	10.76	62.88	76.98	66.05	33.76	30.92	0.09	0.55	0.68	0.58	0.30	0.27
	Cutter Dredge - Pumping		239.65	188.87	149.31	209.88	11.24		2.10	1.66	1.31	1.84	
	Floating Booster - Pumping												
	Hopper Dredge - Generating	20.50	119.77	146.62	125.81	64.31	58.89	0.18	1.05	1.29	1.10	0.56	0.52
	Spill Barge - Generating		0.27	0.36	0.28	0.40	0.02		0.006	0.009	0.007	0.010	0.001
	Subtotal	**97.77**	**821.52**	**902.36**	**760.55**	**532.35**	**292.93**	**0.96**	**7.96**	**8.85**	**7.46**	**5.23**	**2.77**
Idling	Dredges - Idling	1.97	19.18	21.97	18.32	14.95	6.12	0.12	1.21	1.38	1.15	0.94	0.39
	Survey Boat - Idling	0.39	2.30	2.81	2.41	1.23	1.13	0.02	0.14	0.18	0.15	0.08	0.07
	Trawler - Idling	0.83	4.83	5.91	5.07	2.59	2.37	0.05	0.30	0.37	0.32	0.16	0.15
	Subtotal	**3.19**	**26.30**	**30.69**	**25.80**	**18.77**	**9.62**	**0.20**	**1.65**	**1.93**	**1.62**	**1.18**	**0.61**
Construction Equipment	Miscellaneous Equipment		6.75	9.00	8.48	7.44	1.24		0.48	0.65	0.62	0.58	0.10
	Subtotal		**6.75**	**9.00**	**8.48**	**7.44**	**1.24**		**0.48**	**0.65**	**0.62**	**0.58**	**0.10**
Vehicles	Cars	0.08	1.68	1.25	1.67	0.89	0.33	0.10	2.14	1.59	2.14	1.14	0.42
	Pickups	0.08	1.68	1.25	1.68	0.89	0.33	0.11	2.27	1.69	2.26	1.20	0.44
	Subtotal	**0.16**	**3.36**	**2.50**	**3.35**	**1.78**	**0.65**	**0.20**	**4.41**	**3.28**	**4.40**	**2.34**	**0.86**
	Total	**101.12**	**857.94**	**944.56**	**798.18**	**560.35**	**304.45**	**1.36**	**14.51**	**14.71**	**14.11**	**9.33**	**4.33**
		100.96	847.82	933.05	786.35	551.13	302.55	1.16	9.61	10.78	9.08	6.41	3.38

Nonroad

	NOx					
TPY	**101.0**	**854.6**	**942.1**	**794.8**	**558.6**	**303.8**
TONS/DAY	0.39	3.29	3.62	3.06	2.15	1.17
64.53 TPY Emis Budget	0.60%	5.09%	5.61%	4.74%	3.33%	1.81%

Vehicles

	NOx					
TPY	**0.16**	**3.36**	**2.50**	**3.35**	**1.78**	**0.65**
TONS/DAY	0.0006	0.0129	0.0096	0.0129	0.0068	0.0025
186.13 TPY Emis Budget	0.0003%	0.007%	0.005%	0.007%	0.004%	0.001%

Table B-1. Dredging Contract Schedule - Days per Year
Freeport Harbor Channel Improvement Project
NED

Contract No.	Reach	Dredging Duration Months	Dredging Duration Days	Contract Start	Contract Finish	Year 1 2011 days	Year 2 2012 days	Year 3 2013 days	Year 4 2014 days	Year 5 2015 days	Year 6 2016 days
1	New Extention and Part of Outer Bar	35.3	1,059	10/1/2011	9/30/2014	65	261	261	195		
2	Outer Bar and Jetty Channel	41.4	1,242	6/1/2012	11/30/2016		152	261	261	261	239
3	Lower TB, PA1, & Seaway Removel	2	60	4/1/2012	6/1/2012		45				
4	Real Estate	6	180	10/1/2011	3/31/2012	65	65				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	14.5	435	4/1/2012	8/31/2014		196	261	173		
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	3.4	102	9/1/2014	2/28/2016				88	261	41
7	Stauffer Channel	4.4	132	3/1/2016	7/30/2016					109	
8	Mitigation	6	180	4/1/2015	9/30/2015					131	
					TOTAL	130	719	783	717	762	280

Table B-2. Dredge Equipment Engine Horsepower Break-down
Freeport Harbor Channel Improvement Project
NED Alternative

Type	Activity (month)	Hours of Operation	Horse power (HP)
CONTRACT 1: New Extension & Part of Entrance			
DredgingNew Extent (Duration =	**12.3**	**Quantity =**	**2,670,000 CY**
Generic Large Hopper	Dredging	6150	14000
	Idle	2116	
Survey Boat	Dredging	1230	2000
	Idle	423	
Trawlers - 2	Dredging	8610	1200
	Idle	2962	
Dredging Part of Outer Bar (Duration =	**23**	**Quantity =**	**5,550,000 CY**
Generic Large Hopper	Dredging	11500	14000
	Idle	3956	
Survey Boat	Dredging	2300	2000
	Idle	791	
Trawlers - 2	Dredging	16100	1200
	Idle	5538	
Total	**35.3**	**61,676**	
CONTRACT 2: Outer Bar and Jetty Ch			
Dredging Outer Bar (Duration =	**23**	**Quantity =**	**5,550,000 CY**
Generic Large Hopper	Dredging	11500	14000
	Idle	3956	
Survey Boat	Dredging	2300	2000
	Idle	791	
Trawlers - 2	Dredging	16100	1200
	Idle	5538	
Dredging Jetty Ch (Duration =	**18.4**	**Quantity =**	**4,187,000 CY**
Generic Large Hopper	Dredging	9200	14000
	Idle	3165	
Survey Boat	Dredging	1840	2000
	Idle	633	
Trawlers - 2	Dredging	12880	1200
	Idle	4432	
Total	**41.4**	**72,335**	

Table B-2. Dredge Equipment Engine Horsepower Break-down
Freeport Harbor Channel Improvement Project
NED Alternative

Type	Activity (month)	Hours of Operation	Horse power (HP)
CONTRACT 3: Lower TB, PA 1 Work & Seaway Removal			
Dredging Lower TB (Duration =	**2**	**Quantity =**	**318,000 CY**
30" Dredge	Dredging	1000	9000
	Idle	450	3000
Dredging Tugs (3 @ 500hp each)	Dredging	2400	1500
Spill Barge	Dredging	200	165
Crewboat	Construction	200	400
Total	**2**	**4,250**	
CONTRACT 5: Ch to Brz thr Brzpt TB & PA 8			
Dredging Cycle (Duration =	**14.5**	**Quantity =**	**2,316,000 CY**
30" Dredge	Dredging	7250	9000
	Idle	3262.5	3000
Dredging Tugs (3 @ 500hp each)	Dredging	17400	1500
Spill Barge	Dredging	1450	165
Crewboat	Construction	1450	400
Total	**14.5**	**30,813**	
CONTRACT 6: Ch to UTB thr UTB & PA 9			
Dredging Cycle (Duration =	**3.4**	**Quantity =**	**1,037,000 CY**
30" Dredge	Dredging	1700	9000
	Idle	765	3000
Dredging Tugs (3 @ 500hp each)	Dredging	4080	1500
Spill Barge	Dredging	340	165
Crewboat	Construction	340	400
Total	**3.4**	**7,225**	
CONTRACT 7: Stauffer Ch			
Dredging Cycle (Duration =	**4.4**	**Quantity =**	**1,540,000 CY**
30" Dredge	Dredging	2200	9000
	Idle	990	3000
Dredging Tugs (3 @ 500hp each)	Dredging	5280	1500
Spill Barge	Dredging	440	165
Crewboat	Construction	440	400
Total	**4.4**	**9,350**	

Table B-3. Dredging Contract Allocation by Year
Freeport Harbor Channel Improvement Project
NED Alternative

Contract No.	Reach	Dredging Duration Days	Year 1 **2011** percent	Year 2 **2012** percent	Year 3 **2013** percent	Year 4 **2014** percent	Year 5 **2015** percent
1	New Extention and Part of Outer Bar	1,059	8%	33%	33%	25%	
2	Outer Bar and Jetty Channel	1,242		13%	22%	22%	22%
3	Lower TB, PA1, & Seaway Removel	60		100%			
4	Real Estate	180	50%	50%			
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	435		31%	41%	27%	
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	102				23%	67%
7	Stauffer Channel	132					100%
8	Mitigation	180					100%

Table B-4. Dredge Equipment Operating Hours
Freeport Harbor Channel Improvement Project
NED Alternative

Contract No.	Reach	Operating Hours													
		Dredge						Survey Boat		Trawler		Floating Booster	Tug	Spill Barge	Crew Boat
		Dredge Type	Total Dredging	Propelling	Pumping	Power Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
1	New Extension	Generic Large Hopper	6,150	3,998	2,153	6,150	2,116	1,230	423	8,610	2,962				
	Part of Outer Bar	Generic Large Hopper	11,500	7,475	4,025	11,500	3,956	2,300	791	16,100	5,538				
2	Outer Bar	Generic Large Hopper	11,500	7,475	4,025	11,500	3,956	2,300	791	16,100	5,538				
	Jetty Channel	Generic Large Hopper	9,200	5,980	3,220	9,200	3,165	1,840	633	12,880	4,432				
3	Lower TB	30" Dredge	1,000				450						2,400	200	200
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	7,250				3,263						17,400	1,450	1,450
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	1,700				765						4,080	340	340
7	Stauffer Channel	30" Dredge	2,200				990						5,280	440	440
8	Mitigation														

Table B-5. Typical Hopper Dredging Cycle
Freeport Harbor Channel Improvement Project
NEDAlternative

Contract No.	Reach	Dredging Cycle				
		Dredge Type	Total Dredging Hours	Propelling	Pumping	Power Generating
1	New Extension	Generic Large Hopper	6,150	65%	35%	100%
	Part of Outer Bar	Generic Large Hopper	11,500	65%	35%	100%
2	Outer Bar	Generic Large Hopper	11,500	65%	35%	100%
	Jetty Channel	Generic Large Hopper	9,200	65%	35%	100%

Table B-6. Dredge Equipment Engine Horsepower Break-down
Freeport Harbor Channel Improvement Project
NED Alternative

		Horsepower (hp)													
		Dredge Type	Engine Type					Survey Boat		Trawler		Floating Booster	Tug	Spill Barge	Crew Boat
Contract No.	**Location/Disposal Site**		Total	Propulsion	Pump	Generator	Generator at Idling	Main Engine	Idling	Main Engine	Idling	Pumping	Propulsion	Main Engine	Propulsion
1	New Extension	Generic Large Hopper	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
	Part of Outer Bar	Generic Large Hopper	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
2	Outer Bar	Generic Large Hopper	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
	Jetty Channel	Generic Large Hopper	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
3	Lower TB	30" Dredge	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
4	Real Estate						3,000						500	165	400
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	9,000				3,000						500	165	400
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	9,000				3,000						500	165	400
7	Stauffer Channel	30" Dredge	9,000				3,000						500	165	400
8	Mitigation						3,000						500	165	400

Table C-1. Marine Equipment Operating Hours
Freeport Harbor Channel Improvement Project
NED Alternative

Operating Hours			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper	511.19	332.27	178.92	511.19	175.88	102.24	35.16	715.66	246.20				
	Part of Outer Bar	Generic Large Hopper	955.88	621.32	334.56	955.88	328.82	191.18	65.75	1,338.24	460.32				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL		**1,467.07**	**953.60**	**513.48**	**1,467.07**	**504.71**	**293.41**	**100.91**	**2,053.90**	**706.52**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper	2,052.62	1,334.20	718.42	2,052.62	706.24	410.52	141.18	2,873.67	988.60				
	Part of Outer Bar	Generic Large Hopper	3,838.24	2,494.85	1,343.38	3,838.24	1,320.35	767.65	264.00	5,373.53	1,848.36				
2	Outer Bar	Generic Large Hopper	1,488.93	967.80	521.12	1,488.93	512.19	297.79	102.41	2,084.50	717.02				
	Jetty Channel	Generic Large Hopper	1,191.14	774.24	416.90	1,191.14	409.78	238.23	81.96	1,667.60	573.82				
3	Lower TB	30" Dredge	1,000.00				450.00						2,400.00	200.00	200.00
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	2,255.56				1,015.00						5,413.33	451.11	451.11
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**11,826.48**	**5,571.10**	**2,999.82**	**8,570.92**	**4,413.56**	**1,714.18**	**589.55**	**11,999.29**	**4,127.79**		**7,813.33**	**651.11**	**651.11**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper	2,052.62	1,334.20	718.42	2,052.62	706.24	410.52	141.18	2,873.67	988.60				
	Part of Outer Bar	Generic Large Hopper	3,838.24	2,494.85	1,343.38	3,838.24	1,320.35	767.65	264.00	5,373.53	1,848.36				
2	Outer Bar	Generic Large Hopper	2,556.64	1,661.82	894.83	2,556.64	879.49	511.33	175.85	3,579.30	1,231.19				
	Jetty Channel	Generic Large Hopper	2,045.32	1,329.45	715.86	2,045.32	703.63	409.06	140.73	2,863.44	985.31				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	3,003.57				1,351.61						7,208.57	600.71	600.71
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**13,496.39**	**6,820.33**	**3,672.49**	**10,492.82**	**4,961.31**	**2,098.56**	**721.76**	**14,689.94**	**5,053.46**		**7,208.57**	**600.71**	**600.71**

Table C-1. Marine Equipment Operating Hours
Freeport Harbor Channel Improvement Project
NED Alternative

Operating Hours			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper	1,533.57	996.82	536.75	1,533.57	527.65	308.71	105.48	2,146.99	738.61				
	Part of Outer Bar	Generic Large Hopper	2,867.65	1,863.97	1,003.68	2,867.65	986.47	573.53	197.24	4,014.71	1,380.96				
2	Outer Bar	Generic Large Hopper	2,556.64	1,661.82	894.83	2,556.64	879.49	511.33	175.85	3,579.30	1,231.19				
	Jetty Channel	Generic Large Hopper	2,045.32	1,329.45	715.86	2,045.32	703.63	409.06	140.73	2,863.44	985.31				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1,990.87				895.89						4,778.10	398.17	398.17
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	383.59				172.62						920.62	76.72	76.72
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2014 TOTAL		**11,377.64**	**5,852.06**	**3,151.11**	**9,003.17**	**4,165.74**	**1,800.63**	**619.30**	**12,604.44**	**4,336.06**		**5,698.71**	**474.89**	**474.89**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper	2,556.64	1,661.82	894.83	2,556.64	879.49	511.33	175.85	3,579.30	1,231.19				
	Jetty Channel	Generic Large Hopper	2,045.32	1,329.45	715.86	2,045.32	703.63	409.06	140.73	2,863.44	985.31				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	1,137.69				511.96						2,730.46	227.54	227.54
7	Stauffer Channel	30" Dredge	2,200.00				990.00						5,280.00	440.00	440.00
8	Mitigation														
	YEAR 2015 TOTAL		**7,939.65**	**2,991.27**	**1,610.69**	**4,601.96**	**3,085.08**	**920.39**	**316.58**	**6,442.74**	**2,216.50**		**8,010.46**	**667.54**	**667.54**
YEAR 2016															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper	2,341.14	1,521.74	819.40	2,341.14	805.35	468.23	161.03	3,277.60	1,127.41				
	Jetty Channel	Generic Large Hopper	1,872.91	1,217.39	655.52	1,872.91	644.32	374.58	128.86	2,622.08	902.26				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	178.72				60.42						428.92	35.74	35.74
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2016 TOTAL		**4,392.77**	**2,739.14**	**1,474.92**	**4,214.05**	**1,530.10**	**842.81**	**289.89**	**5,899.68**	**2,029.67**		**428.92**	**35.74**	**35.74**

Table C-2. Marine Engine Emission Factors and Fuel Consumption Algorithms
(in g/kW-hr, for all marine engines)
Freeport Harbor Channel Improvement Project

Statistical Parameter	Exponent (x)	Intercept (b)	Coefficient (a)
CO	1	0	0.8378
NO_X	1.5	10.4496	0.1255
PM	1.5	0.2551	0.0059
PM2.5	1.5	0.2551	0.0059
PM10	1.5	0.2551	0.0059
SO_X	n/a	0	2.3735
VOC (HC)	1.5	0	0.0667

Notes:

1.) All regressions but SO_2 are in the form of:

Emissions Rate (g/hp-hr) = (a*(Fractional Load)$^{-x}$ + b) * 0.7457
where the conversion factor of 0.7457 kW/hp is used to calculate the emission factor in g/hp-hr

2.) Fractional Load is equal to actual engine output divided by rated engine output.

3.) The SO_2 regression is the form of:

Emissions Rate (g/hp-hr) = a*(Fuel Sulfur Flow in g/hp-hr) + b
where Fuel Sulfur Flow is the Fuel Consumption times the sulfur content of the fuel;
The sulfur content for the fuel consumption regression was set to 3300 parts per million (0.33 wt%)

4.) **Fuel Consumption (g/hp-hr) = (14.12 / (Fractional Load) + 205.717) * 0.7457**

5.) n/a is not applicable, n/s is not statistically significant.

6.) All information shown above is detailed in Table 5-1 of the EPA technical report "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data", EPA 420-R-00-002, February 2000.

Table C-3. Marine Equipment Load Factors and Emission Factors
Freeport Harbor Channel Improvement Project

	Dredge					Crew Boat		Trawler		Floating Booster	Tug	Spill Barge	Crew Boat
Operating Mode	Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
Load Factor	0.8	0.8	0.8	0.8	0.2	0.4	0.2	0.4	0.2	0.8	0.4	0.4	0.4
EF (Gram/hp-hr)													
CO	0.780934	0.780934	0.780934	0.780934	3.123737	1.561869	3.123737	1.561869	3.123737	0.780934	1.561869	1.561869	1.561869
NO_X	7.923056	7.923056	7.923056	7.923056	8.838583	8.162195	8.838583	8.162195	8.838583	7.923056	8.162195	8.162195	8.162195
PM	0.196377	0.196377	0.196377	0.196377	0.239417	0.207619	0.239417	0.207619	0.239417	0.196377	0.207619	0.207619	0.207619
PM2.5	0.178703	0.178703	0.178703	0.178703	0.217870	0.188933	0.217870	0.188933	0.217870	0.178703	0.188933	0.188933	0.188933
PM10	0.188522	0.188522	0.188522	0.188522	0.229841	0.199314	0.229841	0.199314	0.229841	0.188522	0.199314	0.199314	0.199314
SO_X	1.304627	1.304627	1.304627	1.304627	1.613894	1.407716	1.613894	1.407716	1.613894	1.304627	1.407716	1.407716	1.407716
VOC (HC)	0.069511	0.069511	0.069511	0.069511	0.556090	0.196607	0.556090	0.196607	0.556090	0.069511	0.196607	0.196607	0.196607

Notes:

1.) The dredge type, engine type, horsepower, and fuel type were based on information provided by project sponsors.

2.) The engine load factors for the dredges and support equipment were determined from Table 5-2 of the EPA Report "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data", February 2000.

A survey of dredge engine sizes along with input from project sponsors was used to determine which operating mode and hence which load factor applied to each engine. The following assumptions applied to the load factor determination:

A.) The main engines on the dredges were assumed to operate at full power (e.g. 0.8 "cruise" load factor from Table 5-2 of EPA report) for all hours of operation.

B.) The generators on the dredges were assumed to operate at 0.2 load factor during idling.

C.) The main engines or propulsion engines on the support equipment were assumed to operate at intermittent times during the dredging operations and were also determined to operate at the 0.4 "slow cruise" load factor.

D.) The auxiliary engines, if any, on the support equipment were assumed to operate sparingly during idling and were determined to operate at the 0.2 "maneuvering" load factor.

3.) The emission factors were calculated according to the algorithm table and formulas detailed on page 5-3 of the EPA report. The emissions Rate formula and algorithm table are also shown on Table A-4, "Marine Engine Emission Factor and Fuel Consumption Data", February 2000.

4.) The Emission Rate in tons/hr is based on the following formula: Emission Rate = hp*LF*EF*(0.0022046 lbs/gram)*(1 ton/2000 lbs).

Table C-4. Marine Equipment CO Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

CO (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		2.06	0.37	0.70	0.24	0.14	0.05	0.30	0.10				
	Part of Outer Bar	Generic Large Hopper		3.85	0.69	1.32	0.45	0.26	0.09	0.55	0.19				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			**5.91**	**1.06**	**2.02**	**0.70**	**0.40**	**0.14**	**0.85**	**0.29**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		8.27	1.48	2.83	0.97	0.57	0.19	1.19	0.41				
	Part of Outer Bar	Generic Large Hopper		15.46	2.78	5.29	1.82	1.06	0.36	2.22	0.76				
2	Outer Bar	Generic Large Hopper		6.00	1.08	2.05	0.71	0.41	0.14	0.86	0.30				
	Jetty Channel	Generic Large Hopper		4.80	0.86	1.64	0.56	0.33	0.11	0.69	0.24				
3	Lower TB	30" Dredge	9.64				0.62								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	13.98				2.10						1.86	0.05	0.12
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**23.62**	**34.53**	**6.20**	**11.80**	**6.78**	**2.36**	**0.81**	**4.96**	**1.71**		**1.86**	**0.05**	**0.12**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		8.27	1.48	2.83	0.97	0.57	0.19	1.19	0.41				
	Part of Outer Bar	Generic Large Hopper		15.46	2.78	5.29	1.82	1.06	0.36	2.22	0.76				
2	Outer Bar	Generic Large Hopper		10.30	1.85	3.52	1.21	0.70	0.24	1.48	0.51				
	Jetty Channel	Generic Large Hopper		8.24	1.48	2.82	0.97	0.56	0.19	1.18	0.41				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	18.62				2.79						2.48	0.07	0.17
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**18.62**	**42.27**	**7.59**	**14.45**	**7.76**	**2.89**	**0.99**	**6.07**	**2.09**		**2.48**	**0.07**	**0.17**

Table C-4. Marine Equipment CO Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

CO (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		6.18	1.11	2.11	0.73	0.42	0.15	0.89	0.31				
	Part of Outer Bar	Generic Large Hopper		11.55	2.07	3.95	1.36	0.79	0.27	1.66	0.57				
2	Outer Bar	Generic Large Hopper		10.30	1.85	3.52	1.21	0.70	0.24	1.48	0.51				
	Jetty Channel	Generic Large Hopper		8.24	1.48	2.82	0.97	0.56	0.19	1.18	0.41				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	12.34				1.85						1.85	0.05	0.11
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	2.38				0.36						0.32	0.01	0.02
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2014 TOTAL		**14.72**	**36.27**	**6.51**	**12.40**	**6.47**	**2.48**	**0.85**	**5.21**	**1.79**		**1.96**	**0.05**	**0.13**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		10.30	1.85	3.52	1.21	0.70	0.24	1.48	0.51				
	Jetty Channel	Generic Large Hopper		8.24	1.48	2.82	0.97	0.56	0.19	1.18	0.41				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	7.05				1.06						0.94	0.03	0.06
7	Stauffer Channel	30" Dredge	13.64				2.05						1.82	0.05	0.12
8	Mitigation														
	YEAR 2015 TOTAL		**20.69**	**18.54**	**3.33**	**6.34**	**5.28**	**1.27**	**0.44**	**2.66**	**0.92**		**2.76**	**0.08**	**0.18**

Table C-5. Marine Equipment NOx Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

NO_x (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		20.89	3.75	7.14	0.69	0.74	0.14	1.55	0.29				
	Part of Outer Bar	Generic Large Hopper		39.07	7.01	13.36	1.28	1.38	0.26	2.89	0.54				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			**59.96**	**10.76**	**20.50**	**1.97**	**2.11**	**0.39**	**4.44**	**0.83**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		83.90	15.06	28.68	2.75	2.95	0.55	6.21	1.16				
	Part of Outer Bar	Generic Large Hopper		156.88	28.16	53.63	5.15	5.53	1.03	11.60	2.16				
2	Outer Bar	Generic Large Hopper		60.86	10.92	20.81	2.00	2.14	0.40	4.50	0.84				
	Jetty Channel	Generic Large Hopper		48.69	8.74	16.64	1.60	1.71	0.32	3.60	0.67				
3	Lower TB	30" Dredge	97.82				1.75								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	141.83				5.93						9.74	0.27	0.65
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**239.65**	**350.32**	**62.88**	**119.77**	**19.18**	**12.34**	**2.30**	**25.91**	**4.83**		**9.74**	**0.27**	**0.65**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		83.90	15.06	28.68	2.75	2.95	0.55	6.21	1.16				
	Part of Outer Bar	Generic Large Hopper		156.88	28.16	53.63	5.15	5.53	1.03	11.60	2.16				
2	Outer Bar	Generic Large Hopper		104.50	18.76	35.73	3.43	3.68	0.69	7.73	1.44				
	Jetty Channel	Generic Large Hopper		83.60	15.00	28.58	2.74	2.94	0.55	6.18	1.15				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	188.87				7.90						12.97	0.36	0.86
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**188.87**	**428.87**	**76.98**	**146.62**	**21.97**	**15.10**	**2.81**	**31.72**	**5.91**		**12.97**	**0.36**	**0.86**

Table C-5. Marine Equipment NOx Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

NO_x (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		62.68	11.25	21.43	2.06	2.21	0.41	4.84	0.86				
	Part of Outer Bar	Generic Large Hopper		117.21	21.04	40.07	3.84	4.13	0.77	8.67	1.61				
2	Outer Bar	Generic Large Hopper		104.50	18.76	35.73	3.43	3.68	0.69	7.73	1.44				
	Jetty Channel	Generic Large Hopper		83.60	15.00	28.58	2.74	2.94	0.55	6.18	1.15				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	125.19				5.24						8.60	0.24	0.57
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	24.12				1.01						1.66	0.05	0.11
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2014 TOTAL		**149.31**	**367.99**	**66.05**	**125.81**	**18.32**	**12.96**	**2.41**	**27.22**	**5.07**		**10.25**	**0.28**	**0.68**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		104.50	18.76	35.73	3.43	3.68	0.69	7.73	1.44				
	Jetty Channel	Generic Large Hopper		83.60	15.00	28.58	2.74	2.94	0.55	6.18	1.15				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	71.54				2.99						4.91	0.14	0.33
7	Stauffer Channel	30" Dredge	138.34				5.79						9.50	0.26	0.63
8	Mitigation														
	YEAR 2015 TOTAL		**209.88**	**188.10**	**33.76**	**64.31**	**14.95**	**6.62**	**1.23**	**13.91**	**2.59**		**14.41**	**0.40**	**0.96**

Table C-6. Marine Equipment PM Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

PM (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.52	0.09	0.18	0.02	0.02	0.00	0.04	0.01				
	Part of Outer Bar	Generic Large Hopper		0.97	0.17	0.33	0.03	0.04	0.01	0.07	0.01				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			**1.49**	**0.27**	**0.51**	**0.05**	**0.05**	**0.01**	**0.11**	**0.02**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		2.08	0.37	0.71	0.07	0.08	0.01	0.16	0.03				
	Part of Outer Bar	Generic Large Hopper		3.89	0.70	1.33	0.14	0.14	0.03	0.30	0.06				
2	Outer Bar	Generic Large Hopper		1.51	0.27	0.52	0.05	0.05	0.01	0.11	0.02				
	Jetty Channel	Generic Large Hopper		1.21	0.22	0.41	0.04	0.04	0.01	0.09	0.02				
3	Lower TB	30" Dredge	2.42				0.05								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	3.52				0.16						0.25	0.01	0.02
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**5.94**	**8.68**	**1.56**	**2.97**	**0.52**	**0.31**	**0.06**	**0.66**	**0.13**		**0.25**	**0.01**	**0.02**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		2.08	0.37	0.71	0.07	0.08	0.01	0.16	0.03				
	Part of Outer Bar	Generic Large Hopper		3.89	0.70	1.33	0.14	0.14	0.03	0.30	0.06				
2	Outer Bar	Generic Large Hopper		2.59	0.46	0.89	0.09	0.09	0.02	0.20	0.04				
	Jetty Channel	Generic Large Hopper		2.07	0.37	0.71	0.07	0.07	0.01	0.16	0.03				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	4.68				0.21						0.33	0.01	0.02
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**4.68**	**10.63**	**1.91**	**3.63**	**0.60**	**0.38**	**0.08**	**0.81**	**0.16**		**0.33**	**0.01**	**0.02**

Table C-6. Marine Equipment PM Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

PM (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		1.55	0.28	0.53	0.06	0.06	0.01	0.12	0.02				
	Part of Outer Bar	Generic Large Hopper		2.91	0.52	0.99	0.10	0.11	0.02	0.22	0.04				
2	Outer Bar	Generic Large Hopper		2.59	0.46	0.89	0.09	0.09	0.02	0.20	0.04				
	Jetty Channel	Generic Large Hopper		2.07	0.37	0.71	0.07	0.07	0.01	0.16	0.03				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	3.10				0.14						0.22	0.01	0.01
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	0.60				0.03						0.04	0.00	0.00
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2014 TOTAL		**3.70**	**9.12**	**1.64**	**3.12**	**0.50**	**0.33**	**0.07**	**0.69**	**0.14**		**0.26**	**0.01**	**0.02**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		2.59	0.46	0.89	0.09	0.09	0.02	0.20	0.04				
	Jetty Channel	Generic Large Hopper		2.07	0.37	0.71	0.07	0.07	0.01	0.16	0.03				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	1.77				0.08						0.12	0.00	0.01
7	Stauffer Channel	30" Dredge	3.43				0.16						0.24	0.01	0.02
8	Mitigation														
	YEAR 2015 TOTAL		**5.20**	**4.66**	**0.84**	**1.59**	**0.40**	**0.17**	**0.03**	**0.35**	**0.07**		**0.37**	**0.01**	**0.02**

Table C-7. Marine Equipment $PM_{2.5}$ Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

$PM_{2.5}$ (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.47	0.08	0.16	0.02	0.02	0.00	0.04	0.01				
	Part of Outer Bar	Generic Large Hopper		0.88	0.16	0.30	0.03	0.03	0.01	0.07	0.01				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			**1.35**	**0.24**	**0.46**	**0.05**	**0.05**	**0.01**	**0.10**	**0.02**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		1.89	0.34	0.65	0.07	0.07	0.01	0.14	0.03				
	Part of Outer Bar	Generic Large Hopper		3.54	0.64	1.21	0.13	0.13	0.03	0.27	0.05				
2	Outer Bar	Generic Large Hopper		1.37	0.25	0.47	0.05	0.05	0.01	0.10	0.02				
	Jetty Channel	Generic Large Hopper		1.10	0.20	0.38	0.04	0.04	0.01	0.08	0.02				
3	Lower TB	30" Dredge	2.21				0.04								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	3.20				0.15						0.23	0.01	0.02
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**5.41**	**7.90**	**1.42**	**2.70**	**0.47**	**0.29**	**0.06**	**0.60**	**0.12**		**0.23**	**0.01**	**0.02**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		1.89	0.34	0.65	0.07	0.07	0.01	0.14	0.03				
	Part of Outer Bar	Generic Large Hopper		3.54	0.64	1.21	0.13	0.13	0.03	0.27	0.05				
2	Outer Bar	Generic Large Hopper		2.36	0.42	0.81	0.08	0.09	0.02	0.18	0.04				
	Jetty Channel	Generic Large Hopper		1.89	0.34	0.64	0.07	0.07	0.01	0.14	0.03				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	4.26				0.19						0.30	0.01	0.02
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**4.26**	**9.67**	**1.74**	**3.31**	**0.54**	**0.35**	**0.07**	**0.73**	**0.15**		**0.30**	**0.01**	**0.02**

Table C-7. Marine Equipment $PM_{2.5}$ Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

$PM_{2.5}$ (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		1.41	0.25	0.48	0.05	0.05	0.01	0.11	0.02				
	Part of Outer Bar	Generic Large Hopper		2.64	0.47	0.90	0.09	0.10	0.02	0.20	0.04				
2	Outer Bar	Generic Large Hopper		2.36	0.42	0.81	0.08	0.09	0.02	0.18	0.04				
	Jetty Channel	Generic Large Hopper		1.89	0.34	0.64	0.07	0.07	0.01	0.14	0.03				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	2.82				0.13						0.20	0.01	0.01
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	0.54				0.02						0.04	0.00	0.00
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2014 TOTAL		**3.37**	**8.30**	**1.49**	**2.84**	**0.45**	**0.30**	**0.06**	**0.63**	**0.12**		**0.24**	**0.01**	**0.02**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		2.36	0.42	0.81	0.08	0.09	0.02	0.18	0.04				
	Jetty Channel	Generic Large Hopper		1.89	0.34	0.64	0.07	0.07	0.01	0.14	0.03				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	1.61				0.07						0.11	0.00	0.01
7	Stauffer Channel	30" Dredge	3.12				0.14						0.22	0.01	0.01
8	Mitigation														
	YEAR 2015 TOTAL		**4.73**	**4.24**	**0.76**	**1.45**	**0.37**	**0.15**	**0.03**	**0.32**	**0.06**		**0.33**	**0.01**	**0.02**

Table C-8. Marine Equipment PM_{10} Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

PM_{10} (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.50	0.09	0.17	0.02	0.02	0.00	0.04	0.01				
	Part of Outer Bar	Generic Large Hopper		0.93	0.17	0.32	0.03	0.03	0.01	0.07	0.01				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			**1.43**	**0.26**	**0.49**	**0.05**	**0.05**	**0.01**	**0.11**	**0.02**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		2.00	0.36	0.68	0.07	0.07	0.01	0.15	0.03				
	Part of Outer Bar	Generic Large Hopper		3.73	0.67	1.28	0.13	0.13	0.03	0.28	0.06				
2	Outer Bar	Generic Large Hopper		1.45	0.26	0.50	0.05	0.05	0.01	0.11	0.02				
	Jetty Channel	Generic Large Hopper		1.16	0.21	0.40	0.04	0.04	0.01	0.09	0.02				
3	Lower TB	30" Dredge	2.33				0.05								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	3.37				0.15						0.24	0.01	0.02
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**5.70**	**8.34**	**1.50**	**2.85**	**0.50**	**0.30**	**0.06**	**0.63**	**0.13**		**0.24**	**0.01**	**0.02**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		2.00	0.36	0.68	0.07	0.07	0.01	0.15	0.03				
	Part of Outer Bar	Generic Large Hopper		3.73	0.67	1.28	0.13	0.13	0.03	0.28	0.06				
2	Outer Bar	Generic Large Hopper		2.49	0.45	0.85	0.09	0.09	0.02	0.19	0.04				
	Jetty Channel	Generic Large Hopper		1.99	0.36	0.68	0.07	0.07	0.01	0.15	0.03				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	4.49				0.21						0.32	0.01	0.02
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**4.49**	**10.20**	**1.83**	**3.49**	**0.57**	**0.37**	**0.07**	**0.77**	**0.15**		**0.32**	**0.01**	**0.02**

Table C-8. Marine Equipment PM_{10} Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

PM_{10} (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		1.49	0.27	0.51	0.05	0.05	0.01	0.11	0.02				
	Part of Outer Bar	Generic Large Hopper		2.79	0.50	0.95	0.10	0.10	0.02	0.21	0.04				
2	Outer Bar	Generic Large Hopper		2.49	0.45	0.85	0.09	0.09	0.02	0.19	0.04				
	Jetty Channel	Generic Large Hopper		1.99	0.36	0.68	0.07	0.07	0.01	0.15	0.03				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	2.98				0.14						0.21	0.01	0.01
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	0.57				0.03						0.04	0.00	0.00
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2014 TOTAL		**3.55**	**8.76**	**1.57**	**2.99**	**0.48**	**0.32**	**0.06**	**0.66**	**0.13**		**0.25**	**0.01**	**0.02**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		2.49	0.45	0.85	0.09	0.09	0.02	0.19	0.04				
	Jetty Channel	Generic Large Hopper		1.99	0.36	0.68	0.07	0.07	0.01	0.15	0.03				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	1.70				0.08						0.12	0.00	0.01
7	Stauffer Channel	30" Dredge	3.29				0.15						0.23	0.01	0.02
8	Mitigation														
	YEAR 2015 TOTAL		**4.99**	**4.48**	**0.80**	**1.53**	**0.39**	**0.16**	**0.03**	**0.34**	**0.07**		**0.35**	**0.01**	**0.02**

Table C-9. Marine Equipment SO_2 Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

SO_2 (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		3.44	0.62	1.18	0.13	0.13	0.03	0.27	0.05				
	Part of Outer Bar	Generic Large Hopper		6.43	1.15	2.20	0.23	0.24	0.05	0.50	0.10				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			**9.87**	**1.77**	**3.38**	**0.36**	**0.36**	**0.07**	**0.76**	**0.15**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		13.81	2.48	4.72	0.50	0.51	0.10	1.07	0.21				
	Part of Outer Bar	Generic Large Hopper		25.83	4.64	8.83	0.94	0.95	0.19	2.00	0.39				
2	Outer Bar	Generic Large Hopper		10.02	1.80	3.43	0.36	0.37	0.07	0.78	0.15				
	Jetty Channel	Generic Large Hopper		8.02	1.44	2.74	0.29	0.30	0.06	0.62	0.12				
3	Lower TB	30" Dredge	16.11				0.32								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	23.35				1.08						1.68	0.05	0.11
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**39.46**	**57.68**	**10.35**	**19.72**	**3.50**	**2.13**	**0.42**	**4.47**	**0.88**		**1.68**	**0.05**	**0.11**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		13.81	2.48	4.72	0.50	0.51	0.10	1.07	0.21				
	Part of Outer Bar	Generic Large Hopper		25.83	4.64	8.83	0.94	0.95	0.19	2.00	0.39				
2	Outer Bar	Generic Large Hopper		17.21	3.09	5.88	0.63	0.63	0.13	1.33	0.26				
	Jetty Channel	Generic Large Hopper		13.77	2.47	4.71	0.50	0.51	0.10	1.07	0.21				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	31.10				1.44						2.24	0.06	0.15
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**31.10**	**70.62**	**12.68**	**24.14**	**4.01**	**2.61**	**0.51**	**5.47**	**1.08**		**2.24**	**0.06**	**0.15**

Table C-9. Marine Equipment SO_2 Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

SO_2 (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		10.32	1.85	3.53	0.38	0.38	0.08	0.80	0.16				
	Part of Outer Bar	Generic Large Hopper		19.30	3.46	6.60	0.70	0.71	0.14	1.50	0.29				
2	Outer Bar	Generic Large Hopper		17.21	3.09	5.88	0.63	0.63	0.13	1.33	0.26				
	Jetty Channel	Generic Large Hopper		13.77	2.47	4.71	0.50	0.51	0.10	1.07	0.21				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	20.61				0.96						1.48	0.04	0.10
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	3.97				0.18						0.29	0.01	0.02
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2014 TOTAL		**24.59**	**60.59**	**10.88**	**20.72**	**3.34**	**2.24**	**0.44**	**4.69**	**0.93**		**1.77**	**0.05**	**0.12**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		17.21	3.09	5.88	0.63	0.63	0.13	1.33	0.26				
	Jetty Channel	Generic Large Hopper		13.77	2.47	4.71	0.50	0.51	0.10	1.07	0.21				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	11.78				0.55						0.85	0.02	0.06
7	Stauffer Channel	30" Dredge	22.78				1.06						1.64	0.05	0.11
8	Mitigation														
	YEAR 2015 TOTAL		**34.56**	**30.97**	**5.56**	**10.59**	**2.73**	**1.14**	**0.23**	**2.40**	**0.47**		**2.49**	**0.07**	**0.17**

Table C-10. Marine Equipment VOC Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

VOC (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.18	0.03	0.06	0.04	0.02	0.01	0.04	0.02				
	Part of Outer Bar	Generic Large Hopper		0.34	0.06	0.12	0.08	0.03	0.02	0.07	0.03				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			**0.53**	**0.09**	**0.18**	**0.12**	**0.05**	**0.02**	**0.11**	**0.05**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.74	0.13	0.25	0.17	0.07	0.03	0.15	0.07				
	Part of Outer Bar	Generic Large Hopper		1.38	0.25	0.47	0.32	0.13	0.06	0.28	0.14				
2	Outer Bar	Generic Large Hopper		0.53	0.10	0.18	0.13	0.05	0.03	0.11	0.05				
	Jetty Channel	Generic Large Hopper		0.43	0.08	0.15	0.10	0.04	0.02	0.09	0.04				
3	Lower TB	30" Dredge	0.86				0.11								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1.24				0.37						0.23	0.01	0.02
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**2.10**	**3.07**	**0.55**	**1.05**	**1.21**	**0.30**	**0.14**	**0.62**	**0.30**		**0.23**	**0.01**	**0.02**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.74	0.13	0.25	0.17	0.07	0.03	0.15	0.07				
	Part of Outer Bar	Generic Large Hopper		1.38	0.25	0.47	0.32	0.13	0.06	0.28	0.14				
2	Outer Bar	Generic Large Hopper		0.92	0.16	0.31	0.22	0.09	0.04	0.19	0.09				
	Jetty Channel	Generic Large Hopper		0.73	0.13	0.25	0.17	0.07	0.03	0.15	0.07				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1.66				0.50						0.31	0.01	0.02
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**1.66**	**3.76**	**0.68**	**1.29**	**1.38**	**0.36**	**0.18**	**0.76**	**0.37**		**0.31**	**0.01**	**0.02**

Table C-10. Marine Equipment VOC Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

VOC (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.55	0.10	0.19	0.13	0.05	0.03	0.11	0.05				
	Part of Outer Bar	Generic Large Hopper		1.03	0.18	0.35	0.24	0.10	0.05	0.21	0.10				
2	Outer Bar	Generic Large Hopper		0.92	0.16	0.31	0.22	0.09	0.04	0.19	0.09				
	Jetty Channel	Generic Large Hopper		0.73	0.13	0.25	0.17	0.07	0.03	0.15	0.07				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1.10				0.33						0.21	0.01	0.01
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	0.21				0.06						0.04	0.00	0.00
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2014 TOTAL		**1.31**	**3.23**	**0.58**	**1.10**	**1.15**	**0.31**	**0.15**	**0.66**	**0.32**		**0.25**	**0.01**	**0.02**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		0.92	0.16	0.31	0.22	0.09	0.04	0.19	0.09				
	Jetty Channel	Generic Large Hopper		0.73	0.13	0.25	0.17	0.07	0.03	0.15	0.07				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	0.63				0.19						0.12	0.00	0.01
7	Stauffer Channel	30" Dredge	1.21				0.36						0.23	0.01	0.02
8	Mitigation														
	YEAR 2015 TOTAL		**1.84**	**1.65**	**0.30**	**0.56**	**0.94**	**0.16**	**0.08**	**0.34**	**0.16**		**0.35**	**0.01**	**0.02**

Table C-11. Summary of Marine Equipment Emissions (tpy)
Freeport Harbor Channel Improvement Project
NED Alternative

YEAR 2011

Contract No.	Location/Disposal Site	Dredge	CO	NO_x	PM	$PM_{2.5}$	PM_{10}	SO_2	VOC
1	New Extension	Generic Large Hopper	4.0	35.2	0.9	0.8	0.8	5.8	0.4
	Part of Outer Bar	Generic Large Hopper	7.4	65.8	1.6	1.5	1.6	10.9	0.8
2	Outer Bar	Generic Large Hopper							
	Jetty Channel	Generic Large Hopper							
3	Lower TB	30" Dredge							
4	Real Estate								
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge							
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge							
7	Stauffer Channel	30" Dredge							
8	Mitigation								
	YEAR 2011 TOTAL		**11.4**	**101.0**	**2.5**	**2.3**	**2.4**	**16.7**	**1.2**

YEAR 2012

Contract No.	Location/Disposal Site	Dredge	CO	NO_x	PM	$PM_{2.5}$	PM_{10}	SO_2	VOC
1	New Extension	Generic Large Hopper	15.9	141.3	3.5	3.2	3.4	23.4	1.6
	Part of Outer Bar	Generic Large Hopper	29.7	264.1	6.6	6.0	6.3	43.8	3.0
2	Outer Bar	Generic Large Hopper	11.5	102.5	2.6	2.3	2.4	17.0	1.2
	Jetty Channel	Generic Large Hopper	9.2	82.0	2.0	1.9	2.0	13.6	0.9
3	Lower TB	30" Dredge	10.3	99.6	2.5	2.2	2.4	16.4	1.0
4	Real Estate								
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	18.1	158.4	3.9	3.6	3.8	26.3	1.9
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge							
7	Stauffer Channel	30" Dredge							
8	Mitigation								
	YEAR 2012 TOTAL		**94.8**	**847.8**	**21.1**	**19.2**	**20.3**	**140.5**	**9.6**

YEAR 2013

Contract No.	Location/Disposal Site	Dredge	CO	NO_x	PM	$PM_{2.5}$	PM_{10}	SO_2	VOC
1	New Extension	Generic Large Hopper	15.9	141.3	3.5	3.2	3.4	23.4	1.6
	Part of Outer Bar	Generic Large Hopper	29.7	264.1	6.6	6.0	6.3	43.8	3.0
2	Outer Bar	Generic Large Hopper	19.8	175.9	4.4	4.0	4.2	29.2	2.0
	Jetty Channel	Generic Large Hopper	15.9	140.8	3.5	3.2	3.4	23.3	1.6
3	Lower TB	30" Dredge							
4	Real Estate								
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	24.1	211.0	5.3	4.8	5.0	35.0	2.5
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge							
7	Stauffer Channel	30" Dredge							
8	Mitigation								
	YEAR 2013 TOTAL		**105.4**	**933.1**	**23.2**	**21.1**	**22.3**	**154.7**	**10.8**

YEAR 2014

Contract No.	Location/Disposal Site	Dredge	CO	NO_x	PM	$PM_{2.5}$	PM_{10}	SO_2	VOC
1	New Extension	Generic Large Hopper	11.9	105.5	2.6	2.4	2.5	17.5	1.2
	Part of Outer Bar	Generic Large Hopper	22.2	197.3	4.9	4.5	4.7	32.7	2.3
2	Outer Bar	Generic Large Hopper	19.8	175.9	4.4	4.0	4.2	29.2	2.0
	Jetty Channel	Generic Large Hopper	15.9	140.8	3.5	3.2	3.4	23.3	1.6
3	Lower TB	30" Dredge							
4	Real Estate								
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	16.0	139.8	3.5	3.2	3.3	23.2	1.7
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	3.1	26.9	0.7	0.6	0.6	4.5	0.3
7	Stauffer Channel	30" Dredge							
8	Mitigation								
	YEAR 2014 TOTAL		**88.9**	**786.4**	**19.6**	**17.8**	**18.8**	**130.3**	**9.1**

Table C-11. Summary of Marine Equipment Emissions (tpy)
Freeport Harbor Channel Improvement Project
NED Alternative

YEAR 2015

Contract No.	Location/Disposal Site	Dredge	CO	NO_x	PM	$PM_{2.5}$	PM_{10}	SO_2	VOC
1	New Extension	Generic Large Hopper							
	Part of Outer Bar	Generic Large Hopper							
2	Outer Bar	Generic Large Hopper	19.8	175.9	4.4	4.0	4.2	29.2	2.0
	Jetty Channel	Generic Large Hopper	15.9	140.8	3.5	3.2	3.4	23.3	1.6
3	Lower TB	30" Dredge							
4	Real Estate								
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge							
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	9.1	79.9	2.0	1.8	1.9	13.3	0.9
7	Stauffer Channel	30" Dredge	17.7	154.5	3.9	3.5	3.7	25.6	1.8
8	Mitigation								
	YEAR 2015 TOTAL		**62.5**	**551.1**	**13.7**	**12.5**	**13.2**	**91.4**	**6.4**

YEAR 2016

Contract No.	Location/Disposal Site	Dredge	CO	NO_x	PM	$PM_{2.5}$	PM_{10}	SO_2	VOC
1	New Extension	Generic Large Hopper							
	Part of Outer Bar	Generic Large Hopper							
2	Outer Bar	Generic Large Hopper	18.1	161.1	4.0	3.7	3.9	26.7	1.8
	Jetty Channel	Generic Large Hopper	14.5	128.9	3.2	2.9	3.1	21.4	1.5
3	Lower TB	30" Dredge							
4	Real Estate								
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge							
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	1.4	12.6	0.3	0.3	0.3	2.1	0.1
7	Stauffer Channel	30" Dredge							
8	Mitigation								
	YEAR 2016 TOTAL		**34.1**	**302.6**	**7.5**	**6.9**	**7.2**	**50.1**	**3.5**

TOTAL

Contract No.	Location/Disposal Site	Dredge	CO	NO_x	PM	$PM_{2.5}$	PM_{10}	SO_2	VOC
1	New Extension	Generic Large Hopper	47.7	423.2	10.5	9.6	10.1	70.1	4.9
	Part of Outer Bar	Generic Large Hopper	89.1	791.4	19.7	17.9	18.9	131.2	9.1
2	Outer Bar	Generic Large Hopper	89.1	791.4	19.7	17.9	18.9	131.2	9.1
	Jetty Channel	Generic Large Hopper	71.3	633.1	15.8	14.3	15.1	104.9	7.3
3	Lower TB	30" Dredge	10.3	99.6	2.5	2.2	2.4	16.4	1.0
4	Real Estate								
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	58.2	509.2	12.7	11.5	12.2	84.5	6.0
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	13.7	119.4	3.0	2.7	2.9	19.8	1.4
7	Stauffer Channel	30" Dredge	17.7	154.5	3.9	3.5	3.7	25.6	1.8
8	Mitigation								
	PROJECT TOTAL		**397.1**	**3,521.9**	**87.7**	**79.8**	**84.2**	**583.7**	**40.5**

Table C-12. Annual Marine Equipment Emissions (tpy)
Freeport Harbor Channel Improvement Project
NED Alternative

	CO	NO_X	$PM_{2.5}$	PM_{10}	SO_2	VOC
Year 2011	11.37	100.96	2.29	2.41	16.73	1.16
Year 2012	94.81	847.82	19.21	20.26	140.46	9.61
Year 2013	105.45	933.05	21.15	22.31	154.67	10.78
Year 2014	88.85	786.35	17.82	18.80	130.35	9.08
Year 2015	62.48	551.13	12.49	13.18	91.37	6.41
Year 2016	34.10	302.55	7.53	6.86	7.23	3.48

Table D-1. Construction Equipment Emission Factors
Construction Equipment Emission Factors
Freeport Harbor Channel Improvement Project
NED Alternative

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)					
					NO_x	VOC	PM_{10}	PM2.5	CO	SO_2
Contract 5: Ch to Brz thr Brzpt TB & PA 8										
EP H25HU005 HYD EXCAV, CRWLR, 97,870 LBS, 3.14 CY BKT	Crawler Tractor/Dozers	Diesel	300	59%	3.585981	0.2781069	0.2942914	0.2854627	1.2374105	0.7502724
EP T45XX021 TRUCK TRAILER, LOWBOY, 90 TON, 4 AXLE	Truck Trailer	~	0	0%	0	0	0	0	0	0
EP T50FO019 TRK,HWY, 43,000 GVW, 6X4, 3 AXLE	Highway Truck	Diesel	230	59%	3.729163	0.2867895	0.3016065	0.2925583	1.2615169	0.7502354
EP T50XX011 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP, 4X4	Highway Truck	Diesel	230	59%	3.729163	0.2867895	0.3016065	0.2925583	1.2615169	0.7502354
GEN B20Z1000 BRUSH CHIPPER, 22" (559 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	Chippers/Stump Grinders	Diesel	650	43%	5.2085505	0.3480453	0.4103982	0.3980863	2.9595816	0.7499748
GEN B35Z1140 BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Dragline	Diesel	350	59%	5.2151822	0.3655059	0.3994855	0.3875009	2.5867446	0.7499005
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%	0.9099999	62.807925	9.7481978	8.968342	346.86535	0.1401917
GEN C75Z2200 CRANE, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 40 TON (36 MT), 84' (25.6 M) BOOM, 4X4	Cranes	Diesel	173	43%	4.0891554	0.2871882	0.2397888	0.2325949	0.8792386	0.7421074
GEN H25Z3185 HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23.3' (7.1 M) MAX DIGGING DEPTH	Excavators	Diesel	238	59%	3.3773756	0.2664183	0.2860623	0.2774804	1.2224024	0.750322
GEN L40Z4395 LOADER, FRONT END, WHEEL, ARTICULATED, 2.75 CY (2.1 M3) BUCKET, 4X4,	Tractor/Loader/Backhoe	Diesel	130	21%	6.2439293	1.0575661	0.7586622	0.7359024	4.0710716	0.8725374
GEN L60Z4760 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	Log Skidder	Diesel	119	59%	4.4487882	0.3661478	0.4010053	0.3889752	1.7124951	0.7498978
GEN L60Z4900 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	Log Skidder	Diesel	200	59%	4.2682812	0.3285378	0.334577	0.3245397	1.4639283	0.7500579
GEN T15Z6440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	100	59%	3.7592742	0.3121903	0.3742502	0.3630227	1.4566405	0.7501273
GEN T15Z6480 TRACTOR, CRAWLER (DOZER), 101-135 HP (75-101 KW), POWERSHIFT, W/ UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	135	59%	3.7592742	0.3121903	0.3742502	0.3630227	1.4566405	0.7501273
GEN T15Z6520 TRACTOR, CRAWLER (DOZER), 181-250 HP (135-186 KW), POWERSHIFT, LGP, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	250	59%	3.585981	0.2781069	0.2942914	0.2854627	1.2374105	0.7502724
GEN T40Z7090 TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Highway Truck	Diesel	230	59%	3.729163	0.2867895	0.3016065	0.2925583	1.2615169	0.7502354
GEN T45Z7280 TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	Highway Truck	Diesel	210	59%	3.729163	0.2867895	0.3016065	0.2925583	1.2615169	0.7502354
GEN T50Z7420 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	Diesel	230	59%	3.729163	0.2867895	0.3016065	0.2925583	1.2615169	0.7502354
GEN T50Z7520 TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	Diesel	310	59%	4.3732137	0.2369362	0.308081	0.2988385	1.9281148	0.7503568
MAP C85MA001 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	Cranes	Diesel	350	43%	4.9466203	0.2917844	0.2690519	0.2609804	1.3549245	0.7421121
MAP L15FG001 LANDSCAPING EQUIPMENT, 3,000 GAL, HYDROSEEDER, TRUCK MTD (INCLUDES 56,000 GVW TRUCK)	Highway Truck	Diesel	310	59%	4.3732137	0.2369362	0.308081	0.2988385	1.9281148	0.7503568

Table D-1. Construction Equipment Emission Factors
Construction Equipment Emission Factors
Freeport Harbor Channel Improvement Project
NED Alternative

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)					
					NO_x	VOC	PM_{10}	PM2.5	CO	SO_2
Contract 6: Ch to UTB thr UTB & PA 9										
EP H25HU005 HYD EXCAV, CRWLR, 97,870 LBS, 3.14 CY BKT	Crawler Tractor/Dozers	Diesel	300	59%	3.585981	0.2781069	0.2942914	0.2854627	1.2374105	0.7502724
EP T45XX021 TRUCK TRAILER, LOWBOY, 90 TON, 4 AXLE (ADD TOWING TRUCK)	Truck Trailer	–	0	0%	0	0	0	0	0	0
EP T50FP019 TRK,HWY, 43,000 GVW, 6X4, 3 AXLE	Highway Truck	Diesel	230	59%	3.729163	0.2867895	0.3016065	0.2925583	1.2615169	0.7502354
EP T50XX011 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP, 4X4	Highway Truck	Diesel	230	59%	3.729163	0.2867895	0.3016065	0.2925583	1.2615169	0.7502354
GEN B20Z1000 BRUSH CHIPPER, 22" (559 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	Chippers/Stump Grinders	Diesel	650	43%	5.2085505	0.3480453	0.4103982	0.3980863	2.9595816	0.7499748
GEN B35Z1140 BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Dragline	Diesel	350	59%	5.2151822	0.3655059	0.3994855	0.3875009	2.5667446	0.7499005
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%	0.9099999	62.807925	9.7481978	8.988342	348.88535	0.1401917
GEN C75Z2200 CRANE, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 40 TON (36 MT), 84' (25.6 M) BOOM, 4X4	Cranes	Diesel	250	43%	4.0891554	0.2871862	0.2397886	0.2325949	0.8792386	0.7421074
GEN H25Z3185 HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23.3' (7.1 M) MAX. DIGGING DEPTH	Excavators	Diesel	238	59%	3.3773756	0.2664183	0.2890623	0.2774804	1.2224024	0.750322
GEN L40Z4395 LOADER, FRONT END, WHEEL, ARTICULATED, 2.75 CY (2.1 M3) BUCKET, 4X4,	Tractor/Loader/Backhoe	Diesel	130	21%	8.2439293	1.0575681	0.7586522	0.7359024	4.0710716	0.8725374
GEN L60Z4760 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	Log Skidder	Diesel	119	59%	4.4487882	0.3661478	0.4010053	0.3889752	1.7124951	0.7499978
GEN L60Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	Log Skidder	Diesel	200	59%	4.2682812	0.3285376	0.334577	0.3245397	1.4639283	0.7500579
GEN T15Z6440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	100	59%	3.7592742	0.3121903	0.3742502	0.3630227	1.4566405	0.7501273
GEN L60Z4760 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	Log Skidder	Diesel	119	59%	4.4487882	0.3661478	0.4010053	0.3889752	1.7124951	0.7499978
GEN L60Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	Log Skidder	Diesel	200	59%	4.2682812	0.3285376	0.334577	0.3245397	1.4639283	0.7500579
GEN T15Z6440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	100	59%	3.7592742	0.3121903	0.3742502	0.3630227	1.4566405	0.7501273
GEN T45Z7280 TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	Highway Truck	Diesel	210	59%	3.729163	0.2867895	0.3016065	0.2925583	1.2615169	0.7502354
GEN T50Z7520 TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	Diesel	310	59%	4.3732137	0.3389362	0.308081	0.2988385	1.9281148	0.7503568
GEN T50Z7700 DUMP TRUCK, HIGHWAY, 10 - 13 CY (7.6 - 9.9 M3) DUMP BODY, 35,000 LBS (15,900 KG) GVW, 2 AXLE, 4X2	Highway Truck	Diesel	205	59%	3.729163	0.2867895	0.3016065	0.2925583	1.2615169	0.7502354
MAP C85MA001 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	Cranes	Diesel	350	43%	4.9466203	0.2917844	0.2690519	0.2609804	1.3649245	0.7421121
UPB T15CA004 DOZER,CWLR, D-4H,PS (ADD BLADE)	Crawler Dozers/Tractor	Diesel	80	59%	4.3723798	0.4190596	0.5820331	0.5645721	3.8945662	0.8327177
UPB T40XX008 REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)		–	0	0%						
UPB T50KE003 TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	Highway Truck	Diesel	230	59%	3.729163	0.2867895	0.3016065	0.2925583	1.2615169	0.7502354

Table D-2. Load Factors For Equipment Using Diesel or Gasoline

SCC Code	Equipment	Load Factor[1] Diesel	Gasoline
22xx003010	Aerial Lifts	21%	46%
22xx005015	Agricultural Tractor	59%	62%
22xx006015	Air Compressors	43%	56%
22xx001030	All Terrain Vehicles	42%	100%
22xx002033	Bore/Drill Rigs	43%	79%
22xx002042	Cement & Motar Mixers	43%	59%
22xx004066	Chippers/Stump Grinders	43%	78%
22xx002039	Concrete/Industrial Saws	59%	78%
22xx002045	Cranes	43%	47%
22xx002066	Crawler Dozers/Tractor	59%	80%
22xx002054	Crushing/Procesing Equipment	43%	85%
22xx002078	Dumpers/Tenders	21%	41%
22xx002036	Excavators	59%	53%
22xx007015	Fellers/Bunchers/Skidders	59%	70%
22xx003020	Forklifts	59%	30%
22xx006020	Gas Compressors	43%	85%
22xx006005	Generator Sets	43%	68%
22xx002048	Graders	59%	64%
22xx005050	Hydro Power Units	43%	56%
22xx004056	Lawn and Garden Tractor	43%	44%
22xx002051	Off-Highway Truck	59%	80%
22xx002075	Off-Highway Tractor	59%	70%
22xx004056	Other Agricultural Equipment	59%	55%
22xx002081	Other Construction Equipment	59%	48%
22xx003040	Other General Industrial	43%	54%
22xx003050	Other Material Handling	21%	53%
22xx002003	Pavers	59%	66%
22xx002021	Paving Equipment	59%	59%
22xx002009	Plate Compactors	43%	55%
22xx006030	Pressure Washer	43%	85%
22xx006010	Pumps	43%	69%
22xx003060	Refrigeration/AC	43%	46%
22xx002015	Rollers	59%	62%
22xx002057	Rough Terrain Forklifts	59%	63%
22xx002063	Rubber Tire Dozer	59%	75%
22xx002060	Rubber Tire Loader	59%	71%
22xx002018	Scrapers	59%	70%
22xx002072	Skid Steer Loader	21%	58%
22xx001060	Specialty Vehicle/Carts	21%	58%
22xx002024	Surfacing Equipment	59%	49%
22xx003030	Sweepers/Scrubbers	43%	71%
22xx002006	Tampers/Rammers	43%	55%
22xx003070	Terminal Tractors	59%	78%
22xx005040	Tillers > 6 hp	59%	71%
22xx004026	Timmer/Edger/Brush Cutter	43%	91%
22xx002066	Tractor/Loader/Backhoe	21%	48%
22xx002030	Trenchers	59%	66%
22xx006025	Welders	21%	68%

1. Load Factors from Appendix A of *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*,EPA Office of Air and Radiation Report Number NR-005b, December 2002

Table D-3. Emissions Summary

Freeport Harbor Channel Improvement Project
NED Alternative

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	NOx Emissions (tons per year)					VOC Emissions (tons per year)					PM10 Emissions (tons per year)					PM2.5 Emissions (tons per year)					CO Emissions (tons per year)					SO2 Emissions (tons per year)				
				2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
CONTRACT 5: Ch to Brz thr Brzpt TB & PA 8			52																														
EP H05HU005 HYD EXCAV, CRWLR 97,670 LBS, 3.14 CY BKT	1	24	23	0.0096	0.0088	0.0056			0.0005	0.0007	0.0005			0.0003	0.0007	0.0005			0.0005	0.0007	0.0005			0.0023	0.0030	0.0020			0.0014	0.0016	0.0012		
EP T45XR001 TRUCK TRAILER, LOWBOY, 50 TON, 4 AXLE	1	36	23	-	-	-			-	-	-			-	-	-			-	-	-			-	-	-			-	-	-		
EP T50FD010 TRK,HWY, 40,000 GVW, 6X4, 3 AXLE	1	24	23	0.0092	0.0079	0.0047			0.0004	0.0005	0.0004			0.0004	0.0005	0.0004			0.0004	0.0005	0.0004			0.0018	0.0024	0.0016			0.0011	0.0014	0.0009		
EP T60XD011 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP, 4X4	1	1,176	23	0.3485	0.3326	0.2304			0.0151	0.0234	0.0170			0.0201	0.0307	0.0179			0.0195	0.0299	0.0173			0.0839	0.1115	0.0746			0.0489	0.0653	0.0443		
GEN T05DT003 BRUSH CHIPPER, 22" (559 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	1	181	23	0.1169	0.1132	0.1021			0.0077	0.0102	0.0088			0.0081	0.0121	0.0080			0.0080	0.0117	0.0078			0.0553	0.0871	0.0380			0.0165	0.0221	0.0147		
GEN S05CT140 BUCKET, GRADING, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH/WEAR COSTS)	1	5,631	23	3.9896	4.1194	2.7463			0.2165	0.2887	0.1925			0.2367	0.3155	0.2104			0.2286	0.3061	0.2041			1.3299	2.0274	1.3515			0.4443	0.5923	0.3949		
GEN G05CT210 CHAINBAR, 24" - 42" (610-1,067 MM) BAR	1	143	23	0.0003	0.0004	0.0003			0.0233	0.0309	0.0206			0.0030	0.0048	0.0032			0.0033	0.0044	0.0029			0.1299	0.1718	0.1146			0.0001	0.0001	0.0000		
GEN C75D200 CRANE, HYDRAULIC, SELF PROPELLED, ROUGH TERRAIN, 40 TON (36 MT), 84' (25.6 M) BOOM, 4X4	1	24	23	0.0031	0.0042	0.0028			0.0002	0.0002	0.0002			0.0002	0.0002	0.0002			0.0002	0.0002	0.0002			0.0007	0.0009	0.0006			0.0006	0.0008	0.0005		
GEN H05D165 HYDRAULIC EXCAVATOR, CRAWLER, 36,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23.3' (7.1 M) MAX DIGGING DEPTH	1	24	23	0.0049	0.0043	0.0044			0.0004	0.0005	0.0003			0.0004	0.0005	0.0004			0.0004	0.0005	0.0004			0.0018	0.0024	0.0016			0.0011	0.0015	0.0010		
GEN L40X039 LOADER, FRONT END, WHEEL, ARTICULATED, 2.75 CY (2.1 M3) BUCKET, 4X4	1	314	23	0.0231	0.0338	0.0205			0.0039	0.0052	0.0035			0.0029	0.0037	0.0025			0.0027	0.0035	0.0024			0.0151	0.0201	0.0134			0.0032	0.0043	0.0028		
GEN L60D070 LOG SKIDDER, CABLE, 36,700 LB (16,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	1	346	23	0.0493	0.0657	0.0438			0.0041	0.0054	0.0036			0.0044	0.0059	0.0040			0.0043	0.0057	0.0038			0.0190	0.0253	0.0169			0.0063	0.0111	0.0074		
GEN L60D400 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	1	346	23	0.0795	0.1059	0.0707			0.0061	0.0082	0.0054			0.0062	0.0083	0.0055			0.0060	0.0081	0.0054			0.0270	0.0364	0.0242			0.0140	0.0186	0.0124		
GEN T10D440 TRACTOR, CRAWLER (DOZER), 76-103 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	183	23	0.0175	0.0233	0.0156			0.0015	0.0018	0.0013			0.0017	0.0023	0.0015			0.0017	0.0023	0.0015			0.0068	0.0090	0.0060			0.0035	0.0047	0.0031		
GEN T10D440 TRACTOR, CRAWLER (DOZER), 101-138 HP (75-101 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	64	23	0.0083	0.0110	0.0073			0.0007	0.0009	0.0006			0.0008	0.0011	0.0007			0.0008	0.0011	0.0007			0.0032	0.0043	0.0029			0.0016	0.0022	0.0015		
GEN T15D630 TRACTOR, CRAWLER (DOZER), 181-250 HP (135-186 KW), POWERSHIFT, LGP, W/UNIVERSAL BLADE	1	1,014	23	0.3166	1.2211	0.8140			0.0710	0.0847	0.0631			0.0752	0.1002	0.0668			0.0729	0.0972	0.0648			0.3192	0.4214	0.2808			0.1616	0.2356	0.1703		
GEN T45D280 TRUCK DIPPER, SLEEP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1	24	23	0.0052	0.0070	0.0047			0.0004	0.0005	0.0004			0.0004	0.0005	0.0004			0.0004	0.0005	0.0004			0.0018	0.0024	0.0016			0.0011	0.0014	0.0009		
GEN T45D289 TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 80,000 LB (22,680 KG) GVW TRUCK)	1	10	23	0.0020	0.0027	0.0019			0.0002	0.0002	0.0001			0.0002	0.0002	0.0001			0.0002	0.0002	0.0001			0.0007	0.0009	0.0006			0.0004	0.0005	0.0004		
GEN T60D480 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	93	23	0.0186	0.0247	0.0165			0.0014	0.0019	0.0013			0.0015	0.0020	0.0013			0.0015	0.0019	0.0013			0.0063	0.0084	0.0056			0.0037	0.0050	0.0030		
GEN T60D520 TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	10	23	0.0035	0.0046	0.0031			0.0002	0.0003	0.0002			0.0002	0.0003	0.0002			0.0002	0.0003	0.0002			0.0015	0.0020	0.0014			0.0009	0.0008	0.0005		
MAP C80M001 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1	1,053	23	2.1395	2.5477	1.6965			0.1289	0.1465	0.1120			0.1162	0.1549	0.1033			0.1127	0.1502	0.1002			0.5691	0.7588	0.5235			0.3204	0.4272	0.2848		
MAP L05F001 LANDSCAPING EQUIPMENT, 3,000 GAL, HYDROSEEDER, TRUCK MTD (INCLUDES 26,000 GVW TRUCK)	1	51	23	0.0210	0.0281	0.0187			0.0011	0.0015	0.0010			0.0015	0.0020	0.0013			0.0014	0.0019	0.0013			0.0059	0.0124	0.0082			0.0036	0.0048	0.0032		

Table D-3. Emissions Summary

Freeport Harbor Channel Improvement Project
NED Alternative

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	NOx Emissions (tons per year)					VOC Emissions (tons per year)					PM10 Emissions (tons per year)					PM2.5 Emissions (tons per year)					CO Emissions (tons per year)					SO2 Emissions (tons per year)				
				2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
Contract 6: Ch to UTB thr UTB & PA 9			18																														
EP H254V005 HYD EXCAV, CRWLR, 97,870 LBS, 3.14 CY BKT	1	24	18			0.0043	0.0128	0.0021			0.0003	0.0019	0.0002			0.0003	0.0010	0.0001			0.0003	0.0010	0.0001			0.0014	0.0043	0.0007			0.0030	0.0128	0.0004
EP TA54D021 TRUCK TRAILER, LOWBOY, 90 TON, 4 AXLE (ADD TOWING TRUCK)	1	20	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EP T5DF0019 TRK,HWY, 43,000 GVW, 6X4, 3 AXLE	1	24	18			0.0053	0.0165	0.0017			0.0023	0.0008	0.0001			0.0005	0.0008	0.0001			0.0005	0.0008	0.0001			0.0011	0.0034	0.0006			0.0007	0.0020	0.0003
EP T50KE011 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP, 4X4	1	1,173	18			0.1536	0.4907	0.0618			0.0126	0.0377	0.0063			0.0132	0.0157	0.0085			0.0128	0.0383	0.0064			0.0853	0.1690	0.0277			0.0329	0.0987	0.0165
GEN B0021000 BRUSH CHIPPER, 22" (559 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	1	691	18			0.0766	0.2286	0.0383			0.0031	0.0154	0.0026			0.0060	0.0181	0.0030			0.0059	0.0176	0.0029			0.0425	0.1306	0.0218			0.0110	0.0331	0.0055
GEN W5S21140 BUCKET, DRAGLINE, 3.5 CY (2.3 MS) MEDIUM WEIGHT (ADD TEETH WEAR COSTS)	1	5,368	18			2.0981	6.1149	1.0181			0.1429	0.4286	0.0714			0.1991	0.4584	0.0761			0.1515	0.4546	0.0757			1.0292	3.0095	0.5016			0.2931	0.8793	0.1465
GEN G4S07210 CHAINSAW, 24", 43" (610-1,067 MM) BAR	1	69	18			0.0003	0.0007	0.0001			0.0165	0.0464	0.0077			0.0024	0.0072	0.0012			0.0022	0.0068	0.0011			0.0859	0.2578	0.0430			0.0000	0.0001	0.0000
GEN C7S32200 CRANE, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 40 TON (36 MT), 84' (25.6 M) BOOM, 4X4	1	24	18			0.0029	0.0087	0.0015			0.0002	0.0006	0.0001			0.0002	0.0005	0.0001			0.0002	0.0005	0.0001			0.0006	0.0019	0.0003			0.0005	0.0016	0.0003
GEN H5S23165 HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23.3' (7.1 M) MAX. DIGGING DEPTH	1	24	18			0.0031	0.0094	0.0016			0.0002	0.0007	0.0001			0.0003	0.0006	0.0001			0.0003	0.0006	0.0001			0.0011	0.0034	0.0006			0.0007	0.0021	0.0003
GEN L4S26000 LOADER, FRONT END, WHEEL, ARTICULATED, 2.75 CY (2.1 M3) BUCKET, 4X4	1	369	18			0.0179	0.0537	0.0089			0.0030	0.0091	0.0015			0.0020	0.0058	0.0011			0.0021	0.0063	0.0011			0.0117	0.0350	0.0058			0.0025	0.0075	0.0013
GEN G6S5K200 LOG SKIDDER, CABLE, 25,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	1	162	18			0.0330	0.0989	0.0165			0.0027	0.0081	0.0014			0.0030	0.0089	0.0015			0.0029	0.0086	0.0014			0.0127	0.0381	0.0063			0.0026	0.0077	0.0013
GEN J6S2A800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	1	163	18			0.0532	0.1595	0.0266			0.0041	0.0123	0.0023			0.0042	0.0125	0.0021			0.0040	0.0121	0.0020			0.0182	0.0547	0.0091			0.0039	0.0120	0.0020
GEN T1S26440 TRACTOR, CRAWLER (DOZER), 75-100 HP (57-75 KW), POWERSHIFT, MULRI/VERSAL BLADE	1	139	18			0.0117	0.0352	0.0059			0.0010	0.0029	0.0005			0.0012	0.0036	0.0006			0.0011	0.0034	0.0006			0.0045	0.0136	0.0023			0.0003	0.0010	0.0002
GEN L6S24760 LOG SKIDDER, CABLE, 25,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	1	45	18			0.0039	0.0118	0.0019			0.0003	0.0010	0.0002			0.0003	0.0010	0.0002			0.0003	0.0010	0.0002			0.0013	0.0040	0.0007			0.0007	0.0020	0.0003
GEN J6S2A800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	1	43	18			0.0052	0.0157	0.0031			0.0005	0.0014	0.0002			0.0005	0.0015	0.0002			0.0005	0.0014	0.0002			0.0021	0.0064	0.0011			0.0011	0.0032	0.0005
GEN T1S26440 TRACTOR, CRAWLER (DOZER), 75-100 HP (57-75 KW), POWERSHIFT, MULRI/VERSAL BLADE	1	23	18			0.0015	0.0048	0.0008			0.0001	0.0004	0.0001			0.0002	0.0005	0.0001			0.0001	0.0004	0.0001			0.0006	0.0018	0.0003			0.0003	0.0009	0.0002
T5D117 47,7280 TRUCK TRAILER, WATER TRANSFER, 9,000 GAL (16,923 L) (ADD 70,000 LB (31,800 KG) GVW TRUCK)	1	72	18			0.0083	0.0275	0.0045			0.0007	0.0021	0.0004			0.0008	0.0023	0.0004			0.0007	0.0022	0.0004			0.0031	0.0094	0.0016			0.0010	0.0026	0.0005
GEN T5D27530 TRUCK, HIGHWAY, 65,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	73	18			0.0161	0.0483	0.0080			0.0009	0.0028	0.0004			0.0011	0.0034	0.0006			0.0011	0.0030	0.0005			0.0071	0.0213	0.0035			0.0028	0.0083	0.0014
GEN T5D2700 DUMP TRUCK, HIGHWAY, 10 - 13 CY (7.6 - 9.9 M3) DUMP BODY, 35,000 LBS (15,900 KG) GVW, 2 AXLE, 4X2	1	139	18			0.0149	0.0447	0.0075			0.0011	0.0034	0.0006			0.0012	0.0039	0.0005			0.0012	0.0035	0.0006			0.0050	0.0151	0.0025			0.0030	0.0090	0.0015
MAP C6S8A001 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, LHA-S, RIKI/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1	45	18			0.0092	0.0277	0.0046			0.0005	0.0016	0.0003			0.0005	0.0015	0.0002			0.0005	0.0015	0.0002			0.0026	0.0078	0.0013			0.0014	0.0042	0.0007
GPS T1S02A04 DOZER, CRLR, D-4H/PS (ADD BLADE)	1	69	18			0.0043	0.0130	0.0023			0.0004	0.0013	0.0002			0.0006	0.0018	0.0003			0.0006	0.0016	0.0003			0.0041	0.0123	0.0020			0.0009	0.0028	0.0004
UPS T4S0G005 REAR DUMP BODY, 9.5CY (ADD 33,000 GVW TRUCK)	1	48	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UPS T5K4E003 TRK,HWY, 45,000 GVW, 6X4, 3 AXLE	1	69	18			0.0036	0.0107	0.0018			0.0004	0.0013	0.0002			0.0005	0.0014	0.0002			0.0004	0.0013	0.0002			0.0019	0.0057	0.0009			0.0011	0.0034	0.0005
			TOTALS	**6.75**	**9.00**	**8.48**	**7.44**	**1.24**	**0.48**	**0.65**	**0.62**	**0.58**	**0.10**	**0.48**	**0.64**	**0.62**	**0.58**	**0.10**	**0.47**	**0.62**	**0.60**	**0.57**	**0.09**	**2.80**	**3.74**	**3.76**	**3.90**	**0.63**	**1.07**	**1.42**	**1.32**	**1.12**	**0.19**

Table D-4. Total Estimated Project Emissions by Year of Construction Activity
Freeport Harbor Channel Improvement Project
NED Alternative

	2012	2013	2014	2015	2016
NO_x	6.75	9.00	8.48	7.44	1.24
VOC	0.48	0.65	0.62	0.58	0.10
PM_{10}	0.48	0.64	0.62	0.58	0.10
$PM_{2.5}$	0.47	0.62	0.60	0.57	0.09
CO	2.80	3.74	3.76	3.80	0.63
SO_2	1.07	1.42	1.32	1.12	0.19

Table E-1. Crew Size per Equipment
Freeport Harbor Channel Improvement Project
NED Alternative

	Hopper Dredge		Cutterhead Dredge		
	Hopper Dredge Crew	Shore Crew	Cutterhead Dredge Crew	Shore Crew	Other Construction Equipment
Employees	22	8	46	6	6

Table E-2. Emission Factors for Employee Vehicles
Freeport Harbor Channel Improvement Project

County	Type of Vehicle	EPA Category[1]	Emisson Factor (g/mile)					
			CO[2]	NOx[2]	PM2.5[3]	PM10[3]	SO2[3]	VOC[2]
Brazoria	Cars	LDGV	6.8379	0.5163	0.0114	0.0249	0.0068	0.6596
	Pickups	LDGT1	7.3724	0.5176	0.0116	0.0252	0.0088	0.6988

Notes:
1. LDGV=light duty gasoline-fueled vehicles designated for transport of up to 12 people
LDGT1=light duty gasoline-fueled trucks with a gross vehicle weight (GVW) rating of 6000 pounds or less
2. Emission factors for CO, NOx, and VOC are from MOBILE6.2 run using Brazoria County input file, "30aug2007brazi1a0", which can be found on the TCEQ FTP site: ftp://ftp.tnrcc.state.tx.us/pub/OEPAA/TAD/Modeling/Mobile_EI/HGB/m62/2007/.
3. Emission factors for $PM_{2.5}$, PM_{10}, and SO_2 are from MOBILE6.2 run using Statewide PM1 and PM2 input files, "2007_wk_pm1_d13c5r4ihu.in" and "2007_wk_pm2_d13c5r4ihu.in", which can be found on the TCEQ FTP site: ftp://ftp.tnrcc.state.tx.us/pub/OEPAA/TAD/Modeling/Mobile_EI/Statewide/m62/2007/.

Table E-3. Summary of Employee Vehicles Emissions (tpy)
Freeport Harbor Channel Improvement Project
NED Alternative

Project Year	Type of Vehicle	EPA Category	Daily Vehicles (/day)	Total (VMT)	Travel Days (days/yr)	Annual Travel (VMT/yr)	Annual Emissions (tpy)					
							CO	NO_x	$PM_{2.5}$	PM_{10}	SO_2	VOC
2011	Cars	LDGV	21	50.0	130	136,500	1.0289	0.0777	0.0017	0.0037	0.0010	0.0992
	Pickups	LDGT1	21	50.0	130	136,500	1.1093	0.0779	0.0017	0.0038	0.0013	0.1051
						2011 Total Mobile Emission	**2.138**	**0.156**	**0.0035**	**0.0075**	**0.0023**	**0.204**
2012	Cars	LDGV	82	50.0	719	2,947,900	22.2194	1.6777	0.0370	0.0809	0.0221	2.1433
	Pickups	LDGT1	82	50.0	719	2,947,900	23.9562	1.6819	0.0377	0.0819	0.0286	2.2707
						2012 Total Mobile Emission	**46.176**	**3.360**	**0.0747**	**0.1628**	**0.0507**	**4.414**
2013	Cars	LDGV	56	50.0	783	2,192,400	16.5249	1.2477	0.0276	0.0602	0.0164	1.5940
	Pickups	LDGT1	56	50.0	783	2,192,400	17.8166	1.2509	0.0280	0.0609	0.0213	1.6888
						2013 Total Mobile Emission	**34.342**	**2.499**	**0.0556**	**0.1211**	**0.0377**	**3.283**
2014	Cars	LDGV	82	50.0	717	2,939,700	22.1576	1.6730	0.0369	0.0807	0.0220	2.1374
	Pickups	LDGT1	82	50.0	717	2,939,700	23.8896	1.6772	0.0376	0.0817	0.0285	2.2644
						2014 Total Mobile Emission	**46.047**	**3.350**	**0.0745**	**0.1623**	**0.0506**	**4.402**
2015	Cars	LDGV	41	50.0	762	1,562,100	11.7741	0.8890	0.0196	0.0429	0.0117	1.1358
	Pickups	LDGT1	41	50.0	762	1,562,100	12.6945	0.8913	0.0200	0.0434	0.0152	1.2033
						2015 Total Mobile Emission	**24.469**	**1.780**	**0.0396**	**0.0863**	**0.0269**	**2.339**
2016	Cars	LDGV	41	50.0	280	574,000	4.3264	0.3267	0.0072	0.0158	0.0043	0.4173
	Pickups	LDGT1	41	50.0	280	574,000	4.6646	0.3275	0.0073	0.0159	0.0056	0.4421
						2016 Total Mobile Emission	**8.991**	**0.654**	**0.0146**	**0.0317**	**0.0099**	**0.859**

Notes:
1. Total VMT is assumed to be 50 miles/day round trip.
2. Annual travel = Daily vehicles * Total VMT * Travel days/yr.
3. Annual emissions = Emission factor * Annual travel * 1lb/453.6 grams * 1ton/2000lb

Table E-4. Annual Employee Vehicle Emissions (tpy)
Freeport Harbor Channel Improvement Project
NED Alternative

Year	CO	NO_x	$PM_{2.5}$	PM_{10}	SO_2	VOC
Year 2011	2.14	0.16	0.003	0.008	0.002	0.204
Year 2012	46.18	3.36	0.07	0.16	0.05	4.41
Year 2013	34.34	2.50	0.06	0.12	0.04	3.28
Year 2014	46.05	3.35	0.07	0.16	0.05	4.40
Year 2015	24.47	1.78	0.04	0.09	0.03	2.34
Year 2016	8.99	0.65	0.01	0.03	0.01	0.86

Table F-1. NED Alternative - Additional Maintenance Dredging - Assumptions for Marine Equipment Engines
Freeport Harbor Channel Improvement Project
Additional 1,580,000 cy/yr Maintenance Dredging

Activity	Equipment Type	Quantity	Total Installed Power (hp)	Engine Type	Engine Fuel Type	Engine Load Factor	Engine Horsepower (hp)	Hours of Operation per Day (hrs/day)	Daily Engine Usage (%)	Total Days of Operation (days)	Total Engine Hours of Operation (hrs)
Additional 1,580,000 cy/yr Maintenance Dredging	Hopper Dredge	1	14,000	Propulsion - Oceangoing	Diesel	0.8	9,000	20	65%	40	514
				Propulsion - Dredging	Diesel	0.8	9,000	20	35%	40	277
				Dredge Pump(s)	Diesel	0.8	3,000	20	35%	40	277
				Auxiliary - Oceangoing	Diesel	0.8	2,000	20	65%	40	514
				Auxiliary - Idling	Diesel	0.8	2,000	20	35%	40	277
	Survey Boat	1	2,000	Propulsion	Diesel	0.4	2,000	20	100%	8	158
				Auxiliary	Diesel	0.2	2,000	20	100%	8	158
	Shrimp Boat (Turtle Trawl)	2	600	Propulsion	Diesel	0.4	600	24	100%	28	1,330
				Auxiliary	Diesel	0.2	600	24	100%	28	1,330
Total Engine Hours											4,832

Notes:
1. Days of operation are determined assuming 40,000 CY/day production rate for a hopper dredge removing unconsolidated, predominantly silty dredged material.

Table F-2. NED Alternative - Additional Mainenance Dredging - Marine Equipment Hours of Operation
Freeport Harbor Channel Improvement Project
Additional 1,580,000 cy/yr Maintenance Dredging

			Dredge								
			Generic Large Hopper Dredge					Crew/Survey Boat (Runabout)		Shrimp Boats (Total of Two)	
Contract No.	**Additional Volume/Disposal Site**	**Dredge**	Propulsion Ocean Going	Propulsion Dredging	Dredge Pump(s)	Auxillary Oceangoing	Auxiliary Idling	Propulsion	Secondary	Propulsion	Secondary
Additional Maintenance Dredging	1,580,000 CY of Additional Maintenance Material to ODMS	Hopper	514	277	277	514	277	158	158	1,330	1,330

Table F-3. NED Alternative - Additional Maintenance Dredging - Marine Equipment Estimated Emissions
Freeport Harbor Channel Improvement Project
Additional 1,580,000 cy/yr Maintenance Dredging
(Tons per Year)

Phase No.	Pollutant	Dredge	Dredge									Total Emissions Per Year
			Generic Large Hopper Dredge					Crew/Survey Boat		Shrimp Boat		
			Propulsion Oceangoing	Propulsion - Dredging	Dredge Pump(s)	Auxiliary - Oceangoing	Auxillary - Dredging	Propulsion	Auxiliary	Propulsion	Auxiliary	
Additional 1,580,000 cy/yr Maintenance Dredging	CO	Hopper	3.18	1.71	0.57	0.71	0.38	0.22	0.22	0.55	0.55	**8.09**
	NOX	Hopper	32.29	17.39	5.80	7.18	1.08	1.14	0.62	2.87	1.55	**69.90**
	PM	Hopper	0.80	0.43	0.14	0.18	0.03	0.03	0.02	0.07	0.04	**1.74**
	PM2.5	Hopper	0.73	0.39	0.13	0.16	0.03	0.03	0.02	0.07	0.04	**1.59**
	PM10	Hopper	0.77	0.41	0.14	0.17	0.03	0.03	0.02	0.07	0.04	**1.67**
	SOX	Hopper	5.32	2.86	0.95	1.18	0.20	0.20	0.11	0.50	0.28	**11.60**
	VOC	Hopper	0.28	0.15	0.05	0.06	0.07	0.03	0.04	0.07	0.10	**0.85**

Appendix B

LPP Alternative Emissions Summary

APPENDIX B

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Freeport Harbor Channel Improvement Project
LPP Alternative

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Table A-1. Annual Project Emissions Summary
Freeport Harbor Channel Improvement Project
LPP Alternative

	TONS PER YEAR					
Year 2011	**CO**	**NO_X**	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**VOC**
Dredge & Support Equipment	10.74	95.38	2.16	2.28	15.81	1.09
Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
Employee Vehicles	1.53	0.11	0.002	0.005	0.002	0.146
Subtotal	**12.27**	**95.49**	**2.16**	**2.29**	**15.81**	**1.24**
Year 2012	**CO**	**NO_X**	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**VOC**
Dredge & Support Equipment	83.82	747.30	16.93	17.86	123.83	8.52
Construction Equipment	8.05	19.41	1.34	1.39	3.07	1.39
Employee Vehicles	77.60	5.65	0.13	0.27	0.09	7.42
Subtotal	**169.48**	**772.36**	**18.40**	**19.52**	**126.98**	**17.33**
Year 2013	**CO**	**NO_X**	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**VOC**
Dredge & Support Equipment	96.54	855.17	19.38	20.44	141.75	9.86
Construction Equipment	10.74	25.88	1.79	1.85	4.09	1.86
Employee Vehicles	33.42	2.43	0.05	0.12	0.04	3.19
Subtotal	**140.70**	**883.48**	**21.23**	**22.41**	**145.87**	**14.91**
Year 2014	**CO**	**NO_X**	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**VOC**
Dredge & Support Equipment	79.77	703.71	15.95	16.83	116.67	8.18
Construction Equipment	6.86	14.23	1.05	1.09	2.17	1.08
Employee Vehicles	39.88	2.90	0.06	0.14	0.04	3.81
Subtotal	**126.51**	**720.85**	**17.07**	**18.05**	**118.88**	**13.08**
Year 2015	**CO**	**NO_X**	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**VOC**
Dredge & Support Equipment	24.79	218.29	4.95	5.22	36.19	2.55
Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00
Employee Vehicles	12.32	0.90	0.02	0.04	0.01	1.18
Subtotal	**37.11**	**219.18**	**4.97**	**5.26**	**36.21**	**3.73**
TOTAL (ALL YEARS)						
Dredge & Support Equipment	295.67	2,619.85	59.37	62.63	434.24	30.20
Construction Equipment	25.65	59.53	4.19	4.32	9.33	4.33
Employee Vehicles	164.75	11.99	0.27	0.58	0.18	15.75
	486	**2,691**	**64**	**68**	**444**	**50**

Table A-2. Summary of Annual Project Emissions From All Sources Compared to 2001 Emissions Inventory Freeport Harbor Channel Improvement Project LPP Alternative

	TONS PER YEAR					
2002 EMISSION INVENTORY	**CO**	**NO_X**	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**VOC**
HGA	**1,101,693**	**357,353**	**59,155**	**325,353**	**152,017**	**214,128**
Brazoria County	**59,817**	**44,128**	**6,515**	**40,363**	**11,194**	**15,842**
ANNUAL LPP ALTERNATIVE EMISSIONS	**CO**	**NO_X**	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**VOC**
Year 2011	**12.27**	**95.49**	**2.16**	**2.29**	**15.81**	**1.24**
% of HGA	0.00%	0.03%	0.00%	0.00%	0.01%	0.00%
% of Brazoria County	0.02%	0.22%	0.03%	0.01%	0.14%	0.01%
Year 2012	**169.48**	**772.36**	**18.40**	**19.52**	**126.98**	**17.33**
% of HGA	0.02%	0.22%	0.03%	0.01%	0.08%	0.01%
% of Brazoria County	0.28%	1.75%	0.28%	0.05%	1.13%	0.11%
Year 2013	**140.70**	**883.48**	**21.23**	**22.41**	**145.87**	**14.91**
% of HGA	0.01%	0.25%	0.04%	0.01%	0.10%	0.01%
% of Brazoria County	0.24%	2.00%	0.33%	0.06%	1.30%	0.09%
Year 2014	**126.51**	**720.85**	**17.07**	**18.05**	**118.88**	**13.08**
% of HGA	0.01%	0.20%	0.03%	0.01%	0.08%	0.01%
% of Brazoria County	0.21%	1.63%	0.26%	0.04%	1.06%	0.08%
Year 2015	**37.11**	**219.18**	**4.97**	**5.26**	**36.21**	**3.73**
% of HGA	0.00%	0.06%	0.01%	0.00%	0.02%	0.00%
% of Brazoria County	0.06%	0.50%	0.08%	0.01%	0.32%	0.02%
Peak Annual Emissions	**169**	**883**	**21**	**22**	**146**	**17**
% of HGA	0.02%	0.25%	0.04%	0.01%	0.10%	0.01%
% of Brazoria County	0.3%	2.0%	0.3%	0.06%	1.3%	0.1%

Table A-3. General Conformity Emissions By Source
Freeport Harbor Channel Improvement Project
LPP Alternative

Year	NO_X (tpy)				VOC (tpy)			
	Dredge & Support Equipment	Construction Equipment	Employee Vehicles	NO_X Total	Dredge & Support Equipment	Construction Equipment	Employee Vehicles	VOC Total
2011	95.38	0.00	0.11	**95.49**	1.09	0.00	0.15	**1.24**
2012	747.30	19.41	5.65	**772.36**	8.52	1.39	7.42	**17.33**
2013	855.17	25.88	2.43	**883.48**	9.86	1.86	3.19	**14.91**
2014	703.71	14.23	2.90	**720.85**	8.18	1.08	3.81	**13.08**
2015	218.29	0.00	0.90	**219.18**	2.55	0.00	1.18	**3.73**

Table A-4. General Conformity Emissions By Engine Type
Freeport Harbor Channel Improvement Project
LPP Alternative

		Tons per Year									
		NO_x					VOC				
		2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
Dredging	Hopper Dredge - Propelling	56.65	367.22	429.96	239.96	58.84	0.50	3.22	3.77	2.11	0.52
	Survey Boat - Propelling	2.00	12.93	15.14	8.45	2.07	0.05	0.31	0.36	0.20	0.05
	Trawler - Propelling	4.19	27.16	31.80	17.75	4.35	0.10	0.65	0.77	0.43	0.10
	Tug - Propelling		4.87	8.07	18.43	7.33		0.12	0.19	0.44	0.18
	Crew Boat - Propelling		0.32	0.54	1.23	0.49		0.01	0.01	0.03	0.01
	Hopper Dredge - Pumping	10.17	65.91	77.17	43.07	10.56	0.09	0.58	0.68	0.38	0.09
	Cutter Dredge - Pumping		119.84	117.52	268.32	106.73		1.05	1.03	2.35	0.94
	Floating Booster - Pumping										
	Hopper Dredge - Generating	19.37	125.55	146.99	82.04	20.12	0.17	1.10	1.29	0.72	0.18
	Spill Barge - Generating		0.13	0.22	0.51	0.20		0.00	0.01	0.01	0.00
	Subtotal	**92.37**	**723.95**	**827.41**	**679.74**	**210.70**	**0.91**	**7.05**	**8.11**	**6.67**	**2.07**
Idling	Dredges - Generating	1.86	15.89	19.02	19.09	6.39	0.12	1.00	1.20	1.20	0.40
	Survey Boat - Generating	0.37	2.41	2.82	1.57	0.39	0.02	0.15	0.18	0.10	0.02
	Trawler - Generating	0.78	5.06	5.92	3.31	0.81	0.05	0.32	0.37	0.21	0.05
	Subtotal	**3.01**	**23.35**	**27.76**	**23.97**	**7.59**	**0.19**	**1.47**	**1.75**	**1.51**	**0.48**
Construction Equipment	Miscellaneous Equipment		19.41	25.88	14.23			1.39	1.86	1.08	
	Subtotal		**19.41**	**25.88**	**14.23**			**1.39**	**1.86**	**1.08**	
Vehicles	Cars	0.06	2.82	1.21	1.45	0.45	0.07	3.60	1.55	1.85	0.57
	Pickups	0.06	2.83	1.22	1.45	0.45	0.08	3.82	1.64	1.96	0.61
	Subtotal	**0.11**	**5.65**	**2.43**	**2.90**	**0.90**	**0.15**	**7.42**	**3.19**	**3.81**	**1.18**
	Total	**95.49**	**772.36**	**883.48**	**720.85**	**219.18**	**1.24**	**17.33**	**14.91**	**13.08**	**3.73**
		95.38	747.30	855.17	703.71	218.29	1.09	8.52	9.86	8.18	2.55

Nonroad

	NOx				
TPY	**95.4**	**766.7**	**881.1**	**717.9**	**218.3**
TONS/DAY	0.37	2.95	3.39	2.76	0.84
64.53 TPY Emis Budget	0.57%	4.57%	5.25%	4.28%	1.30%

Vehicles

	NOx				
TPY	**0.11**	**5.65**	**2.43**	**2.90**	**0.90**
TONS/DAY	0.0004	0.0217	0.0094	0.0112	0.0034
186.13 TPY Emis Budget	0.0002%	0.012%	0.005%	0.006%	0.002%

Table B-1. Dredging Contract Schedule - Days per Year
Freeport Harbor Channel Improvement Project
LPP Alternative

Contract No.	Reach	Dredging Duration Months	Dredging Duration Days	Contract Start	Contract Finish	Year 1 2011 days	Year 2 2012 days	Year 3 2013 days	Year 4 2014 days	Year 5 2015 days	Year 6 2016 days
1	New Extention and Part of Outer Bar	23.2	696	10/1/2011	10/31/2013	65	261	218			
2	Outer Bar and Jetty Channel	33.2	996	6/1/2012	3/31/2015		152	261	261	64	
3	Lower TB, PA1, & Seaway Removel	1	30	4/1/2012	5/31/2012		44				
4	Real Estate	6	180	10/1/2011	3/31/2012	65	65				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	8	240	4/1/2012	11/30/2014		196	261	238		
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	4	120	12/1/2013	9/30/2014			22	195		
7	Stauffer Channel	6	180	10/1/2014	4/30/2015				66	86	
8	Mitigation	6	180	4/1/2015	9/30/2015					131	
					TOTAL	130	718	762	760	281	0

Table B-2. Dredge Equipment Engine Horsepower Break-down
Freeport Harbor Channel Improvement Project
LPP Alternative

Type	Activity (month)	Hours of Operation	Horse power (HP)
CONTRACT 1: New Extension & Part of Entrance			
DredgingNew Extent (Duration =	**6**	**Quantity =**	**795,000 CY**
Generic Large Hopper	Dredging	3000	14000
	Idle	1032	
Survey Boat	Dredging	600	2000
	Idle	206	
Trawlers - 2	Dredging	4200	1200
	Idle	1444	
Dredging Part of Outer Bar (Duration =	**17.2**	**Quantity =**	**4,145,000 CY**
Generic Large Hopper	Dredging	8600	14000
	Idle	2958	
Survey Boat	Dredging	1720	2000
	Idle	592	
Trawlers - 2	Dredging	12040	1200
	Idle	4142	
Total	**23.2**	**40,534**	
CONTRACT 2: Outer Bar and Jetty Ch			
Dredging Outer Bar (Duration =	**17.2**	**Quantity =**	**4,145,000 CY**
Generic Large Hopper	Dredging	8600	14000
	Idle	2958	
Survey Boat	Dredging	1720	2000
	Idle	592	
Trawlers - 2	Dredging	12040	1200
	Idle	4142	
Dredging Jetty Ch (Duration =	**16**	**Quantity =**	**3,648,000 CY**
Generic Large Hopper	Dredging	8000	14000
	Idle	2752	
Survey Boat	Dredging	1600	2000
	Idle	550	
Trawlers - 2	Dredging	11200	1200
	Idle	3852	
Total	**33.2**	**58,006**	

Table B-2. Dredge Equipment Engine Horsepower Break-down
Freeport Harbor Channel Improvement Project
LPP Alternative

Type	Activity (month)	Hours of Operation	Horse power (HP)
CONTRACT 3: Lower TB, PA 1 Work & Seaway Removal			
Dredging Lower TB (Duration =	**1**	**Quantity =**	**208,000 CY**
30" Dredge	Dredging	500	9000
	Idle	225	3000
Dredging Tugs (3 @ 500hp each)	Dredging	1200	1500
Spill Barge	Dredging	100	165
Crewboat	Construction	100	400
Total	**1**	**2,125**	
CONTRACT 5: Ch to Brz thr Brzpt TB & PA 8			
Dredging Cycle (Duration =	**8**	**Quantity =**	**1,716,000 CY**
30" Dredge	Dredging	4000	9000
	Idle	1800	3000
Dredging Tugs (3 @ 500hp each)	Dredging	9600	1500
Spill Barge	Dredging	800	165
Crewboat	Construction	800	400
Total	**8**	**17,000**	
CONTRACT 6: Ch to UTB thr UTB & PA 9			
Dredging Cycle (Duration =	**4**	**Quantity =**	**881,000 CY**
30" Dredge	Dredging	2000	9000
	Idle	900	3000
Dredging Tugs (3 @ 500hp each)	Dredging	4800	1500
Spill Barge	Dredging	400	165
Crewboat	Construction	400	400
Total	**4**	**8,500**	
CONTRACT 7: Stauffer Ch			
Dredging Cycle (Duration =	**6**	**Quantity =**	**1,814,000 CY**
30" Dredge	Dredging	3000	9000
	Idle	1350	3000
Dredging Tugs (3 @ 500hp each)	Dredging	7200	1500
Spill Barge	Dredging	600	165
Crewboat	Construction	600	400
Total	**6**	**12,750**	

Table B-3. Dredging Contract Allocation by Year
Freeport Harbor Channel Improvement Project
LPP Alternative

Contract No.	Reach	Dredging Duration Days	Year 1 **2011** percent	Year 2 **2012** percent	Year 3 **2013** percent	Year 4 **2014** percent	Year 5 **2015** percent
1	New Extention and Part of Outer Bar	696	12%	48%	40%		
2	Outer Bar and Jetty Channel	996		21%	35%	35%	9%
3	Lower TB, PA1, & Seaway Removel	30		100%			
4	Real Estate	180	50%	50%			
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	240		28%	38%	34%	
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	120			18%	90%	
7	Stauffer Channel	180				37%	57%
8	Mitigation	180					100%

Table B-4. Dredge Equipment Operating Hours
Freeport Harbor Channel Improvement Project
LPP Alternative

Contract No.	Reach	Operating Hours													
		Dredge						Survey Boat		Trawler		Floating Booster	Tug	Spill Barge	Crew Boat
		Dredge Type	Total Dredging	Propelling	Pumping	Power Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
1	New Extension	Generic Large Hopper	3,000	1,950	1,050	3,000	1,032	600	206	4,200	1,444				
	Part of Outer Bar	Generic Large Hopper	8,600	5,590	3,010	8,600	2,958	1,720	592	12,040	4,142				
2	Outer Bar	Generic Large Hopper	8,600	5,590	3,010	8,600	2,958	1,720	592	12,040	4,142				
	Jetty Channel	Generic Large Hopper	8,000	5,200	2,800	8,000	2,752	1,600	550	11,200	3,852				
3	Lower TB	30" Dredge	500				225						1,200	100	100
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	4,000				1,800						9,600	800	800
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	2,000				900						4,800	400	400
7	Stauffer Channel	30" Dredge	3,000				1,350						7,200	600	600
8	Mitigation														

Table B-5. Typical Hopper Dredging Cycle
Freeport Harbor Channel Improvement Project
LPP Alternative

Contract No.	Reach	Dredging Cycle				
		Dredge Type	Total Dredging Hours	Propelling	Pumping	Power Generating
1	New Extension	Generic Large Hopper	3,000	65%	35%	100%
	Part of Outer Bar	Generic Large Hopper	8,600	65%	35%	100%
2	Outer Bar	Generic Large Hopper	8,600	65%	35%	100%
	Jetty Channel	Generic Large Hopper	8,000	65%	35%	100%

Table B-6. Dredge Equipment Engine Horsepower Break-down
Freeport Harbor Channel Improvement Project
LPP Alternative

Contract No.	Location/Disposal Site	Horsepower (hp)													
		Dredge Type	Engine Type					Survey Boat		Trawler		Floating Booster	Tug	Spill Barge	Crew Boat
			Total	Propulsion	Pump	Generator	Generator at Idling	Main Engine	Idling	Main Engine	Idling	Pumping	Propulsion	Main Engine	Propulsion
1	New Extension	Generic Large Hopper	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
	Part of Outer Bar	Generic Large Hopper	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
2	Outer Bar	Generic Large Hopper	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
	Jetty Channel	Generic Large Hopper	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
3	Lower TB	30" Dredge	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
4	Real Estate						3,000						500	165	400
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	9,000				3,000						500	165	400
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	9,000				3,000						500	165	400
7	Stauffer Channel	30" Dredge	9,000				3,000						500	165	400
8	Mitigation						3,000						500	165	400

Table C-1. Marine Equipment Operating Hours
Freeport Harbor Channel Improvement Project
LPP Alternative

Operating Hours			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper	356.46	233.00	125.46	358.46	123.31	71.69	24.61	501.84	172.54				
	Part of Outer Bar	Generic Large Hopper	1,027.57	667.92	359.65	1,027.57	353.44	205.51	70.74	1,438.60	494.91				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL		**1,386.03**	**900.92**	**485.11**	**1,386.03**	**476.75**	**277.21**	**95.35**	**1,940.44**	**667.44**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper	1,439.34	935.57	503.77	1,439.34	495.13	287.87	98.83	2,015.07	692.80				
	Part of Outer Bar	Generic Large Hopper	4,126.10	2,681.97	1,444.14	4,126.10	1,419.19	825.22	284.03	5,778.54	1,987.25				
2	Outer Bar	Generic Large Hopper	1,771.27	1,151.33	619.95	1,771.27	609.24	354.25	121.93	2,479.78	853.09				
	Jetty Channel	Generic Large Hopper	1,647.70	1,071.00	576.69	1,647.70	566.81	329.54	113.28	2,306.78	793.37				
3	Lower TB	30" Dredge	500.00				225.00						1,200.00	100.00	100.00
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1,128.06				507.63						2,707.34	225.61	225.61
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**10,612.47**	**5,839.87**	**3,144.54**	**8,984.41**	**3,822.99**	**1,796.88**	**618.07**	**12,578.18**	**4,326.51**		**3,907.34**	**325.61**	**325.61**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper	1,202.21	781.43	420.77	1,202.21	413.56	240.44	82.55	1,683.09	578.66				
	Part of Outer Bar	Generic Large Hopper	3,446.32	2,240.11	1,206.21	3,446.32	1,185.38	689.26	237.24	4,824.85	1,659.85				
2	Outer Bar	Generic Large Hopper	3,041.46	1,976.95	1,064.51	3,041.46	1,046.12	608.29	209.37	4,258.05	1,464.85				
	Jetty Channel	Generic Large Hopper	2,829.27	1,839.02	990.24	2,829.27	973.27	565.85	194.51	3,960.98	1,362.29				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1,502.16				675.97						3,605.18	300.43	300.43
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	366.67				165.00						880.00	73.33	73.33
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**12,388.09**	**6,837.52**	**3,681.74**	**10,519.26**	**4,459.30**	**2,103.85**	**723.66**	**14,726.97**	**5,065.55**		**4,485.18**	**373.76**	**373.76**

Table C-1. Marine Equipment Operating Hours
Freeport Harbor Channel Improvement Project
LPP Alternative

Operating Hours			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper	3,041.46	1,976.95	1,064.51	3,041.46	1,046.12	608.29	209.37	4,258.05	1,464.85				
	Jetty Channel	Generic Large Hopper	2,829.27	1,838.02	990.24	2,829.27	973.27	565.85	194.51	3,960.98	1,362.29				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1,369.78				516.40						3,287.48	273.98	273.98
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	1,797.24				808.76						4,313.36	359.45	359.45
7	Stauffer Channel	30" Dredge	1,100.00				495.00						2,640.00	220.00	220.00
8	Mitigation														
	YEAR 2014 TOTAL		**10,137.75**	**3,815.98**	**2,054.76**	**5,870.73**	**3,939.55**	**1,174.15**	**403.88**	**8,219.02**	**2,827.15**		**10,240.85**	**853.40**	**853.40**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper	745.80	484.77	261.03	745.80	256.52	149.16	51.34	1,044.12	359.20				
	Jetty Channel	Generic Large Hopper	693.77	450.96	242.82	693.77	238.66	138.75	47.70	971.27	334.05				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge	1,697.37				763.82						4,073.68	339.47	339.47
8	Mitigation														
	YEAR 2015 TOTAL		**3,136.93**	**935.72**	**503.85**	**1,439.57**	**1,258.99**	**287.91**	**99.04**	**2,015.39**	**693.25**		**4,073.68**	**339.47**	**339.47**

Table C-2. Marine Engine Emission Factors and Fuel Consumption Algorithms
(in g/kW-hr, for all marine engines)
Freeport Harbor Channel Improvement Project

Statistical Parameter	Exponent (x)	Intercept (b)	Coefficient (a)
CO	1	0	0.8378
NO_X	1.5	10.4496	0.1255
PM	1.5	0.2551	0.0059
PM2.5	1.5	0.2551	0.0059
PM10	1.5	0.2551	0.0059
SO_X	n/a	0	2.3735
VOC (HC)	1.5	0	0.0667

Notes:

1.) All regressions but SO_2 are in the form of:

Emissions Rate (g/hp-hr) = (a*(Fractional Load)$^{-x}$ + b) * 0.7457
where the conversion factor of 0.7457 kW/hp is used to calculate the emission factor in g/hp-hr

2.) Fractional Load is equal to actual engine output divided by rated engine output.

3.) The SO_2 regression is the form of:

Emissions Rate (g/hp-hr) = a*(Fuel Sulfur Flow in g/hp-hr) + b
where Fuel Sulfur Flow is the Fuel Consumption times the sulfur content of the fuel;
The sulfur content for the fuel consumption regression was set to 3300 parts per million (0.33 wt%)

4.) **Fuel Consumption (g/hp-hr) = (14.12 / (Fractional Load) + 205.717) * 0.7457**

5.) n/a is not applicable, n/s is not statistically significant.

6.) All information shown above is detailed in Table 5-1 of the EPA technical report "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data", EPA 420-R-00-002, February 2000.

Table C-3. Marine Equipment Load Factors and Emission Factors
Freeport Harbor Channel Improvement Project

	Dredge					Crew Boat		Trawler		Floating Booster	Tug	Spill Barge	Crew Boat
Operating Mode	Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
Load Factor	0.8	0.8	0.8	0.8	0.2	0.4	0.2	0.4	0.2	0.8	0.4	0.4	0.4
EF (Gram/hp-hr)													
CO	0.780934	0.780934	0.780934	0.780934	3.123737	1.561869	3.123737	1.561869	3.123737	0.780934	1.561869	1.561869	1.561869
NO_X	7.923056	7.923056	7.923056	7.923056	8.838583	8.162195	8.838583	8.162195	8.838583	7.923056	8.162195	8.162195	8.162195
PM	0.196377	0.196377	0.196377	0.196377	0.239417	0.207619	0.239417	0.207619	0.239417	0.196377	0.207619	0.207619	0.207619
PM2.5	0.178703	0.178703	0.178703	0.178703	0.217870	0.188933	0.217870	0.188933	0.217870	0.178703	0.188933	0.188933	0.188933
PM10	0.188522	0.188522	0.188522	0.188522	0.229841	0.199314	0.229841	0.199314	0.229841	0.188522	0.199314	0.199314	0.199314
SO_X	1.304627	1.304627	1.304627	1.304627	1.613894	1.407716	1.613894	1.407716	1.613894	1.304627	1.407716	1.407716	1.407716
VOC (HC)	0.069511	0.069511	0.069511	0.069511	0.556090	0.196607	0.556090	0.196607	0.556090	0.069511	0.196607	0.196607	0.196607

Notes:

1.) The dredge type, engine type, horsepower, and fuel type were based on information provided by project sponsors.

2.) The engine load factors for the dredges and support equipment were determined from Table 5-2 of the EPA Report "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data", February 2000.

A survey of dredge engine sizes along with input from project sponsors was used to determine which operating mode and hence which load factor applied to each engine. The following assumptions applied to the load factor determination:

A.) The main engines on the dredges were assumed to operate at full power (e.g. 0.8 "cruise" load factor from Table 5-2 of EPA report) for all hours of operation.

B.) The generators on the dredges were assumed to operate at 0.2 load factor during idling.

C.) The main engines or propulsion engines on the support equipment were assumed to operate at intermittent times during the dredging operations and were also determined to operate at the 0.4 "slow cruise" load factor.

D.) The auxiliary engines, if any, on the support equipment were assumed to operate sparingly during idling and were determined to operate at the 0.2 "maneuvering" load factor.

3.) The emission factors were calculated according to the algorithm table and formulas detailed on page 5-3 of the EPA report. The emissions Rate formula and algorithm table are also shown on Table A-4, "Marine Engine Emission Factor and Fuel Consumption Data", February 2000.

4.) The Emission Rate in tons/hr is based on the following formula: Emission Rate = hp*LF*EF*(0.0022046 lbs/gram)*(1 ton/2000 lbs).

Table C-4. Marine Equipment CO Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

CO (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		1.44	0.26	0.49	0.17	0.10	0.03	0.21	0.07				
	Part of Outer Bar	Generic Large Hopper		4.14	0.74	1.42	0.49	0.28	0.10	0.59	0.20				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			**5.58**	**1.00**	**1.91**	**0.66**	**0.38**	**0.13**	**0.80**	**0.28**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		5.80	1.04	1.98	0.68	0.40	0.14	0.83	0.29				
	Part of Outer Bar	Generic Large Hopper		16.62	2.98	5.68	1.95	1.14	0.39	2.39	0.82				
2	Outer Bar	Generic Large Hopper		7.14	1.28	2.44	0.84	0.49	0.17	1.02	0.35				
	Jetty Channel	Generic Large Hopper		6.64	1.19	2.27	0.78	0.45	0.16	0.95	0.33				
3	Lower TB	30" Dredge	4.82				0.31								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	6.99				1.05						0.93	0.03	0.06
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**11.81**	**36.20**	**6.50**	**12.37**	**5.62**	**2.47**	**0.85**	**5.20**	**1.79**		**0.93**	**0.03**	**0.06**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		4.84	0.87	1.66	0.57	0.33	0.11	0.70	0.24				
	Part of Outer Bar	Generic Large Hopper		13.88	2.49	4.75	1.63	0.95	0.33	1.99	0.69				
2	Outer Bar	Generic Large Hopper		12.25	2.20	4.19	1.44	0.84	0.29	1.76	0.61				
	Jetty Channel	Generic Large Hopper		11.40	2.05	3.90	1.34	0.78	0.27	1.64	0.56				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	9.31				1.40						1.24	0.03	0.08
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	2.27				0.34						0.30	0.01	0.02
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**11.58**	**42.38**	**7.61**	**14.49**	**6.72**	**2.90**	**1.00**	**6.09**	**2.09**		**1.54**	**0.04**	**0.10**

Table C-4. Marine Equipment CO Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

CO (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		12.25	2.20	4.19	1.44	0.84	0.29	1.76	0.61				
	Jetty Channel	Generic Large Hopper		11.40	2.05	3.90	1.34	0.78	0.27	1.64	0.56				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	8.49				1.27						1.13	0.03	0.08
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	11.14				1.67						1.49	0.04	0.10
7	Stauffer Channel	30" Dredge	6.82				1.02						0.91	0.02	0.06
8	Mitigation														
	YEAR 2014 TOTAL		**26.45**	**23.65**	**4.25**	**8.09**	**6.75**	**1.62**	**0.56**	**3.40**	**1.17**		**3.53**	**0.10**	**0.24**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		3.00	0.54	1.03	0.35	0.21	0.07	0.43	0.15				
	Jetty Channel	Generic Large Hopper		2.79	0.50	0.96	0.33	0.19	0.07	0.40	0.14				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge	10.52				1.58						1.40	0.04	0.09
8	Mitigation														
	YEAR 2015 TOTAL		**10.52**	**5.80**	**1.04**	**1.98**	**2.26**	**0.40**	**0.14**	**0.83**	**0.29**		**1.40**	**0.04**	**0.09**

Table C-5. Marine Equipment NOx Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

NO_x (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		14.65	2.63	5.01	0.48	0.52	0.10	1.08	0.20				
	Part of Outer Bar	Generic Large Hopper		42.00	7.54	14.36	1.38	1.48	0.28	3.11	0.58				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			**56.65**	**10.17**	**19.37**	**1.86**	**2.00**	**0.37**	**4.19**	**0.78**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		58.83	10.56	20.11	1.93	2.07	0.39	4.35	0.81				
	Part of Outer Bar	Generic Large Hopper		168.65	30.27	57.66	5.53	5.94	1.11	12.47	2.32				
2	Outer Bar	Generic Large Hopper		72.40	12.99	24.75	2.37	2.55	0.48	5.35	1.00				
	Jetty Channel	Generic Large Hopper		67.35	12.09	23.02	2.21	2.37	0.44	4.98	0.93				
3	Lower TB	30" Dredge	48.91				0.88								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	70.93				2.97						4.87	0.13	0.32
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**119.84**	**367.22**	**65.91**	**125.55**	**15.89**	**12.93**	**2.41**	**27.16**	**5.06**		**4.87**	**0.13**	**0.32**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		49.14	8.82	16.80	1.61	1.73	0.32	3.63	0.68				
	Part of Outer Bar	Generic Large Hopper		140.86	25.28	48.16	4.62	4.96	0.92	10.42	1.94				
2	Outer Bar	Generic Large Hopper		124.31	22.31	42.50	4.08	4.38	0.82	9.19	1.71				
	Jetty Channel	Generic Large Hopper		115.64	20.76	39.54	3.79	4.07	0.76	8.55	1.59				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	94.46				3.95						6.49	0.18	0.43
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	23.06				0.96						1.58	0.04	0.11
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**117.52**	**429.96**	**77.17**	**146.99**	**19.02**	**15.14**	**2.82**	**31.80**	**5.92**		**8.07**	**0.22**	**0.54**

Table C-5. Marine Equipment NOx Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

NO_x (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		124.31	22.31	42.50	4.08	4.38	0.82	9.19	1.71				
	Jetty Channel	Generic Large Hopper		115.64	20.76	39.54	3.79	4.07	0.76	8.55	1.59				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	86.13				3.60						5.92	0.16	0.39
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	113.01				4.73						7.76	0.21	0.52
7	Stauffer Channel	30" Dredge	69.17				2.89						4.75	0.13	0.32
8	Mitigation														
	YEAR 2014 TOTAL		**268.32**	**239.96**	**43.07**	**82.04**	**19.09**	**8.45**	**1.57**	**17.75**	**3.31**		**18.43**	**0.51**	**1.23**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		30.48	5.47	10.42	1.00	1.07	0.20	2.25	0.42				
	Jetty Channel	Generic Large Hopper		28.36	5.09	9.69	0.93	1.00	0.19	2.10	0.39				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge	106.73				4.47						7.33	0.20	0.49
8	Mitigation														
	YEAR 2015 TOTAL		**106.73**	**58.84**	**10.56**	**20.12**	**6.39**	**2.07**	**0.39**	**4.35**	**0.81**		**7.33**	**0.20**	**0.49**

Table C-6. Marine Equipment PM Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

PM (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.36	0.07	0.12	0.01	0.01	0.00	0.03	0.01				
	Part of Outer Bar	Generic Large Hopper		1.04	0.19	0.35	0.04	0.04	0.01	0.08	0.02				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			**1.40**	**0.25**	**0.48**	**0.05**	**0.05**	**0.01**	**0.11**	**0.02**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		1.46	0.26	0.50	0.05	0.05	0.01	0.11	0.02				
	Part of Outer Bar	Generic Large Hopper		4.18	0.75	1.43	0.15	0.15	0.03	0.32	0.06				
2	Outer Bar	Generic Large Hopper		1.79	0.32	0.61	0.06	0.06	0.01	0.14	0.03				
	Jetty Channel	Generic Large Hopper		1.67	0.30	0.57	0.06	0.06	0.01	0.13	0.03				
3	Lower TB	30" Dredge	1.21				0.02								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1.76				0.08						0.12	0.00	0.01
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**2.97**	**9.10**	**1.63**	**3.11**	**0.43**	**0.33**	**0.07**	**0.69**	**0.14**		**0.12**	**0.00**	**0.01**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		1.22	0.22	0.42	0.04	0.04	0.01	0.09	0.02				
	Part of Outer Bar	Generic Large Hopper		3.49	0.63	1.19	0.13	0.13	0.03	0.27	0.05				
2	Outer Bar	Generic Large Hopper		3.08	0.55	1.05	0.11	0.11	0.02	0.23	0.05				
	Jetty Channel	Generic Large Hopper		2.87	0.51	0.98	0.10	0.10	0.02	0.22	0.04				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	2.34				0.11						0.17	0.00	0.01
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	0.57				0.03						0.04	0.00	0.00
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**2.91**	**10.66**	**1.91**	**3.64**	**0.52**	**0.39**	**0.08**	**0.81**	**0.16**		**0.21**	**0.01**	**0.01**

Table C-6. Marine Equipment PM Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

PM (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		3.08	0.55	1.05	0.11	0.11	0.02	0.23	0.05				
	Jetty Channel	Generic Large Hopper		2.87	0.51	0.98	0.10	0.10	0.02	0.22	0.04				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	2.13				0.10						0.15	0.00	0.01
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	2.80				0.13						0.20	0.01	0.01
7	Stauffer Channel	30" Dredge	1.71				0.08						0.12	0.00	0.01
8	Mitigation														
	YEAR 2014 TOTAL		**6.65**	**5.95**	**1.07**	**2.03**	**0.52**	**0.21**	**0.04**	**0.45**	**0.09**		**0.47**	**0.01**	**0.03**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		0.76	0.14	0.26	0.03	0.03	0.01	0.06	0.01				
	Jetty Channel	Generic Large Hopper		0.70	0.13	0.24	0.03	0.03	0.01	0.05	0.01				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge	2.65				0.12						0.19	0.01	0.01
8	Mitigation														
	YEAR 2015 TOTAL		**2.65**	**1.46**	**0.26**	**0.50**	**0.17**	**0.05**	**0.01**	**0.11**	**0.02**		**0.19**	**0.01**	**0.01**

Table C-7. Marine Equipment $PM_{2.5}$ Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

$PM_{2.5}$ (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.33	0.06	0.11	0.01	0.01	0.00	0.03	0.00				
	Part of Outer Bar	Generic Large Hopper		0.95	0.17	0.32	0.03	0.03	0.01	0.07	0.01				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			**1.28**	**0.23**	**0.44**	**0.05**	**0.05**	**0.01**	**0.10**	**0.02**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		1.33	0.24	0.45	0.05	0.05	0.01	0.10	0.02				
	Part of Outer Bar	Generic Large Hopper		3.80	0.68	1.30	0.14	0.14	0.03	0.29	0.06				
2	Outer Bar	Generic Large Hopper		1.63	0.29	0.56	0.06	0.06	0.01	0.12	0.02				
	Jetty Channel	Generic Large Hopper		1.52	0.27	0.52	0.05	0.05	0.01	0.12	0.02				
3	Lower TB	30" Dredge	1.10				0.02								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1.60				0.07						0.11	0.00	0.01
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**2.70**	**8.28**	**1.49**	**2.83**	**0.39**	**0.30**	**0.06**	**0.63**	**0.12**		**0.11**	**0.00**	**0.01**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		1.11	0.20	0.38	0.04	0.04	0.01	0.08	0.02				
	Part of Outer Bar	Generic Large Hopper		3.18	0.57	1.09	0.11	0.11	0.02	0.24	0.05				
2	Outer Bar	Generic Large Hopper		2.60	0.50	0.96	0.10	0.10	0.02	0.21	0.04				
	Jetty Channel	Generic Large Hopper		2.61	0.47	0.89	0.09	0.09	0.02	0.20	0.04				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	2.13				0.10						0.15	0.00	0.01
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	0.52				0.02						0.04	0.00	0.00
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**2.65**	**9.70**	**1.74**	**3.32**	**0.47**	**0.35**	**0.07**	**0.74**	**0.15**		**0.19**	**0.01**	**0.01**

Table C-7. Marine Equipment $PM_{2.5}$ Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

$PM_{2.5}$ (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		2.80	0.50	0.96	0.10	0.10	0.02	0.21	0.04				
	Jetty Channel	Generic Large Hopper		2.61	0.47	0.89	0.09	0.09	0.02	0.20	0.04				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1.94				0.09						0.14	0.00	0.01
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	2.55				0.12						0.18	0.00	0.01
7	Stauffer Channel	30" Dredge	1.56				0.07						0.11	0.00	0.01
8	Mitigation														
	YEAR 2014 TOTAL		**6.05**	**5.41**	**0.97**	**1.85**	**0.47**	**0.20**	**0.04**	**0.41**	**0.08**		**0.43**	**0.01**	**0.03**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		0.69	0.12	0.24	0.02	0.02	0.00	0.05	0.01				
	Jetty Channel	Generic Large Hopper		0.64	0.11	0.22	0.02	0.02	0.00	0.05	0.01				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge	2.41				0.11						0.17	0.00	0.01
8	Mitigation														
	YEAR 2015 TOTAL		**2.41**	**1.33**	**0.24**	**0.45**	**0.16**	**0.05**	**0.01**	**0.10**	**0.02**		**0.17**	**0.00**	**0.01**

Table C-8. Marine Equipment PM_{10} Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

PM_{10} (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.35	0.06	0.12	0.01	0.01	0.00	0.03	0.01				
	Part of Outer Bar	Generic Large Hopper		1.00	0.18	0.34	0.04	0.04	0.01	0.08	0.02				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			**1.35**	**0.24**	**0.46**	**0.05**	**0.05**	**0.01**	**0.10**	**0.02**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		1.40	0.25	0.48	0.05	0.05	0.01	0.11	0.02				
	Part of Outer Bar	Generic Large Hopper		4.01	0.72	1.37	0.14	0.15	0.03	0.30	0.06				
2	Outer Bar	Generic Large Hopper		1.72	0.31	0.59	0.06	0.06	0.01	0.13	0.03				
	Jetty Channel	Generic Large Hopper		1.60	0.29	0.55	0.06	0.06	0.01	0.12	0.02				
3	Lower TB	30" Dredge	1.18				0.02								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1.69				0.08						0.12	0.00	0.01
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**2.85**	**8.74**	**1.57**	**2.99**	**0.41**	**0.32**	**0.06**	**0.66**	**0.13**		**0.12**	**0.00**	**0.01**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		1.17	0.21	0.40	0.04	0.04	0.01	0.09	0.02				
	Part of Outer Bar	Generic Large Hopper		3.35	0.60	1.15	0.12	0.12	0.02	0.25	0.05				
2	Outer Bar	Generic Large Hopper		2.96	0.53	1.01	0.11	0.11	0.02	0.22	0.04				
	Jetty Channel	Generic Large Hopper		2.75	0.49	0.94	0.10	0.10	0.02	0.21	0.04				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	2.25				0.10						0.16	0.00	0.01
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	0.55				0.03						0.04	0.00	0.00
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**2.80**	**10.23**	**1.84**	**3.50**	**0.49**	**0.37**	**0.07**	**0.78**	**0.15**		**0.20**	**0.01**	**0.01**

Table C-8. Marine Equipment PM_{10} Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

PM_{10} (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		2.98	0.53	1.01	0.11	0.11	0.02	0.22	0.04				
	Jetty Channel	Generic Large Hopper		2.75	0.49	0.94	0.10	0.10	0.02	0.21	0.04				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	2.05				0.09						0.14	0.00	0.01
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	2.69				0.12						0.19	0.01	0.01
7	Stauffer Channel	30" Dredge	1.65				0.08						0.12	0.00	0.01
8	Mitigation														
	YEAR 2014 TOTAL		**6.39**	**5.71**	**1.02**	**1.95**	**0.50**	**0.21**	**0.04**	**0.43**	**0.09**		**0.45**	**0.01**	**0.03**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		0.73	0.13	0.25	0.03	0.03	0.01	0.06	0.01				
	Jetty Channel	Generic Large Hopper		0.67	0.12	0.23	0.02	0.02	0.00	0.05	0.01				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge	2.54				0.12						0.18	0.00	0.01
8	Mitigation														
	YEAR 2015 TOTAL		**2.54**	**1.40**	**0.25**	**0.48**	**0.17**	**0.05**	**0.01**	**0.11**	**0.02**		**0.18**	**0.00**	**0.01**

Table C-9. Marine Equipment SO_2 Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

SO_2 (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		2.41	0.43	0.82	0.09	0.09	0.02	0.19	0.04				
	Part of Outer Bar	Generic Large Hopper		6.92	1.24	2.36	0.25	0.26	0.05	0.54	0.11				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			**9.33**	**1.67**	**3.19**	**0.34**	**0.34**	**0.07**	**0.72**	**0.14**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		9.69	1.74	3.31	0.35	0.36	0.07	0.75	0.15				
	Part of Outer Bar	Generic Large Hopper		27.77	4.98	9.49	1.01	1.02	0.20	2.15	0.42				
2	Outer Bar	Generic Large Hopper		11.92	2.14	4.08	0.43	0.44	0.09	0.92	0.18				
	Jetty Channel	Generic Large Hopper		11.09	1.99	3.79	0.40	0.41	0.08	0.86	0.17				
3	Lower TB	30" Dredge	8.05				0.16								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	11.68				0.54						0.84	0.02	0.06
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**19.73**	**60.47**	**10.85**	**20.67**	**2.90**	**2.23**	**0.44**	**4.68**	**0.92**		**0.84**	**0.02**	**0.06**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		8.09	1.45	2.77	0.29	0.30	0.06	0.63	0.12				
	Part of Outer Bar	Generic Large Hopper		23.19	4.16	7.93	0.84	0.86	0.17	1.80	0.35				
2	Outer Bar	Generic Large Hopper		20.47	3.67	7.00	0.74	0.76	0.15	1.59	0.31				
	Jetty Channel	Generic Large Hopper		19.04	3.42	6.51	0.69	0.70	0.14	1.48	0.29				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	15.55				0.72						1.12	0.03	0.07
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	3.80				0.18						0.27	0.01	0.02
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**19.35**	**70.80**	**12.71**	**24.20**	**3.47**	**2.61**	**0.51**	**5.48**	**1.08**		**1.39**	**0.04**	**0.09**

Table C-9. Marine Equipment SO_2 Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

SO_2 (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		20.47	3.67	7.00	0.74	0.76	0.15	1.59	0.31				
	Jetty Channel	Generic Large Hopper		19.04	3.42	6.51	0.69	0.70	0.14	1.48	0.29				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	14.18				0.66						1.02	0.03	0.07
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	18.61				0.86						1.34	0.04	0.09
7	Stauffer Channel	30" Dredge	11.39				0.53						0.82	0.02	0.05
8	Mitigation														
	YEAR 2014 TOTAL		**44.18**	**39.51**	**7.09**	**13.51**	**3.49**	**1.46**	**0.29**	**3.06**	**0.60**		**3.18**	**0.09**	**0.21**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		5.02	0.90	1.72	0.18	0.19	0.04	0.39	0.08				
	Jetty Channel	Generic Large Hopper		4.67	0.84	1.60	0.17	0.17	0.03	0.36	0.07				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge	17.57				0.82						1.26	0.03	0.08
8	Mitigation														
	YEAR 2015 TOTAL		**17.57**	**9.69**	**1.74**	**3.31**	**1.17**	**0.36**	**0.07**	**0.75**	**0.15**		**1.26**	**0.03**	**0.08**

Table C-10. Marine Equipment VOC Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

VOC (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.13	0.02	0.04	0.03	0.01	0.01	0.03	0.01				
	Part of Outer Bar	Generic Large Hopper		0.37	0.07	0.13	0.09	0.04	0.02	0.07	0.04				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			**0.50**	**0.09**	**0.17**	**0.12**	**0.05**	**0.02**	**0.10**	**0.05**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.52	0.09	0.18	0.12	0.05	0.02	0.10	0.05				
	Part of Outer Bar	Generic Large Hopper		1.46	0.27	0.51	0.35	0.14	0.07	0.30	0.15				
2	Outer Bar	Generic Large Hopper		0.64	0.11	0.22	0.15	0.06	0.03	0.13	0.06				
	Jetty Channel	Generic Large Hopper		0.59	0.11	0.20	0.14	0.06	0.03	0.12	0.06				
3	Lower TB	30" Dredge	0.43				0.06								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	0.62				0.19						0.12	0.00	0.01
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**1.05**	**3.22**	**0.58**	**1.10**	**1.00**	**0.31**	**0.15**	**0.65**	**0.32**		**0.12**	**0.00**	**0.01**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.43	0.08	0.15	0.10	0.04	0.02	0.09	0.04				
	Part of Outer Bar	Generic Large Hopper		1.24	0.22	0.42	0.29	0.12	0.06	0.25	0.12				
2	Outer Bar	Generic Large Hopper		1.09	0.20	0.37	0.26	0.11	0.05	0.22	0.11				
	Jetty Channel	Generic Large Hopper		1.01	0.18	0.35	0.24	0.10	0.05	0.21	0.10				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	0.83				0.25						0.16	0.00	0.01
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	0.20				0.06						0.04	0.00	0.00
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**1.03**	**3.77**	**0.68**	**1.29**	**1.20**	**0.36**	**0.18**	**0.77**	**0.37**		**0.19**	**0.01**	**0.01**

Table C-10. Marine Equipment VOC Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

VOC (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		1.09	0.20	0.37	0.26	0.11	0.05	0.22	0.11				
	Jetty Channel	Generic Large Hopper		1.01	0.18	0.35	0.24	0.10	0.05	0.21	0.10				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	0.76				0.23						0.14	0.00	0.01
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	0.99				0.30						0.19	0.01	0.01
7	Stauffer Channel	30" Dredge	0.61				0.18						0.11	0.00	0.01
8	Mitigation														
	YEAR 2014 TOTAL		**2.35**	**2.11**	**0.38**	**0.72**	**1.20**	**0.20**	**0.10**	**0.43**	**0.21**		**0.44**	**0.01**	**0.03**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		0.27	0.05	0.09	0.06	0.03	0.01	0.05	0.03				
	Jetty Channel	Generic Large Hopper		0.25	0.04	0.09	0.06	0.02	0.01	0.05	0.02				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge	0.94				0.28						0.18	0.00	0.01
8	Mitigation														
	YEAR 2015 TOTAL		**0.94**	**0.52**	**0.09**	**0.18**	**0.40**	**0.05**	**0.02**	**0.10**	**0.05**		**0.18**	**0.00**	**0.01**

Table C-11. Summary of Marine Equipment Emissions (tpy)
Freeport Harbor Channel Improvement Project
LPP Alternative

YEAR 2011

Contract No.	Location/Disposal Site	Dredge	CO	NO_x	PM	$PM_{2.5}$	PM_{10}	SO_2	VOC
1	New Extension	Generic Large Hopper	2.8	24.7	0.6	0.6	0.6	4.1	0.3
	Part of Outer Bar	Generic Large Hopper	8.0	70.7	1.8	1.6	1.7	11.7	0.8
2	Outer Bar	Generic Large Hopper							
	Jetty Channel	Generic Large Hopper							
3	Lower TB	30" Dredge							
4	Real Estate								
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge							
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge							
7	Stauffer Channel	30" Dredge							
8	Mitigation								
	YEAR 2011 TOTAL		**10.7**	**95.4**	**2.4**	**2.2**	**2.3**	**15.8**	**1.1**

YEAR 2012

Contract No.	Location/Disposal Site	Dredge	CO	NO_x	PM	$PM_{2.5}$	PM_{10}	SO_2	VOC
1	New Extension	Generic Large Hopper	11.2	99.1	2.5	2.2	2.4	16.4	1.1
	Part of Outer Bar	Generic Large Hopper	32.0	283.9	7.1	6.4	6.8	47.1	3.3
2	Outer Bar	Generic Large Hopper	13.7	121.9	3.0	2.8	2.9	20.2	1.4
	Jetty Channel	Generic Large Hopper	12.8	113.4	2.8	2.6	2.7	18.8	1.3
3	Lower TB	30" Dredge	5.1	49.8	1.2	1.1	1.2	8.2	0.5
4	Real Estate								
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	9.1	79.2	2.0	1.8	1.9	13.1	0.9
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge							
7	Stauffer Channel	30" Dredge							
8	Mitigation								
	YEAR 2012 TOTAL		**83.8**	**747.3**	**18.6**	**16.9**	**17.9**	**123.8**	**8.5**

YEAR 2013

Contract No.	Location/Disposal Site	Dredge	CO	NO_x	PM	$PM_{2.5}$	PM_{10}	SO_2	VOC
1	New Extension	Generic Large Hopper	9.3	82.7	2.1	1.9	2.0	13.7	0.9
	Part of Outer Bar	Generic Large Hopper	26.7	237.2	5.9	5.4	5.7	39.3	2.7
2	Outer Bar	Generic Large Hopper	23.6	209.3	5.2	4.7	5.0	34.7	2.4
	Jetty Channel	Generic Large Hopper	21.9	194.7	4.8	4.4	4.7	32.3	2.2
3	Lower TB	30" Dredge							
4	Real Estate								
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	12.1	105.5	2.6	2.4	2.5	17.5	1.2
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	2.9	25.8	0.6	0.6	0.6	4.3	0.3
7	Stauffer Channel	30" Dredge							
8	Mitigation								
	YEAR 2013 TOTAL		**96.5**	**855.2**	**21.3**	**19.4**	**20.4**	**141.7**	**9.9**

Table C-11. Summary of Marine Equipment Emissions (tpy)
Freeport Harbor Channel Improvement Project
LPP Alternative

YEAR 2014

Contract No.	Location/Disposal Site	Dredge	CO	NO_x	PM	$PM_{2.5}$	PM_{10}	SO_2	VOC
1	New Extension	Generic Large Hopper							
	Part of Outer Bar	Generic Large Hopper							
2	Outer Bar	Generic Large Hopper	23.6	209.3	5.2	4.7	5.0	34.7	2.4
	Jetty Channel	Generic Large Hopper	21.9	194.7	4.8	4.4	4.7	32.3	2.2
3	Lower TB	30" Dredge							
4	Real Estate								
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	11.0	96.2	2.4	2.2	2.3	16.0	1.1
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	14.4	126.2	3.1	2.9	3.0	20.9	1.5
7	Stauffer Channel	30" Dredge	8.8	77.3	1.9	1.8	1.8	12.8	0.9
8	Mitigation								
	YEAR 2014 TOTAL		**79.8**	**703.7**	**17.5**	**15.9**	**16.8**	**116.7**	**8.2**

YEAR 2015

Contract No.	Location/Disposal Site	Dredge	CO	NO_x	PM	$PM_{2.5}$	PM_{10}	SO_2	VOC
1	New Extension	Generic Large Hopper							
	Part of Outer Bar	Generic Large Hopper							
2	Outer Bar	Generic Large Hopper	5.8	51.3	1.3	1.2	1.2	8.5	0.6
	Jetty Channel	Generic Large Hopper	5.4	47.7	1.2	1.1	1.1	7.9	0.5
3	Lower TB	30" Dredge							
4	Real Estate								
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge							
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge							
7	Stauffer Channel	30" Dredge	13.6	119.2	3.0	2.7	2.9	19.8	1.4
8	Mitigation								
	YEAR 2015 TOTAL		**24.8**	**218.3**	**5.4**	**4.9**	**5.2**	**36.2**	**2.5**

TOTAL

Contract No.	Location/Disposal Site	Dredge	CO	NO_x	PM	$PM_{2.5}$	PM_{10}	SO_2	VOC
1	New Extension	Generic Large Hopper	23.3	206.5	5.1	4.7	4.9	34.2	2.4
	Part of Outer Bar	Generic Large Hopper	66.7	591.8	14.7	13.4	14.1	98.1	6.8
2	Outer Bar	Generic Large Hopper	66.7	591.8	14.7	13.4	14.1	98.1	6.8
	Jetty Channel	Generic Large Hopper	62.0	550.5	13.7	12.5	13.2	91.2	6.3
3	Lower TB	30" Dredge	5.1	49.8	1.2	1.1	1.2	8.2	0.5
4	Real Estate								
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	32.1	281.0	7.0	6.4	6.7	46.6	3.3
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	17.4	152.0	3.8	3.4	3.6	25.2	1.8
7	Stauffer Channel	30" Dredge	22.5	196.5	4.9	4.5	4.7	32.6	2.3
8	Mitigation								
	PROJECT TOTAL		**295.7**	**2,619.9**	**65.2**	**59.4**	**62.6**	**434.2**	**30.2**

Table C-12. Annual Marine Equipment Emissions (tpy)
Freeport Harbor Channel Improvement Project
LPP Alternative

	CO	NO_X	$PM_{2.5}$	PM_{10}	SO_2	VOC
Year 2011	10.74	95.38	2.16	2.28	15.81	1.09
Year 2012	83.82	747.30	16.93	17.86	123.83	8.52
Year 2013	96.54	855.17	19.38	20.44	141.75	9.86
Year 2014	79.77	703.71	15.95	16.83	116.67	8.18
Year 2015	24.79	218.29	4.95	5.22	36.19	2.55

Table D-1. Total Estimated Project Emissions by Year of Construction Activity

Construction Equipment Emission Factors
Freeport Harbor Channel Improvement Project
LPP Alternative

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)					
					NO_x	VOC	PM_{10}	PM2.5	CO	SO_2
Contract 5: Ch to Brz thr Brzpt TB & PA 8										
EP H25HJ005 HYD EXCAV, CRWLR, 97,870 LBS, 3.14 CY BKT	Crawler Tractor/Dozers	Diesel	300	59%	3.585981	0.2781069	0.2942914	0.2854627	1.2374105	0.7502724
EP T45XX021 TRUCK TRAILER, LOWBOY, 55 TON, 4 AXLE	Truck Trailer	--	0	0%	0	0	0	0	0	0
EP T55FO019 TRK,HWY, 43,000 GVW, 6X4, 3 AXLE	Highway Truck	Diesel	230	59%	3.72916299	0.28578955	0.3016065	0.2925583	1.2615169	0.7502354
EP T50XX011 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP 4X4	Highway Truck	Diesel	230	59%	3.72916299	0.28578955	0.3016065	0.2925583	1.2615169	0.7502354
GEN B2021000 BRUSH CHIPPER, 22" (559 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	Chippers/Stump Grinders	Diesel	850	43%	5.20855505	0.34804529	0.4103982	0.3980863	2.9595816	0.7499748
GEN B35Z1140 BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Dragline	Diesel	350	59%	6.21518222	0.39550596	0.3994855	0.3875009	2.5667446	0.7499005
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%	0.90999985	62.8079254	9.74818783	8.968342	348.86535	0.14019109
GEN C75ZZ200 CRANE, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 40 TON (36 MT), 64' (25.6 M) BOOM, 4X4	Cranes	Diesel	173	43%	4.08915543	0.26778822	0.23578859	0.23259494	0.87623862	0.7421074
GEN H25Z3185 HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23.3' (7.1 M) MAX DIGGING DEPTH	Excavators	Diesel	238	59%	3.37737562	0.26641856	0.29606228	0.27746042	1.22240239	0.75032198
GEN L40Z0399 LOADER, FRONT END, WHEEL, ARTICULATED, 2.75 CY (2.1 M3) BUCKET, 4X4.	Tractor/Loader/Backhoe	Diesel	130	21%	6.2436293	1.05756613	0.7586622	0.7359024	4.0710716	0.8725374
GEN L60ZA760 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	Log Skidder	Diesel	119	59%	4.4487882	0.39614776	0.4010053	0.3889752	1.7124951	0.7498978
GEN L60ZA800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	Log Skidder	Diesel	200	59%	4.2682812	0.32863763	0.334577	0.3245397	1.4639283	0.7505579
GEN T15Z6440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	100	59%	3.7592742	0.31219032	0.3742502	0.3630227	1.4566405	0.7501273
GEN T15Z6460 TRACTOR, CRAWLER (DOZER), 101-135 HP (75-101 KW), POWERSHIFT, W/ UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	135	59%	3.7592742	0.31219032	0.3742502	0.3630227	1.4566405	0.7501273
GEN T15Z6520 TRACTOR, CRAWLER (DOZER), 181-250 HP (135-186 KW), POWERSHIFT, LGP, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	250	59%	3.585981	0.2781069	0.2942914	0.2854627	1.2374105	0.7502724
GEN T40Z7660 TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Highway Truck	Diesel	230	59%	3.72916299	0.28578955	0.3016065	0.2925583	1.2615169	0.7502354
GEN T45Z7280 TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	Highway Truck	Diesel	210	59%	3.72916299	0.28578955	0.3016065	0.2925583	1.2615169	0.7502354
GEN T50Z7420 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	Diesel	230	59%	3.72916299	0.28578955	0.3016065	0.2925583	1.2615169	0.7502354
GEN T50Z7520 TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	Diesel	310	59%	4.37321137	0.23863621	0.308081	0.2988385	1.9281148	0.7503568
MAP C85MA001 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	Cranes	Diesel	350	43%	4.94820027	0.29176438	0.26905162	0.26026035	1.36492453	0.7421209
MAP L15P0001 LANDSCAPING EQUIPMENT, 3,000 GAL, HYDROSEEDER, TRUCK MTD (INCLUDES 50,000 GVW TRUCK)	Highway Truck	Diesel	310	59%	4.37321137	0.23863621	0.308081	0.2988385	1.9281148	0.7503568

Table D-1. Total Estimated Project Emissions by Year of Construction Activity

Construction Equipment Emission Factors
Freeport Harbor Channel Improvement Project
LPP Alternative

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)					
					NO_x	VOC	PM_{10}	PM2.5	CO	SO_2
Contract 6: Ch to UTB thr UTB & PA 9										
EP H25HJ005 HYD EXCAV, CRWLR, 97,870 LBS, 3.14 CY BKT	Crawler Tractor/Dozers	Diesel	300	59%	3.585981	0.2781069	0.2942914	0.2854527	1.2374105	0.7502724
EP T45XX021 TRUCK TRAILER, LOWBOY, 90 TON, 4 AXLE (ADD TOWING TRUCK)	Truck Trailer	–	0	0%	0	0	0	0	0	0
EP T50FD019 TRK,HWY, 43,000 GVW, 6X4, 3 AXLE	Highway Truck	Diesel	230	59%	3.72916299	0.28678655	0.3016065	0.2925583	1.2615169	0.7502354
EP T50XX011 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP, 4X4	Highway Truck	Diesel	230	59%	3.72916299	0.28678655	0.3016065	0.2925583	1.2615169	0.7502354
GEN B20Z1000 BRUSH CHIPPER, 22" (559 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	Chippers/Stump Grinders	Diesel	650	43%	5.20855052	0.34804929	0.4103982	0.3980863	2.9595816	0.7499748
GEN B35Z1140 BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Dragline	Diesel	350	59%	5.21918222	0.36560586	0.3994855	0.3875009	2.5867446	0.7499005
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	5	78%	0.80999985	62.8079254	9.74819783	8.968342	348.86535	0.14019169
GEN C75Z2200 CRANE, HYDRAULIC, SELF PROPELLED, ROUGH TERRAIN, 40 TON (36 MT), 84' (25.6 M) BOOM, 4X4	Cranes	Diesel	250	43%	4.08915543	0.28718822	0.23978859	0.23259494	0.67923882	0.7421074
GEN H05Z5185 HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23.3' (7.1 M) MAX. DIGGING DEPTH	Excavators	Diesel	238	59%	3.97737962	0.28641835	0.28590028	0.27748042	1.22240239	0.75032198
GEN L40Z4395 LOADER, FRONT END, WHEEL, ARTICULATED, 2.75 CY (2.1 M3) BUCKET, 4X4	Tractor/Loader/Backhoe	Diesel	130	21%	6.2439293	1.05795813	0.7585622	0.7359024	4.0710716	0.8725374
GEN L80Z4760 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	Log Skidder	Diesel	119	59%	4.4487682	0.36814778	0.4010053	0.3889752	1.7124951	0.7498978
GEN L80Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	Log Skidder	Diesel	200	59%	4.2682812	0.32853763	0.334577	0.3245397	1.4639283	0.7500579
GEN T15Z8440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	100	59%	3.7592742	0.31219032	0.3742502	0.3630227	1.4568405	0.7501273
GEN L80Z4760 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	Log Skidder	Diesel	119	59%	4.4487682	0.36814778	0.4010053	0.3889752	1.7124951	0.7498978
GEN L80Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	Log Skidder	Diesel	200	59%	4.2682812	0.32853763	0.334577	0.3245397	1.4639283	0.7500579
GEN T15Z8440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	100	59%	3.7592742	0.31219032	0.3742502	0.3630227	1.4568405	0.7501273
GEN T45Z7280 TRUCK TRAILER, WATER TANKER, 9,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	Highway Truck	Diesel	210	59%	3.72916299	0.28678655	0.3016065	0.2925583	1.2615169	0.7502354
GEN T50Z7520 TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	Diesel	310	59%	4.3732137	0.33693021	0.306081	0.2988385	1.9281148	0.7503568
GEN T50Z7700 DUMP TRUCK, HIGHWAY, 10 - 13 CY (7.6 - 9.9 M3) DUMP BODY, 35,000 LBS (15,900 KG) GVW, 2 AXLE, 4X2	Highway Truck	Diesel	205	59%	3.72916299	0.28678655	0.3016065	0.2925583	1.2615169	0.7502354
MAP C85MA001 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	Cranes	Diesel	350	43%	4.94652027	0.29178438	0.28905152	0.26098036	1.36492453	0.74211209
UPB T15CA004 DOZER,CRWLR, D-4H,PS (ADD BLADE)	Crawler Dozers/Tractor	Diesel	80	59%	4.3723798	0.41905964	0.5820331	0.5645721	3.5845662	0.8327177
UPB T40XX006 REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)		–	0	0%						
UPB T50KE003 TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	Highway Truck	Diesel	230	59%	3.72916299	0.28678655	0.3016065	0.2925583	1.2615169	0.7502354

Table D-2. Total Estimated Project Emissions by Year of Construction Activity

SCC Code	Equipment	Load Factor[1] Diesel	Load Factor[1] Gasoline
22xx003010	Aerial Lifts	21%	46%
22xx005015	Agricultural Tractor	59%	62%
22xx006015	Air Compressors	43%	56%
22xx001030	All Terrain Vehicles	42%	100%
22xx002033	Bore/Drill Rigs	43%	79%
22xx002042	Cement & Motar Mixers	43%	59%
22xx004066	Chippers/Stump Grinders	43%	78%
22xx002039	Concrete/Industrial Saws	59%	78%
22xx002045	Cranes	43%	47%
22xx002066	Crawler Dozers/Tractor	59%	80%
22xx002054	Crushing/Procesing Equipment	43%	85%
22xx002078	Dumpers/Tenders	21%	41%
22xx002036	Excavators	59%	53%
22xx007015	Fellers/Bunchers/Skidders	59%	70%
22xx003020	Forklifts	59%	30%
22xx006020	Gas Compressors	43%	85%
22xx006005	Generator Sets	43%	68%
22xx002048	Graders	59%	64%
22xx005050	Hydro Power Units	43%	56%
22xx004056	Lawn and Garden Tractor	43%	44%
22xx002051	Off-Highway Truck	59%	80%
22xx002075	Off-Highway Tractor	59%	70%
22xx004056	Other Agricultural Equipment	59%	55%
22xx002081	Other Construction Equipment	59%	48%
22xx003040	Other General Industrial	43%	54%
22xx003050	Other Material Handling	21%	53%
22xx002003	Pavers	59%	66%
22xx002021	Paving Equipment	59%	59%
22xx002009	Plate Compactors	43%	55%
22xx006030	Pressure Washer	43%	85%
22xx006010	Pumps	43%	69%
22xx003060	Refrigeration/AC	43%	46%
22xx002015	Rollers	59%	62%
22xx002057	Rough Terrain Forklifts	59%	63%
22xx002063	Rubber Tire Dozer	59%	75%
22xx002060	Rubber Tire Loader	59%	71%
22xx002018	Scrapers	59%	70%
22xx002072	Skid Steer Loader	21%	58%
22xx001060	Specialty Vehicle/Carts	21%	58%
22xx002024	Surfacing Equipment	59%	49%
22xx003030	Sweepers/Scrubbers	43%	71%
22xx002006	Tampers/Rammers	43%	55%
22xx003070	Terminal Tractors	59%	78%
22xx005040	Tillers > 6 hp	59%	71%
22xx004026	Timmer/Edger/Brush Cutter	43%	91%
22xx002066	Tractor/Loader/Backhoe	21%	48%
22xx002030	Trenchers	59%	66%
22xx006025	Welders	21%	68%

1. Load Factors from Appendix A of *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, EPA Office of Air and Radiation Report Number NR-005b, December 2002

Table D-3. Total Estimated Project Emissions by Year of Construction Activity

Freeport Harbor Channel Improvement Project
LPP Alternative

Hrs/Day:	10
Day/Week:	5
Week/Mon:	4.5
Month/Yea	12
Hours/Yea	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	NOx Emissions (tons per year)			VOC Emissions (tons per year)			PM10 Emissions (tons per year)			PM2.5 Emissions (tons per year)			CO Emissions (tons per year)			SO2 Emissions (tons per year)		
				2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014
Contract 5: Ch to Brz thr Brzpt TB & PA 8			8																		
EP H25HU005 HYD EXCAV, CRWLR, 97,970 LBS, 3.14 CY BKT	1	24	8	0.0189	0.0252	0.0042	0.0015	0.0020	0.0003	0.0016	0.0021	0.0003	0.0015	0.0020	0.0003	0.0065	0.0087	0.0014	0.0040	0.0053	0.0009
EP T45XX021 TRUCK TRAILER, LOWBOY, 90 TON, 4 AXLE	1	24	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EP T50FC019 TRK,HWY, 43,000 GVW, 6X4, 3 AXLE	1	24	8	0.0151	0.0201	0.0033	0.0012	0.0015	0.0003	0.0012	0.0016	0.0003	0.0012	0.0016	0.0003	0.0051	0.0068	0.0011	0.0030	0.0040	0.0007
EP T50XX011 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP, 4X4	1	1,136	8	0.7129	0.9505	0.1584	0.0548	0.0731	0.0122	0.0577	0.0769	0.0128	0.0559	0.0746	0.0124	0.2412	0.3216	0.0536	0.1434	0.1912	0.0319
GEN B20Z1000 BRUSH CHIPPER, 22" (559 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	1	183	8	0.3304	0.4405	0.0734	0.0221	0.0294	0.0049	0.0260	0.0347	0.0058	0.0253	0.0337	0.0056	0.1877	0.2503	0.0417	0.0476	0.0634	0.0106
GEN B35Z1140 BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1	6,651	8	6.8825	11.8433	1.9739	0.6225	0.8300	0.1383	0.6804	0.9072	0.1512	0.6600	0.8800	0.1467	4.3717	5.8289	0.9715	1.2772	1.7030	0.2838
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	183	8	0.0010	0.0013	0.0002	0.0667	0.0889	0.0148	0.0104	0.0138	0.0023	0.0095	0.0127	0.0021	0.3705	0.4940	0.0823	0.0001	0.0002	0.0000
GEN C75Z2200 CRANE, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 40 TON (36 MT), 84' (25.6 M) BOOM,	1	24	8	0.0091	0.0121	0.0020	0.0006	0.0008	0.0001	0.0005	0.0007	0.0001	0.0005	0.0007	0.0001	0.0019	0.0026	0.0004	0.0016	0.0022	0.0004
GEN H25Z3185 HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23.3' (7.1 M) MAX DIGGING DEPTH	1	24	8	0.0141	0.0188	0.0031	0.0011	0.0015	0.0002	0.0012	0.0016	0.0003	0.0012	0.0015	0.0003	0.0051	0.0068	0.0011	0.0031	0.0042	0.0007
GEN L40Z4395 LOADER, FRONT END, WHEEL, ARTICULATED, 2.75 CY (2.1 M3) BUCKET, 4X4	1	313	8	0.0864	0.0885	0.0148	0.0112	0.0150	0.0025	0.0081	0.0108	0.0018	0.0078	0.0104	0.0017	0.0433	0.0577	0.0096	0.0093	0.0124	0.0021
GEN L60Z4760 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	1	366	8	0.1418	0.1890	0.0315	0.0117	0.0156	0.0026	0.0128	0.0170	0.0028	0.0124	0.0165	0.0028	0.0546	0.0728	0.0121	0.0239	0.0319	0.0053
GEN L60Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	1	366	8	0.2286	0.3048	0.0508	0.0178	0.0235	0.0039	0.0179	0.0239	0.0040	0.0174	0.0232	0.0039	0.0784	0.1045	0.0174	0.0402	0.0536	0.0089
GEN T15Z5440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	183	8	0.0503	0.0671	0.0112	0.0042	0.0056	0.0009	0.0050	0.0067	0.0011	0.0049	0.0065	0.0011	0.0195	0.0260	0.0043	0.0100	0.0134	0.0022
GEN T15Z6480 TRACTOR, CRAWLER (DOZER), 101-135 HP (75-101 KW), POWERSHIFT, W/ UNIVERSAL BLADE	1	64	8	0.0238	0.0317	0.0053	0.0020	0.0026	0.0004	0.0024	0.0032	0.0005	0.0023	0.0031	0.0005	0.0092	0.0123	0.0020	0.0047	0.0063	0.0011
GEN T15Z6520 TRACTOR, CRAWLER (DOZER), 181-250 HP (135-186 KW), POWERSHIFT, LGP, W/UNIVERSAL	1	4,014	8	2.8329	3.5106	0.5851	0.2042	0.2723	0.0454	0.2161	0.2881	0.0480	0.2096	0.2795	0.0466	0.9085	1.2114	0.2019	0.5509	0.7345	0.1224
GEN T40Z7090 TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1	24	8	0.0151	0.0201	0.0033	0.0012	0.0015	0.0003	0.0012	0.0016	0.0003	0.0012	0.0016	0.0003	0.0051	0.0068	0.0011	0.0030	0.0040	0.0007
GEN T45Z7280 TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	1	10	8	0.0057	0.0076	0.0013	0.0004	0.0006	0.0001	0.0005	0.0006	0.0001	0.0004	0.0006	0.0001	0.0019	0.0026	0.0004	0.0012	0.0015	0.0003
GEN T50Z7420 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	85	8	0.0533	0.0711	0.0119	0.0041	0.0055	0.0009	0.0043	0.0058	0.0010	0.0042	0.0056	0.0009	0.0180	0.0241	0.0040	0.0107	0.0143	0.0024
GEN T50Z7520 TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	10	8	0.0099	0.0132	0.0022	0.0005	0.0007	0.0001	0.0007	0.0009	0.0002	0.0007	0.0009	0.0002	0.0044	0.0058	0.0010	0.0017	0.0023	0.0004
MAP C85MA001 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM	1	6,651	8	6.1403	8.1871	1.3645	0.3622	0.4829	0.0805	0.3340	0.4453	0.0742	0.3240	0.4319	0.0720	1.6943	2.2591	0.3766	0.9212	1.2283	0.2047
MAP L15F0001 LANDSCAPING EQUIPMENT, 3,000 GAL, HYDROSEEDER, TRUCK MTD (INCLUDES 56,000 GVW	1	61	8	0.0505	0.0807	0.0134	0.0033	0.0044	0.0007	0.0043	0.0057	0.0009	0.0041	0.0055	0.0009	0.0267	0.0356	0.0059	0.0104	0.0139	0.0023

Table D-3. Total Estimated Project Emissions by Year of Construction Activity

Freeport Harbor Channel Improvement Project
LPP Alternative

Hrs/Day:	10
Day/Week:	5
Week/Mon	4.5
Month/Yea	12
Hours/Yea	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	NOx Emissions (tons per year)			VOC Emissions (tons per year)			PM10 Emissions (tons per year)			PM2.5 Emissions (tons per year)			CO Emissions (tons per year)			SO2 Emissions (tons per year)		
				2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014
Contract 6: Ch to UTB thr UTB & PA 9			4																		
EP H25HU005 HYD EXCAV, CRWLR, 97,970 LBS, 3.14 CY BKT	1	24	4			0.0188			0.0013			0.0014			0.0013			0.0056			0.0035
EP T45XX021 TRUCK TRAILER, LOWBOY, 90 TON, 4 AXLE (ADD TOWING TRUCK)	1	24	4			-			-			-			-			-			-
EP T50FC019 TRK,HWY, 43,000 GVW, 6X4, 3 AXLE	1	24	4			0.0134			0.0010			0.0011			0.0011			0.0045			0.0027
EP T50XX011 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP, 4X4	1	1,173	4			0.6543			0.0503			0.0529			0.0513			0.2213			0.1316
GEN B2Z1000 BRUSH CHIPPER, 22" (559 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	1	191	4			0.3085			0.0205			0.0242			0.0234			0.1742			0.0441
GEN B3SZ1140 BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1	6,868	4			8.1532			0.5714			0.6245			0.6058			4.0127			1.1724
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	191	4			0.0009			0.0619			0.0096			0.0088			0.3438			0.0001
GEN C75Z2200 CRANE, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 40 TON (36 MT), 84' (25.6 M) BOOM,	1	24	4			0.0116			0.0008			0.0007			0.0007			0.0025			0.0021
GEN H25Z3185 HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23.3' (7.1	1	24	4			0.0125			0.0010			0.0011			0.0010			0.0045			0.0028
GEN L40Z4395 LOADER, FRONT END, WHEEL, ARTICULATED, 2.75 CY (2.1 M3) BUCKET, 4X4,	1	381	4			0.0716			0.0121			0.0087			0.0084			0.0467			0.0100
GEN L60Z4790 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	1	383	4			0.1319			0.0109			0.0119			0.0115			0.0508			0.0222
GEN L80Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	1	383	4			0.2128			0.0164			0.0167			0.0162			0.0729			0.0374
GEN T1526440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	191	4			0.0467			0.0039			0.0046			0.0045			0.0181			0.0093
GEN L80Z4790 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	1	45	4			0.0155			0.0013			0.0014			0.0014			0.0060			0.0026
GEN L80Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	1	45	4			0.0250			0.0019			0.0020			0.0019			0.0086			0.0044
GEN T1526440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	25	4			0.0061			0.0005			0.0006			0.0006			0.0024			0.0012
GEN T4527280 TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	1	73	4			0.0372			0.0029			0.0030			0.0029			0.0126			0.0075
GEN T5027520 TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	73	4			0.0644			0.0035			0.0045			0.0044			0.0284			0.0110
GEN T5027700 DUMP TRUCK, HIGHWAY, 10 - 13 CY (7.6 - 9.9 M3) DUMP BODY, 35,000 LBS (15,900 KG) GVW, 2	1	120	4			0.0597			0.0046			0.0048			0.0047			0.0202			0.0120
MAP C85MA001 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM	1	45	4			0.0369			0.0022			0.0020			0.0019			0.0102			0.0055
UPB T15CA004 DOZER,CWLR, D-4H,PS (ADD BLADE)	1	80	4			0.0182			0.0017			0.0024			0.0023			0.0162			0.0035
UPB T40XX009 REAR DUMP BODY, 6.0CY (ADD 30,000 GVW TRUCK)	1	80	4			-			-			-			-			-			-
UPB T50KE003 TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	1	40	4			0.0223			0.0017			0.0018			0.0018			0.0075			0.0045
TOTALS				**19.41**	**25.88**	**14.23**	**1.39**	**1.86**	**1.08**	**1.39**	**1.85**	**1.09**	**1.34**	**1.79**	**1.05**	**8.05**	**10.74**	**6.86**	**3.07**	**4.09**	**2.17**

Table D-4. Total Estimated Project Emissions by Year of Construction Activity
Freeport Harbor Channel Improvement Project
LPP Alternative

	2012	2013	2014
NO_x	19.41	25.88	14.23
VOC	1.39	1.86	1.08
PM_{10}	1.39	1.85	1.09
$PM_{2.5}$	1.34	1.79	1.05
CO	8.05	10.74	6.86
SO_2	3.07	4.09	2.17

Table E-1. Crew Size per Equipment
Freeport Harbor Channel Improvement Project
LPP Alternative

	Hopper Dredge		Cutterhead Dredge		
	Hopper Dredge Crew	Shore Crew	Cutterhead Dredge Crew	Shore Crew	Other Construction Equipment
Employees	22	8	46	6	6

Table E-2. Emission Factors for Employee Vehicles
Freeport Harbor Channel Improvement Project

County	Type of Vehicle	EPA Category[1]	Emisson Factor (g/mile)					
			CO[2]	NOx[2]	PM2.5[3]	PM10[3]	SO2[3]	VOC[2]
Brazoria	Cars	LDGV	6.8379	0.5163	0.0114	0.0249	0.0068	0.6596
	Pickups	LDGT1	7.3724	0.5176	0.0116	0.0252	0.0088	0.6988

Notes:
1. LDGV=light duty gasoline-fueled vehicles designated for transport of up to 12 people
LDGT1=light duty gasoline-fueled trucks with a gross vehicle weight (GVW) rating of 6000 pounds or less
2. Emission factors for CO, NOx, and VOC are from MOBILE6.2 run using Brazoria County input file, "30aug2007brazi1a0", which can be found on the TCEQ FTP site: ftp://ftp.tnrcc.state.tx.us/pub/OEPAA/TAD/Modeling/Mobile_EI/HGB/m62/2007/.
3. Emission factors for $PM_{2.5}$, PM_{10}, and SO_2 are from MOBILE6.2 run using Statewide PM1 and PM2 input files, "2007_wk_pm1_d13c5r4ihu.in" and "2007_wk_pm2_d13c5r4ihu.in", which can be found on the TCEQ FTP site: ftp://ftp.tnrcc.state.tx.us/pub/OEPAA/TAD/Modeling/Mobile_EI/Statewide/m62/2007/.

Table E-3. Summary of Employee Vehicles Emissions (tpy)
Freeport Harbor Channel Improvement Project
LPP Alternative

Project Year	Type of Vehicle	EPA Category	Daily Vehicles (/day)	Total (VMT)	Travel Days (days/yr)	Annual Travel (VMT/yr)	Annual Emissions (tpy)					
							CO	NO_x	$PM_{2.5}$	PM_{10}	SO_2	VOC
2011	Cars	LDGV	15	50.0	130	97,500	0.7349	0.0555	0.0012	0.0027	0.0007	0.0709
	Pickups	LDGT1	15	50.0	130	97,500	0.7923	0.0556	0.0012	0.0027	0.0009	0.0751
						2011 Total Mobile Emission	**1.527**	**0.111**	**0.0025**	**0.0054**	**0.0017**	**0.146**
2012	Cars	LDGV	138	50.0	718	4,954,200	37.3416	2.8195	0.0623	0.1360	0.0371	3.6021
	Pickups	LDGT1	138	50.0	718	4,954,200	40.2605	2.8266	0.0633	0.1376	0.0481	3.8161
						2012 Total Mobile Emission	**77.602**	**5.646**	**0.1256**	**0.2736**	**0.0852**	**7.418**
2013	Cars	LDGV	56	50.0	762	2,133,600	16.0817	1.2143	0.0268	0.0586	0.0160	1.5513
	Pickups	LDGT1	56	50.0	762	2,133,600	17.3388	1.2173	0.0273	0.0593	0.0207	1.6435
						2013 Total Mobile Emission	**33.421**	**2.432**	**0.0541**	**0.1178**	**0.0367**	**3.195**
2014	Cars	LDGV	67	50.0	760	2,546,000	19.1901	1.4490	0.0320	0.0699	0.0191	1.8511
	Pickups	LDGT1	67	50.0	760	2,546,000	20.6902	1.4526	0.0326	0.0707	0.0247	1.9611
						2014 Total Mobile Emission	**39.880**	**2.902**	**0.0645**	**0.1406**	**0.0438**	**3.812**
2015	Cars	LDGV	56	50.0	281	786,800	5.9304	0.4478	0.0099	0.0216	0.0059	0.5721
	Pickups	LDGT1	56	50.0	281	786,800	6.3940	0.4489	0.0101	0.0219	0.0076	0.6061
						2015 Total Mobile Emission	**12.324**	**0.897**	**0.0199**	**0.0435**	**0.0135**	**1.178**

Notes:
1. Total VMT is assumed to be 50 miles/day round trip.
2. Annual travel = Daily vehicles * Total VMT * Travel days/yr.
3. Annual emissions = Emission factor * Annual travel * 1lb/453.6 grams * 1ton/2000lb

Table E-4. Annual Employee Vehicle Emissions (tpy)
Freeport Harbor Channel Improvement Project
LPP Alternative

Year	CO	NO_x	$PM_{2.5}$	PM_{10}	SO_2	VOC
Year 2011	1.53	0.11	0.002	0.005	0.002	0.146
Year 2012	77.60	5.65	0.13	0.27	0.09	7.42
Year 2013	33.42	2.43	0.05	0.12	0.04	3.19
Year 2014	39.88	2.90	0.06	0.14	0.04	3.81
Year 2015	12.32	0.90	0.02	0.04	0.01	1.18

Table F-1. LPP Alternative - Additional Maintenance Dredging - Assumptions for Marine Equipment Engines
Freeport Harbor Channel Improvement Project
Additional 1,280,000 cy/yr Maintenance Dredging

Activity	Equipment Type	Quantity	Total Installed Power (hp)	Engine Type	Engine Fuel Type	Engine Load Factor	Engine Horsepower (hp)	Hours of Operation per Day (hrs/day)	Daily Engine Usage (%)	Total Days of Operation (days)	Total Engine Hours of Operation (hrs)
Additional 1,280,000 cy/yr Maintenance Dredging	Hopper Dredge	1	14,000	Propulsion - Oceangoing	Diesel	0.8	9,000	20	65%	32	416
				Propulsion - Dredging	Diesel	0.8	9,000	20	35%	32	224
				Dredge Pump(s)	Diesel	0.8	3,000	20	35%	32	224
				Auxiliary - Oceangoing	Diesel	0.8	2,000	20	65%	32	416
				Auxiliary - Idling	Diesel	0.8	2,000	20	35%	32	224
	Survey Boat	1	2,000	Propulsion	Diesel	0.4	2,000	20	100%	6	128
				Auxiliary	Diesel	0.2	2,000	20	100%	6	128
	Shrimp Boat (Turtle Trawl)	2	600	Propulsion	Diesel	0.4	600	24	100%	22	1,075
				Auxiliary	Diesel	0.2	600	24	100%	22	1,075
Total Engine Hours											3,910

Notes:
1. Days of operation are determined assuming 40,000 CY/day production rate for a hopper dredge removing unconsolidated, predominantly silty dredged material.

Table F-2. LPP Alternative - Additional Mainenance Dredging - Marine Equipment Hours of Operation
Freeport Harbor Channel Improvement Project
Additional 1,280,000 cy/yr Maintenance Dredging

			Dredge								
			Generic Large Hopper Dredge					Crew/Survey Boat (Runabout)		Shrimp Boats (Total of Two)	
Contract No.	**Additional Volume/Disposal Site**	**Dredge**	Propulsion Ocean Going	Propulsion Dredging	Dredge Pump(s)	Auxillary Oceangoing	Auxiliary Idling	Propulsion	Secondary	Propulsion	Secondary
Additional Maintenance Dredging	1,280,000 CY of Additional Maintenance Material to ODMS	Hopper	416	224	224	416	224	128	128	1,075	1,075

Table F-3. LPP Alternative - Additional Maintenance Dredging - Marine Equipment Estimated Emissions
Freeport Harbor Channel Improvement Project
Additional 1,280,000 cy/yr Maintenance Dredging
(Tons per Year)

Phase No.	Pollutant	Dredge	Dredge									Total Emissions Per Year
			Generic Large Hopper Dredge					Crew/Survey Boat		Shrimp Boat		
			Propulsion Oceangoing	Propulsion - Dredging	Dredge Pump(s)	Auxiliary - Oceangoing	Auxillary - Dredging	Propulsion	Auxiliary	Propulsion	Auxiliary	
Additional 1,280,000 cy/yr Maintenance Dredging	CO	Hopper	2.58	1.39	0.46	0.57	0.31	0.18	0.18	0.44	0.44	**6.55**
	NOX	Hopper	26.16	14.09	4.70	5.81	0.87	0.92	0.50	2.32	1.26	**56.63**
	PM	Hopper	0.65	0.35	0.12	0.14	0.02	0.02	0.01	0.06	0.03	**1.41**
	PM2.5	Hopper	0.59	0.32	0.11	0.13	0.02	0.02	0.01	0.05	0.03	**1.28**
	PM10	Hopper	0.62	0.34	0.11	0.14	0.02	0.02	0.01	0.06	0.03	**1.36**
	SOX	Hopper	4.31	2.32	0.77	0.96	0.16	0.16	0.09	0.40	0.23	**9.40**
	VOC	Hopper	0.23	0.12	0.04	0.05	0.05	0.02	0.03	0.06	0.08	**0.69**

Appendix C

Public Notice and Publisher's Affidavit

RECEIVED
JAN 0 6 2011
PORT FREEPORT
ENGINEERING DEPT

THE STATE OF TEXAS
COUNTY OF BRAZORIA

Before me, the undersigned authority, on this day personally appeared

Deana Lesco

who, after being duly sworn, did depose and say:

My name is Deana Lesco

Advertising Director of The Facts, a daily newspaper as that term is defined by Art. 28 a R.C.S. of Texas 1925, as amended, having a general circulation in Brazoria County and published in the City of Clute, County of Brazoria, State of Texas.

The attached printed matter is a true and correct copy of the publication of

NOTICE OF PUBLIC MEETING

which was published and appeared in said newspaper, with publication being on the following date(s): December 19, 26, 2010

My fee is 640.00

Deana Lesco

Deana Lesco

Given under my hand and seal of office on this 3rd day of January, A.D. 2011.

Joanne Wasson

Joanne Wasson
Notary Public in and for
Brazoria County, Texas.
My commission expires 11/20/14

JOANNE WASSON
NOTARY PUBLIC
STATE OF TEXAS
EXPIRES
11-20-2014

VERIFIED & APPROVED
BY:

The facts
Sunday, Dec. 19, 2010

of the Village of Surf- | The majority of the pipeline is located in | bids will not be accepted. Plano and | is the buyer's responsibility.

NOTICE OF PUBLIC MEETING AND AVAILABILITY OF DRAFT ENVIRONMENTAL IMPACT STATEMENT FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT AND DRAFT GENERAL CONFORMITY DETERMINATION

Interested parties are hereby notified of and invited to attend an open house and public meeting to be conducted by the U. S. Army Corps of Engineers and the Brazos River Harbor Navigation District (Port Freeport) on:

THURSDAY, JANUARY 13, 2011
OPEN HOUSE 5:30-7:00 PM
PUBLIC MEETING 7:00-8:30 PM
(REGISTRATION BEGINS AT 5:30 PM)

FREEPORT COMMUNITY HOUSE
1300 WEST SECOND STREET,
FREEPORT, TEXAS 77541

The meeting will provide an opportunity for all persons to comment on the Draft Environmental Impact Statement (DEIS), and the Draft General Conformity Determination (DGCD). Those unable to attend may find the draft DEIS, and the DGCD at http://www.swg.usace.army.mil/pao/HotTopic.asp. Written comments must be postmarked by February 5, 2011.

Comments may be mailed or emailed to:
GALVESTON DISTRICT,
CORPS OF ENGINEERS
ATTN: MS. JANELLE STOKES
P. O. BOX 1229
GALVESTON, TEXAS 77553
or
Janelle.S.Stokes@usace.army.mil

Appendix D

TCEQ General Conformity Concurrence Letter

Bryan W. Shaw, Ph.D., *Chairman*
Buddy Garcia, *Commissioner*
Carlos Rubinstein, *Commissioner*
Mark R. Vickery, P.G., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

March 1, 2011

Ms. Janelle Stokes
Regional Environmental Specialist
United States Army Corps of Engineers, Galveston District
P.O. Box 1229
Galveston, Texas 77553-1229

Re: General Conformity Concurrence for the Freeport Harbor Channel Improvement Project

Dear Ms. Stokes:

This letter provides general conformity concurrence for the proposed Freeport Harbor Channel Improvement Project. The Texas Commission on Environmental Quality (TCEQ) reviewed the project in accordance with Title 40 Code of Federal Regulations Part 93, and Title 30 Texas Administrative Code (TAC) § 101.30. The proposed project is located in the Houston-Galveston-Brazoria (HGB) area, which is classified as severe nonattainment for the 1997 eight-hour ozone standard, and emissions are expected to be above the 25 tons per year *de minimis* threshold. This threshold amount is specified in the table found in § 101.30(c)(2)(A). Therefore, a general conformity analysis is required. 1

The TCEQ has determined, pursuant to 30 TAC §101.30(h)(1)(E)(i)(I), that emissions from the proposed project will not exceed the emissions budgets specified in the most recent state implementation plan (SIP) revision approved by the United States Environmental Protection Agency (EPA). The most recently approved SIP revision, the HGB Reasonable Further Progress SIP adopted by the Commission on May 23, 2007, was approved by the EPA on March 29, 2010. This general conformity determination is based upon information provided in a December 2010 Draft General Conformity Determination prepared for the United States Army Corps of Engineers (USACE).

In support of the ozone National Ambient Air Quality Standard, the TCEQ suggests the USACE adopt pollution prevention and/or reduction measures in conjunction with this and future projects, such as the following: 2

- encourage construction contractors to apply for Texas Emission Reduction Plan grants;
- establish bidding conditions that give preference to clean contractors;
- direct construction contractors to exercise air quality best management practices;
- direct contractors that will use tugboats during construction to use clean fuels;
- direct operators of the assist tugboats used in maneuvering dredge vessels to use clean fuels;
- select assist tugs based on lowest nitrogen oxides (NO_X) emissions instead of lowest price; or
- purchase and permanently retire surplus NO_X offsets prior to commencement of operations.

Thank you for providing the necessary information and staff assistance for our review. We would also appreciate update(s), as appropriate, as this project moves forward. I look forward to working with you in the future on any upcoming projects you may have that affect air quality in your district. If you require further assistance on this matter, please contact Mrs. Amy Muttoni at (512) 239-6351 or Amy.Muttoni@tceq.texas.gov.

Sincerely,

David Brymer, Director
Air Quality Division
Texas Commission on Environmental Quality

DB/KH/kb

David Brymer, Director
Air Quality Division
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, TX 78711-3087

RESPONSE TO COMMENTS

Comment No.	Response
1	By this letter, USACE notes that TCEQ has provided general conformity concurrence for the proposed FHCIP, and that TCEQ has determined that emissions will not exceed the emissions budgets specified in the most recent state implementation plan.
2	TCEQ recommended that USACE adopt pollution prevention and/reduction measures in conjunction with this project. USACE will: 1) encourage construction contractors to apply for Texas Emission Reduction Plan grants, the EPA's Voluntary Diesel Retrofit Program, or the EPA's Diesel Emission Reduction Plan offering the opportunity to apply for resources for upgrading or replacing older equipment to reduce NOx emissions, 2)encourage contractors to use cleaner, newer equipment with lower NOx emissions), 3) direct contractors and operators that will use non-road diesel equipment to use clean, low-sulfur fuels, 4) direct contractors that will use tugboats during construction to use clean, low-sulfur fuels, 5) direct operators of the assist tugboats used in maneuvering dredge vessels to use clean, low-sulfur fuels, and 6) direct operators of the dredging vessels to use clean, low-sulfur fuels.

Appendix D

Hazardous, Toxic, and Radioactive Waste Analysis and Data

Appendix D-1

Hazardous, Toxic, and Radioactive Waste Report

Appendix D-1

Hazardous, Toxic, and Radioactive Waste

1.0 INTRODUCTION

The Freeport Harbor Channel is a deep-draft navigation channel that connects the harbor facilities located in Freeport, Brazoria County, Texas, with the Gulf of Mexico. The U.S. Army Corps of Engineers (USACE) has proposed channel improvements to the existing project that include deepening and widening the existing channel and turning basins and reauthorizing the Stauffer Channel. This proposed project is referred to as the Freeport Harbor Channel Improvement Project (FHCIP). The project area includes a 1-mile buffer around the Freeport Harbor Channel System from the Stauffer Channel Turning Basin through the jettied Freeport Harbor entrance extending approximately 3 miles offshore to the 60-foot depth contour of the Gulf of Mexico. The project area also encompasses upland and offshore placement areas for disposal of dredged material from proposed improvements with a 1-mile buffer (Figure 1).

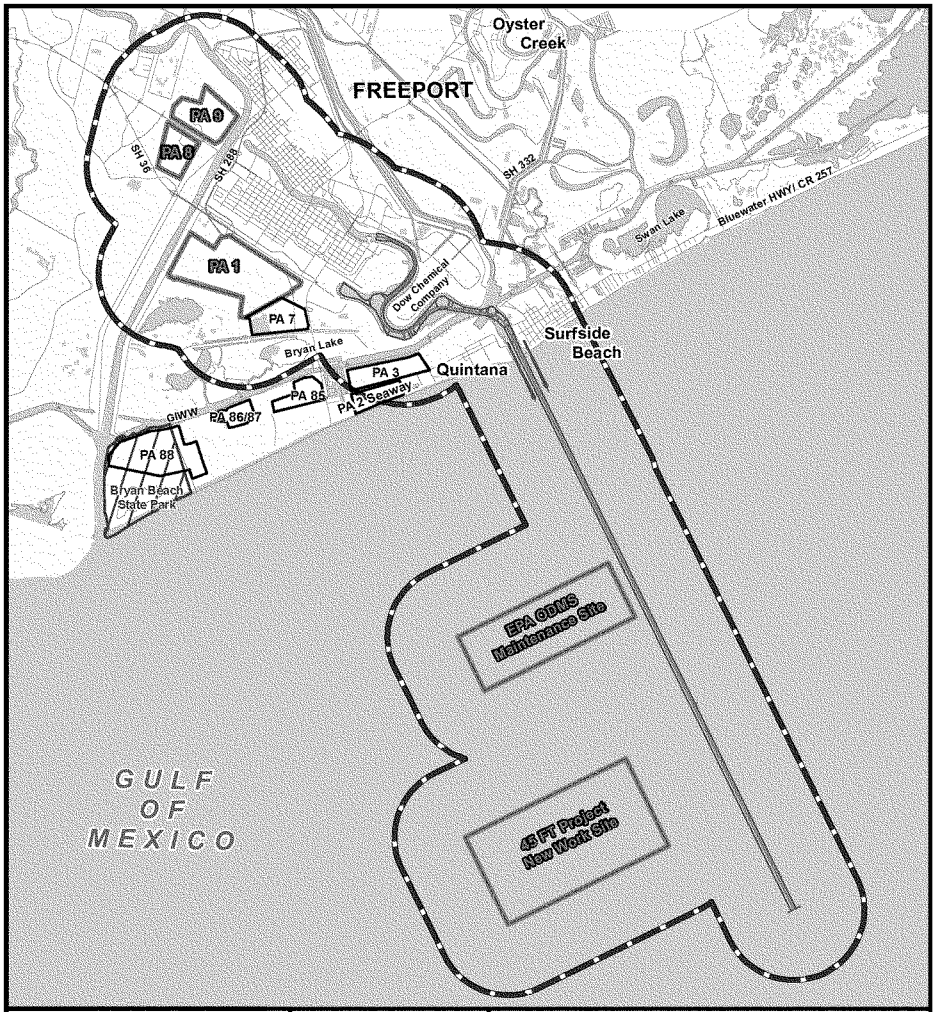
PBS&J was contracted by the USACE, Galveston District to compile and summarize Hazardous, Toxic, and Radioactive Waste (HTRW) data for the FHCIP project area. This HTRW assessment was conducted in general accordance with procedures described in the Department of the Army, USACE document ER 1165-2-132, Water Resource Policies and Authorities–Hazardous, Toxic and Radioactive Waste (HTRW) Guidance for Civil Works Projects. The objective of this preliminary assessment is to identify the existence of, and potential for, HTRW contamination on lands in the project area, or external contamination that could impact, or be impacted by, the FHCIP.

The findings and recommendations presented in this HTRW assessment are based on the following scope of work:

A. Site History – An assessment of the history of the project area was performed by examination of available historic aerial photographs taken in 1944, 1965, 1975, 1987, 1995, and 2004.

B. Site Visit – PBS&J conducted visual inspections of the project area in March 2008 to determine the land use and existing condition of the project area and to identify the existence of conditions of environmental concern indicating the possible presence of hazardous materials or petroleum products.

C. Setting – PBS&J reviewed existing, available information to characterize the physical setting and geology of the project area, including a description of surface elevation, surface drainage, surface run-off and run-on, and other identifying physical features.



Legend

- Channel Centerline
- Dredged Material Placement Areas
- Bryan Beach State Park
- Project Area
- Placement Areas

0 0.45 0.9 1.8
Miles

Figure 1

Freeport Harbor Channel Improvement Project Area

Prepared for: USACE Galveston	
Job No.: 044190100	
Prepared by: A.Christiansen	Date: 03/24/2008

File: N:/Clients/U_Z/USACE/Projects/Freeport/044190100/projects/Figures/fig_1_appD.mxd

Additionally, PBS&J conducted interviews with Texas Commission on Environmental Quality (TCEQ) and local officials regarding potential sources of contamination to the project area.

D. Regulatory Agency Review – Available public information relating to the project area and surrounding properties was reviewed to identify regulated facilities, spill/release sites, and corrective or remedial actions. This information was obtained from a review of Federal, State, and local regulatory agency databases.

2.0 SITE HISTORY

Aerial photographs of the project area were obtained to examine the historic usage of the current Brazos River Channel, Brazos Harbor, and Port Freeport, and the former Brazos River Channel. The photographs depict the project area as it appeared in 1944, 1965, 1975, 1987, 1995, and 2004. The aerial photographs were obtained from the U.S. Geological Survey (USGS), the Agricultural Stabilization Conservation Service (ASCS), and the Texas Department of Transportation (TxDOT).

The earliest aerial photography available of the area was taken in 1944. These aerial photographs depict the project area from the western end of the former Brazos River Channel gulfward to include the Freeport Jetty Channel. The Brazos River had already been rerouted to the Brazos River Diversion Channel, which empties into the Gulf about 6 miles west of the Freeport Harbor Channel. The aerial photographs (ASCS, 1944) indicate that development in the project area is limited to the first process areas of the Dow Chemical facility and the construction of the workers housing in the Freeport area. The residential development appears to occur on both the north and south sides of the former Brazos River, but the development on the southern side is more extensive. The Dow plant, which occupied less than half of its current area, has constructed tank farms and process areas on the narrow bend of the waterway. Several impoundments are visible north of a railroad track. A small area containing several large, open-top, aboveground storage tanks is visible on the west bank of the waterway. The surrounding areas are mostly undeveloped, with some unimproved roads providing limited access. One bridge is noted in the town of Freeport (Farm to Market Road [FM] 1495), another crosses a canal northeast of Dow, and a third crosses the Gulf Intracoastal Waterway (GIWW) near Quintana. The barrier islands appear broader and more expansive than today and are predominantly undeveloped. Several small structures are also present at the U.S. Coast Guard Station. Large tracts of land adjacent to the GIWW appear to be used as dredge placement areas (PAs). The tracts of land proposed for the upland PAs 8 and 9 are undeveloped land used possibly for agriculture.

The 1965 photograph (ASCS, 1965) depicts the continued growth of the Dow facility with the construction of an additional process and storage area on the north side of the facility that is bound by a canal. Other industrial development includes the dredging of the Brazos Harbor and the installation of additional storage tanks at the Phillips tank farm along the west shore of the

waterway. The town of Freeport has undergone continued growth with the addition of new homes on the north and south side of the Old Brazos River segment. The town of Surfside is visible with the presence of streets and structures. A new bridge is visible crossing the GIWW east of Surfside.

The 1975 photograph (ASCS, 1975) indicates continued growth; however, new development is not as readily apparent as in previous photographs. However, new warehouse structures are visible at the Brazos Harbor, and a new bridge crossing the Old Brazos River at FM 1495 is noted. Additional residential development appears to have occurred in Surfside. Several new roads are visible on the barrier island to the west of the Entrance Channel. Land use in this area remains mostly undeveloped, but two parcels are now used as surface impoundments.

The 1987 photograph (ASCS, 1987) indicates the addition of facilities and land-use changes in the project area. The most notable changes occur along the shoreline of the waterway, including the construction of a facility at Quintana consisting of a small tank farm and a berthing dock, the construction of a barge berthing facility on the peninsula between the GIWW and the Old Brazos River, the construction of additional process and storage facilities adjacent to Dow along the northern bank of the canal, additional storage capacity at the Phillips tank farm, and new docking facilities along the west bank of the Old Brazos River west of Dow.

The 1995 photograph (ASCS, 1995) indicates that the project area, adjacent properties, and surrounding properties remain basically unchanged from the 1987 photograph. The most notable changes seen in this infra-red image is the use of large parcels of land adjacent to the town of Freeport and the various industrial complexes for surface storage impoundments. These large tracts apparently contain water and sediment. Additional development is noted in the Quintana area. The process and storage facility located north of Dow beyond the canal appears to have been decommissioned and dismantled. What remains appears to be one structure and several small ponds. The drilling platform known as Zeus is visible at its mooring in the Entrance Channel. The tract of land identified as PA 1 appears to have been converted to an upland PA.

The most recent aerial photograph (ASCS, 2004) was taken in 2004, and the project area and surrounding properties are basically unchanged from the previous photograph. Portions of the original Dow facility appear to have been dismantled and are vacant. A canal is visible across the length of PA 1, while the tracts of proposed PAs 8 and 9 remain undeveloped agricultural land. No other visible changes are detectable in the photograph.

3.0 SITE RECONNAISSANCE

A visual inspection of the project area was conducted by PBS&J personnel on March 18–19, 2008, by boat and automobile. Port Freeport provided an escorted tour of the project area using Port Security personnel and a Port Security boat. The remaining component of the site reconnaissance was conducted by accessing the project area by public roadways. The site

inspection was intended to identify indicators of areas of potential hazardous waste and confirm mapped locations of sites identified through the various regulatory agency reviews. Photography of the project area was restricted; however, photographs allowed taken during the site reconnaissance have been included in Appendix D-5.

The project area is characterized by a commercialized riverfront developed with industrial and maritime businesses. The former Brazos River (Old Brazos River) channel follows a sinuous path forming a long, narrow bend and intersecting the GIWW before flowing into the Gulf of Mexico. The site reconnaissance conducted by boat began at the Stauffer Turning Basin, which defines the northern extent of the project area (Site Photograph No. 1, Appendix D-5). A sign indicating the presence of underground gas or petroleum pipelines was observed within the turning basin (Site Photograph No. 2, Appendix D-5). The properties along the western shore of this northern segment of the Old Brazos River include small, private businesses that provide boat maintenance including wet and dry docks and refueling. One of these businesses operates several registered aboveground storage tanks used apparently for retail fuel sales. These tanks were reported in the regulatory agency database report. The tanks appeared to be located within secondary containment. The property along the entire eastern shore from the water lock to the GIWW is owned and operated by Dow. This facility has the greatest number of records reported in the regulatory agency database report for releases of regulated substances. Land use adjacent to the shore includes a railroad spur, a surface impoundment, a freshwater canal, and existing and former process areas. An earthen levee constructed along the shore separates the waterway from the adjacent railroad spur and process areas at the Dow facility.

The properties along the western shore of the central segment of the Old Brazos River include American Rice, Inc. and Port Freeport. These facilities, which occupy an area known as the Brazos Harbor, operate a shipping dock, warehouses, and grain silos. A ship was in the process of off-loading at Port Freeport docks during the site reconnaissance. The goods off-loaded from this ship were fruit including bananas and pineapples. Other items observed in and adjacent to the warehouse included numerous freight boxes, refrigerated cargo boxes, and components of wind turbines (i.e., tower sections and blades). Large spools of cable were observed adjacent to a warehouse at the Port facility. The space is reportedly leased by Port Freeport to a company that installs offshore marine cable for utility or communication.

Adjacent to Port Freeport, along the western shore, is a facility that stores anhydrous ammonia. The facility has a ship dock and a large pressurized storage vessel. ConocoPhillips operates the adjacent facility, which is a tank farm containing over 19 registered aboveground storage tanks. The tanks appear to be within secondary containment. The nearest facility occupies a narrow strip of land bound by the Old Brazos River to the north and the GIWW to the south. This small facility serves to off-load tankers of crude oil and transfer the unrefined product to either the Bryan Mound storage facility or to a processing facility or refinery (Site Photograph No. 3, Appendix D-5). The Freeport LNG (liquid natural gas) facility occupies a large tract of land

along the southern bank of the GIWW. The facility was under construction at the time of the site reconnaissance. The remaining industrial facility. Another feature encountered during the site reconnaissance that is a potential source of contaminants to the project area is the abandoned drilling platform known as Zeus. This relict is docked along the western shore of the Freeport Channel almost midway between the GIWW and the jetties (Site Photograph No. 4, Appendix D-5). The properties that occupy the east and west shores of the Freeport channel between the GIWW and the jetties are characterized as residential and recreational. This segment is located adjacent to open waters of the Gulf of Mexico, but is protected by a 4,000-foot-long jetty (Site Photograph No. 5, Appendix D-5). A pipeline marker was observed near the U.S. Coast Guard Station indicating one or more underground pipelines crossing the Freeport ship channel (Site Photograph No. 6, Appendix D-5). Another pipeline marker was observed near the mouth of the entrance channel. The site reconnaissance conducted by boat concluded at the mouth of the jetty.

The areas designated as placement areas are characterized as undeveloped land. PA 1 has been used as a placement area and as a result remains undeveloped with several large unvegetated areas containing dredged material. Proposed PAs 8 and 9 are accessible by county roadway and appear to be grazed; they remain essentially undisturbed coastal prairie with some wooded areas.

The results of the site reconnaissance confirmed the mapped locations of sites identified through the various regulatory agency reviews. No new sites were identified. The site reconnaissance did, however, confirm numerous sources of hazardous material and hazardous waste immediately adjacent to the project footprint that have the potential to impact the project.

4.0 SETTING

4.1 DESCRIPTION OF PROJECT AREA

The project area for the FHCIP is located along the mid to upper Texas coast within Brazoria County. In general, the landward portion of the project area encompasses areas dominated by industrial, commercial, and residential development with some recreational, agricultural, and marsh areas. Prior to the diversion of the Brazos River, the Freeport Harbor Channel was the mouth of the Brazos River. Currently, the channel extends into the Gulf, with no associated bay, and terminates immediately southeast of State Highway (SH) 288, after passing through the City of Freeport. Inland from the channel, areas that are not developed are typically converted into upland dredged material PAs, marshes, lakes, or agricultural land used for livestock and/or crop production.

The portion of the Gulf within the project area is confined to the shelf area and is largely devoid of significant physiographic features. The Freeport Harbor Channel is a moderate- to high-energy environment partially protected by two (north-south) man-made rock jetties. These jetties extend into the Gulf approximately 0.5 mile from the shoreline.

The project area is characterized as Quaternary (Recent and Holocene) Alluvium containing thick deposits of clay, silt, sand, and gravel (Barnes 1982, 1987), overlying the Pleistocene-aged Beaumont Formation. These formations consist mainly of stream channel, point bar, natural levee, and backswamp deposits associated with former and current river channels and bayous. The underlying Beaumont Formation is estimated to be less than 1,000 feet thick and consists mostly of clay, silt, sand, and gravel.

The surface topography of the project area is mainly flat to gently rolling and slopes to the southeast toward the Gulf. Surface elevations within the project area range from a high of approximately 5 feet above mean sea level (msl) at the northern portion (SH 288) to a low of approximately 0 foot msl at the Gulf. The Brazos River drains areas to the west of the project area and discharges into the Gulf, forming a delta. A few short, low-gradient streams drain directly into the GIWW, channels, and scattered lakes. Most common among coastal features are beach ridges, open sand beaches, dunes, mudflats, marshes, and deltas.

The bathymetry of the project area has been partially modified by human activity, mainly by channel dredging and subsequent formation of dredged material PAs. Water depths in the Freeport Harbor Entrance and Jetty channels are currently maintained by the USACE to a depth of –47 feet mean low tide (MLT). The existing channel is approximately 5.2 miles in length and is approximately 400 feet in width at the bottom and 1,150 feet wide at the water surface. Area tidal channels, passes, and dredged channels are greater than average depth. Water exchange between Port Freeport and the Gulf is normally limited to natural and artificial tidal passes through both the Freeport Harbor Channel and the GIWW. Fresh water is supplied to the GIWW by the Brazos River and by small streams that drain local areas adjacent to coastal uplands.

4.2 INTERVIEWS

PBS&J conducted interviews with staff of the TCEQ Region 12 office in May 2006 regarding potential sources of contamination to the project area. PBS&J contacted Aron Athavaley, site investigator, regarding his knowledge of HTRW contamination on lands in the project area, or external contamination that could impact the project. Mr. Athavaley informed PBS&J that, while there are facilities with ongoing corrective action activities adjacent to the waterway, there are no active enforcement actions under way. When PBS&J inquired of any direct sources of contamination to the project, he stated that there are off-site areas of impacted groundwater that could discharge into the waterway. These impacts have been documented by groundwater monitor wells along the Dow facility. Summaries of these interviews are included in Appendix D-3.

5.0 REGULATORY AGENCY DATABASE REVIEW

5.1 METHODOLOGY

PBS&J retained the services of TelAll Corporation (TelAll) of Austin, Texas, to conduct the regulatory agency database information search described in Section 1.0. The scope of the regulatory information search included the following databases: the National Priority List (NPL); the State Superfund List (TXSSF); Comprehensive Environmental Response, Compensation and Liability Information System Database (CERCLIS) including the No Further Remedial Action Planned (NFRAP) database; Resource Conservation and Recovery Act (RCRA) Generators and Violators List (RCRA-G); RCRA Corrective Actions List (CORRACT); RCRA Treatment, Storage, or Disposal List (RCRA TSD); Texas Underground and Aboveground Storage Tank Database (TXUST and TXAST); Leaking Underground Storage Tank Listings (TXLUST); Texas Voluntary Cleanup Program (TXVCP); Innocent Owner/Operator Program (IOP); City/County Solid Waste Landfill listings (TXLF); Unauthorized and Unpermitted Landfill Sites (LFUN); Emergency Response Notification System (ERNS) database; and Texas Spills Incident Information System (TXSPILL) database.

PBS&J performed a review and evaluation of the available public information relating to the site. The review consisted of summarizing the regulatory agency database information acquired by TelAll. A site reconnaissance was conducted in March 2008 to verify the location of sites referenced in the regulatory database search and to locate any additional unreported hazardous materials sites. The site locations were provided by TelAll and are approximate, since they are based on street address information included in the databases. A map illustrating the locations of these registered sites is included as Appendix D-4.

5.2 REGULATORY AGENCY DATABASE RESULTS

A total of 1,066 listings were identified within the study area during the various database searches. Several of these listings were associated with the same facilities or property (e.g., a facility/property that contains multiple petroleum storage tanks and is the site of several reported spills or emergency response actions). The 1,066 database listings were associated with a total of 201 facilities or properties within the study area. On the basis of the results of the regulatory database searches, the following sites are located within the subject area:

- Three CERCLIS sites;
- Six NFRAP sites;
- Five CORRACT sites;
- Nine RCRA generators sites;
- One RCRA treatment, storage, and disposal site;

- One hundred twenty-six petroleum storage tanks at 30 sites;
- Nineteen leaking underground storage tank sites;
- Five hundred forty-five reported emergency response actions; and
- Four hundred five reported spills.

No NPL, State Superfund, Voluntary Cleanup, or City/County solid waste landfill sites were located within the study area. The regulatory agency databases searched included sites that are onshore and are not typically available for the offshore portion of this project. The following provides a summary of the results of the regulatory agency database information search.

CERCLIS Sites: The CERCLIS database is the Environmental Protection Agency's (EPA) official repository for site- and nonsite-specific Superfund data in support of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The database contains information on hazardous waste site assessment and remediation from 1983 to the present and is used by the EPA in evaluating the status and progress of site cleanup actions, and to communicate planned activities and budgets. The NPL is a priority subset of the CERCLIS list and is a list of priority facilities that the EPA has determined to pose a threat to human health and/or the environment and where remedial action is required.

The regulatory database search listed the following three CERCLIS site within the study area.

- Gulfco Marine Maintenance (Site ID No. 3) at Brazoria County Road (CR) 756, Freeport, Texas 77541. The site is currently on the final NPL.
- Freeport Pharmacy (Site ID No. 36) at 200 Block of East 2nd Street, Freeport, Texas 77451. The site is not listed on the NPL.
- Nalco Chemical Company (Site ID No. 285) at CR 229, Freeport, Texas 77541. The site is not listed on the NPL.

NFRAP Sites: NFRAP sites indicate a CERCLIS site that is designated by the EPA as no further remedial action planned. Six NFRAP sites located within the study area were found during the database search. None of these sites are listed on the NPL, and all have undergone preliminary site assessment. The NFRAP sites include the follow facilities.

- Dow Chemical Company (Site ID No. 1) located at Old Brazos River at Dow Canal, Freeport, Texas 77541
- ConocoPhillips Petroleum Company (Site ID No. 2) located at Quintana Road, Freeport, Texas 77541
- Gulf Chemical and Metallurgical (Site ID No. 3) located at 302 Midway Road, Freeport, Texas 77541
- Mineral Research and Development Corporation (Site ID No. 3) located at 302 Midway Road, Freeport, Texas 77541

- Smith Welding (Site ID No. 58) located at 510 South Avenue A, Freeport, Texas 77541
- Stauffer Chemical Company, Phosphorous Product Division (Site ID No. 64), 608 East 2nd Street, Freeport, Texas 77541

CORRACT Sites: The CORRACT list is a subset of RCRIS and includes sites that are currently undergoing, or have undergone, corrective action. According to the database, five CORRACT sites are located within the study area. The following five sites were also listed in the RCRA TSD database:

- Dow Chemical Company (Site ID No. 1) located at Old Brazos River at Dow Canal, Freeport, Texas 77541
- ConocoPhillips Petroleum Company (Site ID No. 2) located at Quintana Road, Freeport, Texas 77541
- Gulf Chemical and Metallurgical (Site ID No. 3) located at 302 Midway Road, Freeport, Texas 77541
- Rhone Poulenc (Site ID No. 67) located at 6213 E. Highway 332, Freeport, Texas 77541
- Schenectady International Inc. (Site ID No. 71) located at 702 FM 523, Freeport, Texas 77541

RCRA Generators Sites: Under the RCRA, generators and transporters of hazardous waste are required to provide information concerning their activities to State agencies and the EPA. The RCRA-G list is also a subset of the Resource Conservation and Recovery Information System (RCRIS) database and tracks facilities that are registered generators or transporters of hazardous waste. According to the regulatory review, a total of nine regulated generator/transporter facilities are located within the study area. One of these facilities is listed as conditionally exempt small quantity generators (CESQG generate less than 100 kilograms [kg]/month of hazardous waste), two are listed as small quantity generators (SQG generate at least 100 kg/month but less than 1,000 kg/month of hazardous waste), and four are listed as large quantity generators (LQG generate at least 1,000 kg/month of hazardous waste). Two of the nine facilities are listed as transporters of hazardous waste. No permit violations were listed for any RCRA-G site.

- ConocoPhillips (Site ID No. 2) located at Highway 36 at Seaway Road, Jones Creek, Texas 77541
- ConocoPhillips (Site ID No. 2) located at CR 271, Freeport, Texas 77541
- Chemical Specialties (Site ID No. 3) located at 302 Midway Road, Freeport, Texas 77541
- Enduro Systems, Inc. (Site ID No. 18) located at 102 South Avenue A, Freeport, Texas 77541
- Texas Crewboats (Site ID No. 41) located at 222 West 2nd Street, Freeport, Texas 77541
- Masco Operators, Inc. (Site ID No. 42) located at 225 East Park Avenue, Freeport, Texas

- Gulf Chemical and Metallurgical (Site ID No. 3) located at 302 Midway Road, Freeport, Texas 77541
- Brazosport Independent School District (ISD) (Site ID No. 33) located at 1800 West 2nd Street, Freeport, Texas 77541
- Seaway Freeport Terminal (Site ID No. NA) located at Quintana Road, Freeport, Texas 77541

RCRA Treatment, Storage, and Disposal Sites: The RCRA treatment, storage, or disposal (TSD) database is also a subset of RCRIS. The database tracks facilities that treat, store, or dispose of hazardous materials and that are required to provide information to State agencies and the EPA. One RCRA-TSD facility was identified within the study area during the database search.

- Gulf Chemical and Metallurgical (Site ID No. 3) located at 302 Midway Road, Freeport, Texas 77541

Registered Storage Tanks Sites: The aboveground storage tank database (TXAST) and underground storage tank database (TXUST) are maintained by TCEQ to track permitted petroleum storage tank sites. According to the database, 20 facilities containing a total of 47 ASTs and 29 facilities containing a total of 79 USTs are located within the study area. Nineteen of the ASTs were listed as active, and the remaining 28 were listed as inactive. Sixteen of the registered USTs were listed as active, 58 were listed as removed from the ground, and 5 were listed as abandoned in-place.

Leaking Underground Storage Tank Sites: The leaking underground storage tank database (TXLUST) is a list maintained by TCEQ of facilities where a known underground storage tank release has occurred. According to the database, a total of 19 sites within the study area are listed as the location of a LUST. Final concurrence has been issued by TCEQ, and the cases have been closed for 16 of the LUST facilities. Two of the three sites pending closure reported impacts to groundwater, while the other reported no impact to soil or groundwater.

ERNS/State Spill Sites: The ERNS supports the release notification requirements of CERCLA and serves as a mechanism to document and verify incident location information as initially reported. More than one emergency response notification may have occurred at the same facility/property. Reported ERNS sites are frequently not identified at a facility address, and as a result, the spill or release locations are usually difficult to precisely locate. The database contained documentation for a total of 545 spill notifications at approximately 118 facilities/properties. The majority of the ERNS spill sites within the study area reportedly occurred at the following two locations.

- Dow Chemical Company (Site ID No. 1) located at the Old Brazos River at Dow Canal, Freeport, Texas 77541

- ConocoPhillips Petroleum Company (Site ID No. 2) located at Quintana Road, Freeport, Texas 77541

The TXSPILL includes cases where emergency response was needed for cleanup of toxic substances. As with the ERNS releases, several of these cases may occur at a single facility/property, and their spill or release locations are usually difficult to precisely locate. According to the database, a total of 405 spill-related cases occurred at 15 sites. Similar to the ERNS releases, the majority of the reported spills occurred at Dow Chemical Company.

6.0 REFERENCES

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———. 1965. Aerial photographs.

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———. 1987. Aerial photographs.

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Barnes, V.E. 1982. Geologic Atlas of Texas, Houston Sheet. (1968; revised 1982) The University of Texas at Austin, Bureau of Economic Geology, Austin.

———. 1987. Geologic Atlas of Texas, Beeville-Bay City Sheet. (1975; revised 1987) The University of Texas at Austin, Bureau of Economic Geology.

PBS&J. 2005. Freeport Harbor Entrance Channel Contaminant Assessment. Document No. 050194. PBS&J, Austin, Texas.

Appendix D-2

TelALL Historic Aerial Photo Search

TelALL™ Corporation

Historic Aerial Photo Search

for the site

Freeport EIS, Freeport, TX

performed for

PBS&J

5/18/2006

Photos Found

Date	County	Source	Scale	Researcher Comment
10-31-65	BRAZORIA	**ASCS**	1 inch = 2000 feet	EAST
4-15-44	BRAZORIA	**ASCS**	1 inch = 2000 feet	WEST
4-15-44	BRAZORIA	**ASCS**	1 inch = 2000 feet	CENTER
4-15-44	BRAZORIA	**ASCS**	1 inch = 2000 feet	EAST TOP
4-15-44	BRAZORIA	**ASCS**	1 inch = 2000 feet	EAST BOTTOM

AERIAL PHOTO SOURCE ACRONYMS

ASCS	AGRICULTURAL STABALIZATION .CONSERVATION SERVICE	**TXDOT**	TEXAS DEPARTMENT OF TRANSPORTATION
FAIRCHILD	PRIVATE COMPANY	**USAF**	UNITED STATES AIR FORCE
GLO	GENERAL LAND OFFICE	**USDA**	UNITED STATES DEPARTMENT OF AGRICULTURE
TOBIN	PRIVATE COMPANY	**USGS**	UNITED STATES GEOLOGICAL SURVEY
AMS	ARMY MAPPING SERVICE	**WALLACE**	PRIVATE COMPANY
COSA	CITY OF SAN ANTONIO	**HGACOG**	HOUSTON AREA COUNCIL GALVESTON
NCTCOG	NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS	**TELALL**	PRIVATE COMPANY
CAPCO	CAPITOL AREA PLANNING COUNCIL		

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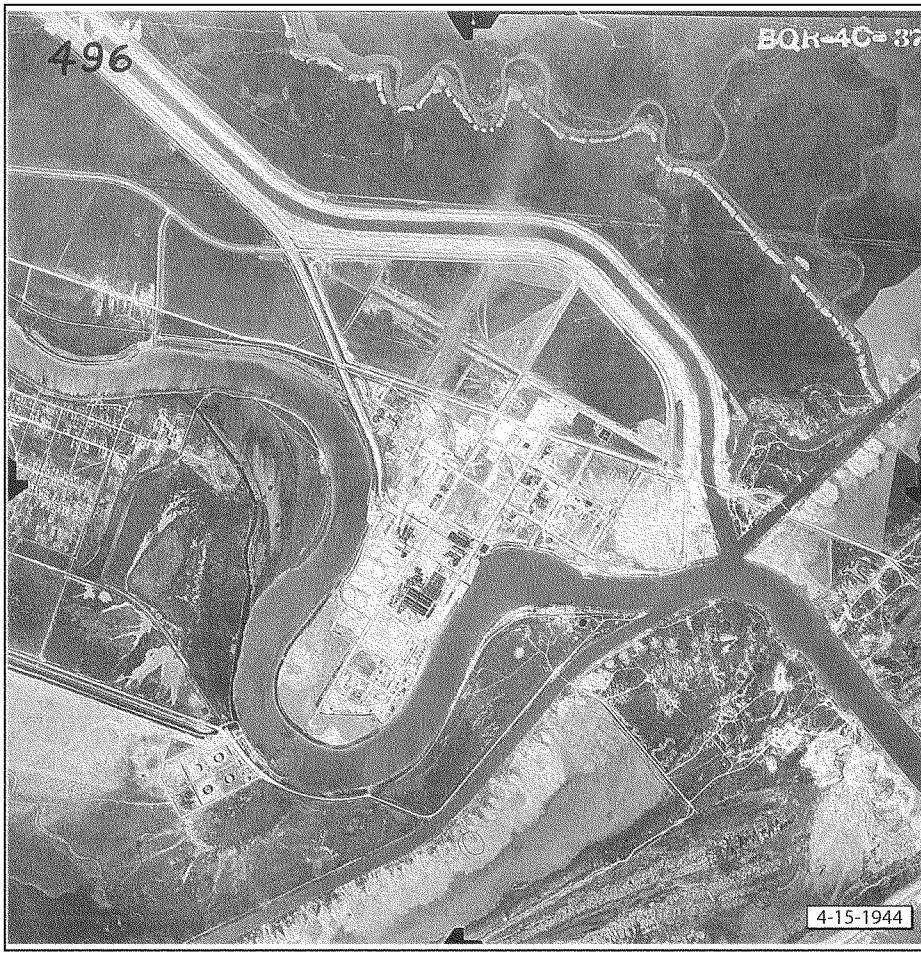

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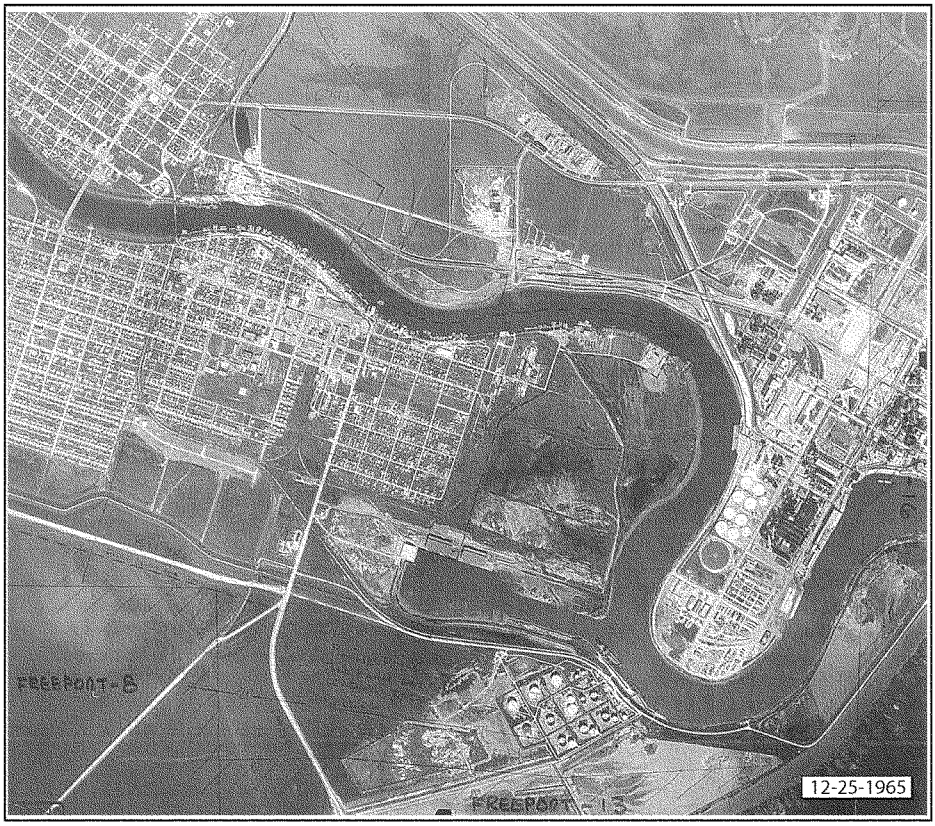

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TelALL™ Corporation

Historic Aerial Photo Search

for the site

Freeport EIS, Freeport, TX

performed for

PBS&J

5/18/2006

Photos Found

Date	County	Source	Scale	Researcher Comment
2004	BRAZORIA	**USDA**	1 inch = 2000 feet	EAST
2004	BRAZORIA	**USDA**	1 inch = 2000 feet	WEST
2-1995	BRAZORIA	**USGS**	1 inch = 2000 feet	EAST
2-1995	BRAZORIA	**USGS**	1 inch = 2000 feet	WEST
10-28-87	BRAZORIA	**TXDOT**	1 inch = 2000 feet	WEST
10-28-87	BRAZORIA	**TXDOT**	1 inch = 2000 feet	CENTER TOP
10-28-87	BRAZORIA	**TXDOT**	1 inch = 2000 feet	CENTER BOTTOM
10-28-87	BRAZORIA	**TXDOT**	1 inch = 2000 feet	EAST
1-25-75	BRAZORIA	**ASCS**	1 inch = 2000 feet	WEST
1-25-75	BRAZORIA	**ASCS**	1 inch = 2000 feet	EAST
10-31-65	BRAZORIA	**ASCS**	1 inch = 2000 feet	WEST
12-25-65	BRAZORIA	**ASCS**	1 inch = 2000 feet	CENTER

AERIAL PHOTO SOURCE ACRONYMS

ASCS	AGRICULTURAL STABALIZATION .CONSERVATION SERVICE	**TXDOT**	TEXAS DEPARTMENT OF TRANSPORTATION
FAIRCHILD	PRIVATE COMPANY	**USAF**	UNITED STATES AIR FORCE
GLO	GENERAL LAND OFFICE	**USDA**	UNITED STATES DEPARTMENT OF AGRICULTURE
TOBIN	PRIVATE COMPANY	**USGS**	UNITED STATES GEOLOGICAL SURVEY
AMS	ARMY MAPPING SERVICE	**WALLACE**	PRIVATE COMPANY
COSA	CITY OF SAN ANTONIO	**HGACOG**	HOUSTON AREA COUNCIL GALVESTON
NCTCOG	NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS	**TELALL**	PRIVATE COMPANY
CAPCO	CAPITOL AREA PLANNING COUNCIL		

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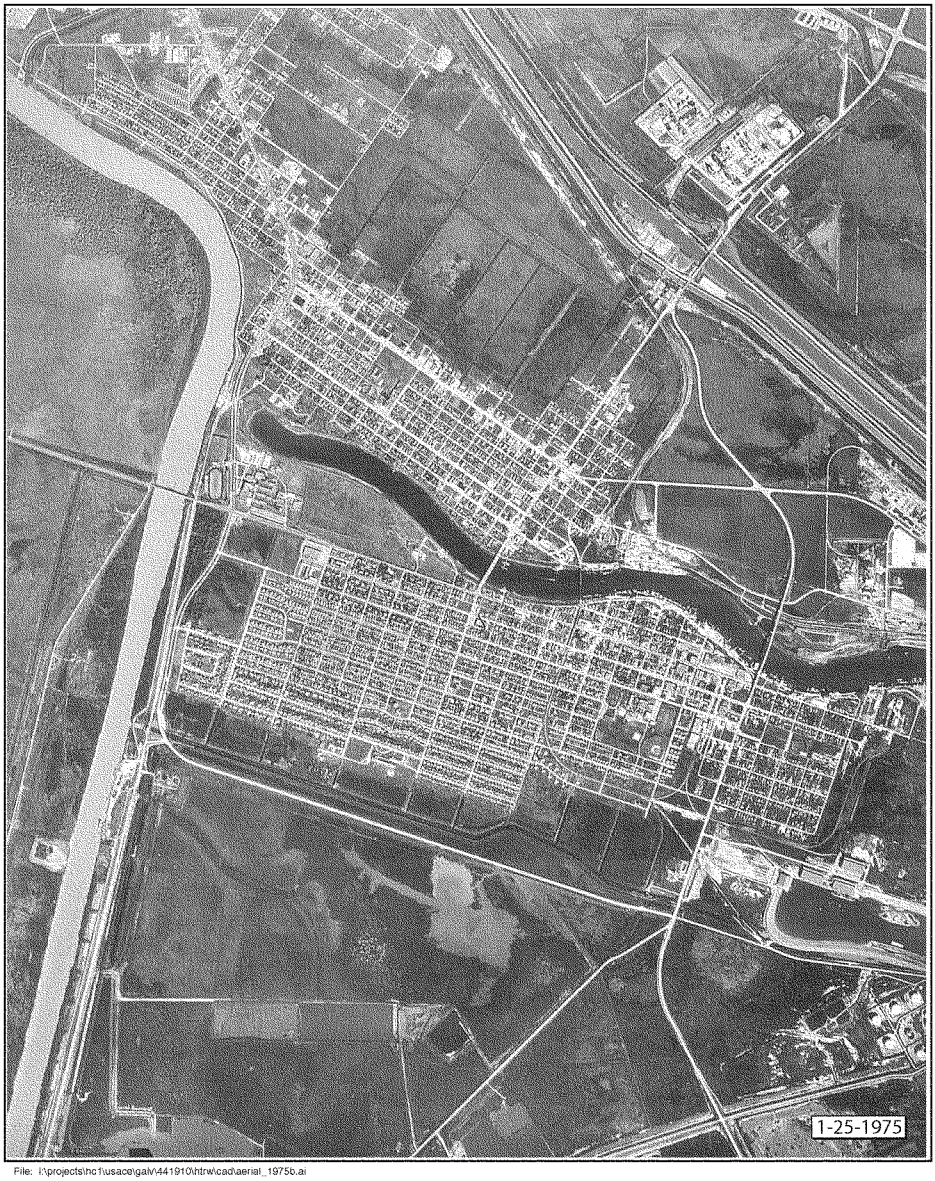

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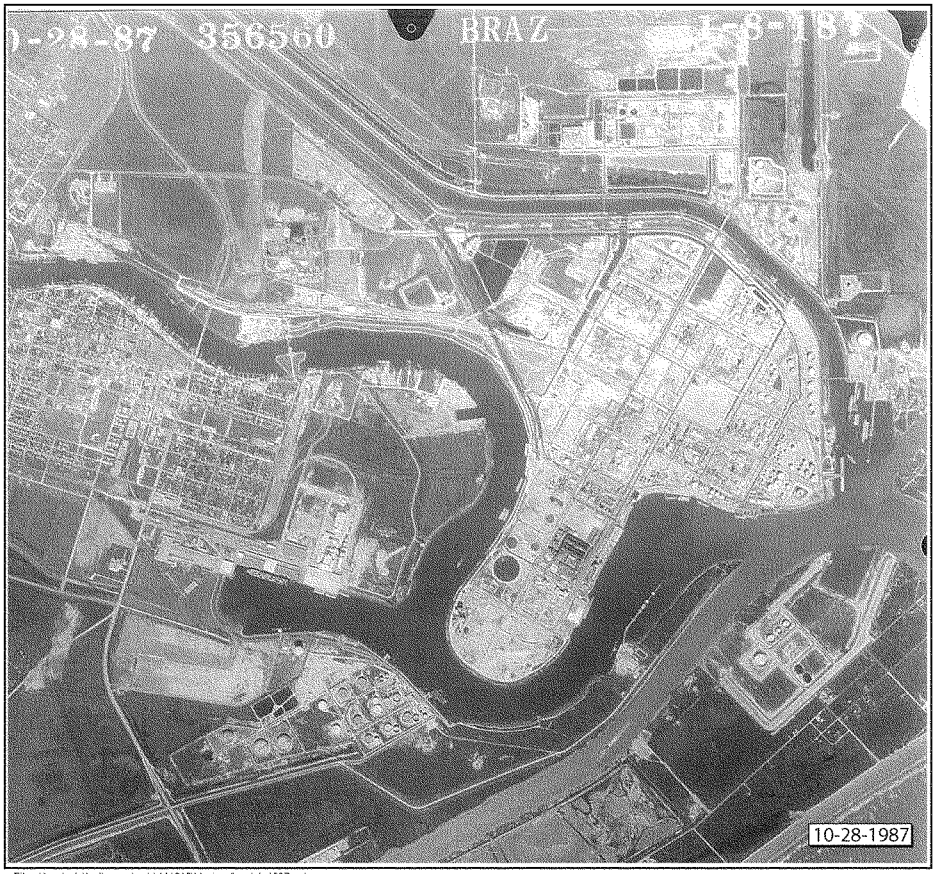

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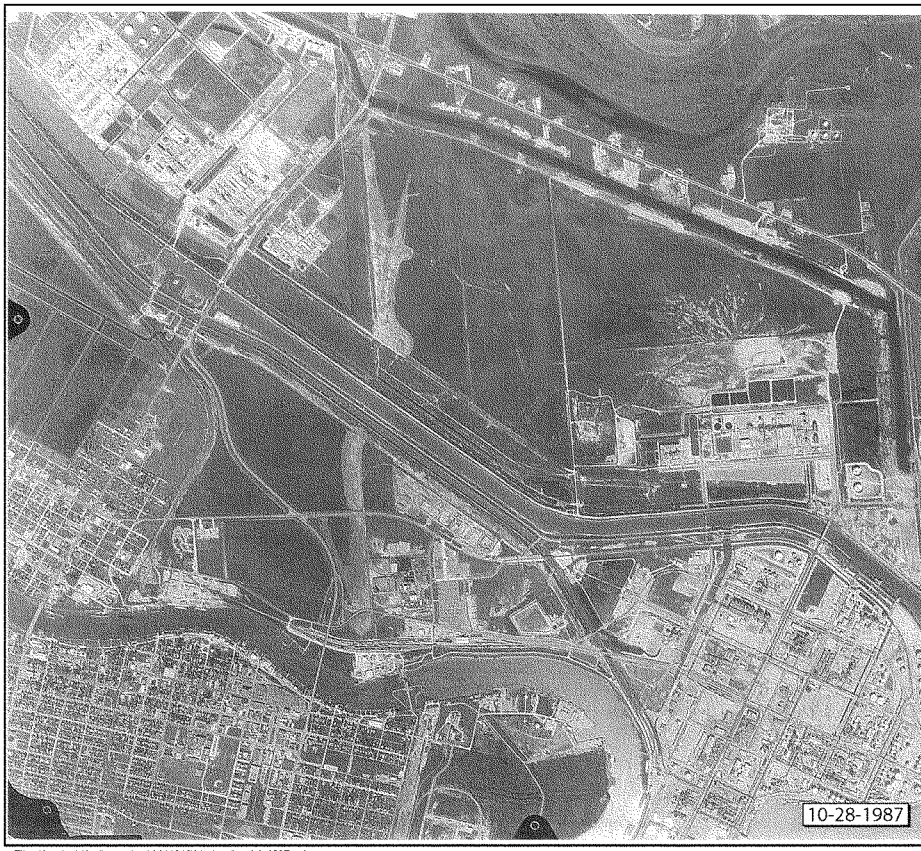

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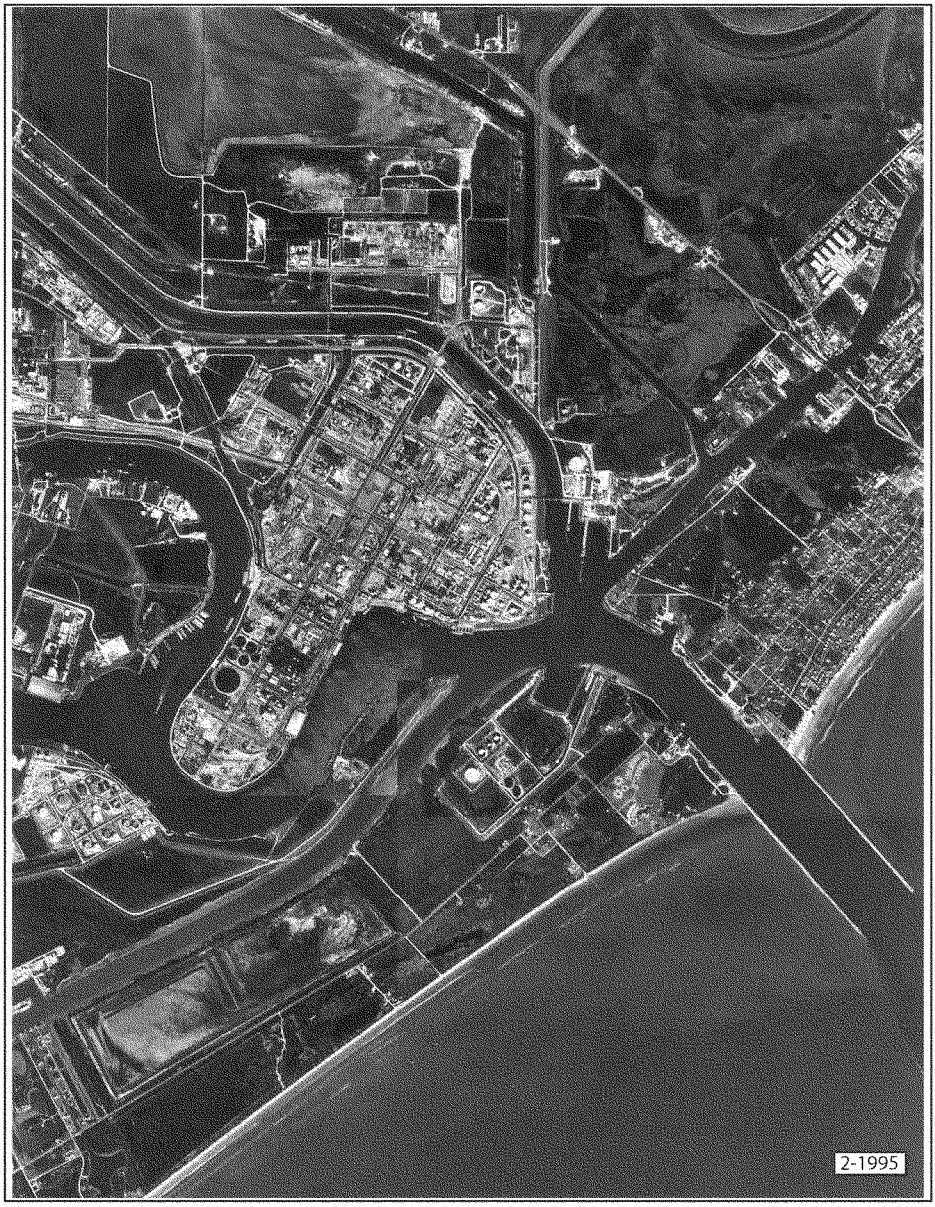

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Appendix D-3

Hazardous, Toxic, and Radioactive Waste Interviews

PBS&J

Date 5/17/06
Time
Length

TELEPHONE CONVERSATION
SUMMARY

Incoming Call
Returned Call

JOB NO.

COMMUNICANT Linda Broasch POSITION Group LEADER
AFFILIATION TCEQ LOCATION Houston
PHONE NO. 713 767-3579 PBS&J CONTACT STEVE McVEY
PURPOSE Interview for HTRW issues for Freeport

REMINDERS

COMMUNICATION I informed Ms. Broasch of my affiliation and stated my purpose. I told her that Arch Atharley recommended that I call to inquire of possible impacts to sediment of Freeport Harbor and ship channel.
She stated that there are contaminants in sediment in the river.
Upstream sediments are equally prone to contamination.
There is little flow to Brazos River/Harbor/Port
Water is both fresh and brine.
She recommended that obtain data from Surface Water Quality Monitoring database (call IT Staff)
She also stated that boats are sources of contaminants too.

REQUIRED ACTION Call 512 239-DATA

COPIES TO:

Prior Attempts Log

Date	Time	Recall by

PBS&J

Date 5/~~16~~17/06
Time
Length

TELEPHONE CONVERSATION
SUMMARY

Incoming Call
Returned Call

JOB NO.

COMMUNICANT Aron Atharley POSITION Site Investigator
AFFILIATION TCEQ Region 12 LOCATION Houston
PHONE NO. 713 767-3500 PBS&J CONTACT STEVE MCVEY
PURPOSE Interview for HTRW - Freeport, Texas

REMINDERS

COMMUNICATION
I informed Mr. Atharley of my affiliation and stated my purpose. He gave permission to interview and to use his name.
- Current enforcement of industry - None (that he is aware of).
- Violations of business adj to waterway - none
- Recent inspections? Most recent inspection performed by TCEQ of Dow April ~~2006~~ 2005. Next scheduled inspection for Dow's June 2006.
He is not aware of any reported releases that would be beyond effluent parameters.
He did state that Dow does have some off-site migration of impacted groundwater. Found water adjacent to waterway has reported to contain detectable levels of certain constituents.
Referred me to Stream monitoring Program

REQUIRED ACTION Contact Ms. Jenda Broasch (TCEQ)

COPIES TO:

Prior Attempts Log

Date	Time	Recall by

Appendix D-4

TelALL Data Summaries

TelALL Corporation

Environmental Data Search

for the site

Freeport Harbor Channel Improvement Project (FHCIP)
Near SH 288 and SH 36, Freeport, TX

441901.00

performed for

PBS&J

11/9/2007

PBJA6864

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Preface

TelALL Corporation
PBJA6864

This document of environmental concerns near Near SH 288 and SH 36, Freeport, TX reports findings of the TelALL data search, prepared on the request of PBS&J.

TelALL Corporation (TelALL) has designed this document to comply with the AAI and ASTM standard E 1527 - 05 (Accuracy and Completeness) and has used all available resources, but makes no claim to the entirety or accuracy of the cited government, state, or tribal records. Our databases are updated at least every 90 days or as soon as possible after publication by the referenced agencies. The following fields of governmental, state, and tribal databases may not represent all known, unknown, or potential sources of contamination to the referenced site. Many different variables effect the outcome of the following document. TelALL maintains extremely high standards, and stringent procedures that are used to search the referenced data. However, TelALL reserves the right at any time to amend any information related to this report.

If there is a need for further information regarding this report, or for any customer support please call TelALL at 800 583-0004 for assistance.

This report is divided into the following components:

MAP	Identified geocodeable findings relative to this data search.
SUMMARY 1	Sorting of the identified sites by distance from the subject site.
FINAL	A description of each database and a detailed explanation of findings.

Sources

Database	Acronym	Last Updated	Minimum Search Distance	Findings
National Priority List	NPL	03/2008	1	0
Comprehensive Environmental Response, Compensation, and Liability Information System	CERCLIS	03/2008	0.5	0
No Further Remedial Action Planned	NFRAP	03/2008	0.5	1
Resource Conservation and Recovery Information System - Treatment Storage or Disposal	RCRA TSD	03/2008	1	1
Corrective Action	CORRACT	03/2008	1	1
Resource Conservation and Recovery Information System - Generators	RCRA-G	03/2008	0.25	0
Emergency Response Notification System	ERNS	01/2008	0.25	1
Texas Voluntary Cleanup Program	TXVCP	03/2008	0.5	0
Innocent Owner/Operator Program	TXIOP	03/2008	0.5	0
Texas State Superfund	TXSSF	01/2008	1	0
TCEQ Solid Waste Facilities	TXLF	02/2008	1	0
Unauthorized and Unpermitted Landfill Sites	LFUN	02/2008	0.5	0
Leaking Underground Storage Tanks	TXLUST	01/2008	0.5	4
Texas Underground Storage Tanks	TXUST	01/2008	0.25	7
Texas Above Ground Storage Tanks	TXAST	01/2008	0.25	2
Texas Spills List	TXSPILL	02/2008	0.25	0
Brownfield	BRNFD	03/2008	0.5	0
Dry Cleaner	DRYC	02/2008	0.5	0
Indian Reservation Underground Storage Tanks	IRUST	02/2008	0.25	0

Freeport
Freeport
Jones Creek
77541
Old Brazos River
Dow Operations Plant B
Hanley Rd
Extine Ln
Cord 330
Crockett Ln
Bowie Ln
Travis Ln
Austin Ln
County Road 329
Cord 217
County Hwy 217
Highway 36
State Hwy 36
Levee Rd
W Floodgate Rd
Autrey St
Jones Rd
Laffitte St
Zapata St
Austin Park
Roeller St
Quintana St
Munson St
Farm Rd 523
Front St
Archer St
W 2nd St
Arbutus St
Mulberry St
Holly St
Lynn Ln
Dixie Dr
Acacia Cir
W 10th St
W 11th St
W 8th St
W 9th St
Pecan St
Mesquite St
Locust St
Elm St
Beech St
Cedar St
Walnut St
Magnolia St
Hickory St
Kawakawa St
Grove St
Division St
Fisher St
De Zavalla St
Caldwell
Freeport-bp
N
NPL
CERCLIS
NFRAP
TXSSF
TXLF
LFUN
ERNS
RCRA TSD
LUST
TXVCP
TXIOP
BRNFD
DRYC
CORRACT
RCRA-G
TXAST
TXUST
TXSPILL
IRUST
0
.5
1.0
1 inch = .5 mile
1:24K Topo Boundary
USPS Zip Boundary
Site Locations are Approximate Only
Site Boundary
TXRRC Identified Oil Well (Select Counties Only)
TelALL
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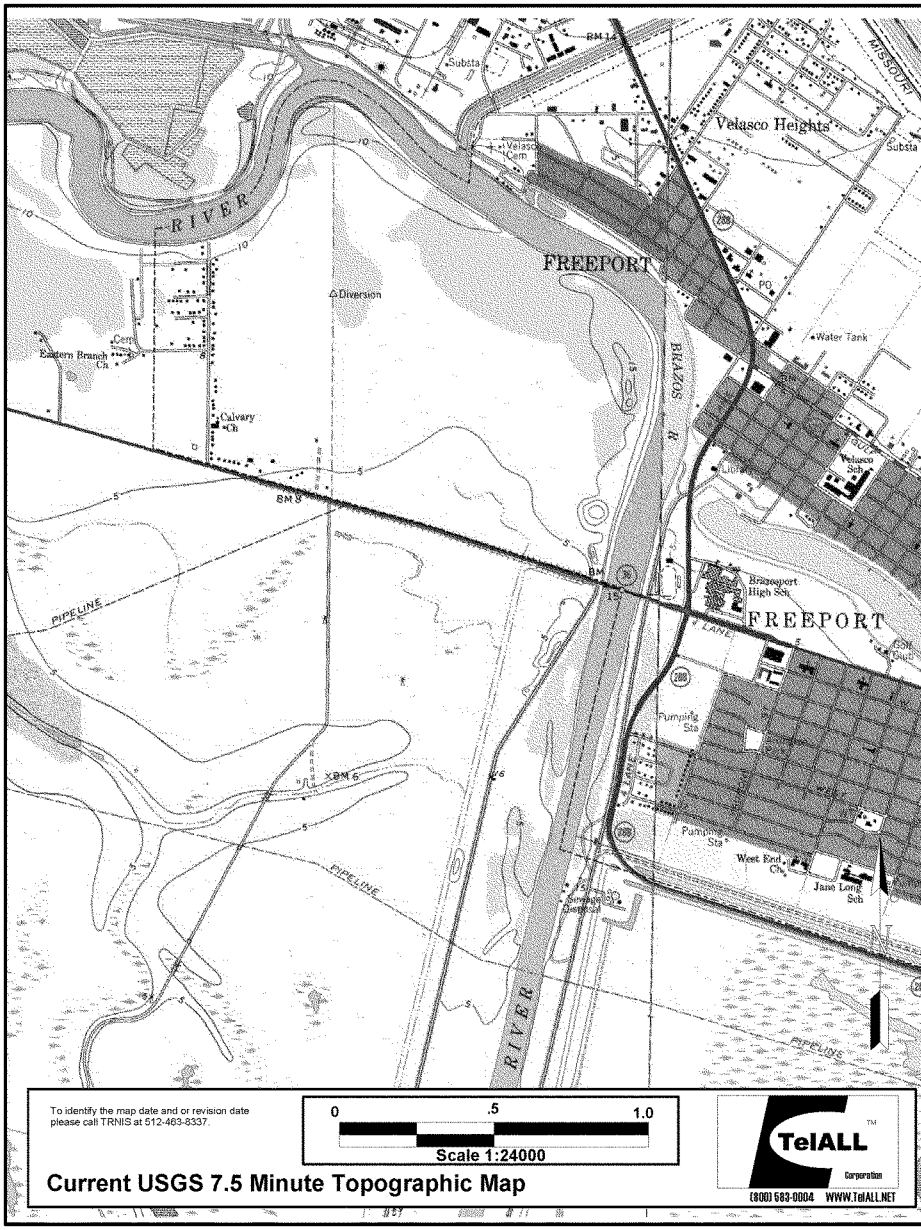
(800) 583-0004
WWW.TelALL.NET

0
.25
.5
1 inch = 1400 feet
1995 NAPP Photograph
TelALL
Corporation
(800) 683-0004 WWW.TelALL.NET


Velasco Heights
Substa
Velasco Cem
RIVER
FREEPORT
Diversion
Eastern Branch Ch
Cem
Calvary Ch
BRAZOS R
Water Tank
Velasco Sch
Brazosport High Sch
FREEPORT
PIPELINE
Pumping Sta
West End Ch
Jane Long Sch
RIVER
To identify the map date and or revision date please call TRNIS at 512-463-8337.
0
.5
1.0
Scale 1:24000
Current USGS 7.5 Minute Topographic Map
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Corporation
(800) 583-0004 WWW.TelALL.NET

TelALL Corporation

441901.00
Freeport Harbor Channel Improvement Project (FHCIP)
Near SH 288 and SH 36, Freeport, TX

Sites Sorted By Distance from Center

Page 1
Job PBJA6864
Date 11/9/2007

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	TXLF				NO FINDINGS WITHIN ONE MILE.
	NPL				NO FINDINGS WITHIN ONE MILE.
	CERCLIS				NO FINDINGS WITHIN 1/2 MILE.
	RCRA-G				NO FINDINGS WITHIN 1/4 MILE.
	IRUST				NO FINDINGS WITHIN 1/4 MILE.
	TXSSF				NO FINDINGS WITHIN ONE MILE.
	TXSPILL				NO FINDINGS WITHIN 1/4 MILE.
	LFUN				NO FINDINGS WITHIN 1/2 MILE.
	TXIOP				NO FINDINGS WITHIN 1/2 MILE.
	BRNFD				NO FINDINGS WITHIN 1/2 MILE.
	DRYC				NO FINDINGS WITHIN 1/2 MILE.
	TXVCP				NO FINDINGS WITHIN 1/2 MILE.
.2					
E	TXAST	4	516 LEVEE RD	FREEPORT	EAST LEVEE PUMP STATION
E	TXAST	4	516 LEVEE RD	FREEPORT	EAST LEVEE PUMP STATION
.25					
E	TXUST	3	500 BRAZOSPORT BLVD	FREEPORT	VISITORS CENTER
E	TXUST	3	500 BRAZOSPORT BLVD	FREEPORT	VISITORS CENTER
E	TXUST	3	500 BRAZOSPORT BLVD	FREEPORT	VISITORS CENTER
E	TXUST	5	606 N BRAZOSPORT BLVD	FREEPORT	EVCO INDUSTRIAL HARDWARE
E	TXUST	5	606 N BRAZOSPORT BLVD	FREEPORT	EVCO INDUSTRIAL HARDWARE
E	TXUST	5	606 N BRAZOSPORT BLVD	FREEPORT	EVCO INDUSTRIAL HARDWARE
.41					
N E	TXLUST	1	1002 BRAZOSPORT BLVD	FREEPORT	BUC EES 8
N E	TXLUST	1	1002 BRAZOSPORT BLVD	FREEPORT	BUCEES 18
.5					
N E	TXLUST	6	923 N GULF BLVD	FREEPORT	WILSON OIL CO SHELL STATION
1.					
N	RCRA TSD	2	2301 N BRAZOSPORT BLVD STE B1226	FREEPORT	THE DOW CHEMICAL COMPANY
N	CORRACT	2	2301 N BRAZOSPORT BLVD STE B1226	FREEPORT	THE DOW CHEMICAL COMPANY
Site Location Unknown					
	TXUST	unknown	BRAZOSPORT BLVD	FREEPORT	BRAZOSPORT J SCHOOL DIST
	TXLUST	unknown	823 BRAZOSPORT BLVD	FREEPORT	DIRTYS TATTOOS & SIGNS
	ERNS	unknown	COUNTY ROAD 217	FREEPORT	SPACE INC
	NFRAP	unknown	HWY.288	FREEPORT	DOW CHEMICAL CO.-PLANT B

Distances given are tenths of a statute mile.

TelALL Corporation

Environmental Data Search

for the site

Freeport EIS, Freeport, TX

441591.00

performed for

PBS&J

3/1/2006

PBJA6794

www.TelALL.net

(800) 583-0004 by fax (512) 472-4466

Preface

TelALL Corporation
PBJA6794

This document of environmental concerns near Freeport EIS, Freeport, TX reports findings of the TelALL data search, prepared on the request of PBS&J.

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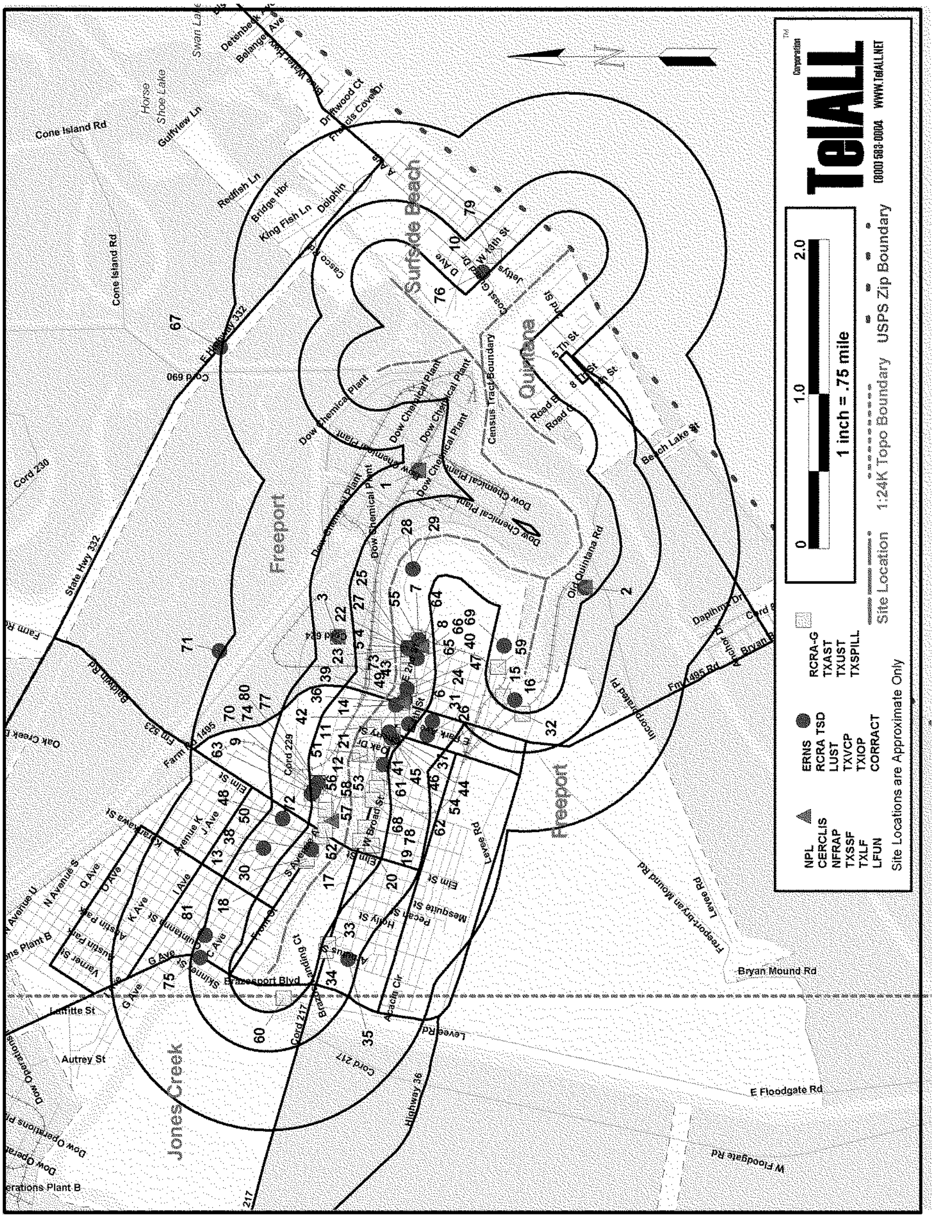
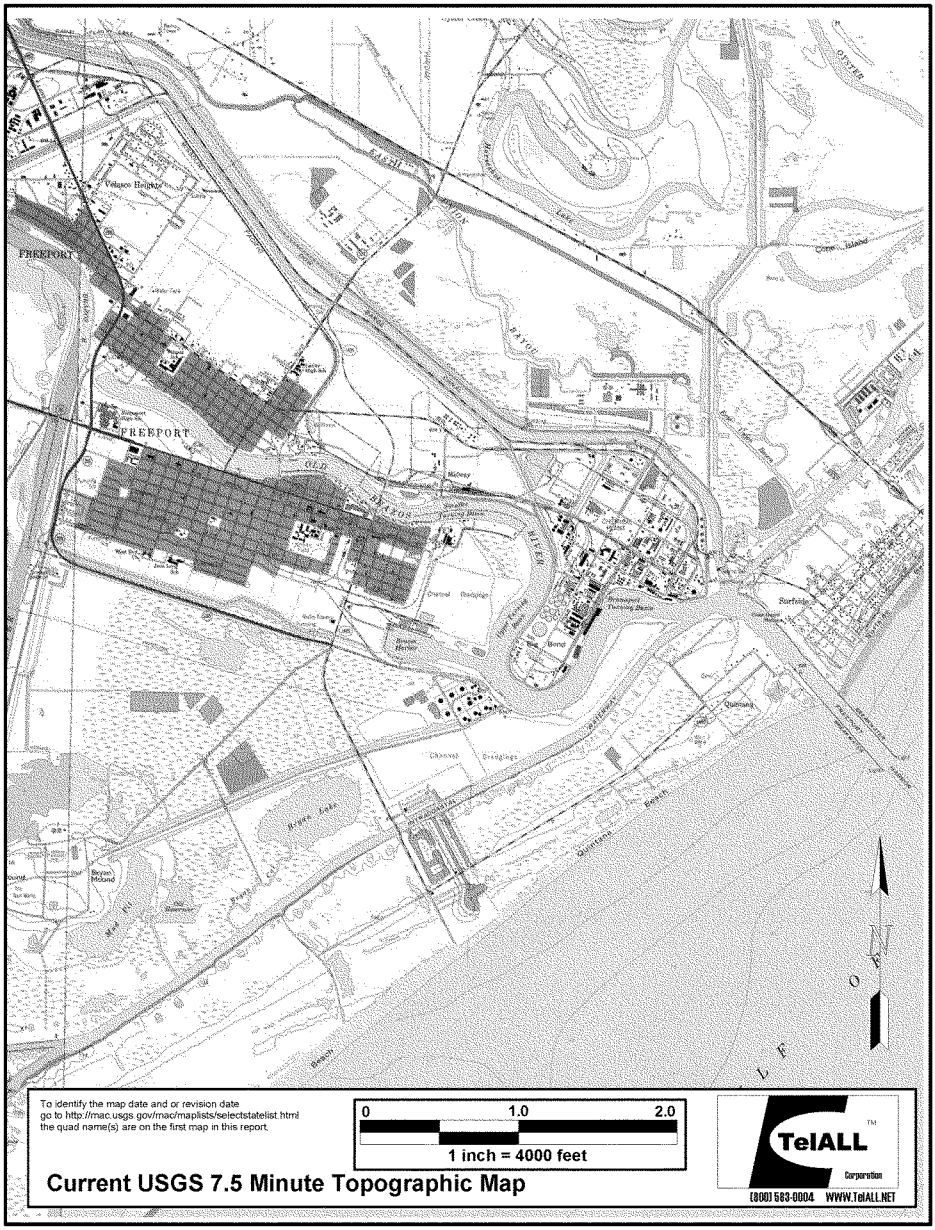
Sources

Database	Acronym	Last Updated	Minimum Search Distance	Findings
National Priority List	NPL	10/2005	1	0
Comprehensive Environmental Response, Compensation, and Liability Information System	CERCLIS	11/2005	0.5	3
No Further Remedial Action Planned	NFRAP	11/2005	0.5	6
Resource Conservation and Recovery Information System - Treatment Storage or Disposal	RCRA TSD	10/2005	1	1
Corrective Action	CORRACT	10/2005	1	5
Resource Conservation and Recovery Information System - Generators	RCRA-G	10/2005	0.25	9
Emergency Response Notification System	ERNS	10/2005	0.25	545
Texas Voluntary Cleanup Program	TXVCP	12/2005	0.5	0
Innocent Owner/Operator Program	TXIOP	12/2005	0.5	0
Texas State Superfund	TXSSF	10/2005	1	0
TCEQ Solid Waste Facilities	TXLF	01/2005	1	0
Unauthorized and Unpermitted Landfill Sites	LFUN	04/2002	0.5	1
Leaking Underground Storage Tanks	TXLUST	02/2006	0.5	18
Texas Underground Storage Tanks	TXUST	02/2006	0.25	73
Texas Above Ground Storage Tanks	TXAST	02/2006	0.25	45
Texas Spills List	TXSPILL	09/2003	0.25	403


TelALL Corporation
(800) 583-0004 WWW.TelALL.NET
0
1.0
2.0
1 inch = .75 mile
Site Location
1:24K Topo Boundary
USPS Zip Boundary
NPL
CERCLIS
NFRAP
TXSSF
TXLF
LFUN
ERNS
RCRA TSD
LUST
TXVCP
TXIOP
CORRACT
RCRA-G
TXAST
TXUST
TXSPILL
Site Locations are Approximate Only
Surfside Beach
Quintana
Freeport
Jones Creek
Dow Chemical Plant
Census Tract Boundary
Cone Island Rd
State Hwy 332
Brazosport Blvd
Bryan Mound Rd
E Floodgate Rd
W Floodgate Rd
Freeport-bryan Mound Rd
Levee Rd
Beach Lake St
Old Quintana Rd
Highway 36

0
1.0
2.0
1 inch = 4000 feet
1995 NAPP Photograph
TelALL
Corporation
(800) 683-0004 WWW.TelALL.NET



To identify the map date and or revision date
go to http://rmac.usgs.gov/rmac/maplists/selectstatelist.html
the quad name(s) are on the first map in this report.

Current USGS 7.5 Minute Topographic Map

TelALL Corporation

441591.00

Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Page 1
Job PBJA6794
Date 3/1/2006

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	TXSSF				NO FINDINGS WITHIN ONE MILE.
	TXLF				NO FINDINGS WITHIN ONE MILE.
	TXVCP				NO FINDINGS WITHIN 1/2 MILE.
	NPL				NO FINDINGS WITHIN ONE MILE.
	TXIOP				NO FINDINGS WITHIN 1/2 MILE.
.05					
	TXAST	11	1 CHERRY ST	FREEPORT	SINGLETON SHRIMP
	TXAST	11	1 CHERRY ST	FREEPORT	SINGLETON SHRIMP
	TXAST	11	1 CHERRY ST	FREEPORT	SINGLETON SHRIMP
	TXAST	51	400 W BRAZOS	FREEPORT	WESTERN SEAFOOD
	TXAST	53	404 W BRAZOS	FREEPORT	WESTERN
.07					
	ERNS	14	100 WEST BRAZOS OLD BRAZOS RIVER	FREEPORT	
	ERNS	14	100 WEST BRAZOS OLD BRAZOS RIVER	FREEPORT	
	TXAST	43	227 BRAZOS ST	FREEPORT	BARONS MARINE WAYS INC
	TXAST	43	227 BRAZOS ST	FREEPORT	BARONS MARINE WAYS INC

Distances given are tenths of a statute mile.

TelALL Corporation

441591.00

Sites Sorted By Distance from Center

Page 2
Job PBJA6794
Date 3/1/2006

Freeport EIS, Freeport, TX

Distance/Direction	Database	Site Number	Address	City/State	Site Name
.09					
	ERNS	4	1200 E. BRAZOS	FREEPORT	MI DRILLING FLUIDS
	ERNS	4	1200 E. BRAZOS	FREEPORT	MI DRILLING FLUIDS
	ERNS	4	1200 E. BRAZOS	FREEPORT	MI DRILLING FLUIDS
	ERNS	5	1201 EAST BRAZOS	FREEPORT	TDI BROOKS INC.
	ERNS	5	1201 EAST BRAZOS	FREEPORT	TDI BROOKS INC.
	ERNS	5	1201 EAST BRAZOS	FREEPORT	TDI BROOKS INC.
	TXAST	22	1100 E BRAZOS	FREEPORT	FREEPORT ICE & FUEL
	TXAST	22	1100 E BRAZOS	FREEPORT	FREEPORT ICE & FUEL
	TXAST	22	1100 E BRAZOS	FREEPORT	FREEPORT ICE & FUEL
	TXAST	22	1100 E BRAZOS	FREEPORT	FREEPORT ICE & FUEL
	TXAST	22	1100 E BRAZOS	FREEPORT	FREEPORT ICE & FUEL
	TXAST	22	1100 E BRAZOS	FREEPORT	FREEPORT ICE & FUEL
	TXAST	22	1100 E BRAZOS	FREEPORT	FREEPORT ICE & FUEL
	TXSPILL	23	1100 E BRAZOS ST	FREEPORT	G & G ENTERPRISES
	ERNS	24	115 EAST 2ND STREET	FREEPORT	E T CORP
	TXSPILL	25	1160 E BRAZOS ST	FREEPORT	BARON SEAFOOD
	ERNS	25	1160 EAST BRAZOS OLD BRAZOS	FREEPORT	BARON SEAFOOD
	ERNS	25	1160 EAST BRAZOS OLD BRAZOS	FREEPORT	BARON SEAFOOD
	TXAST	27	1200 E BRAZOS	FREEPORT	FREEPORT TERMINAL
	TXAST	27	1200 E BRAZOS	FREEPORT	FREEPORT TERMINAL
	TXAST	27	1200 E BRAZOS	FREEPORT	FREEPORT TERMINAL
	TXAST	27	1200 E BRAZOS	FREEPORT	FREEPORT TERMINAL
	ERNS	28	1200 E BRAZOS WWT DOCK	FREEPORT	TUG BOAT ARIES
	ERNS	29	1200 EAST BRAZOS	FREEPORT	M I DRILLING FLUIDS LLC
	CERCLIS	36	200 BLOCK EAST 2ND	FREEPORT	FREEPORT PHARMACY
	TXAST	39	220 E 2ND	FREEPORT	HARBOR ICE & FUEL
	TXAST	39	220 E 2ND	FREEPORT	HARBOR ICE & FUEL
	TXAST	39	220 E 2ND	FREEPORT	HARBOR ICE & FUEL
	TXAST	39	220 E 2ND	FREEPORT	HARBOR ICE & FUEL
	ERNS	40	222 EAST 2ND ST	FREEPORT	STANCO MARINE INC.
	TXUST	47	300 E 2ND ST	FREEPORT	W H PIERCE JR
	TXUST	47	300 E 2ND ST	FREEPORT	W H PIERCE JR
	TXUST	47	300 E 2ND ST	FREEPORT	W H PIERCE JR
	TXAST	49	326 E 2ND	FREEPORT	FREEPORT ICE COMPANY
	TXAST	49	326 E 2ND	FREEPORT	FREEPORT ICE COMPANY
	TXAST	49	326 E 2ND	FREEPORT	FREEPORT ICE COMPANY
	TXAST	49	326 E 2ND	FREEPORT	FREEPORT ICE COMPANY
	TXAST	73	803 E BRAZOS	FREEPORT	EAST FREEPORT PUMP STATION
	TXAST	73	803 E BRAZOS	FREEPORT	EAST FREEPORT PUMP STATION

Distances given are tenths of a statute mile.

TelALL Corporation

441591.00

Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
.1					
S	ERNS	2	ST RD 731 AND FM 1495 2.1 MI NORTH F	FREEPORT	PHILLIPS 66
S	TXSPILL	2	#3 DOCK AT PHILLIPS, FREEPORT TERM	FREEPORT	PHILLIPS PETROLEUM
S	TXSPILL	2	PHILLIPS FREEPORT ON OLD RIVER RO	FREEPORT	PHILLIPS FREEPORT
S	ERNS	2	BRAZOS HARBOR ICW 395 PHILLIPS DO	FREEPORT	
S	ERNS	2	QUINTANA RD	FREEPORT	PHILLIPS 66 CO
S	ERNS	2	PHILLIPS TERMINAL #1 CTY RD 731 FRE	FREEPORT	PHILLIPS 66
S	ERNS	2	PHILLIPS FREEPORT TERM. OLD BRAZO	FREEPORT	PHILLIPS 66
S	ERNS	2	POB 896 QUINTANA RD.	FREEPORT	PHILLIPS 66 CO
S	ERNS	2	PHILLIPS FREEPORT TWO DOCK 3	FREEPORT	
S	erns	2	PHILLIPS TERMINAL DOCK 3 1000 COUN	FREEPORT	PHILLIPS OIL COMPANY
S	erns	2	QUINTANA RD	FREEPORT	PHILLIPS 66
S	ERNS	2	PHILLIP'S DOCK TERMINAL 1, DOCK 2	FREEPORT	JAHRE SHIPPING
S	erns	2	QUINTANA RD	FREEPORT	PHILLIPS 66
S	ERNS	2	QUINTANA RD	FREEPORT	PHILLIPS 66 CO
S	ERNS	2	QUINTANA RD	FREEPORT	PHILLIPS 66
S	ERNS	2	PHILLIPS PETROLEUM DOCK FREEPORT	FREEPORT	SABINE TRANSPORTATION
S	ERNS	2	HWY 35 AND FM 524 PHILLIPS PETROLE	FREEPORT	
S	ERNS	2	PHILLIPS PETROLEUM TERM	FREEPORT	CONOCO
S	erns	2	FREEPORT TERMINAL	FREEPORT	PHILLIPS PETROLEUM
S	erns	2	1000 COUNTY ROAD 731/ COUNTY ROA	FREEPORT	PHILLIPS OIL COMPANY
S	erns	2	FREEPORT TERMINAL	FREEPORT	PHILLIPS PETROLEUM
S	ERNS	2	DOCK NO.1 TERMINAL NO.2	FREEPORT	PHILLIPS 66
S	ERNS	2	1 MI NE OF INTERSECTION OF FM 1495	FREEPORT	PHILLIPS 66
S	ERNS	2	1 MILE NE OF THE INTER- SECTION OF C	FREEPORT	PHILLIPS PETROLEUM
S	ERNS	2	PHILLIPS FREEPORT	FREEPORT	HOLLYWOOD MARINE
S	ERNS	2	QUINTANA RD	FREEPORT	PHILLIPS 66
S	ERNS	2	PHILLIPS FREEPORT	FREEPORT	HOLLYWOOD MARINE
S	ERNS	2	QUINTANA RD	FREEPORT	PHILLIPS 66
S	CORRACT	2	COUNTY ROAD 731 1 MI NE AND .3	FREEPORT	CONOCOPHILLIPS COMPANY
S	RCRA-G	2	COUNTY ROAD 731 1 MI NE AND .3	FREEPORT	CONOCOPHILLIPS COMPANY
S	ERNS	2	PHILLIPS 66 DOCK NO.3	FREEPORT	BRENT TRANSPORTATION
S	ERNS	2	PHILLIPS DOCKS TERMINAL 1 DOCK 2	FREEPORT	
S	ERNS	2	PHILLIPS TERMINAL NO.2 QUINTANA RD	FREEPORT	PHILLIPS 66
S	ERNS	2	PHILLIPS SWEENY/ SAN BERNARD RIVE	FREEPORT	HOLLYWOOD MARINE INC
S	erns	2	QUINTANA RD 1000 COUNTY RD 240	FREEPORT	PHILLIPS 66
S	ERNS	2	QUINTANA RD	FREEPORT	PHILLIPS 66
S	ERNS	2	FREEPORT HARBOR PHILLIPS TERMINA	FREEPORT	HOLLYWOOD BARGES
S	ERNS	2	PHILLIPS SWINNING ST BERNARD RIVE	FREEPORT	HOLLYWOOD MARINE
S	ERNS	2	QUINTANA RD	FREEPORT	PHILLIPS 66
S	ERNS	2	PHILLIPS MARINE TERMINAL #4 DOCK--B	FREEPORT	
S	ERNS	2	FREEPORT BERTH 2	FREEPORT	PHILLIPS 66
S	ERNS	2	QUINTANA RD	FREEPORT	PHILLIPS 66
S	ERNS	2	QUINTANA RD POB 897	FREEPORT	PHILLIPS 66 CO
S	ERNS	2	PORT OF FREEPORT IN CHANNEL NEAR	FREEPORT	
S	erns	2	PHILLIPS TERMINAL BERTH 2	FREEPORT	M/V BOW SAPHIR
S	ERNS	2	HIGH ISLAND BLOCK 561A	FREEPORT	PHILLIPS PETROLEUM CO
S	erns	2	QUINTANA RD	FREEPORT	PHILLIPS 66
S	ERNS	2	QUINTANA RD	FREEPORT	PHILLIPS 66
S	ERNS	2	PHILLIPS #2 TERMINAL	FREEPORT	
S	erns	2	PHILLIPS PETROLEUM, NUMBER THREE	FREEPORT	TEXACO

Distances given are tenths of a statute mile.

TelALL Corporation

441591.00

Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
S	TXLUST	2	1852 1/2 W 2ND ST	FREEPORT	PHILLIPS 66
S	erns	2	1000 COUNTY ROAD 731/ COUNTY ROA	FREEPORT	PHILLIPS OIL COMPANY
S	erns	2	FREEPORT TERMINAL	FREEPORT	PHILLIPS PETROLEUM
S	erns	2	1000 COUNTY ROAD 731/ COUNTY ROA	FREEPORT	PHILLIPS OIL COMPANY
S	ERNS	2	QUINTANA RD	FREEPORT	PHILLIPS 66 CO
S	ERNS	2	NEAR THE BRAZOS RIVER ON RIGHT OF	FREEPORT	PHILLIPS 66 CO
S	ERNS	2	QUINTANA RD, TOW BOAT MAMA RU MO	FREEPORT	PHILLIPS 66 CO
S	ERNS	2	PHILLIPS DOCK/FREEPORT TERMINAL O	FREEPORT	ALAMO INLAND MARINE
S	erns	2	PHILLIPS PETROLEUM, NUMBER THREE	FREEPORT	TEXACO
S	TXSPILL	2	ENTIRE TERMINAL	FREEPORT	PHILLIPS TERMINAL
S	TXSPILL	2	MAIN PROCESS FLAREEPN-62-61-5, CR	BRAZORIA	PHILLIPS CLEMINS TERMINAL
S	RCRA-G	2	HIGHWAY 36 W @ SEAWAY RD	JONES CREEK	CONOCOPHILLIPS
S	ERNS	2	QUINTANA RD	FREEPORT	PHILLIPS 66 CO
S	ERNS	2	POB 896 QUINTANA RD.	FREEPORT	PHILLIPS 66 CO
S	ERNS	2	PHILLIPS DOCK	FREEPORT	HOLLYWOOD MARINE INC
S	ERNS	2	PHILLIPS FREEPORT BERTH 3	FREEPORT	HOLLYWOOD MARINE INC
S	ERNS	2	PHILLIPS PETROLEUM DOCK NO.2	FREEPORT	DIXIE MARINE INC
S	NFRAP	2	QUINTANA ROAD	FREEPORT	PHILLIPS PETROLEUM CO FREEPOR
S	ERNS	2	.5 MILES SOUTH OF FREEPORT	FREEPORT	PHILIPS PETROLEUM CO.
S	ERNS	2	PHILLIPS 66	FREEPORT	
S	ERNS	2	1 MILE NE INTERSECTION COUNTY RD 7	FREEPORT	PHILLIPS PETROLEUM CO
S	ERNS	2	#3 BERTH #2 TERMINAL QUINTANA RD	FREEPORT	PHILLIPS 66 CO
S	ERNS	2	PHILLIPS TERMINAL NO. 1, DOCK 2	FREEPORT	STAPP TOWING CO.
S	ERNS	2	PHILLIPS #2 TERMINAL MILE POST 395	FREEPORT	TUGBOAT "CREOLE RIVER"
S	ERNS	2	PHILLIPS DOCKS COUNTY RD 731	FREEPORT	
S	ERNS	2	QUINTANNA ROAD TERMINAL NO. 2	FREEPORT	PHILLIPS 66
S	ERNS	2	PO BOX 892 QUINTANA RD	FREEPORT	PHILLIPS 66
S	erns	2	PHILLIPS PETROLEUM, NUMBER THREE	FREEPORT	TEXACO
S	ERNS	2	NO. 2 TERMINAL NO. 2 BERTH AT PHILLI	FREEPORT	
S	TXSPILL	2	FREEPORT DOCK #3	FREEPORT	PHILLIPS 66
S	ERNS	2	POB 896 QUINTANA RD.	FREEPORT	PHILLIPS 66 CO
S	ERNS	2	QUINTANA RD DOCK NO.2	FREEPORT	PHILLIPS 66
S	ERNS	2	PHILLIPS PETROLEUM	FREEPORT	LEEVAC MARINE
S	ERNS	2	PHILLIPS PETROLEUM TERMINAL	FREEPORT	
S	ERNS	2	IN FRONT OF THE PHILLIPS 66 DOCK	FREEPORT	
	TXUST	12	10 ASH	FREEPORT	SHRIMP BOAT STORE
	TXAST	17	1010 E 2ND ST	FREEPORT	CAPT ELLIOTS PARTY BOATS INC
	TXAST	17	1010 E 2ND ST	FREEPORT	CAPT ELLIOTS PARTY BOATS INC
.11					
	TXUST	56	510 S AVE A	FREEPORT	FREEPORT SERVICE CENTER
	TXUST	56	510 S AVE A	FREEPORT	FREEPORT SERVICE CENTER
	TXSPILL	57	510 S AVENUE A # 77541	FREEPORT	CITY OF FREEPORT
	NFRAP	58	510 SOUTH AVE A	FREEPORT	SMITH WELDING WORKS INC
	TXUST	78	903 2ND ST	FREEPORT	STOP N GO 2492
	TXUST	78	903 2ND ST	FREEPORT	STOP N GO 2492
	TXUST	78	903 2ND ST	FREEPORT	STOP N GO 2492

Distances given are tenths of a statute mile.

TelALL Corporation

441591.00

Sites Sorted By Distance from Center

Page 5
Job PBJA6794
Date 3/1/2006

Freeport EIS, Freeport, TX

Distance/Direction	Database	Site Number	Address	City/State	Site Name
.12					
	RCRA-G	18	102 S AVENUE A	FREEPORT	ENDURO SYSTEMS INC
	TXAST	30	122 S AVE A	FREEPORT	VELASCO SCALE CO
	TXUST	30	122 S AVE A	FREEPORT	VELASCO SCALE CO
	TXUST	30	122 S AVE A	FREEPORT	VELASCO SCALE CO

Distances given are tenths of a statute mile.

TelALL Corporation

441591.00

Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
.13					
	TXSPILL	1	BLOCK A-7000, JUMBO EDC UNIT, DOW	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	LEAKING CELL @ UNOITY,DOW CHEMIC	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	DOW BARGE CANAL, FREEPORT TX.	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	UNIT H 3200, DOW CHEMICAL - FREEPO	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	DOW, FREEPORT	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	LEAKING FLANGE,DOW CHEMICAL - FRE	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-3200 CHLORPYRIDINE UNIT IN THROX	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW CHEMICAL - FREEPORT,.	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-3200 BLOCK, DOW CHEMICAL, FREEP	FREEPORT	DOW CHEMICAL
	TXSPILL	1	A-3861 BLOCK, DOW, 2301 N. BRAZOSP	FREEPORT	DOW CHEM OPERATION
	TXSPILL	1	PROCESS UNIT IN SUMP AREA OF FREE	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW C	FREEPORT	DOW CHEMICAL
	TXSPILL	1	FREEPORT FACILITY	FREEPORT	DOW CHEMICAL
	TXSPILL	1	FREEPORT FACILITY	FREEPORT	DOW CHEMICAL
	TXSPILL	1	LIGHTNING STRUCK HCL TANK,DOW CH	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	PIPELINE IN 1000 BLOCK, FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A600 MAG1,DOW CHEMICAL ,2301 N. BR	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	DOW C	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	DOW CHEMICAL, OYSTER CREEK UNIT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL
	TXSPILL	1	AREA 26 DOW FACILITY FREEPORT	FREEPORT	CENTURY WEST
	TXSPILL	1	A-3200 CHOROPURADINE UNIT,DOW CH	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	DOW, FREEPORT, PLANT A, 3000 BLOCK	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	DOW FREEPORT FACILITY	FREEPORT	DOW CHEMICAL
	TXSPILL	1	A 3204 BLOCK, DOW, 2301 N. BRAXOSP	FREEPORT	DOW USA
	TXSPILL	1	PLANT A AT THE INTERSECTION OF FAR	FREEPORT	DOW CHEMICAL
	TXSPILL	1	A-1700 BLK ETHYL BENZENE PLANT	FREEPORT	DOW
	TXSPILL	1	DOW CHEM A A8 DOCK, FREEPORT,TX	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW CHEMICAL A A8 DOCK, FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW CANAL, FREEPORT,TX	FREEPORT	UNK
	TXSPILL	1	INCINTERATOR WAS SHUT DOWN	FREEPORT	RHONE POULENC
	TXSPILL	1	LIGHT HYDROCARBONS 7 PLANT,DOW	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	DOW FACILITY IN FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOCK A-22 FREEPORT TX.	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW PROPERTY AT JACINTO PORT BLV	FREEPORT	DOW CHEMICAL
	TXSPILL	1	FREEPORT HARBOR	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	DOW PLANT A FACILITY COOLING SYST	FREEPORT	DOW CHEMICAL TEXAS OPERATION
	TXSPILL	1	PLANT A FACILITY	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW, FREEPORT BLDG. OC-708	FREEPORT	
	TXSPILL	1	AREA 26 DOW FREEPORT	FREEPORT	CENTURY CORTRACTORS
	TXSPILL	1	A1700 BLK, PLANT A, 2301 BRAZOSPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW PLANT A IN FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	UNK	FREEPORT	DOW CHEMICAL
	TXSPILL	1	UNK	FREEPORT	DOW CHEMICAL
	TXSPILL	1	D-440 TANK INB-33 TANK FARM,DOW CH	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	FREEPORT BARGE CANAL	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	OC-600 LIGHT HYDROCARBONS #8,DO	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-3200 CHLOROPYRADIENES UNIT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	A-3200 SYSTET PLANT, FROM A TANK T	FREEPORT	DOW
	TXSPILL	1	DOW CHEM, FREEPORT A3200 BLOCK	FREEPORT	DOW CHEMICAL

Distances given are tenths of a statute mile.

TelALL Corporation

441591.00

Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	TXSPILL	1	LIGHT HYDROCARBONS 7 PLANT,DOW	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	AIR AFFECTED, PROCESS UNIT, DOW F	FREEPORT	DOW, NO. AMERICAN
	TXSPILL	1	CAUSTIC PRODUCTION	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	PLANT A AT FM 1495 & 229, FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW CHEMICAL - FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	AT DOW CHEMICAL PLANT IN FREEPOR	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	UNION PACIFIC RAILYARD, FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-3800 BLOCK, FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	LIGHT HYDROCARBON PRODUCTION #8,	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	PRODUCTION UNIT, FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	ETHYL BENZENE UNIT, FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	PRODUCTION UNIT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	STYRENE # 2 UNIT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	AREA OC-708, DOW FACILITY, FREEPOR	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	STYRENE II UNIT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	PLANT A, FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	GLYCERINE 2 FINISHING UNIT AND SOIL	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	TRICHLOROETHYLENE	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	FM 1495 & COUNTY ROAD 229 @ FACILIT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	FACILITY AT ABOVE LOCATION @ FM 14	FREEPORT	DOW CHEMICAL
	TXSPILL	1	PLANT A 850' INTO DITCH	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-3800, ETHYLENE/AMINE UNIT,DOW CH	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	DOW DOCK @ FREEPORT	FREEPORT	DOW CHEMICAL USA TX. DIV.
	TXSPILL	1	DOW CHEMICAL PLANT, FREEPORT	FREEPORT	DOW CHEMICAL USA, TX. DIV.
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL USA TEX. DIV.
	TXSPILL	1	DOW BARGE CANAL DOCKS PLANT A, F	FREEPORT	DOW CHEMICAL CO. USA TX. DIV
	TXSPILL	1	PLANT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	BRIAN MOUND	FREEPORT	DOW CHEMICAL
	TXSPILL	1	OLD BRAZOS RIVER @ DOW PLANT 'A', F	FREEPORT	DOW CHEMICAL CO USA, TX. DIV.
	TXSPILL	1	FM 1495 AND CR 229, PLANT A	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	ROTARY KILN @ FACILITY AT ABOVE LO	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	DOW CHEMICAL COMPANY ICW	FREEPORT	KIRBY MARINE
	ERNS	1	DOW CHEMICAL DOCK	FREEPORT	DAN MARINE TOWING
	TXSPILL	1	FACILITY AT ABOVE LOCATION	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DITCH ON FACILITY AT ABOVE LOCATIO	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	PLANT A @ DOW CHEM, 3301 5TH AVE S	FREEPORT	DOW CHEMICAL
	TXSPILL	1	FACILITY AT ABOVE LOCATION	FREEPORT	DOW CHEMICAL
	TXSPILL	1	TRUCK LOADING AREA @ FACILITY AT A	FREEPORT	DOW CHEMICAL
	TXSPILL	1	FM 1495 & COUNTY ROAD 225	FREEPORT	DOW CHEMICAL
	TXSPILL	1	A4000 BLOCK PLANT A	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW PLANT IN FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	A1600 BLOCK OF DOW PLANT A, FREEP	FREEPORT	DOW CHEMICAL
	TXSPILL	1	REACTOR IN POLYETHYLENE # 2	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	PLANT A FACILITY AT 826 BLOCK	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	PLANT A, FREEPORT	FREEPORT	DOW CHEMICAL USA, TEX DIV.
	TXSPILL	1	3200 BLOCK INSIDE FACILITY AT ABOVE	FREEPORT	DOW CHEMICAL
	TXSPILL	1	BLOCK 400 OF 'PLANT A' COMPLEX, FRE	FREEPORT	DOW CHEMICAL
	TXSPILL	1	FACILITY AT ABOVE LOCATION	FREEPORT	DOW CHEMICAL
	TXSPILL	1	A3200 CHLOROPURADINE.DOW CHEMIC	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	MAGNESIUM PRODUCTION A-600	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	PROCESS UNIT ETHYLDIAMENE BLOCK.	FREEPORT	DOW CHEMICAL - FREEPORT

Distances given are tenths of a statute mile.

TelALL Corporation

441591.00

Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	ETHYLENE PRODUCTION UNIT,DOW CH	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	POLYETHYLENE #4 UNIT, DOW CHEMIC	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	ENTHYLBENZENE A.,DOW CHEMICAL - F	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	POLYETHYLENE UNIT#4, FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-3500 BLOCK SHIP FLARE.	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A7 DOCK IN PLANT A IN BAY CANAL	FREEPORT	DOW FREEPORT
	TXSPILL	1	DOW CHEMICAL PLANT AT FREEPORT	FREEPORT	DOW CHEMICAL COMPANY
	TXSPILL	1	DOW PLANT A, FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW CHEMICAL PLANT A, FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW PLANT IN FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW FREEPORT FACILITY	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW CHEMICAL A320 BLOCK	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	PIPELINE CORRIDOR BETWEEN PLANTS	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW CHEMICAL - FREEPORT PLANT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	DOW CHEMICAL, FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW PLANT A, FREEPORT	FREEPORT	DOW CHEMICAL COMPANY
	TXSPILL	1	PLANT A, DOW CHEMICAL CO., FREEPO	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	DOW CHEMICAL PLANT, FREEPORT	FREEPORT	DOW CHEMICAL COMPANY USA
	TXSPILL	1	A 1700 ETHYL BENZENE UNIT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW FREEPORT PLANT	FREEPORT	DOW CHEMICAL-TEXAS DIVISION
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL COMPANY
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL COMPANY
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW-TEXAS OPERATIONS
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL, OYSTER CREEK DI
	TXSPILL	1	DOW PLANT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW PLANT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW CHEMICAL PLANT A CAUSTIC UNIT	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	DOW CHEMICAL COMPANY	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	PLANT SITE AT ABOVE ADDRESS	FREEPORT	DOW CHEMICAL U.S.A.
	TXSPILL	1	DOW PLANT A, FREEPORT	FREEPORT	DOW CHEMICAL COMPANY
	TXSPILL	1	@ CO. A4 DOCK AT PLANT A ON THE OL	FREEPORT	DOW CHEMICAL U.S.A. (TX. DIV.)
	TXSPILL	1	PIPELINE FROM DOW FREEPORT PLANT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	PLANT A	FREEPORT	DOW CHEMICAL USA TEX. DIV.
	TXSPILL	1	BRAZOS RIVER HARBOR, FREEPORT AT	FREEPORT	DOW CHEMICAL CO. USA TX. DIV.
	TXSPILL	1	PLANT 'A' BETWEEN DOW BARGE CANA	FREEPORT	DOW CHEMICAL USA, TEX. DIV.
	TXSPILL	1	DOW CHEMICAL, FREEPORT	FREEPORT	DOW CHEMICAL CO. USA, TX. DIV.
	TXSPILL	1	2600 BLK. 'A' PLANT, OUTFALL 201, OUTF	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	DOW A-4 DOCK, PLT A, FREEPORT SHIP	FREEPORT	DOW CHEM. TEX. DIV.
	TXSPILL	1	LOADING DOCK AREA	FREEPORT	DOW CHEMICAL
	TXSPILL	1	LOADING DOCK AREA	FREEPORT	DOW CHEMICAL
	TXSPILL	1	FREEPORT PLANT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	BLOCK A-1800 IN DOW'S PLANT A	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	DOW PLANT A, FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	CO. A8 DOCK AT PLANT A ON THE OLD B	FREEPORT	DOW CHEMICAL U.S.A
	TXSPILL	1	PLANT SITE AT ABOVE ADDRESS	FREEPORT	DOW CHEMICAL

Distances given are tenths of a statute mile.

TelALL Corporation

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Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	TXSPILL	1	POLYETHYLENE #1 UNIT AT ABOVE FACI	FREEPORT	DOW CHEMICAL COMPANY
	TXSPILL	1	OUTFALL NO. 1	FREEPORT	DOW CHEMICAL COMPANY
	TXSPILL	1	HAZARDOUS WASTE LANDFILL @ FACILI	FREEPORT	DOW CHEMICAL
	TXSPILL	1	PLANT A @ FM 1495 & CO. RD. 229	FREEPORT	DOW CHEMICAL
	TXSPILL	1	A 1800 BLOCK OF DOW PLANT A, FREEP	FREEPORT	DOW CHEMICAL
	TXSPILL	1	IN A2700 BLOCK OF ABOVE FACILITY	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW PLANT A, FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW PLANT A IN FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW PLANT A IN FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW CHEMICAL PLANT	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	FACILITY AT ABOVE ADDRESS	FREEPORT	DOW CHEMICAL
	TXSPILL	1	ON PLANT SITE THROUGH OUTFALL 001	FREEPORT	DOW CHEMICAL USA, PLANT A
	TXSPILL	1	PLANT A	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	PDC PROCESSING SYSTEM	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	PUMP SEAL ON PROCESS PUMP	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	ETHYLENE PRODUCTION	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	DOW PLANT, FREEPORT, TEXAS	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	DOW PLANT, FREEPORT, TEXAS	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	A3500 MARINE OPERATIONS	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	ALLYL CHLORIDE UNIT	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	A-3200 CHLOROPERIDIENE, FREEPORT	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	BLOCK A-7000, JUMBO EDC UNIT, DOW	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	POLYETHYLENE UNIT	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	ETHYLENE PRODUCTION CRACKING UNI	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	SHEENING ONTO RIVER FROM OUTFALL	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	BETWEEN OYSTER CREEK AND PLANT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	FURNACE, FREEPORT	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	FREEPORT FACILITY	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	CLORINE UNIT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	POLYETHYLENE #2	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	FIRE AT OC 600 BLK LIGHT HYDROCARB	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	FREEPORT PLANT	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	LIGHT HYDROCARBONS #7 PLANT	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	PIPELINE	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	PSA 150, F550 FLARE FOR PROCESS VE	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	OUTDOOR BURNING	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	DOW A4 MOTOR VESSEL @ DOW, 2301	FREEPORT	DOW
	TXSPILL	1	DOW CHEMICAL PLANT A	FREEPORT	DOW CHEMICAL
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	PLANT A FACILITY AT FM 1495 & COUNT	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	PLANT A A 4100 FARM ROAD 1405, COU	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	BOLIVAR PENNISULA BARGE TERMINAL	FREEPORT	DOW CHEMICAL
	TXSPILL	1	A-8 DOCK AT BRAZOS HARBOR, FREEP	FREEPORT	DOW CHEMICAL FREEPORT
	TXSPILL	1	DOW, FREEPORT BARGE DOCK A4,	FREEPORT	DOW FREEPORT(M/V MARINE CHEMI
	TXSPILL	1	DOW PLANT A ON FM 1495, FREEPORT,	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW PLANT A, F.R. 1495, FREEPORT, 77	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW, BRAZOS HARBOR, FREEPORT	FREEPORT	DOW CHEMICAL

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TelALL Corporation

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Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	TXSPILL	1	A-3 DOCK DOW FREEPORT ON MAIN DO	FREEPORT	DOW CHEMICAL FREEPORT
	TXSPILL	1	PLANT A PUMP P-208B	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-3 DOCK, DOW, 2301 BRAZOSPORT BL	FREEPORT	DOW CHEMICALS
	TXSPILL	1	SYM-TET UNIT TOX EQUIPMENT.	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	DOW'S A-8 DOCK, BRAZOS RIVER, FREE	FREEPORT	DOW CHEMICAL
	TXSPILL	1	A1600 AIR STRIPPER @ DOW, 2301 BRA	FREEPORT	DOW CHEMICAL
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	PRODUCTION UNIT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	COMPRESSOR TO FLARE.	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	STRATTAN RIDGE FACILITY PIPELINE	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	LIGHT HYDROCARBON 7, DOW CHEMIC	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	UNIT 301, DOW CHEMICAL - FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	LIGHT HYDROCARBON UNIT 7	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	POLYCARBONATE UNIT, BLK 8400, DOW	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A3200 BLOCK D206PSV, DOW CHEMICAL	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	ETHYLBENZINE A UNIT	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	DOW DOCK # 4 AT FREEPORT, 77541	FREEPORT	GRASSO OIL FIELD SERVICES
	TXSPILL	1	A 3200 CHLORPURADIENE UNIT,DOW C	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	N & S RAILCAR LOAD RACK	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	CHLOROALKLYDE,DOW CHEMICAL - FR	FREEPORT	DOW CHEMICAL - FREEPORT
	NFRAP	1	OLD BRAZOS RIVER & DOW CANAL	FREEPORT	DOW CHEMICAL CO TEXAS DIVISION
	TXSPILL	1	DOW CHEMICAL - FREEPORT PLANT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	6 INCH UNDERGROUND PIPELINE,DOW	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	DOW, FREEPORT, TX SANITARY LANDFI	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	PHENOL ASTOL UNIT, OYSTER CREEK,	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	PLUG ON PUMP IN UNIT A-3800 ETHYLE	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-2400,DOW CHEMICAL - FREEPORT,230	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-1800,DOW CHEMICAL - FREEPORT,230	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	PLANT A, 3800 BLOCK,DOW CHEMICAL -	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	FLASH DRUM	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	DOW CHEMICAL - FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	ETHYLBENZENE UNIT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A 3200 CHLOROPURADENES,DOW CHE	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A PLANT 1700 BLOCK,DOW CHEMICAL -	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-3800 BLOCK.,DOW CHEMICAL - FREEP	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-3200 BLOCK, DOW CHEMICAL - FREEP	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	LIGHT HYDROCARBONS # 7, WASTE HE	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	UNIT A-38, ETHYLENE AMINE, DOW CHE	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	DOW CHEMICAL - FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A8 DOCK,DOW CHEMICAL - FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	POLY 4 4100 UNIT, DOW CHEMICAL - FR	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	403 OUTFALL, DOW CHEMICAL - FREEP	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-3200 BLOCK AT PLANT, FREEPORT, TX	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-3200, CHLOROPYRIDINE UNIT, DOW C	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	LIGHT HYDROCARBON NO. 7	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	ALIAL CHLORIDE UNIT	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	FREEPORT	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	LIGHT HYDROCARBONS NO. 7	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	POLYETHYLENE #2	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	FLANG ON VESSEL D-200	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	LIGHT HYDROCARBONS #8	FREEPORT	DOW CHEMICAL - FREEPORT

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TelALL Corporation

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Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	TXSPILL	1	PLANT A	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	SYM-TET PLAN PLANT-A 3200	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	RAIL CAR LOADING ARM	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	CHLORAPRENE PLT.	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	LIGHT HYDROCARBONS 7 UNIT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A3200	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	LIGHT HYDROCARBON	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	CRACKED GAS COMPRESSOR	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	ETHYLENE DIAMINE PLANT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-3200 UNIT, DOW CHEMICAL , 2301 BRA	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A2600 BLOCK	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A3200 BLOCK, DOW CHEMICAL - FREEP	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A2400 BLOCK, DOW CHEMICAL - FREEP	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	DOW FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	FM 1495 EXIT, DOW CANAL ROAD TO C	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-22 DOCK FREEPORT MARINE VESSEL	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	VERSENE UNIT, A2600 BLOCK	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	F-550 FLARE, FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	PLANT A, DOW CHEMICAL - FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	DOW CHEMICAL FREEPORT PLANT A		DOW CHEMICAL
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	DOW CHEMICAL PLANT A FREEPORT	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	DOW CHEMICAL PLANT A PIPELINE	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	PIPELINE CORRIDOR NORTHEAST OF D	FREEPORT	DOW CHEMICAL USA
	ERNS	1	(ITALIAN VESSEL) DOW CHEMICAL FACI	FREEPORT	TEXAS MARINE
	TXSPILL	1	DOW CHEMICAL PLANT	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	CHLORINE 4 PLANT @ FACILITY AT ABO	FREEPORT	DOW CHEMICAL
	TXSPILL	1	PLANT SITE SODIUM HYDROXIDE STOR	FREEPORT	DOW CHEMICAL COMPANY
	TXSPILL	1	DOW CHEMICAL PLANT A BLOCK A	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	DOW CHEMICAL PLANT A FREEPORT	FREEPORT	DOW CHEMICAL COMPANY U.S.A.
	TXSPILL	1	FROM PLANT TO OUTFALL 201	FREEPORT	DOW CHEMICAL (TEX. DIVISION)
	TXSPILL	1	DOW CHEMICAL USA FREEPORT		DOW CHEMICAL USA
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL COMPANY
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	DOW CHEMICAL COMPANY PLANT A	FREEPORT	DOW CHEMICAL COMPANY
	TXSPILL	1	DOW CHEMICAL COMPANY DOCKS	FREEPORT	DOW CHEMICAL COMPANY
	TXSPILL	1	DOCK A-14, FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	HEAT EXCHANGER IN PLANT A.	FREEPORT	DOW CHEMICAL COMPANY
	TXSPILL	1	LINE FROM REACTOR TO STORAGE TAN	FREEPORT	DOW U.S.A (TEXAS DIVISION)
	TXSPILL	1	DESIGN REP. TRYING TO FIX A-3500 BLO	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	DOW CHEMICAL CO. TEXAS WORKS	FREEPORT	DOW CHEMICAL COMPANY
	TXSPILL	1	REACTOR IN PLANT (A-3200), DOW FREE	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	OYSTER CREEK UNIT 1	FREEPORT	DOW CHEMICAL USA TX OPERATION
	TXSPILL	1	A1700 BLOCK OF DOW CHEMICAL PLAN	FREEPORT	DOW CHEMICAL COMPANY

Distances given are tenths of a statute mile.

TelALL Corporation

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Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	TXSPILL	1	PLANT A FACILITY A-1800 BLOCK	FREEPORT	DOW CHEMICAL
	TXSPILL	1	PLANT A FACILITY A-1800 BLOWN	FREEPORT	DOW CHEMICAL
	TXSPILL	1	PLANT SITE (A-1700)	PREEPORT	DOW CHEMICAL
	TXSPILL	1	INTERNAL DITCHES IN PLANT	FREEPORT	DOW CHEMICALS TEXAS OPERATIO
	TXSPILL	1	PLANT A PRODUCTION UNIT (CHLOROP	FREEPORT	DOW CHEMICAL USA,TX OPNS
	TXSPILL	1	AT PARKING LOT FOR A3A DOCK OF DO	FREEPORT	DOW CHEMICAL
	TXSPILL	1	A-13 DOCK, FREEPORT HAUBOR, INTER	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DISPERSIMENT TOWER, DOW FACILITY	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DISPERSMENT TOWER, DOW FACILITY	FREEPORT	DOW CHEMICAL
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	DOW FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW CHEMICAL COMPANY	FREEPORT	DOW CHEMICAL COMPANY
	TXSPILL	1	PLANT A FACILITY FM 1495 INTERSECTI	FREEPORT	DOW CHEMICALS
	TXSPILL	1	A 1800 BLOCK, (BL-0082R), 2301 BRAZOS	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	A-3200 BLK IN FREEPORT PLANT, BRAZ	FREEPORT	DOW CHEMICAL
	TXSPILL	1	AMINES DIANIMES PLANT A 1700 BLOCK	FREEPORT	DOW CHEMICALS
	TXSPILL	1	DOW CHEMICAL PLANT FM 1495 & KATY	FREEPORT	DOW CHEMICAL COMPANY
	TXSPILL	1	A 3200 BLOCK, CHLOROPYRIDINE PROD	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	RAILYARD, VELASCO, UNION PACIFIC IN	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	A-3 DOCK, FREEPORT, FM 1495 & COUN	FREEPORT	DOW CHEMICAL
	TXSPILL	1	PLANT FACILITY, A-3000 BLOCK,FREEPO	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW CHEMICAL COMPANY PLANT A	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	DOW CHEMICAL PLANT A FREEPORT	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	A-14 DOCK, DOW CHEMICAL, FREEPORT	FREEPORT	DOW CHEMICAL U.S.A (TX. DIV.)
	TXSPILL	1	3 A DOCK	FREEPORT	DOW FREEPORT
	TXSPILL	1	DOCK 822 , FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	ON SITE CANAL - MAIN OUTFALL CANAL	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	A-600 BLOCK, NEAR MIXING BOX. PLANT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	SOUTH OF PLANT 'A' IN WASTEWATER C	FREEPORT	DOW CHEMICAL
	TXSPILL	1	A-600 BLOCK, NEAR MIXING BOX, PLANT	FREEPOSR	DOW CHEMICAL CO.
	TXSPILL	1	BRAZOS HARBOR- A-8 DOCK, DOW CHE	FREEPORT	DOW CHEMICAL
	TXSPILL	1	A-1600, DOW, 2301 BRAZOSPORT BLVD.,	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	FREEPORT FACILITY	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	POLYETHYLENE #2	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	POLYETHYLENE #2 PLANT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	FREEPORT PLANT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	POLYETHYLENE #2,DOW CHEMICAL - FR	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	DOW CHEMICAL PLANT	FREEPORT	DOW CHEMICAL USA DIVISION
	TXSPILL	1	OYSTER CREEK UNIT, FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-8 DOCK AT DOW	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	RELEIF VALVE	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	ETHYLBENZENE A-1700, FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-3200 UNIT, FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	CATOX UNIT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A LEVEL CHLORIDE B-6800	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	GENERAL DELIVERY	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	PHENOL/ ACETONE PRODUCTION OC30	FREEPORT	DOW CHEMICAL - FREEPORT

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TelALL Corporation

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Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	TXSPILL	1	DOW PLANT, FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	PLANT A ON FM 1495 OUTSIDE OF FREE	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW DISCHARGE CANAL	FREEPORT	DOW CHEMICAL DIVISION
	TXSPILL	1	DOW CHEMICAL PLANT 'A' CANAL	FREEPORT	DOW CHEMICAL OYSTER CREEK DIV
	TXSPILL	1	A-8 DOCK, PLANT A, FREEPORT	FREEPORT	DOW CHEMICAL CO. USA, TX. DIV.
	TXSPILL	1	LIGHT HYDROCARBONS	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	A-6 DOCK	FREEPORT	DOW
	TXSPILL	1	A3-A DOCK AT DOW, FREEPORT	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	A3-A DOCK AT DOW, FREEPORT	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	A-1900 SITE	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	A7 DOCK OF PLANT A, FREEPORT, CR 2	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW PLANT A, 3600 BLOCK, FREEPORT	FREEPORT	DOW CHEMICAL - FREEPORT
	TXSPILL	1	SALT GLASS POWER HOUSE, A-5000 BL	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW PLANT A, FM 1495 & CO RD 229, FR	FREEPORT	DOW CHEMICAL
	TXSPILL	1	AT BAYPORT DOCK-INTERSECTION OF F	FREEPORT	DOW CHEMICAL USA TX OPERATION
	TXSPILL	1	A 7000 AT DOW	FREEPORT	DOW USA
	TXSPILL	1	INTERCOASTAL WATERWAY INT W/ FRE	FREEPORT	DOW CHEMICAL
	TXSPILL	1	A-1600 BLOCK PLANT A-CHLORINATED	FREEPORT	DOW USA TEXAS OPERATIONS
	TXSPILL	1	FREEPORT PLANT, INSIDE PLANT	FREEPORT	DOW - FREEPORT
	TXSPILL	1	FREEPORT FACILITY, CR 229 & FM 1495	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	CO. RD. 229 & FM 1495, FREEPORT	FREEPORT	DOW CHEMICAL
	TXSPILL	1	DOW-FREEPORT, PLANT D-6200	FREEPORT	DOW CHEMICAL CO.
	TXSPILL	1	DOW CHEMICAL ,FREEPORT (PLANT A)	FREEPORT	DOW CHEMICAL
	TXSPILL	1	SOIL INSIDE PLANT FACILITY	FREEPORT	DOW USA
	TXSPILL	1	FREEPERT, TX	FREEPORT	DOW CHEMICAL CO
	TXSPILL	1	PLANT	FREEPORT	DOW CHEMICAL TX OPERATIONS
	TXSPILL	1	DOW CHEMICAL AT HWY 288B AT A8 DO	FREEPORT	DOW CHEMICAL USA
	TXSPILL	1	PLANT A, INTERSECTION OF SH2292 FM	FREEPORT	DOW CHEMICAL CO. PLANT A
	TXSPILL	1	DOW CHEMICAL CO. BARGE CANAL	FREEPORT	DOW CHEMICAL
	ERNS	1	COUNTY RD 229 AND FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	FREE PORT SHIP CHANNEL DOW CHEMI	FREE PORT	DIXIE CARRIER INC
	ERNS	1	COUNTY RD 229 AND FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	COUNTY RD 229 AND FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	COUNTY RD 229 AND FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	COUNTY RD 229 AND FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	COUNTY RD 229 & FARM RD 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	DOCK A8 DOW CHEMICAL FREEPORT	FREEPORT	DIXIE MARINE INC
	ERNS	1	DOW CHEMICAL DOCK A8	FREEPORT	STROHM SHIPPING
	ERNS	1	COUNTY RD 229 AND FM 1495 DOCK A-7	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	P O BOX BB	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	DOW CHEMICAL IN THE INTRACOASTAL	FREEPORT	
	ERNS	1	COUNTY RD 229 & FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	COUNTY RD 229 & FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	INTERSECTION OF FM 1495 AND COUNT	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	COUNTY RD 229 AND FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	DOW CHEMICAL PLANT DOCK NO.4	FREEPORT	MARINE TRANSPORT MGMT INC
	ERNS	1	PLANT A DOCK A3 FARM ROAD 1495 CO	FREEPORT	DOW CHEMICAL CO
	ERNS	1	A-3 DOCK COUNTY RD 229 AND FM 1495	FREEPORT	DOW CHEMICAL CO
	ERNS	1	A4 DOCK AT DOW CHEMICAL	FREEPORT	T/V CATALINA
	ERNS	1	PLANT A, FM 1495 AND COUNTY RD 229	FREEPORT	DOW CHEMICAL CO
	ERNS	1	DOW CHEMICAL FARM RD. 1495 AND CO	FREEPORT	DOW CHEMICAL CO

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TelALL Corporation

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Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	ERNS	1	BRAZOS R. AT FREEPORT	FREEPORT	DOW CHEM
	ERNS	1	COUNTY RD 229 AND FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	28-57.0N 95-19.0W DOCK A3	FREEPORT	DOW CHEMICAL CO
	ERNS	1	COUNTY RD 229 AND FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	FARM ROAD 1495 AND COUNTY ROAD 2	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	COUNTY RD 229 AND FARM RD 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	A9 DOCK COUNTY RD 229 & FM1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	COUNTY 229 AND FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	DOW CHEMICAL PLANT	FREEPORT	TEXAS MARINE AGENCY
	ERNS	1	COUNTY RD 229 & FM 1495 DOW CHEMI	FREEPORT	
	ERNS	1	AA DOCK NEXT TO M/V STOLT SAPPHIR	BRAZORIA	
	ERNS	1	INTERSECTION OF FARM ROAD 1495 AN	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	FARM RD 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	FARM ROAD 1495 AT THE INTERSECTIO	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	FARM RD 1495 AND COUNTY RD 229	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	322	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	BRAZOS HARBOR AT ITS INTERSECTION	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	COUNTY RD 229 & FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	FM 1495 & CR 229	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	FM 1495 AND CR229	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	FM 1495 AND CTY RD 229	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	ACROSS FROM RATTLESNAKE PT, 5 MI	SURFSIDE	
	ERNS	1	FARM RD 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	DOW CHEMICAL A-4 DOCK	FREEPORT	
	ERNS	1	FARM RD 1495 COUNTY RD 229	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	PLANT A FACILITY FARM RD 1495 AND C	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	FARM ROAD 1495 AT INTERSECTION OF	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	FARM RD. 1495 AND CO. RD. 229	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	COUNTY RD 229 & FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	COUNTY RD 229 & FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	COUNTY RD 229 & FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	COUNTY RD 229 & FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	DOW FREEPORT DOCK A8	FREEPORT	JO TANKERS
	ERNS	1	COUNTY RD 229 & FM 1495	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	DOW CHEMICAL DOCK A-3	FREEPORT	
	ERNS	1	FREEPORT HARBOR DOW CHEMICAL D	FREEPORT	
	ERNS	1	COUNTY RD 229 AT THE INTERSECTION	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	DOW CHEMICAL PLANT "A" FARM ROAD	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	FTM 1495 AND COUNTY ROAD 229	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	FARM ROAD 1495 AT THE INTERSECTIO	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	DOW CHEMICAL PLANT	FREEPORT	MISENER MARINE CONSTRUCTION
	ERNS	1	FARM RD 1495 AND COUNTY RD 229	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	A-4 DOCK AT DOW CHEMICAL PLANT	FREEPORT	NATIONAL MARINE NAVIGATI.
	ERNS	1	DOW CHEMICAL COUNTY RD 229 & FM 1	FREEPORT	CONTINENTAL DREDGING
	erns	1		FREEPORT	DOW CHEMICAL
	erns	1	NEAR DOW CHEMICAL PLANT	FREEPORT	UNION PACIFIC RAILROAD
	erns	1	DOW BARGE CANAL A 4100 BLOCK	FREE PORT	PILING INC.
	erns	1	A3200 BLOCK 2031 N. BRAZOSPORT BLV	FREEPORT	DOW CHEMICAL CORP
	erns	1	DOW CHEMICAL CO. TERMINAL	FREEPORT	ANGLO-PACIFIC / LAURIN MARITIME
	erns	1	DOW CHEMICAL GULF ICW	FREEPORT	
	ERNS	1	DOW CHEMICAL PLANT A FARM RD 1495	FREEPORT	DOW CHEMICAL CO

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Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

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	erns	1	DOW CHEMICAL DOCK A22	FREEPORT	STOLT PARCEL TANKERS INC
	erns	1	DOW CHEMICALS	FREEPORT	ATHENIAN SEA CARRIERS
	erns	1	DOW CHEMICAL FUEL DOCK	FREEPORT	KIRBY INLAND MARINE
	erns	1	DOW CHEMICAL A-1 DOCK MM 390 GIC	FREEPORT	KIRBY INLAND MARINE
	erns	1	DOW CHEMICAL PLANT	FREEPORT	KIRBY INLAND MARINE
	ERNS	1	A-3200 BLOCK DOW CHEMICAL SYMTEC	FREEPORT	DOW CHEMICAL CORP
	ERNS	1	(ITALIAN VESSEL) DOW CHEMICAL FACI	FREEPORT	TEXAS MARINE
	ERNS	1	DOW CHEMICAL COMPANY ICW	FREEPORT	KIRBY MARINE
	erns	1	DOW CHEMICALS DOCK A22	FREEPORT	KIRBY INLAND MARINE
	erns	1	DOW CHEMICAL FREEPORT TEXAS DOC	FREEPORT	
	ERNS	1	ALONG FREEPORT CHANNEL	FREEPORT	DOW CHEMICAL
	CORRACT	1	BUILDING B-401	FREEPORT	DOW CHEMICAL CO
	ERNS	1	GULF OF MEXICODOW CHEMICAL TERM	FREEPORT	
	ERNS	1	ON THE INTRACOASTAL WATERWAY AT	FREEPORT	M/V DOMENICO IEVOLI
	ERNS	1	A-1700 UNIT2301 NORTH BRAZOSPORT	FREEPORT	DOW CHEMICAL
	ERNS	1	A1700 UNIT2301 NORTH BRAZOSPORT B	FREEPORT	DOW CHEMICAL
	erns	1	COMPANY PIER NORTH BRAZOSPORT B	FREEPORT	DOW CHEMICAL
	erns	1	DOW CHEMICAL FREEPORT TEXAS DOC	FREEPORT	
	erns	1	A22 DOCK	FREEPORT	DOW CHEMICAL
	erns	1	DOW CHEMICAL COMPANY OYSTER IND	FREEPORT	
	erns	1	DOW CHEMICAL COMPANY OYSTER IND	FREEPORT	
	erns	1	DOW CHEMICAL COMPANY OYSTER IND	FREEPORT	
	erns	1	DOW CHEMICALS	FREEPORT	ATHENIAN SEA CARRIERS
	erns	1	DOW CHEMICALS	FREEPORT	ATHENIAN SEA CARRIERS
	ERNS	1	DOW CHEM CO A4 DOCK	FREEPORT	
	erns	1	DOW CHEMICAL FREEPORT TEXAS DOC	FREEPORT	
	ERNS	1	DOW CHEMICALS	FREEPORT	BACON TOWING CO
	ERNS	1	DOW CHEMICAL DOCK	FREEPORT	DAN MARINE TOWING
	ERNS	1	FM RD 1495, COUNTY RD 229	FREEPORT	DOW CHEMICAL CO
	ERNS	1	DOW CHEMICAL DOCK A1	FREEPORT	HOLLYWOOD MARINE
	ERNS	1	BLDG OC 708 PLANT "A" FACILITY	FREEPORT	DOW CHEMICAL CO
	ERNS	1	BRAZOS HARBOR AT DOW'S A3 DOCK 1	FREEPORT	
	ERNS	1	DOW CHEMICAL CO DOCK A-4	FREEPORT	MARINE TRANSPORT MGMT INC
	ERNS	1	DOW FREEPORT SLIP A-8	FREEPORT	JO TANKERS
	ERNS	1	ON THE M/V MARINE CHEMIST AT DOW	FREEPORT	DOW CHEMICAL
	ERNS	1	A8 DOCK DOW CHEMICAL	FREEPORT	
	ERNS	1	PLANT A FARM ROAD 1495 COUNTRY R	FREEPORT	DOW CHEMICAL CO
	ERNS	1	DOW CHEMICAL COUNTY RD 229 & FAR	FREEPORT	
	ERNS	1	PLANT A 3200 BLOCK	FREEPORT	DOW CHEMICAL CO
	ERNS	1	DOW FREEPORT DOCK BETWEEN A-3 A	FREEPORT	PACE MARINE SERVICES
	ERNS	1	DOW CHEMICAL A-4 DOCK	FREEPORT	
	ERNS	1	BLDG OC 708 FM 1490	FREEPORT	DOW CHEMICAL CO
	ERNS	1	PLANT A FM 1495 AND COUNTY RD 229	FREEPORT	DOW CHEMICAL CO
	ERNS	1	DOW CHEMICAL CO. PLANT A FACILITY	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	PLANT "A" COUNTY RD 229 AND FM 1495	FREEPORT	DOW CHEMICAL CO
	ERNS	1	DOW CHEMICAL DOCK A 13	FREEPORT	
	ERNS	1	DOW D6 DOCK MILE 8 BRAZOS RIVER	FREEPORT	BARGE TRANSPORTATION CO
	ERNS	1	PLANT	FREEPORT	DOW CHEMICAL
	ERNS	1	DOW CHEMICAL PLANT A FARM RD 1495	FREEPORT	
	ERNS	1	DOW CHEMICAL PROPERTY ADJACENT	FREEPORT	
	ERNS	1	BLDG OC 708	FREEPORT	DOW CHEMICAL CO

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Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	TXSPILL	1	FACILITY AT ABOVE LOCATION	FREEPORT	DOW CHEMICAL
	ERNS	1	DOW CHEM A PLANT SCALES HWY 523	FREEPORT	
	ERNS	1	INTERSECTION OF FM 1495 AND CNTY R	FREEPORT	DOW CHEMICAL
	ERNS	1	BLDG OC 708	FREEPORT	DOW CHEMICAL CO
	ERNS	1	BLDG OC 708	FREEPORT	DOW CHEMICAL CO
	ERNS	1	DOW DOCK A-4	FREEPORT	STOLT-CORMORANT INC.
	ERNS	1	A2400 BLOCK	FREEPORT	DOW CHEMICAL CO
	ERNS	1	BLDG OC 708 DOW A4 DOCK	FREEPORT	DOW CHEMICAL CO
	ERNS	1	IN THE FREEPORT HARBOR ADJACENT	FREEPORT	
	ERNS	1	INTERSECTION OF FARM ROAD 1495 AN	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	DOW CHEMICAL CO A8 DOCK 2301 BRAZ	FREEPORT	CIVIL MECHANICAL INC
	ERNS	1	FARM RD 1495 AND COUNTY RD 229	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	1495 FARM RD AND 229 COUNTY RD	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	DOW A22 DOCK INTERSECTION THE IC	FREEPORT	DOW CHEMICAL
	ERNS	1	INTERSECTION OF FARM RD 1495 AND	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	ACROSS FROM DOW CHEMICAL A1 DOC	FREEPORT	M/V MORNING STAR
	ERNS	1	INTERSECTION FM RD 1495 AND COUNT	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	INTERSECTION OF FM 1495 AND COUNT	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	DOW CHEMICAL A-22	FREEPORT	SMQI SERVICES INC.
	ERNS	1	DOW CHEMICAL	FREEPORT	COASTAL TOWING INC
	ERNS	1	INT OF FR 1495 AND CNTY RD 229	FREEPORT	DOW CHEMICAL
	ERNS	1	INT FREEPORT HARBOR AND INTRACOA	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	DOW CHEMICAL PORT OF FREEPORT	FREEPORT	DOW CHEMICAL
	ERNS	1	DOW A8 DOCK / MI 395 ICW FREEPORT I	FREEPORT	
	ERNS	1	FARM RD 149 & COUNTY RD 229	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	INT FARM RD 1495 AND CTY RD 229	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	INTERSECTION OF FARM ROAD 1495 AN	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	FARM RD 1495 & CTY RD 229	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	DOW CHEMICAL A-22	FREEPORT	TEXAS MARINE AGENCY
	ERNS	1	COUNTY RD 229 INTERSECTIN FARM RD	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	INTERSECTION OF FM RD 1495 AND CTY	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	FM 1495 & CR 229 DOW CHEMICAL FACI	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	FREEPORT HARBOR AT THE DOW CHEM	FREEPORT	
	ERNS	1	INTERSECTION FARM RD 1495 AND COU	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	1495 FARM RD AND COUNTY RD 229	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	COUNTY RD 229 & FM 1425	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	FARM RD 1495 & COUNTY RD 229	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	INTERSECTION OF FM 1495 & COUNTY R	FREEPORT	DOW CHEMICAL
	ERNS	1	FM RD 1495 AT CTY RD 229	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	DOW PLANT A FACILITY FARM ROAD 149	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	INT OF FM 1495 & COUNTY RD 229	FREEPORT	DOW CHEMICAL
	ERNS	1	DOW CHEMICAL PLANT	FREEPORT	GROENDYKE TRANSPORT
	ERNS	1	DOW CHEMICAL COMPANY HWY 322	FREEPORT	CENTURY CONTRACTORS
	ERNS	1	INTERSECTION OF INTRA- COASTAL CA	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	FARM FD 1495 AND COUNTY RD 229	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	DOW TERMINAL / PIER A-4	FREEPORT	M/T PANAM QUERIDA
	ERNS	1	INTERSECTION OF FARM RD 1495 AND	FREEPORT	DOW CHEMICAL
	ERNS	1	FARM ROAD 1459 AND COUNTY ROAD 2	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	FARM RD 1495 & 229	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	DOW PIER	FREEPORT	DIXIE CARRIERS
	ERNS	1	INTERSECTION OF FARM ROAD 1495 AN	FREEPORT	DOW CHEMICAL COMPANY

Distances given are tenths of a statute mile.

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Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	ERNS	1	FARM RD 1495 AND COUNTY RD 229	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	DOW CHEMICAL FACILITY A8 DOCK. INT	FREEPORT	
	ERNS	1	FM 1495 AND COUNTY RD 229	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	FARM ROAD 1495 AT INTERSECTION OF	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	DOW CHEMICAL DOCK A22	FREEPORT	TRANSMARINE NAVIGATION
	ERNS	1	DOW 3A DOCK	FREEPORT	
	ERNS	1	DOCK A-4 DOW	FREEPORT	M/T TOLRUNNER
	ERNS	1	PLANT A FACILITY INTERSECTION OF TX	FREEPORT	DOW CHEMICAL COMPANY
	ERNS	1	INTERSECTION FARM RD 1495 AND COU	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	NEAR DOW CHEM FACILITY AT INTERSE	FREEPORT	
	ERNS	1	DOW CHEMICAL A-4 DOCK INTERSECTI	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	DOW CHEMICAL PROPERTY ON THE INT	FREEPORT	WESTERN TOWING CO
	ERNS	1	INT OF FM 1495 & CNT RD 229	FREEPORT	DOW CHEMICAL
	ERNS	1	BRAZOS RIVER INSIDE DOW CHEMICAL	FREEPORT	
	ERNS	1	INTERSECTION OF FM1495 AND CTY RD	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	FARM RD 1495 AND COUNTY RD 229	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	INTERSECTION OF COUNTY RD 229 AND	FREEPORT	DOW CHEMICAL
	ERNS	1	DOW DIVISION	FREEPORT	DOW CHEMICALS
	ERNS	1	INTERSECTION FM1495 & COUNTY RD 2	FREEPORT	DOW CHEMICAL
	ERNS	1	INT. OF FM RD 1495 & CTY RD 229	FREEPORT	DOW CHEMICAL
	ERNS	1	INT OF FM RD 1495 & CTY RD 229	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	FARM RD 1495 AND COUNTY RD 229	FREEPORT	DOW CHEMICAL COM.
	ERNS	1	DOW CHEMICAL TERMINAL	FREEPORT	SCANDANAVIAN MARINE
	ERNS	1	DOW CHEMICAL	OYSTER CREEK	DESTEC ENERGIES
	ERNS	1	INTERSECTION OF COUNTY RD 229 AND	FREEPORT	DOW CHEMICAL COM.
	TXUST	52	402 S AVE A	FREEPORT	SERGIOS GARAGE
	TXUST	52	402 S AVE A	FREEPORT	SERGIOS GARAGE
	TXUST	52	402 S AVE A	FREEPORT	SERGIOS GARAGE
	TXUST	52	402 S AVE A	FREEPORT	SERGIOS GARAGE
.14					
	TXLUST	38	201 S AVE A	FREEPORT	VACANT
	TXUST	38	201 S AVE A	FREEPORT	VACANT
	TXUST	38	201 S AVE A	FREEPORT	VACANT
	TXUST	38	201 S AVE A	FREEPORT	VACANT
	ERNS	65	618 EAST 2ND ST	FREEPORT	DIXIE CARRIER
	ERNS	66	618 EAST 2ND STREET	FREEPORT	GNH TOWING
	ERNS	66	618 EAST 2ND STREET	FREEPORT	GNH TOWING
.15					
	erns	7	503 PORT ROAD	FREEPORT	TETRA TECHNOLOGIES
	TXLUST	21	103 CHERRY ST 240 2ND ST	FREEPORT	INTERMEDICS
	TXUST	50	331 S AVENUE A	FREEPORT	HANDI STOP 72
	TXUST	50	331 S AVENUE A	FREEPORT	HANDI STOP 72
	TXUST	50	331 S AVENUE A	FREEPORT	HANDI STOP 72
	TXAST	55	505 PORT RD	FREEPORT	AMERICAN RICE
	TXAST	55	505 PORT RD	FREEPORT	AMERICAN RICE
	TXAST	55	505 PORT RD	FREEPORT	AMERICAN RICE
	TXAST	72	722 S AVE B	FREEPORT	AGIN SHRIMP PACKERS
	TXAST	72	722 S AVE B	FREEPORT	AGIN SHRIMP PACKERS

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.16					
	erns	8	618 E. SECOND	FREEPORT	
	erns	8	618 E. SECOND	FREEPORT	
	erns	8	618 E. SECOND	FREEPORT	
.17					
	TXUST	19	1021 W BROAD	FREEPORT	FREEPORT CO & TOLL
	TXUST	20	1024 W BROAD ST	FREEPORT	DIAMOND FOOD MART 3
	TXUST	20	1024 W BROAD ST	FREEPORT	DIAMOND FOOD MART 3
	TXUST	20	1024 W BROAD ST	FREEPORT	DIAMOND FOOD MART 3
	NFRAP	64	608 E 2ND STREET	FREEPORT	STAUFFER CHEMICAL CO PHOSPHO
.18					
	TXUST	59	515 PETE SCHAFF BLVD	FREEPORT	BRAZOS RIVER HARBOR NAV DISTRI
	ERNS	69	700 PETE SCHAFF BLVD MAINTENANCE	FREEPORT	DOLE FRESH FRUIT
	ERNS	69	700 PETE SCHAFF BLVD MAINTENANCE	FREEPORT	DOLE FRESH FRUIT
.19					
	TXUST	37	200 W 2ND	FREEPORT	VACANT LOT
	TXUST	37	200 W 2ND	FREEPORT	VACANT LOT
	TXUST	37	200 W 2ND	FREEPORT	VACANT LOT
	TXUST	37	200 W 2ND	FREEPORT	VACANT LOT
	RCRA-G	41	222 W SECOND ST	FREEPORT	TEXAS CREWBOATS
	RCRA-G	42	225 E PARK AVE	FREEPORT	MASCO OPERATORS INC
	TXLUST	44	230 W 2ND	FREEPORT	SHAMROCK MINI MART
	TXUST	45	231 W 2ND ST	FREEPORT	SHAMROCK MINI EXPRESS
	TXUST	45	231 W 2ND ST	FREEPORT	SHAMROCK MINI EXPRESS
	TXUST	46	240 W 2ND ST	FREEPORT	INTERMEDICS INC
	TXUST	46	240 W 2ND ST	FREEPORT	INTERMEDICS INC
	TXUST	46	240 W 2ND ST	FREEPORT	INTERMEDICS INC
	TXUST	46	240 W 2ND ST	FREEPORT	INTERMEDICS INC
	TXUST	46	240 W 2ND ST	FREEPORT	INTERMEDICS INC
	TXUST	46	240 W 2ND ST	FREEPORT	INTERMEDICS INC
	TXUST	46	240 W 2ND ST	FREEPORT	INTERMEDICS INC
	TXUST	46	240 W 2ND ST	FREEPORT	INTERMEDICS INC
W	TXAST	60	516 LEVEE RD	FREEPORT	EAST LEVEE PUMP STATION
W	TXAST	60	516 LEVEE RD	FREEPORT	EAST LEVEE PUMP STATION
	TXUST	68	626 W 2ND	FREEPORT	GIROUARDS INC
	TXUST	68	626 W 2ND	FREEPORT	GIROUARDS INC
.21					
	TXUST	62	602 W 2ND ST	FREEPORT	ABANDONED STATION
	TXUST	62	602 W 2ND ST	FREEPORT	ABANDONED STATION
	TXUST	62	602 W 2ND ST	FREEPORT	ABANDONED STATION
	TXUST	62	602 W 2ND ST	FREEPORT	ABANDONED STATION
	TXUST	62	602 W 2ND ST	FREEPORT	ABANDONED STATION
	TXUST	62	602 W 2ND ST	FREEPORT	ABANDONED STATION
.22					
	erns	6	226 WEST PARK AVE ARCO SEAWAY D	FREEPORT	DSD SHIPPING
	TXAST	15	1001 PINE ST	FREEPORT	BRAZOS RIVER HARBOR NAVIGATIO
	TXUST	15	1001 PINE ST	FREEPORT	BRAZOS RIVER HARBOR NAVIGATIO
	TXUST	15	1001 PINE ST	FREEPORT	BRAZOS RIVER HARBOR NAVIGATIO
	ERNS	16	1001 PINE ST	FREEPORT	MCDERMOTT MARINE CONSTRUC

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Freeport EIS, Freeport, TX

Distance/Direction	Database	Site Number	Address	City/State	Site Name
.23					
	TXUST	61	530 W 2ND	FREEPORT	CARLOS GARAGE
.24					
	TXLUST	54	430 W 2ND ST	FREEPORT	MECHANIC SHOP
	TXUST	54	430 W 2ND	FREEPORT	MECHANIC SHOP
	TXUST	54	430 W 2ND	FREEPORT	MECHANIC SHOP

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Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
.25					
	TXSPILL	3	SCRUBBER	FREEPORT	GULF CHEMICAL & METALLURGICAL
	RCRA-G	3	302 MIDWAY RD	FREEPORT	GULF CHEMICAL & METALLURGICAL
	TXSPILL	3	#1 ESP OFF RASTER #4,GULF CHEMICAL	FREEPORT	GULF CHEMICAL & METALLURGICAL
	TXLUST	3	302 MIDWAY	FREEPORT	GULF COAST METALLURGICAL
	TXAST	3	302 MIDWAY RD	FREEPORT	GULF CHEMICAL & METALLURGICAL
	RCRA TSD	3	302 MIDWAY RD	FREEPORT	GULF CHEMICAL & METALLURGICAL
	TXUST	3	302 MIDWAY RD	FREEPORT	GULF CHEMICAL & METALLURGICAL
	RCRA-G	3	302 MIDWAY RD	FREEPORT	CHEMICAL SPECIALTIES INC
	TXSPILL	3	ESP 1&2, GULF CHEMICAL & METALLUR	FREEPORT	GULF CHEMICAL & METALLURGICAL
	CERCLIS	3	BRAZORIA COUNTY RD 756	FREEPORT	GULFCO MARINE MAINTENANCE
	TXSPILL	3	ESP 1&2	FREEPORT	GULF CHEMICAL & METALLURGICAL
	TXSPILL	3	ELECTRIC ARC FURNACE BUILDING	FREEPORT	GULF CHEMICAL & METALLURGICAL
	TXSPILL	3	ESP 1 & 2	FREEPORT	GULF CHEMICAL & METALLURGICAL
	NFRAP	3	302 MIDWAY	FREEPORT	GULF CHEM & METALLURGICAL
	NFRAP	3	302 MIDWAY RD/PO DRAWER FF	FREEPORT	MINERAL RESEARCH & DEVELOPME
	TXSPILL	3	ESP NO. 1	FREEPORT	GULF CHEMICAL & METALLURGICAL
	CORRACT	3	302 MIDWAY RD	FREEPORT	GULF CHEMICAL & METALLURGICAL
	TXSPILL	3	UNIT NO. 1, 302 MIDWAY ROAD, FREEPO	FREEPORT	GULF CHEMICAL & METALURGICAL
	TXUST	3	302 MIDWAY RD	FREEPORT	GULF CHEMICAL & METALLURGICAL
	erns	9	701 S AVE D	FREEPORT	UNION PACIFIC
	erns	9	701 SOUTH AVENUE D	FREEPORT	
	erns	10	823 COAST GUARD DR.	FREEPORT	USCG-CUTTER KNIGHT ISLAND
	TXAST	32	1324 PINE ST	FREEPORT	PINE STREET PUMP STATION
	RCRA-G	33	1800 W SECOND	FREEPORT	BRAZOSPORT ISD
	TXUST	33	1800 W 2ND ST	FREEPORT	BRAZOSPORT ISD
	TXUST	34	1852 1/2 W 2ND ST	FREEPORT	THREE 71
	TXUST	34	1852 1/2 W 2ND ST	FREEPORT	THREE 71
	TXUST	34	1852 1/2 W 2ND ST	FREEPORT	THREE 71
	TXUST	34	1852 1/2 W 2ND ST	FREEPORT	THREE 71
	TXUST	34	1852 1/2 W 2ND ST	FREEPORT	THREE 71
	TXUST	34	1852 1/2 W 2ND ST	FREEPORT	THREE 71
	TXUST	63	603 S AVE D	FREEPORT	LIQUID CARBONIC IND MED CORP
	ERNS	63	603 SOUTH AVENUE D	FREEPORT	LIQUID CARBONIC
	ERNS	70	701 S AVENUE D	FREEPORT	BASF
	TXUST	74	817 S AVE D	FREEPORT	AREA SUPPLY
	TXUST	74	817 S AVE D	FREEPORT	STANLEY CONSTRUCTION CO
	ERNS	76	823 COAST GUARD DRIVE	FREEPORT	USCG-STATION FREEPORT
	TXLUST	76	823 COAST GUARD DR	SURFSIDE	USCG STATION FREEPORT
	TXAST	77	901 S AVE D	FREEPORT	PLANT NO 2
	TXAST	77	901 S AVE D	FREEPORT	PLANT NO 2
	TXUST	77	901 S AVE D	FREEPORT	PLANT NO 2
	ERNS	77	901 S AVE D	FREEPORT	SOUTHERN MATERIALS
	TXUST	77	901 S AVE D	FREEPORT	PLANT NO 2
	TXUST	79	91 FORT VELASCO DR	SURFSIDE BEACH	STOP N GO 2506
	TXUST	79	91 FORT VELASCO DR	SURFSIDE BEACH	STOP N GO 2506
	TXUST	79	91 FORT VELASCO DR	SURFSIDE BEACH	STOP N GO 2506
	TXLUST	80	917 S AVE D	FREEPORT	STANLEY CONSTRUCTION
	TXAST	80	917 S AVENUE D	FREEPORT	FFREEPORT

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.35						
		TXLUST	26	118 WEST 5TH STREET	FREEPORT	GULF STATES INC
		TXLUST	31	131 E 5TH ST	FREEPORT	FREEPORT DRIVE IN GROCERY
.36						
	N	**TXLUST**	13	10 S GULF BLVD	FREEPORT	TRACOR HYDRO SERVICES INC
.4						
		TXLUST	48	320 S GULF BLVD	FREEPORT	DIAMOND FOOD MART 2
		TXLUST	48	320 SOUTH GULF BLVD	FREEPORT	DIAMOND FOOD MART 2
.45						
		TXLUST	35	1922 4TH ST	FREEPORT	STOP N GO 2597
.47						
	N	**TXLUST**	75	823 BRAZOSPORT BLVD	FREEPORT	DIRTYS TATTOOS & SIGNS
	N	**TXLUST**	81	923 N GULF BLVD	FREEPORT	WILSON OIL CO SHELL STATION
1.						
	N	**CORRACT**	67	6213 E HIGHWAY 332 STE I	FREEPORT	RHONE POULENC
	N	**CORRACT**	71	702 FM 523	FREEPORT	SCHENECTADY INTERNATIONAL INC

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Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
Site Location Unknown					
	ERNS	unknown	MOBIL DOCKS 2311 FM 1495	BRAZORIA	
	ERNS	unknown	FARM RD 1495 AND COUNTY RD 229	FREEPORT	
	ERNS	unknown	PLANT A, IN THE ETHYLENE AMINES PL	BRAZORIA	
	ERNS	unknown	FARM RD 1495 AND COUNTY RD 229	BRAZORIA	
	ERNS	unknown	COUNTRY RD 229 AND FARM RD 1495 JU	FREEPORT	
	ERNS	unknown	INTRACOASTAL CANAL MILE 401 WEST	FREEPORT	
	ERNS	unknown	FARM RD 1495 AND COUNTY RD 229	FREEPORT	
	ERNS	unknown	OLD QUINTANA RD	BRAZORIA	
	ERNS	unknown	BRAZOS #453 "A" PLATFORM 29-30N 95-	BRAZOS	
	ERNS	unknown	PLANT A AT FM 1495 AND 229 RD	FREEPORT	
	ERNS	unknown	TERMINAL #1, DOCK #2 QUINTANA RD	BRAZORIA	
	ERNS	unknown	PLANT A FARM ROAD 295 COUNTY RD 2	FREEPORT	
	ERNS	unknown	BRAZOS RIVER MM 394	BRAZORIA	
	ERNS	unknown	PLANT A, FM 1495 AND CO RD 229 1/2 MI	BRAZORIA	
	ERNS	unknown	AT PLANT A ON FARM RD 1495 AND CO	BRAZORIA	
	ERNS	unknown	SOUTHWEST CORNER OF SLIP / MOBIL	FREEPORT	
	ERNS	unknown	BRAZOS HARBOR	FREEPORT	
	ERNS	unknown	A6 DOCK PLANT A AT FARM RD 1495 AN	FREEPORT	
	ERNS	unknown	BRAZOS RIVER	FREEPORT	
	ERNS	unknown	PLANT A FARM RD 1495 AND COUNTY R	FREEPORT	
	ERNS	unknown	A8 DOCK PLANT A FARM RD. 1495 AND	BRAZORIA	
	ERNS	unknown	OLD BRAZOS RIVER	BRAZORIA	
	ERNS	unknown	OLD BRAZOS RIVER CLOSE TO THE ME	FREEPORT	
	ERNS	unknown	QUINTANA RD IN THE OLD BRAZOS RIVE	FREEPORT	
	ERNS	unknown	FARM RD 1495 AND CTY 229	BRAZORIA	
	ERNS	unknown	PLANT A 1800 BLOCK / FARM MARKET IN	BRAZORIA	
	ERNS	unknown	FM 1495 AND CTY 229	FREEPORT	
	ERNS	unknown	FARM MARKET 1495 AND CNTY RD 229	FREEPORT	
	ERNS	unknown	AT THE PLANT FM 1495 CR229	FREEPORT	
	ERNS	unknown	MOBIL MARINE BASE, 2311 FM 1495	FREEPORT	
	ERNS	unknown	FM 1495 AND CR 229	FREEPORT	
	ERNS	unknown	MOBIL MARINE DOCK 2311 FM 1495	FREEPORT	
	ERNS	unknown	PLANT A ON FM 1495 & COUNTY ROAD 2	FREEPORT	
	ERNS	unknown	FM 1495 AND CR 229 PLANT A A3200 BL	FREEPORT	
	ERNS	unknown	FARM MARKET 1495 AND COUNTY RD 22	FREEPORT	
	ERNS	unknown	FARM DE MARKET 1495 AND COUNTY R	FREEPORT	
	ERNS	unknown	MILE 396 ON OLD BRAZOS RIVER	BRAZORIE	
	ERNS	unknown	PLANT A FARM RD 1495 CNTY RD 229	FREEPORT	
	ERNS	unknown	A8 DOCK, PLANT A (BRAZOS HARBOR)	FREEPORT	
	ERNS	unknown	MOBIL DOCK 2311 SM 1495	FREEPORT	
	ERNS	unknown	FARM RD. 1495 AND COUNTY RD. 229	FREEPORT	
	ERNS	unknown	FARM RD 1495 AND COUNTY RD 229	FREEPORT	
	ERNS	unknown	FARM RD 1495 AND COUNTY RD 229	FREEPORT	
	ERNS	unknown	PLANT A FACILITY FARM RD 1495 AND C	FREEPORT	
	ERNS	unknown	PLANT A FARM RD 1495 AND COUNTY R	BRAZORIA	
	ERNS	unknown	A-FACILITY FARM ROAD 1495 AND COUN	BRAZORIA	
	ERNS	unknown	INTERSECT OF COUNTY RD 229 AND FA	FREEPORT	
	ERNS	unknown	BRAZOS CHANNEL AT A6 DOCK	FREEPORT	
	ERNS	unknown	PLANT A FARM RD 1495 AND CO RD 229	FREEPORT	
	ERNS	unknown	FARM DE MARKET 1495 AND COUNTY R	FREEPORT	

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	ERNS	unknown	BRAZOS BLOCK 23, A	BRAZOS	
	ERNS	unknown	FM 1495 AND COUNTY RD 229	FREEPORT	
	ERNS	unknown	BRAZOS RIVER	FREEPORT	
	ERNS	unknown	A-22 DOCK 2301 BRAZOSPORT BLVD	FREEPORT	
	ERNS	unknown	OLD BRAZOS RIVER NEAR WESTERN SE	FREEPORT	
	ERNS	unknown	OLD BRAZOS RIVER MM:NONE	FREEPORT	
	ERNS	unknown	BRAZOS RIVER NEAR CG STA	FREEPORT	
	ERNS	unknown	BRAZOS 376	BRAZOS	
	ERNS	unknown	AT BRAZOS RIVER AND ICW	FREEPORT	
	ERNS	unknown	QUINTANA RD	FREEPORT	
	ERNS	unknown	QUINTANA RD	FREEPORT	
	ERNS	unknown	QUINTANA RD	FREEPORT	
	ERNS	unknown	OLD BRAZOS RIVER AT WESTERN SEAF	FREEPORT	
	ERNS	unknown	QUINTANA RD SOUTH OF NO.4 DOCK	FREEPORT	
	ERNS	unknown	OLD BRAZOS RIVER STANCO DOCK	FREEPORT	
	ERNS	unknown	OCSG #3938 BRAZOS A23	BRAZOS	
	ERNS	unknown	OLD BRAZOS RIVER G AND G ICEHOUSE	FREEPORT	
	ERNS	unknown	1.75MI E OF INTERSECTION OF FMR 149	FREEPORT	
	erns	unknown	WEST BRAZOS STREET / OLD BRAZOS R	FREEPORT	
	erns	unknown	WEST BRAZOS STREET / OLD BRAZOS R	FREEPORT	
	erns	unknown	WEST BRAZOS STREET / OLD BRAZOS R	FREEPORT	
	ERNS	unknown	FREEPORT INTERCOASTAL WATERWAY	FREEPORT	
	ERNS	unknown	FREEPORT TWO TERMINAL	FREEPORT	
	ERNS	unknown	FREEPORT INTERCOASTAL WATERWAY	FREEPORT	
	ERNS	unknown	BRAZOS RIVER MM:NONE	FREEPORT	
	ERNS	unknown	QUINTANA RD	FREEPORT	
	ERNS	unknown	COUNTY RD 229 & FARM RD 1495 IN BRA	FREEPORT	
	ERNS	unknown	BRAZOS RIVER BUTCH'S BAIT CAMP	FREEPORT	
	ERNS	unknown	BRAZOS RIVER HWY 288	FREEPORT	
	ERNS	unknown	INTRA-COASTAL WATERWAY AND BRAZ	FREEPORT	
	ERNS	unknown	FM 1495 CR 229	FREEPORT	
	ERNS	unknown	BRAZOS HARBOUR A2 DOCK	FREEPORT	
	ERNS	unknown	OLD BRAZOS RIVER	FREEPORT	
	ERNS	unknown	OLD BRAZOS RIVER NEAR FLOOD GATE	FREEPORT	
	ERNS	unknown	FM RD 1495 AND CTY RD 229	FREEPORT	
	ERNS	unknown	BRAZOS NO.105A	BRAZOS AREA	
	ERNS	unknown	PORT OF FREEPORT OLD BRAZOS RIVE	FREEPORT	
	ERNS	unknown	BRAZOS A 105	BRAZOS	
	ERNS	unknown	FARM RD 1495 AND COUNTY RD 229	FREEPORT	
	ERNS	unknown	QUINTANA RD POB 897	FREEPORT	
	ERNS	unknown	OLD BRAZOS RIVER	FREEPORT	
	ERNS	unknown	BRAZOS HARBOR DOCK 1	FREEPORT	
	ERNS	unknown	BRAZOS A-53	BRAZOS AREA	
	ERNS	unknown	BRAZOS HARBOR	FREEPORT	
	ERNS	unknown	BRAZOS 451A A PLATFORM OCSG # 393	BRAZOS	
	ERNS	unknown	PINE ST. BRIDGE AND WESTON SEAFOO	FREEPORT	
	ERNS	unknown	QUINTANA RD POB 897	FREEPORT	
	ERNS	unknown	QUINTANA RD OLD BRAZOS HARBOR	FREEPORT	
	ERNS	unknown	QUINTANA RD NEAR BERTH NO.2	FREEPORT	
	ERNS	unknown	BRAZOS 105	BRAZOS	
	erns	unknown	OLD BRAZOS RIVER	FREEPORT	

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	erns	unknown	OLD BRAZOS RIVER	FREEPORT	
	erns	unknown	UNKNOWN SHEEN INCIDENT BRAZOS B	BRAZOS AREA	
	erns	unknown	BRAZOS HARBOR	FREEPORT	
	erns	unknown	BRAZOS HARBOR	FREEPORT	
	ERNS	unknown	OLD BRAZOS RIVER	FREEPORT	
	erns	unknown	UNKNOWN SHEEN INCIDENT OLD BRAZ	FREEPORT	
	erns	unknown	UNKNOWN SHEEN INCIDENT OLD BRAZ	FREEPORT	
	erns	unknown	UNKNOWN SHEEN INCIDENT BRAZOS B	BRAZOS AREA	
	erns	unknown	OLD BRAZOS RIVER	FREEPORT	
	ERNS	unknown	MARINE TERMINAL, BRAZOS HARBOR, D	FREEPORT	
	erns	unknown	INTERSECTION OF INTERCOASTAL WAT	FREEPORT	
	erns	unknown	OLD BRAZOS RIVER / NEAR WESTERN S	FREEPORT	
	erns	unknown	TOP COAT SKAUGEN PETROTRANS RO	FREEPORT	
	erns	unknown	OLD BRAZOS BEACH	FREEPORT	
	erns	unknown	ON BRAZOS RIVER	FREEPORT	
	erns	unknown	VELASCO YARD	FREEPORT	
	erns	unknown	BRAZOS HARBOR PIER NO.3	FREEPORT	
	erns	unknown	OLD BRAZOS RIVER	FREEPORT	
	ERNS	unknown	PLANT A FARM TO MARKET ROAD 1495	FREEPORT	
	ERNS	unknown	QUINTANA ROAD	FREEPORT	
	ERNS	unknown	OLD BRAZOS RIVER WEST 2ND ST	FREEPORT	
	erns	unknown	ON THE OLD BRAZOS RIVER AT 400 W.	FREEPORT	
	erns	unknown	ON THE OLD BRAZOS RIVER AT 400 W.	FREEPORT	
	erns	unknown	ON THE OLD BRAZOS RIVER AT 400 W.	FREEPORT	
	erns	unknown	BRAZOS BLOCK 453	BRAZOS	
	erns	unknown	BRAZOS BLOCK 453	BRAZOS	
	erns	unknown	UNKNOWN SHEEN INCIDENT BRAZOS B	BRAZOS AREA	
	ERNS	unknown	FM. 1495 AND COUNTRY RD. 229	FREEPORT	
	erns	unknown	UNKNOWN SHEEN INCIDENT OLD BRAZ	FREEPORT	
	erns	unknown	OLD RIVER, EAST OF THE PINE ST BRID	FREEPORT	
	erns	unknown	OLD RIVER, EAST OF THE PINE ST BRID	FREEPORT	
	erns	unknown	OLD RIVER, EAST OF THE PINE ST BRID	FREEPORT	
	erns	unknown	OLD BRAZOS RIVER	FREEPORT	
	erns	unknown	OLD BRAZOS RIVER	FREEPORT	
	erns	unknown	OLD BRAZOS RIVER	FREEPORT	
	ERNS	unknown	OLD BRAZOS RIVER / TERMINAL 2 QUIN	FREEPORT	
	erns	unknown	BRAZOS BLOCK 453	BRAZOS	
	ERNS	unknown	PLANT A, FARM TO MARKET 1495 AND C	FREEPORT	
	ERNS	unknown	#2 TERMINAL, #1 BERTH OLD BRAZOS	FREEPORT	
	ERNS	unknown	PLANT A, HWY FM 1495 AND CR 229	FREEPORT	
	ERNS	unknown	BRIAN BEACH SWING BARGE, 1495 AND	FREEPORT	
	ERNS	unknown	OLD BRAZOS RIVER SOUTHSIDE NEAR	FREEPORT	
	ERNS	unknown	OLD BRAZOS RIVER G AND G ICEHOUSE	FREEPORT	
	erns	unknown	BRAZOS HARBOR	FREEPORT	
	ERNS	unknown	PLANT A FM 1495, COUNTY ROAD 229	BRAZORIA	
	ERNS	unknown	OCSG #3938 BRAZOS A23	BRAZOS	
	ERNS	unknown	PLANT A, COUNTY RD. 229 AND FM 1495	BRAZORIA	
	ERNS	unknown	COUNTY RD 229 AND FM 1495 ON COMP	FREEPORT, NEARES	
	ERNS	unknown	OLD BRAZOS RIVER STANCO DOCK	FREEPORT	
	ERNS	unknown	PLANT A AT FARM DEMARKET RD, 1495	FREEPORT	
	ERNS	unknown	PLANT A SITE NEAR HIGHWAY 1495	BRAZORIA	

Distances given are tenths of a statute mile.

TelALL Corporation

441591.00

Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	ERNS	unknown	FM 1495 & CNTY 229	FREEPORT	
	ERNS	unknown	BRAZOS RIVER MM:NONE	FREEPORT	
	ERNS	unknown	PLANT A FARM RD AND 1495 CR229	BRAZORIA	
	ERNS	unknown	PHILIPS NO 2 TERMINAL;NO 1 DOCK;QUI	FREEPORT	
	ERNS	unknown	DOCK 14 WESTERN SEAFOOD OLD BRA	FREEPORT	
	ERNS	unknown	BRAZOS BLOCK 23, A	BRAZOS	
	ERNS	unknown	OLL BRAZOS RIVER BETWEEN HIGHWA	FREEPORT	
	ERNS	unknown	PLANT A, 2700 BLOCK, HIGHWAY 1495	FREEPORT	
	ERNS	unknown	OLD BRAZOS RIVER AT WESTERN SEAF	FREEPORT	
	ERNS	unknown	PLANT A FAC, CNTY RD 229 AND 1495	BRAZORIA	
	ERNS	unknown	FM 1495 AND CR 229	FREEPORT	
	ERNS	unknown	COUNTY RD 229 & FM 1495, PLANT SITE	BRAZORIA	
	ERNS	unknown	PLANT A, AT BLOCK 18, HIGHWAY 523	FREEPORT	
	erns	unknown	AT THE DOCK 2215 FM 1495	FREEPORT	ABDON CALLAIS OFFSHORE
	erns	unknown	AT THE DOCK 2215 FM 1495	FREEPORT	ABDON CALLAIS OFFSHORE
	erns	unknown	AT THE DOCK 2215 FM 1495	FREEPORT	ABDON CALLAIS OFFSHORE
	ERNS	unknown	AT SOUTH EAST FACING SLIP2215 FM 14	FREEPORT	ABDON CALLAIS OFFSHORE
	ERNS	unknown	BRAZOS PORT BIRTH A-22	FREEPORT	ALLIED TOWING CORP.
	ERNS	unknown	BRAZOS PORT BIRTH A-22	FREEPORT	ALLIED TOWING CORP.
	ERNS	unknown	BRAZOS CITY DOCK NO. 5	FREEPORT	AMERICAN DREDGE
	ERNS	unknown	OCSG 6071-WELL A-2 BRAZOS BLOCK 49	BRAZOS	AQUILA ENERGY RESOURCES
	ERNS	unknown	BRAZOS 132-A	BRAZOS AREA	ARCO OIL AND GAS CO.
	ERNS	unknown	FREEPORT 2 MARINE TERMINL BRAZOS	FREEPORT	ARCO PIPELINE COMPANY
	ERNS	unknown	FREEPORT 2 MARINE TERMINL BRAZOS	FREEPORT	ARCO PIPELINE COMPANY
	ERNS	unknown	QUINTANNA RD DOCK #1 BERTH	BRAZORIA	B/V TREM
	ERNS	unknown	PHILIPS PETROLEUM DOCK FREEPORT,	FREEPORT	BRENT TRANSPORTATION
	ERNS	unknown	QUINTANA RD DOCK NO 3	FREEPORT	BROWN AND ROOT
	ERNS	unknown	FREEPORT LIGHTERING AREA	FREEPORT	C/T NYHERON
	ERNS	unknown	OLD BRAZOS RIVER	FREEPORT	CAPTAIN VICTOR
	ERNS	unknown	MONSANTO CHOCOLATE BAYOU BRAZO	FREEPORT	CHERYL K INC.
	ERNS	unknown	BRAZOS A 17	FREEPORT	CHEVRON USA INC
	ERNS	unknown	OLD BRAZOS RIVER WEST OF FLOOD G	FREEPORT	CITY OF FREEPORT
	ERNS	unknown	BRAZOS 368	BRAZOS AREA	COASTAL STATES GAS TRANS
	ERNS	unknown	BRAZOS HARBOR DOCK NO. 2	FREEPORT	CONTAINER SHIP "CONCORD"
	ERNS	unknown	FREEPORT DOCKS	FREEPORT	CREOLE TOWING
	ERNS	unknown	1/4 MILE WEST OF THE BRAZOS RIVER	BRAZORIA	CTC M/V KITTY CENAC
	TXLUST	unknown	BRAZOSPORT BLVD	FREEPORT	DIAMOND MINI MART 5
	ERNS	unknown	QUINTANA RD. DOCK NO. 3	FREEPORT	DIXIE MARINE INC.
	ERNS	unknown	BRAZOS BLOCK 437	BRAZOS	ENSERCH EXPLORATION INC
	TXAST	unknown	RT 2	FREEPORT	ERA HELICOPTERS
	TXSPILL	unknown	BRAZOS HARBOR	FREEPORT	EVANS STEAMSHIP CO.
	ERNS	unknown	BRAZOS 453 A PLATFORM OCSG 4713	BRAZOS	EXXON
	ERNS	unknown	WESTERN SEAFOOD / BRAZOS RIVER	FREEPORT	F/V FISHERMAN IX
	ERNS	unknown	OLD BRAZOS RIVER	FREEPORT	F/V JACK AARON
	ERNS	unknown	WEST BRAZOS WESTERN SEAFOOD DO	FREEPORT	F/V STEPHANY LYNN
	ERNS	unknown	FREEPORT -A- DOCK	FREEPORT	G & H TOWING
	ERNS	unknown	BRAZOS A DOCK FREEPORT HARBOR	FREEPORT	G AND H TOWING COMPANY
	ERNS	unknown	BRAZOS A DOCK FREEPORT HARBOR	FREEPORT	G AND H TOWING COMPANY
	ERNS	unknown	BRAZOS A-133	BRAZOS	GOM SHELF LLC
	ERNS	unknown	POB 896 QUINTANA RD.	FREEPORT	HOLYWOOD MARINE
	ERNS	unknown	QUINTANA ROAD	FREEPORT	INGRAM BARGE LINES

Distances given are tenths of a statute mile.

TelALL Corporation

441591.00

Freeport EIS, Freeport, TX

Sites Sorted By Distance from Center

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	LFUN	unknown	JONES CREEK AREA ON BRAZOS RIVER	BRAZORIA	JONES CREEK
	erns	unknown	BRAZOS FLOOD GATES	FREEPORT	KIRBY INLAND MARINE
	erns	unknown	BRAZOS FLOOD GATES	FREEPORT	KIRBY INLAND MARINE
	erns	unknown	BRAZOS FLOOD GATES	FREEPORT	KIRBY INLAND MARINE
	ERNS	unknown	BRAZOS FLOOD GATES	BRAZORIA	KIRBY INLAND MARINE
	ERNS	unknown	FREEPORT TERMINAL #1, DOCK #2, BRA	BRAZORIA	LEBOUF BROTHERS TOWING COMP
	ERNS	unknown	OLD BRAZOS RIVER	FREEPORT	M/V "THUAN HAI"
	ERNS	unknown	OLD BRAZOS RIVER	FREEPORT	M/V "THUAN HAI"
	ERNS	unknown	WEST BRAZOS MOORING	FREEPORT	M/V PHIGIT
	ERNS	unknown	BRAZOS BLOCK A7	BRAZOS	MESA OPERATING LIMITED PA
	erns	unknown	MILE 400 GULF ICW EASTSIDE OF BRAZ	FREEPORT	MO GULF TRANSPORT INC
	TXSPILL	unknown	MOBIL DOCKS AT FM 1495 & INTERCOAS	FREEPORT	MOBIL OIL
	CERCLIS	unknown	COUNTY ROAD 229	FREEPORT	NALCO CHEMICAL COMPANY PLANT
	ERNS	unknown	BRAZOS HARBOR DOCK A	FREEPORT	OBC SHIPPING, INC
	ERNS	unknown	PLATFORM SOUTH BRAZOS	SOUTH BRAZOS	OXYUSA INC.
	erns	unknown	BRAZOS	BRAZOS	PIONEER NATURAL RESOURCES
	erns	unknown	BRAZOS	BRAZOS	PIONEER NATURAL RESOURCES
	erns	unknown	BRAZOS	BRAZOS	PIONEER NATURAL RESOURCES
	ERNS	unknown	BRAZOS HARBOR DOLE FACILITY PIER	FREEPORT	PRINCE ARROW S.A.
	ERNS	unknown	BRAZOS RIVER FLOOD GATES MILE 401	FREEPORT	SABINE TRANSPORTATION
	ERNS	unknown	PHILIPS TERMINAL DOCK NO.2	FREEPORT	SCAN AMERICAN SHIPPING
	ERNS	unknown	BRAZOS BLOCK 552	BRAZOS	SEAGULL ENERGY
	ERNS	unknown	QUINTANA RD	FREEPORT	SEAWAY CRUDE PIPELINE CO
	RCRA-G	unknown	QUINTANA ROAD	FREEPORT	SEAWAY FREEPORT TERMINAL
	ERNS	unknown	BRAZOS 19-C OCS NO.G3936	BRAZOS AREA	SHELL OFFSHORE
	TXSPILL	unknown	BARGE SLIP E OF OLD BRAZOS RIVER N	FREEPORT	SHELL OIL COMPANY
	ERNS	unknown	OLD BRAZOS RIVER RM 397	FREEPORT	STAPP TOWING CO
	ERNS	unknown	DOCK #2 QUINTANA RD	BRAZORIA	STAPP TOWING
	ERNS	unknown	QUINTANA DR	FREEPORT	TEPPCO
	ERNS	unknown	DOCK #2FREEPORT TERMINAL #2QUINT	FREEPORT	TEPPCO
	ERNS	unknown	QUINTANA RD	FREEPORT	TEPPCO CRUDE OIL, LP
	ERNS	unknown	EAST END OF 2ND STREET	FREEPORT	TESORO PETROLEUM INC
	TXSPILL	unknown	US COAST GUARD, 823 COAST GUARD	FREEPORT	U.S. COAST GUARD
	ERNS	unknown	BRAZOS 105 PLATFORM A	BRAZOS AREA	UNICAL
	ERNS	unknown	VELASCO RAIL YARD/ AT INTERSECTIO	FREEPORT	UNION PACIFIC RAILROAD
	TXSPILL	unknown	BRAZOS RIVER, INTO DISCHARGE CANA	FREEPORT	UNKNOWN
	ERNS	unknown	OLD RIVER UNDER VELASCO RD BRIDG	FREEPORT	UNKNOWN
	ERNS	unknown	BRAZOS/ BLOCK 375	BRAZOS	UNOCAL
	TXUST	unknown	BRAZOS RIVER FLOODGATE	FREEPORT	US ARMY CORP ENGR GALVESTON
	TXUST	unknown	BRAZOS RIVER FLOODGATE	FREEPORT	US ARMY CORP ENGR GALVESTON
	TXUST	unknown	BRAZOS RIVER FLOODGATE	FREEPORT	US ARMY CORP ENGR GALVESTON
	TXSPILL	unknown	US COAST GUARD, 823 COAST GUARD	FREEPORT	US COAST GUARD
	TXSPILL	unknown	FREEPORT USCG FACILITY,823 COAST	FREEPORT	USCG
	ERNS	unknown	DOCK #3, BRAZOS HARBOR, OFF QUINT	FREEPORT	VESSEL, JOANN B
	TXLUST	unknown	E 2ND ST	FREEPORT	W H PIERCE JR
	ERNS	unknown	MAINE INDUSTRIAL SPECIALTIES WEST	FREEPORT	WESTERN SEAFOOD
	ERNS	unknown	WILLIAMS BRAZOS PLATFORM, BLOCK I	BRAZOS	WILLIAMS
	erns	unknown	BRAZOS 538	BRAZOS	WILLIAMS FIELD SERVICES
	erns	unknown	BRAZOS 538	BRAZOS	WILLIAMS FIELD SERVICES
	erns	unknown	BRAZOS 538	BRAZOS	WILLIAMS FIELD SERVICES

Distances given are tenths of a statute mile.

Appendix D-5

Site Reconnaissance Photos

Photo 1 - View of flood control gate located at the northern extent of the project area at the Stauffer Turning Basin, facing northwest.

Photo 2 - View of sign within the Stauffer Turning Basin indicating a gas and petroleum pipeline crossing.

Appendix D-5

SITE PHOTOGRAPHS
HTRW SITE RECONNAISSANCE
FHCIP

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Photo 3 - View of two tankers being offloaded at a facility located adjacent to the Brazosport Turning Basin, facing southwest.

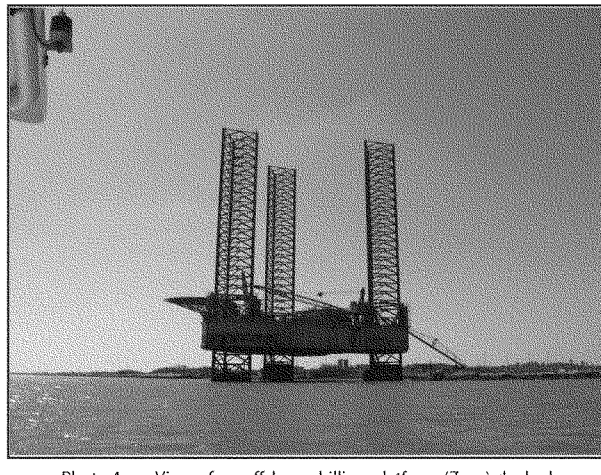

Photo 4 - View of an offshore drilling platform (Zeus) docked along the Quintana shoreline, facing south.

Appendix D-5

SITE PHOTOGRAPHS
HTRW SITE RECONNAISSANCE
FHCIP

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Photo 5 - View of entrance to Port of Freeport through the Freeport Jetty, facing southeast.

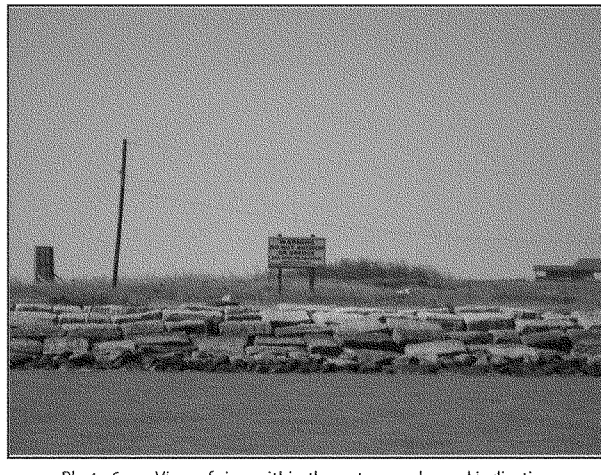

Photo 6 - View of sign within the entrance channel indicating a gas and petroleum pipeline crossing, facing north-east.

Appendix D-5

SITE PHOTOGRAPHS
HTRW SITE RECONNAISSANCE
FHCIP

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Appendix E

Programmatic Agreement

PROGRAMMATIC AGREEMENT
REGARDING COMPLIANCE WITH SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT FOR THE CONSTRUCTION AND MAINTENANCE OF THE FEDERAL FREEPORT HARBOR NAVIGATION CHANNEL IMPROVEMENT PROJECT, BRAZORIA COUNTY, TEXAS
AMONG
THE U.S. ARMY CORPS OF ENGINEERS GALVESTON DISTRICT
THE TEXAS STATE HISTORIC PRESERVATION OFFICER
AND
PORT FREEPORT

WHEREAS, the U.S. Army Corps of Engineers, Galveston District (USACE) has determined that the proposed construction and maintenance of the Federal Freeport Harbor Navigation Channel Improvement Project (hereinafter, "undertaking") may have an effect on properties eligible for inclusion in the National Register of Historic Places (NRHP) (hereinafter, "historic properties") pursuant to Section 106 of the National Historic Preservation Act (16 U.S.C § 470) (hereinafter "NHPA") and its implementing regulation, "Protection of Historic Properties," (36 CFR 800); and

WHEREAS, the existing Federal Freeport Harbor Navigation Channel (FHNC) is administered by the USACE under the authority of Section 101 of the River and Harbor Act of 1970 (P.L. 91-611), and the USACE is studying FHNC operation under the authority of Section 216 of the Flood Control Act of 1970 (P.L. 91-611) which provides for review of completed projects when found advisable due to significantly changed physical or economic conditions; and

WHEREAS, Port Freeport (Port) is the non-federal partner with the USACE for this undertaking and is providing all lands, easements, rights-of-way, relocations, removals, and upland placement areas necessary for the project construction and operation; and

WHEREAS, the size of the project area and the number of alternatives being studied for proposed channel improvements make it necessary to defer final identification and evaluation of historic properties until authorization of proposed improvements is obtained; and

WHEREAS, the USACE, the Texas State Historic Preservation Officer (SHPO), and the Port agree that it is advisable to accomplish compliance with Section 106 through the development and execution of this Programmatic Agreement (PA) in accordance with § 800.6 and § 800.14(b)(3); and

WHEREAS, the USACE has invited the Advisory Council on Historic Preservation (Council) to determine whether the Council wishes to enter into the Section 106 process; and

NOW, THEREFORE, the USACE, the SHPO and the Port, agree that the proposed undertaking shall be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on historic properties and to satisfy the USACE's Section 106 responsibilities for all individual aspects of the undertaking.

Stipulation I
Identification, Evaluation, Effect Determination and Resolution

A. *Scope of Undertaking.* This PA shall be applicable to all new Federal construction activities related to the proposed undertaking and activities related to maintenance dredging of the Federal project. The Area of Potential Effects of the Federal undertaking (APE) shall be established by the USACE in consultation with the SHPO and shall include all areas to be directly affected by new dredging and channel construction, construction staging and access areas, new or extensions of existing placement areas, ecological mitigation features, areas affected by the beneficial uses of dredged material, and ongoing maintenance dredging activities related to the FHNC project.

B. *Qualifications and Standards.* The USACE shall ensure that all work conducted in conjunction with this PA is performed in a manner consistent with the Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation (48 Federal Register 44716-44740; September 23, 1983), as amended, or the Secretary of the Interior's Standards for the Treatment of Historic Properties (36 CFR 68), as appropriate.

C. *Definitions.* The definitions set forth in § 800.16 are incorporated herein by reference and apply throughout this PA.

D. *Identification of Historic Properties.* Prior to the initiation of construction or maintenance activities of the undertaking, the USACE shall make a reasonable and good faith effort to identify historic properties located in the APE. These steps may include, but are not limited to, background research, consultation, oral history interviews, sample field investigation and field survey. The level of effort for these activities shall be determined in consultation with the SHPO, the Port, Native American Indian tribes that attach religious and cultural significance to identified historic properties and any other consulting party. If no historic properties are identified in the APE, the USACE shall document this finding pursuant to § 800.11(d) and retain this documentation in USACE files for at least seven (7) years.

E. *Evaluation of National Register Eligibility.* If historic properties are identified within the APE, the USACE shall determine their eligibility for the National Register of Historic Places in accordance with the process described in § 800.4(c) and criteria established in 36 CFR 60. The determination of cultural significance shall be conducted in consultation with the SHPO, the Port, Native American Indian tribes that attach religious and cultural significance to identified historic properties and any other consulting party. Should the USACE and the SHPO agree that a property is or is not eligible, such consensus shall be deemed conclusive for the purpose of the PA. Should the USACE and SHPO not agree regarding the eligibility of a property, the USACE shall obtain a determination of eligibility from the Keeper of the National Register pursuant to 36 CFR 63.

F. *Assessment of Adverse Effects.*

1. *No Historic Properties Affected.* The USACE shall make a reasonable and good faith effort to evaluate the effect of each undertaking on historic properties in the APE. The USACE may conclude that no historic properties are affected by an undertaking if no historic properties are present in the APE, or the undertaking will have no effect as defined in §800.16(i). This finding shall be documented in compliance with § 800.11(d) and the documentation shall be retained by the USACE for at least seven (7) years. The USACE shall provide information on the finding to the public upon request, consistent with the confidentiality requirements of § 800.11(c).

2. *Finding of No Adverse Effect.* The USACE, in consultation with the SHPO, the Port, Native American Indian tribes that attach religious and cultural significance to identified historic properties and any other consulting party, shall apply the criteria of adverse effect to historic properties within the APE in accordance with § 800.5. The USACE may propose a finding of no adverse effect if the undertaking's effects do not meet the criteria of § 800.5(a)(1) or the undertaking is modified to avoid adverse effects in accordance with 36 CFR 68. The USACE shall provide to the SHPO documentation of this finding meeting the requirements of § 800.11(e). The SHPO shall have 30 calendar days in which to review the findings and provide a written response to the USACE. The USACE may proceed upon receipt of written concurrence from the SHPO. Failure of the SHPO to respond within 30 days of receipt of the finding shall be considered agreement with the finding. The USACE shall maintain a record of the finding and provide information on the finding to the public upon request, consistent with the confidentiality requirements of § 800.11(c).

3. *Resolution of Adverse Effect.* If the USACE determines that the undertaking will have an adverse effect on historic properties as measured by criteria in § 800.5.(a)(1), the agency shall consult with the SHPO, the Port, Native American Indian tribes that attach religious and cultural significance to identified historic properties and any other consulting party to resolve adverse effects in accordance with § 800.6.

a. For historic properties that the USACE and the SHPO agree will be adversely affected, the USACE shall:

1) Consult with the SHPO to identify other individuals or organizations to be invited to become consulting parties. If additional consulting parties are identified, the USACE shall provide them copies of documentation specified in § 800.11(e) subject to confidentiality provisions of § 800.11(c).

2) Afford the public an opportunity to express their views on resolving adverse effects in a manner appropriate to the magnitude of the project and its likely effects on historic properties.

3) Consult with the SHPO, the Port, Native American tribes which have indicated an interest in the undertaking, and any other consulting parties to seek ways to avoid, minimize or mitigate adverse effects.

4) Prepare an historic property treatment plan which describes mitigation measures the USACE proposes to resolve the undertaking's adverse effects and provide this plan for review and comment to the SHPO, the Port, Native American tribes which have indicated an interest in the undertaking, and any other consulting parties. All parties shall have 30 calendar days in which to provide a written response to the USACE.

b. If the USACE and SHPO fail to agree on how adverse effects will be resolved, the USACE shall request that the Council join the consultation and provide the Council with documentation pursuant to § 800.11(g).

1) If the Council agrees to join the consultation, the USACE shall proceed in accordance with § 800.9.

2) If, after consulting to resolve adverse effects pursuant to Stipulations I, II or IV of this PA, the Council, USACE or SHPO determines that further consultation will not be productive, then any party may terminate consultation in accordance with the notification requirement and process prescribed by § 800.7.

Stipulation II
Post Review Changes and Discoveries

A. *Changes in the Undertaking.* If construction on the undertaking has not commenced and the USACE determines that it will not conduct the undertaking as originally coordinated, the USACE shall reopen consultation pursuant to Stipulation I E – F.

B. *Unanticipated Discoveries or Effects.* Pursuant to § 800.13(a)(2), if historic properties are discovered or unanticipated effects on historic properties are found after construction on an undertaking has commenced, the USACE shall develop a treatment plan to resolve adverse effects and notify the SHPO, the Port, Native American Indian tribes that attach religious and cultural significance to identified historic properties and any other consulting party within two working days of the discovery. The notification shall include the USACE assessment of National Register eligibility of affected properties and proposed actions to resolve the adverse effects. Comments received from the SHPO, the Native American tribes or other consulting party within two working days of the notification shall be taken into account by the USACE in carrying out the proposed treatment plan. The USACE may assume SHPO concurrence in its eligibility assessment unless otherwise notified by the SHPO. The USACE shall provide the SHPO, the Port, Native American Indian tribes that attach religious and cultural significance to identified historic properties and any other consulting party which have expressed an interest in the undertaking a report of the USACE actions when they are completed.

Stipulation III
Curation and Disposition of Recovered Materials and Records

The USACE shall ensure that all archeological materials and associated records owned by the State of Texas or Port, which result from identification, evaluation, and treatment efforts conducted under this PA, are accessioned into a curational facility that has been certified or granted provisional status by the Texas SHPO in accordance with the Texas Administrative Code, Title 13, Part 2, Chapter 29.6 and meets the standards of 36 CFR 79, except as specified in Stipulation IV for human remains. Management and care of artifacts and collections shall follow the Texas Administrative Code, Title 13, Part 2, Chapter 29. Archeological items and materials from privately-owned lands in Texas shall be returned to their owners upon completion of analyses required for Section 106 compliance under this PA.

Stipulation IV
Treatment of Human Remains

A. *Prior Consultation of Native American Burials*: If the USACE investigations conducted pursuant to Stipulation I of this PA indicate a high likelihood that Native American Indian human remains may be encountered, the USACE shall develop a treatment plan for these remains in consultation with the SHPO, the Port, Native American Indian tribes that attach religious and cultural significance to identified historic properties and any other consulting party. The USACE shall ensure that tribes indicating an interest in the undertaking are afforded a reasonable

opportunity to identify concerns, advise on identification and evaluation, and participate in the resolution of adverse effects in compliance with the terms of this PA.

B. *Inadvertent Discovery.* Immediately upon the inadvertent discovery of human remains during historic properties investigations or construction activities conducted pursuant to this PA, the USACE shall ensure that all ground disturbing activities cease in the vicinity of the human remains and any associated grave goods. Within two working days of the discovery, the USACE shall initiate consultation with the SHPO, Native American Indian tribes and any other consulting party that might attach religious and cultural significance to identified historic properties. The USACE shall consult with the SHPO, Native American Indian tribes and other consulting party which have expressed an interest in the undertaking in an effort to develop a plan for resolving the adverse effects.

C. *Advisory Council on Historic Preservation Policy Statement regarding Treatment of Burial Sites, Human Remains and Funerary Objects effective 23 February 2007:* This policy applies to all Federal Agencies with Undertakings that are subject to review under Section 106 of the NHPA. To be considered under Section 106, the burial site must be or be a part of an historic property, meaning that it is listed or eligible for listing in the National Register of Historic Places. This policy shall be applied if the burial site meets this criterion.

D. *Dispute Resolution.* If, during consultations conducted under paragraphs A and B of this stipulation, all consulting parties cannot agree upon an consensus plan for resolving adverse effects, the matter shall be referred to the Council for resolution in accordance with the procedures outlined in § 800.9.

Stipulation V
PA Amendments, Disputes and Termination

A. *Amendments.* Any party to this PA may propose to the other parties that it be amended, whereupon the parties shall consult in accordance with § 800.6(c)(7) to consider such an amendment.

B. *Disputes.* Disputes regarding the completion of the terms of this agreement shall be resolved by the signatories. If the signatories cannot agree regarding a dispute, any one of the signatories may request the participation of the ACHP in resolving the dispute in accordance with the procedures outlined in § 800.9.

C. *Termination of PA.* Any party to this PA may terminate it by providing sixty (60) days notice to the other parties, provided that the parties shall consult during the period prior to the termination to seek agreement on amendments or other actions that will avoid termination. In the event of termination of this PA by the SHPO, the USACE shall comply with the provisions of § 800 Subpart B.

Stipulation VI
Termination of Consultation

If, after consulting to resolve adverse effects pursuant to Stipulation I, II or IV of this PA, the USACE or SHPO determines that further consultation will not be productive, then either party may terminate consultation in accordance with the notification requirements and process prescribed by § 800.7.

Stipulation VII
Term of this Agreement

This PA remains in force for a period of ten (10) years from the date of its execution by all signatories. Sixty (60) days prior to the conclusion of the ten (10) year period, the USACE shall notify all parties in writing of the end of the ten year period to determine if they have any objections. If there are no objections received prior to expiration, the PA shall continue to remain in force for a new ten (10) year period.

DISTRICT ENGINEER, U.S. ARMY CORPS OF ENGINEERS, GALVESTON

MARCH 14, 2008

Colonel David C. Weston, District Engineer **Date**

TEXAS STATE HISTORIC PRESERVATION OFFICER

3/31/08

F. Lawerence Oaks, Texas State Historic Preservation Officer **Date**

PORT FREEPORT

MARCH 27, 2008

James F. Brown Jr., Chairman of the Board of Commissioners **Date**

Appendix F

Socioeconomic Baseline Conditions

Appendix F

Socioeconomic Baseline Conditions

1.0 SOCIOECONOMIC RESOURCES

This section presents a summary of economic and demographic characteristics of the study area within Brazoria County. Data were collected for Brazoria County and for the towns and cities that are within the study area (Figure 1). Population, employment, the area economy, a historical perspective of economic development, and Environmental Justice (EJ) are key areas of discussion.

1.1 Population

The proposed action involves widening and deepening of the existing navigation channels and turning basins as well as extending the Freeport Entrance Channel farther into the Gulf of Mexico (Gulf) (see Tables 2.4-1 and 2.4-2 of Final Environmental Impact Statement [FEIS]). The study area includes Brazoria County as well as the following towns/cities: Alvin, Angleton, Bailey's Prairie, Bonney, Brazoria, Brookside Village, Clute, Danbury, Freeport, Hillcrest, Holiday Lakes, Iowa Colony, Jones Creek, Lake Jackson, Liverpool, Manvel, Oyster Creek City, Pearland, Quintana, Richwood, Surfside Beach, Sweeny, and West Columbia.

The proposed action is located in Brazoria County with a 2009 population of 304,844 persons. Brazoria County maintained steady growth, increasing by 13 percent between 1980 and 1990, by 26 percent between 1990 and 2000, and 26 percent between 2000 and 2009 (Tables 1 and 2). Populations given for the study area towns/cities represent 2009 population estimates (Texas State Data Center, 2010). The City of Freeport, population 13,677, is located south of Oyster Creek (population 1,429), which is located northwest of the proposed action, while Quintana (population 37) and Surfside Beach (population 922) compose the southern portion of the study area. Located northwest of Freeport is Angleton (population 20,133), Bailey's Prairie (population 789), Lake Jackson (population 29,205), and Richwood (population 3,663). Bonney (population 425) is north of Angleton, and Liverpool (population 469) is east of Bonney. West Columbia (population 4,519) is west of Bailey's Prairie and northwest of Brazoria (population 3,120) and Jones Creek (population 2,294). Sweeny (population 3,985) is west of Brazoria (see Figure 1).

Population projections provided by the Texas Water Development Board (TWDB) 2006 Regional Water Plan indicate that population in Brazoria County is expected to grow at a similar rate as state growth rates through 2040. Brazoria County is projected to grow 37 percent from 2009 to 2040, while the State of Texas is projected to grow 50 percent during the same time (see Table 2). In addition, towns/cities within the study area are also expected to grow between 2009 and 2040. Cities that are expected to have the greatest growth include Freeport (82 percent

increase), Oyster Creek (48 percent increase), and Brookside Village (47 percent increase). A few communities are not expecting any growth. These include Manvel (53 percent decrease), West Columbia (14 percent decrease), Jones Creek (7 percent decrease), and Brazoria with a 3 percent decrease (see Table 2).

Approximately 71 homes were destroyed by Hurricane Ike in 2008. Of those, 53 were owner-occupied, and 18 were renter-occupied. Home values vary by area. For instance, values in the Alvin area show an increase, while Pearland and Angleton have decreased since 2008. Overall, home values in the Brazosport area had risen in 2008 but were brought down, approximately $38 million decrease in total value, from the damage to the coast during the hurricane (U.S. Department of Homeland Security, 2008). Due to the expected overall growth within the study area, a likely concern could include the amount of current available housing. A multiple listing service was reviewed to determine the amount of housing within the study area.

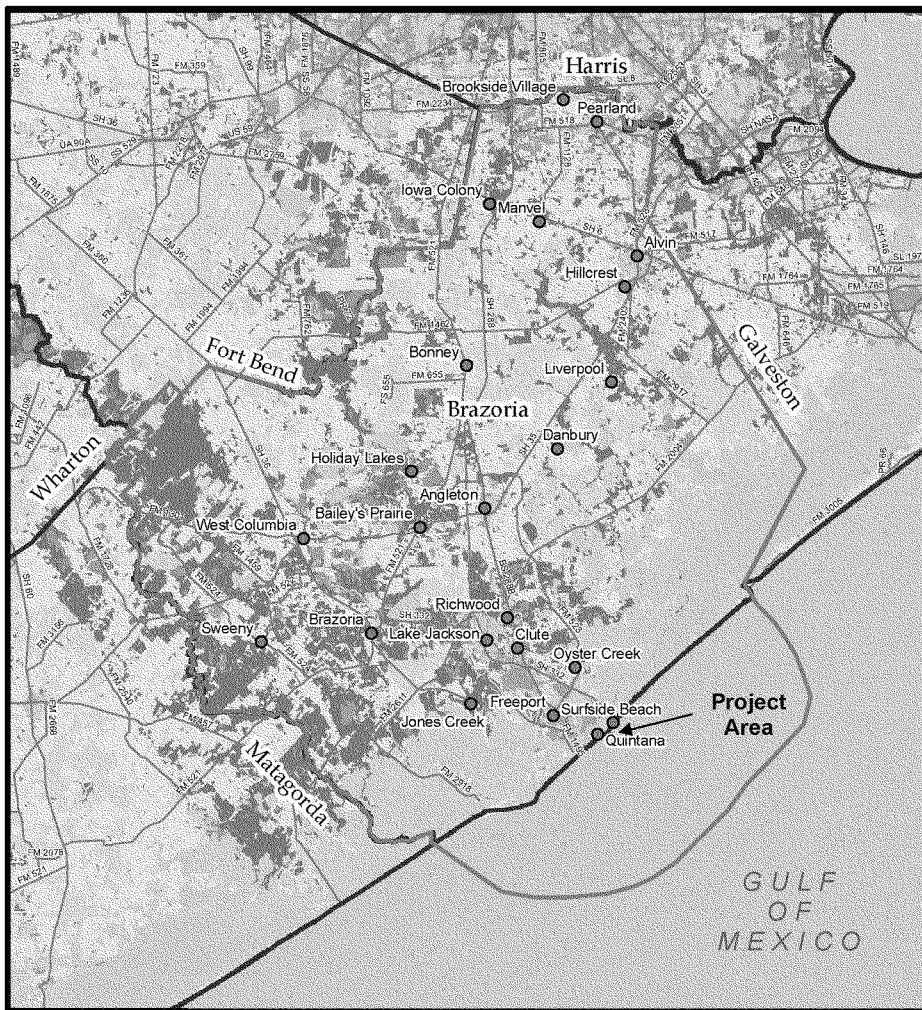
Within the study area, approximately 570 homes are listed for sale. The number of homes for sale in specific price ranges are as follows: $1.8–1.0 million (3 homes), $930,000–524,000 (7 homes), $429,000–300,000 (52 homes), $299,900–204,000 (111 homes), $199,900–150,000 (95 homes), $149,900–101,900 (162 homes), $100,000–80,000 (70 homes), $79,900–50,000 (54 homes), and 17 homes in the range $49,900–35,000 (Multiple Listing Service, 2010). As shown, adequate housing is available within the study area to meet the demands of a growing population.

General population characteristics can be ascertained using parameters such as the number of households, age characteristics, median household income, poverty levels, and educational attainment.

The U.S. Census Bureau's 2000 census data were used to identify general population characteristics (Tables 3 through 7). Whenever possible, the most-up-to-date information has been provided to characterize the study area general population. The 2000 data are the most consistent for all parameters at the city/town level.

The study area general population can be characterized as comprising family households with an average family size of 3.23 persons that own their own homes. The largest age cohort was persons between 35 to 49 years of age (25.6 percent), followed by persons 50 to 64 years of age (13.9 percent), and persons 5 to 14 years of age (16.0 percent).

The study area median household income was $48,632, and the total percentage of persons living below the poverty level was 10.2 percent. The majority of the population attained a high school diploma and attended college. However, on average, only 6.9 percent received an Associates Degree, 13.8 percent received a Bachelors Degree, and 5.9 percent received a Graduate or Professional degree.



Incorporated towns/cities
Study Area
On-System Roads 2003
Freeport Harbor CIP Area

Cover Types

Agricultural
Bare or Transitional
Grassland
High Intensity Developed
Low Intensity Developed
Non-Woody Wetland
Open Water
Woody Land
Woody Wetland

10 5 0 10 Miles

Figure 1

Freeport Harbor Channel Improvement Study Area and Land Use Categories

Prepared for: USACE Galveston	
Job No.: 044190100	
Prepared by: A.Christiansen	Date: 03/24/2008

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1.2 Community Services

Brazoria County has a well-developed infrastructure to provide health, police, fire, emergency, and social services within the study area. A wide range of public services and facilities is offered at different locations for the local communities of Surfside Beach, the City of Freeport, Quintana Beach, and the Lake Jackson/Clute area. The regional provider of hospital and healthcare services is the Brazosport Memorial Hospital. Professional services such as healthcare are found in the larger communities of Freeport and Lake Jackson. All areas of the county are served by the Brazoria County Sheriff's Department and the Texas Department of Public Safety. Individual communities are served by police or marshals. All departments have regular 24-hour patrols.

Fire protection within the vicinity of the study area is provided by the various fire departments of the study area cities. The cities of Alvin, Angleton, Clute, Danbury, Manvel, Pearland, Richwood, Sweeny, and West Columbia all have volunteer fire departments. The project area is served by the Freeport Fire Department, which serves the City of Freeport and is a "Combination Department," in that it has 10 full-time employees and 19 reserve members (Stanford, 2007). The assigned service area for fire protection includes the Village of Quintana by an annual contract and coverage for Surfside Beach. The service area includes approximately 175 square miles, of which 20 square miles is located within the city limits of the City of Freeport. The department operates out of two stations, with one station on each side of the city and an additional station utilized primarily for storage of excess equipment. The department has four class "A" pumpers, two command vehicles, one beach rescue vehicle, one water tanker truck, one crew cab flat-bed utility truck, one 5-ton crew cab utility truck with one 36-foot enclosed fifth-wheel trailer containing a high-pressure breathing air system and hazardous material equipment, three ambulance units, one 55-foot snorkel elevated water fire truck, and two fire boats. The Freeport Fire & Emergency Medical Service Department currently provides service to the City of Freeport and the Village of Quintana. Surfside Beach provides emergency services through the Surfside Beach Police Department, with one full-time employee, one part-time employee, and volunteers (*The Alliance*, 2006a). Law enforcement within the vicinity of the study area is served by both State and local departments. The Texas Highway Patrol, a service of the Texas Department of Public Safety's Traffic Law Enforcement Division, maintains an office in Angleton. The Brazoria County Sheriff's office and the Texas Highway Patrol serve the highways in unincorporated areas of Brazoria County. Within the incorporated area of Brazoria County, the cities of Alvin, Angleton, Brazoria, Brookside Village, Clute, Danbury, Hillcrest, Freeport, Jones Creek, Lake Jackson, Manvel, Oyster Creek, Pearland, Quintana, Richwood, Surfside Beach, Sweeny, and West Columbia all provide police protection.

Brazoria County is served by eight different school districts: Alvin Independent School District (ISD), Angleton ISD, Brazosport ISD, Columbia-Brazoria ISD, Damon ISD, Danbury ISD, Pearland ISD, and Sweeny ISD. The Alvin ISD is located in the northeast portion of Brazoria County, and includes 13 elementary schools, 5 middle and junior high schools, 2 high schools, 1 academic alternative school, and 1 behavior alternative school (Alvin ISD, 2010). For the

academic year 2008–2009, the enrollment for Alvin ISD was 16,000. Higher education is offered at Alvin Community College. Angleton ISD serves Angleton, Bonney, and Bailey's Prairie and has 5 elementary schools, 1 middle school, 1 intermediate school, 1 high school, and 1 early childhood campus. Enrollment for the academic year 2008–2009 was 6,290 (Texas Education Agency [TEA], 2010). The Brazosport ISD has schools within the communities of Freeport, Oyster Creek, Quintana, and Surfside Beach. The District includes 11 elementary schools, 2 middle schools, 3 intermediate schools, 2 high schools, and an alternative placement center (TEA, 2010). The district had an enrollment of 12,960 for the academic year 2008–2009. Higher education is available through the Brazosport College campus located in Lake Jackson. It is easily accessed from all towns and cities in south Brazoria County and offers a broad range of courses and classes to address diverse educational goals. Students planning to pursue a bachelor's degree can enroll in introductory academic classes, as well as courses in 16 majors, which transfer to 4-year schools (Brazosport College, 2006). Columbia-Brazoria ISD serves the cities of West Columbia and Brazoria and includes 3 elementary schools, a junior high, and a high school. The district had an enrollment 3,135 for the academic year 2008–2009 (TEA, 2010). Damon ISD has only one school, Damon Elementary, and serves the city of Damon and the surrounding area. For the academic year 2008–2009, enrollment for Damon ISD was 160 (TEA, 2010). Danbury ISD serves the city of Danbury and the surrounding areas, and encompasses one elementary school, one middle school, and one high school. Enrollment for the academic year 2008–2009 was 757 (TEA, 2010). Pearland ISD serves the cities of Pearland and Brookside Village, and includes 11 elementary schools, 9 middle and junior high schools, 2 high schools, Sheryl Searcy Ninth Grade Center, and the PACE Institute, a 7th and 8th grade campus for special-needs students. For the academic year 2008–2009, enrollment for Pearland ISD was 17,640 (TEA, 2010). Sweeny ISD serves the city of Sweeny and includes an elementary school, junior high school, and high school. Enrollment for the academic year 2008–2009 was 1,968 (TEA, 2010).

Within Brazoria County, a variety of entities provide electric utility, natural gas, water, wastewater, and solid waste disposal services. These services are summarized in Table 8.

1.3 Employment

According to the Texas Workforce Commission (TWC), the largest percentages of jobs in Brazoria County are within education and health services, trade, transportation and utilities, and government service sectors. Third-quarter employment in 2007 had a total of 84,819 persons employed in Brazoria County, of which 19 percent were employed in trade, transportation, and utilities, 19 percent in education and health care services, and 18 percent in the government sector. The workforce decreased 3.2 percent from 2007 to 2009, with a total of 82,063 persons employed in Brazoria County for the third quarter of 2009. The top three employment sectors for the third quarter of 2009 were trade, transportation, and utilities (21 percent), the government sector (20 percent), and education and health services (20 percent). Between 2007 and 2009, unemployment rates increased from 4.8 to 7.5 percent (TWC, 2010).

According to the U.S. Census Bureau 2000 data, the class of workers within the study area is similar to the State of Texas when looking at the percentage of government workers and unpaid family workers and has a slightly lower percentage of self-employed workers and a slightly higher percentage of private wage and salary workers (Table 9).

Approximately 55,192 Texas jobs are related to the activity within Port Freeport. The port is responsible for 11,696 direct local jobs, which creates $1.11 billion in personal income, with Brazoria County residents holding 75 percent of those jobs (Port Freeport, 2009). Top employers within the Brazosport area are primarily oil industry/port-related enterprises, healthcare, government, and retail industries (Table 10).

The number of workers who work outside their place of residence but still within the state and county in which they reside is much higher when compared to the State of Texas. The study area has a similar percentage of persons working inside their state of residence (99.1 percent) when compared to the state, with 99.0 percent; the percentage of workers that work inside their county of residence (59.7 percent) is much lower than the state (78.6 percent); and outside their place of residence (75.6 percent) is higher than the State of Texas (44.6 percent) (Table 11).

1.4 Economics

1.4.1 Historical Perspective

The Freeport area has been an important trade and shipping area since the nineteenth century. The navigation of Port Freeport began as early as 1821, when Stephen F. Austin chose the mouth of the Brazos River as a location for development of a deepwater port. In 1889, Congress authorized the Brazos River and Dock Company to construct a navigable channel between the mouth of the Brazos River and the Gulf (Brazos River Harbor Navigation District [BRHND], 2004).

The first dock and terminal facilities were constructed in the early 1950s, and by 1961, the channel was dredged to a depth of 36 feet. Since that time, additional land has been purchased and developed for deepening and widening of the jetty system, construction of additional office and warehouse space, and numerous infrastructure improvements. Port Freeport was authorized in 1988 to accept, operate, and maintain a Foreign Trade Zone within its boundaries (BRHND, 2004).

On November 17, 1986, President Ronald Reagan signed "The Water Resources Development Act of 1986," which authorized the Freeport Harbor, Texas, 45-foot Project. The project included the construction of the Surfside Jetty Park Complex. In 1999, the main Entrance Channel was rebuilt and widened, and in 2000, the Deep Berthing Area was dredged to a depth of 70 feet (BRHND, 2004).

To diversify Port Freeport's cargo base, in 2004 the port began major projects that include a cool storage facility to handle temperature-sensitive commodities; construction of Berth 7, to accommodate vessels up to 48-foot draft; and the signing of a land lease agreement with Freeport LNG to facilitate the construction of a liquefied natural gas (LNG) receiving facility. These projects are in addition to multiple existing warehouses, transit sheds, dock facilities, and terminals (BRHND, 2004).

1.4.2 Current Regional Economics

The economy of Brazoria County and the Port Freeport area is broadly based in manufacturing and agriculture. The primary economic bases of the county include chemical manufacturing, petroleum processing, offshore production maintenance services, biochemical and electronic industries, commercial fishing, and agriculture. The deepwater channel and port facilities, sports fishing services, and tourism are major components of the county's economic base (BRHND, 2004).

Port Freeport handles large volumes of commodities, including petroleum products, agricultural products, and general cargo such as animal feed, synthetic rubber, and automobiles (BRHND, 2004). The port is ranked 16th in U.S. foreign tonnage and 27th in the U.S. in total tonnage. Top import countries include Brazil, Colombia, Costa Rica, Guatemala, Honduras, and Mexico. Top export countries include Brazil, Colombia, Costa Rica, Cuba, Nigeria, Honduras, Saudi Arabia, and the Dominican Republic (Port Freeport, 2009). As stated in the Comprehensive Annual Financial Report for Port Freeport (BRHND, 2004), if Port Freeport harbor is deepened to 60 feet, it will boast the deepest-draft port facility on the Gulf.

Port Freeport totaled over $28.6 million in revenue in 2009. As a result of local and regional purchases by the 11,696 employees, an additional 43,496 induced jobs are estimated to be supported in the regional economy resulting in $4.6 billion in personal income, $10.2 billion in total economic activity in Texas, and $1.3 billion of investment in the local economy over the past 5 years (Port Freeport, 2009).

Freeport has become BASF Corporation's manufacturing base for nylon intermediates and polymers in North America with the construction of a $59 million polycaprolactam plant. The plant was built on existing operations and added 10 permanent positions. Construction is expected to employ 190 workers at its peak (*The Alliance*, 2005a).

Phase I of the Freeport LNG terminal, a 211-acre tract located on Quintana Island, opened in April 2008. The first phase brought 1,500 contractor jobs at its peak with an average of 600 workers a day. The Federal Energy Regulatory Commission has approved a $1 billion expansion of the site to begin in 2011. Currently, the facility has 50 permanent employees (*The Alliance*, 2009a).

Dow Texas Operations opened a new phenolic glycol ethers production facility in Freeport in 2008, which brought three permanent jobs to the area, in addition to numerous temporary construction jobs. In addition to bringing numerous construction jobs to the area, the plant will also reduce the company's transport of hazardous materials across the nation (Evans, 2007).

In 2007, Port Freeport began construction on a new Velasco terminal. To date, approximately 800 feet of berthing is complete. The Velasco Terminal is anticipating 1,591 direct local jobs brought to Brazoria County and $70 million in income to those workers. Approximately $43 million has been spent to date with $159 million budgeted over the next 5 years. Ultimately, the project will add 2,400 feet of berthing to the port (Port Freeport, 2009; Tompkins, 2006).

Air Liquide, which has a plant in Oyster Creek, has constructed an air separation unit on 2 acres adjacent to the current plant for the transmission of oxygen and nitrogen gas and liquid to its customers. This new construction could provide 100 jobs in addition to the 15 full-time plant jobs (Hagerty, 2007).

Although Hurricane Ike damaged range lights and caused shoaling at the channel entrance, resulting in restrictions to vessel depth, and downed power lines forced a shift in vehicular traffic to the port, overall the port did not suffer major destruction. Port Freeport employees whose homes were severely damaged were provided temporary housing (Port Freeport, 2009).

1.4.3 Tourism and Recreation

Tourism is a major contributor to the study area economy. The natural resources of the Gulf provide extensive recreational opportunities in the Freeport area. Outdoor recreation in the area includes fishing, birdwatching, windsurfing, boating, jet skiing, swimming, shelling, and beachcombing (among others).

Brazoria County was chosen as the location for the 2006 Texian Rally sponsored by The Texas Independence Trail Region. Brazoria County was chosen because of its association with the Texas Independence Trail, as well as being the burial place of Stephen F. Austin before his grave was moved to Austin. In addition, the Masonic Oak in Brazoria County was the location of the first Masonic Lodge meeting held in Texas in 1835 (*The Alliance*, 2006b).

Freeport ranks as one of the top areas in the Nation for diversity of species and number of species encountered (*Texas Explorer*, 2006). There are several marinas located within the Freeport area that support recreational as well as commercial fishing. There are numerous parks located within the area that provide beach access. The Freeport Bryan Beach is located southwest of the Village of Quintana at the end of Farm-to-Market Road (FM) 1495 and has a 3½-mile beach, named one of the cleanest beaches in Brazoria County. Follet's Island Beach is located near and northeast of the Village of Surfside Beach. It has 10 miles of beach and is used for swimming, picnicking, and fishing. Quintana Beach Park includes such amenities as restrooms, showers, concession stand, boardwalks, picnic areas, and shaded pavilions for group rentals. On

the property is the Coveney House, which has a beach ecology laboratory featuring hands-on displays (Brazoria County Parks Department, 2010). One of the newest parks is the Surfside Jetty Park, which has a visitor's center, shuffleboard, picnic tables, public showers, convenience store, restrooms, playground, horseshoe pits, lighted volleyball courts, and a sidewalk from the park to the jetty and beach. The Surfside Pedestrian Beach is located on the west side of Surfside Beach and does not allow vehicles. Amenities include portable restrooms located along the beach (City of Freeport, 2006a).

In 2009, Dow Chemical Co. donated 388 acres of Columbia Bottomlands to U.S. Fish and Wildlife Service (USFWS). The land, which is located ½ mile from the Angleton Road and FM 2004 intersection, will become the USFWS Dow Woods Unit. This habitat will benefit migratory songbirds and also provide hike and bike trails for visitors (*The Alliance*, 2009b).

Also in Freeport is a proposed marina on the Old Brazos River that could become the catalyst for downtown revitalization with restaurants, hotels, and gift shops.

An agreement has been reached for Surfside Beach to lease ½ acre, adjacent to city hall, for a nature trail and home for Surfside Beach's Save Our Beach Association (*The Alliance*, 2005b). The former Surfside Beach tourist center could house the group's monthly meetings as well as become a learning center for area residents and visitors.

1.4.4 Community Values

Overall, the communities in the study area support development at Port Freeport. Future growth at the port includes new construction and expansion of existing facilities for companies such as Freeport LNG, BASF Corporation, Dow Chemical, and ConocoPhillips. New jobs in the Brazosport community are a direct result of the expansion of Port Freeport. According to *The Alliance*, a newsletter distributed by the Economic Development Alliance for Brazoria County, Phase I of the Freeport LNG terminal has benefited Quintana by providing more than 400 jobs since 2005, and Freeport LNG anticipates an additional 60 plant operator positions once the site is open (*The Alliance*, 2006c). The community is expected to benefit from the long-term investment of Freeport LNG through projects such as the maintenance of beaches, roads, and water system, and helping to keep the tax rate low. In addition, the facility would assist in retaining local jobs in the chemical industry. Even with the economic and community service benefits from facilities such as Freeport LNG, some residents are concerned about the size of the facility and the security demands that may ultimately affect Quintana's residents. Throughout Brazoria County, particularly in the study area, future projects include expansion of highways, new schools, new businesses, and water and sewer projects in Surfside Beach as big industrial employers such as BASF, Dow Chemical, and ConocoPhillips expand their facilities (*The Alliance*, 2006d).

1.4.5 Commercial Fisheries

There is little commercial fishing in the Freeport area. Commercial fishing within the Galveston Bay system is a relatively moderate contributor to the Freeport area economy compared to other industry sectors.

1.4.6 Tax Base

In Texas, the state sales tax is 6.25 percent, with local sales/use tax not to exceed an additional 2 percent. Property is appraised and property tax is collected by local (county) tax offices or appraisal districts, and these funds are used to fund many local needs including public schools, city streets, county roads, and police and fire protection (Texas Comptroller of Public Accounts, 2010). The predominant property tax jurisdictions within the study area include independent school districts, municipalities, and municipal utility districts (Table 12).

Activity at Port Freeport terminals generates $163.6 million in State and local taxes. Also, the Federal government receives $6.3 million of customs revenue from cargo activity at the public and private facilities (Port Freeport, 2004).

1.5 Environmental Justice

In compliance with Executive Order (EO) 12898—Federal Action to Address Environmental Justice (EJ) in Minority Populations and Low-Income Populations—an analysis has been performed to determine whether the proposed action would have a disproportionately adverse impact on minority or low-income population groups within the study area. The EO requires that minority and low-income populations do not receive disproportionately high adverse human health and environmental impacts and requires that representatives of minority or low-income populations who could be affected by the project be involved in the community participation and public involvement process.

The data used in this study to determine the potential for disproportionate impacts to low-income and/or minority populations within the project study area and within the region and the State are presented in Tables 13 and 14. The information is based on 2000 U.S. Census Bureau State, county, and block group level data for ethnicity and income.

In terms of ethnicity, the population living within the study area census tracts (CT) (with a total minority population of 37.6 percent) is less ethnically diverse than Brazoria County and the State of Texas. The percentage of white persons within the study area is 65.3 with the largest percentage of minority persons being Hispanic or Latino, with 22.8 percent of the total population. Within the study area, Freeport has the largest minority population (67.0 percent), which is predominantly composed of Hispanic (51.6 percent) and African American (13.2 percent) persons. Freeport also has the highest percent of persons living below poverty in the study area. The percentage of persons living below poverty within the study area is 10.2

percent. The poverty rates of the study area cities range from 3.0 percent (Bonney and Manvel) to 22.9 percent (Freeport).

EO 13166, "Improving Access to Services for Persons with Limited English Proficiency (LEP)," signed by President Bill Clinton on August 11, 2000, calls for all agencies to ensure that their federally conducted programs and activities are meaningfully accessible to LEP individuals. Table 14 contains the percent LEP population for the study area.

A small percentage of persons in the study area do not speak English or have difficulty speaking English. Data for "Ability to Speak English" for the population 5 years old and over indicates that 3 percent of the population in the study area speak English "Not Well," while 1.2 percent of the population speak English "Not at All" (see Table 14).

2.0 LAND USE/AESTHETICS

2.1 Land Use

Brazoria County lies in the Coastal Bend region of Texas. The Freeport Channel is located in Brazoria County on the mid to upper Texas coast, about 40 miles southwest of Galveston, Texas. The authorized Federal navigation project (Freeport Channel) consists of channels and turning basins that begin in deep water in the Gulf, about 4.9 miles offshore. The Freeport Channel then passes through the jettied inlet and extends about 3.54 miles westward to Freeport. The project is geographically divided into four segments, the Entrance Channel, Main Channel reaches, Stauffer Channel, and Brazos Harbor. Because potential project-related impacts may affect resources outside the footprint of the proposed project, the study area for land use analysis is identified below. Land use within the study area consists of agricultural land, industrial land, urban-residential and urban-commercial land, recreational land and facilities, and marshlands. Water use includes mineral production, commercial and sport fishing, recreation, and transportation.

In Brazoria County, agriculture has historically been and continues to be an important part of the economy. Approximately 61 percent of the land is used for agriculture, with 41 percent used for range and pastureland and the remaining 20 percent cultivated (Natural Resources Conservation Service, 2000). Within Brazoria County, only about 14 percent of land use is considered urban. According to the U.S. Department of Agriculture (USDA) 2002 Census of Agriculture, Brazoria County had 2,455 farms in 2002, up 8 percent from 1997, and had approximately 614,000 acres of land in farms. In 2002, the market value of production for Brazoria County was $47,422,000, with crop sales accounting for 52 percent and livestock sales accounting for the remaining 48 percent (USDA, 2002).

As previously stated, the project area for the proposed action is located on the mid to upper Texas coast in Brazoria County, Texas, extending offshore at the 60-foot depth contour of the Gulf, through the jettied Freeport Harbor Entrance Channel upstream to the Stauffer Channel

Turning Basin. In addition, the project area encompasses upland placement areas and ocean dredged material disposal sites for disposal of dredged material from proposed channel improvements (Figure 2).

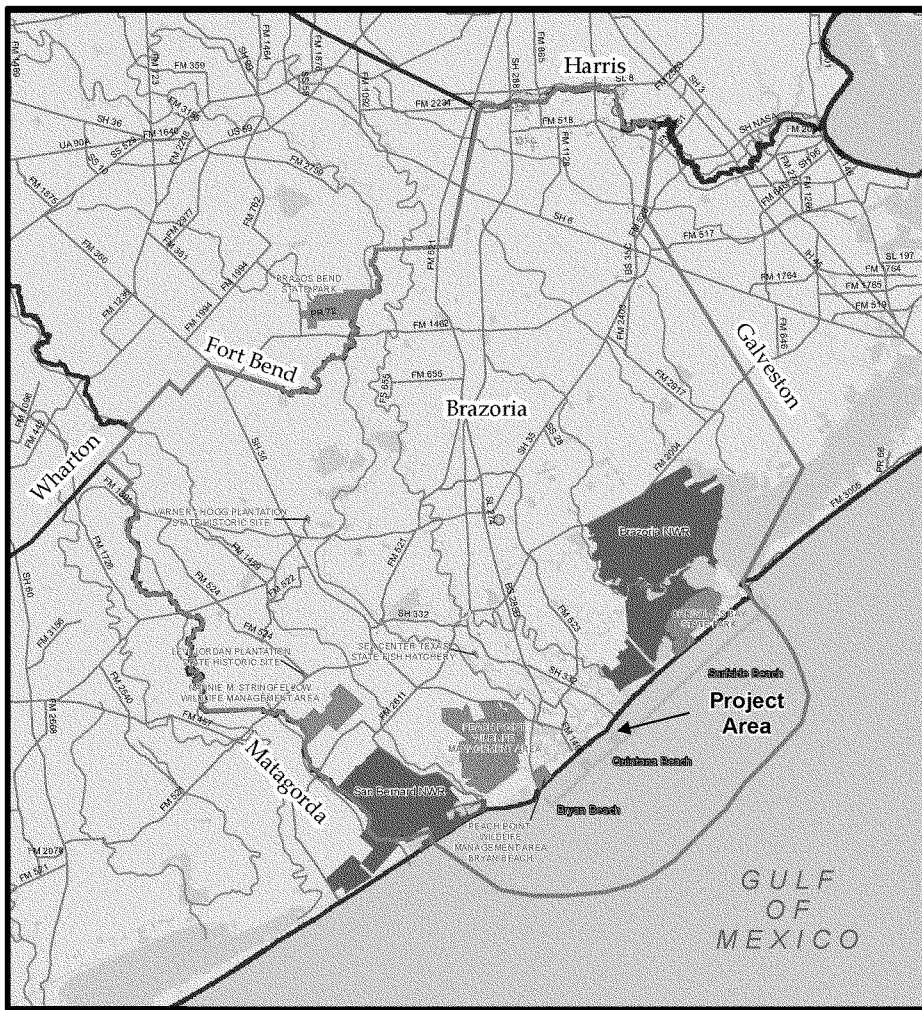
For the purposes of this analysis, the study area includes the following towns/cities: Alvin, Angleton, Bailey's Prairie, Bonney, Brazoria, Brookside Village, Clute, Danbury, Freeport, Hillcrest, Holiday Lakes, Iowa Colony, Jones Creek, Lake Jackson, Liverpool, Manvel, Oyster Creek City, Pearland, Quintana, Richwood, Surfside Beach, Sweeny, and West Columbia (see Figure 1).

The study area is approximately 1,110,643 acres in size. It primarily comprises open water (245,336 acres) and undeveloped land. The undeveloped land consists of grassland (335,531 acres), woody (forested) land (208,508 acres), agricultural (118,698 acres), nonwoody wetland (113,517 acres), and bare or transitional (3,418 acres). Developed land (28,833 acres high intensity, 19,919 acres low intensity) is primarily concentrated in the northeastern portion of the study area around Pearland and Alvin as well as the southern portion of the study area in communities near Port Freeport and along major roadways such as State Highway (SH) 36, SH 332, SH 288, and FM 523.

Port Freeport currently comprises 186 acres of developed land and 7,723 acres of undeveloped land (Port Freeport, 2006). Facilities along the west side of the Freeport Jetty Channel include the Exxon Quintana Station and LNG Quintana Terminal, as well as the Coast Guard boat basin and access channel located on the east side of the channel. Continuing northward along the Brazos River Channel, ConocoPhillips Petroleum facilities and the BASF Corporation Terminal are to the west and Dow Chemical is to the east of the channel. The northernmost facilities in the project area include Chiquita, American Rice, Inc., and Vulcan Materials Bulk Aggregate Facility, located just south of the Stauffer Turning Basin. All parcels are accessible by water, highway, and rail. Numerous golf courses and county parks are located within the study area, including those that provide beach access such as Bryan Beach, located southwest of the Village of Quintana; Quintana Beach Park, located southwest of the Freeport Jetty Channel; and Surfside Jetty Park and Surfside Pedestrian Beach, located on the east side of the Freeport Jetty Channel. In addition to public and private parks, there are State and Federal areas located in the study area. These include Nannie M. Stringfellow Wildlife Management Area (WMA) located in the southwestern portion of the study area as well as the Peach Point WMA, Brazoria National Wildlife Refuge (NWR), San Bernard NWR, and Christmas Bay State Park located along the coastline.

2.2 Transportation

Major roadways within the study area include FM 523, which provides access from Angleton to Oyster Creek; SH 288, the primary land route connecting the Freeport area with the Houston



Golf Courses
City Parks
Study Area
On-System Roads 2003
Freeport Harbor CIP Area
County Parks
State areas
Federal Refuges
Beaches

N W E S

10 5 0 10 Miles

Figure 2

Freeport Harbor Channel Improvement Project Study Area and Recreational Areas

Prepared for: USACE	
Job No.: 044190100	
Prepared by: Amy C./RCoop	Date: 03/24/2008

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metropolitan area, approximately 50 miles to the north; SH 36, which provides north-south connection from Rosenberg to Freeport; and SH 332, which provides a direct route from Lake Jackson to Surfside Beach. There is direct access to the Gulf Intracoastal Waterway (GIWW) and the Freeport Harbor utilizing FM 523, SH 36, SH 288, and SH 332, with rail service provided by the Union Pacific Railroad (UPRR). These roadways provide for efficient shipping of goods from the port.

Rail transportation is integral to the operations of Port Freeport and numerous industrial sites located along the Freeport Jetty Channel, GIWW, Brazos River Channel, Brazos Harbor, Brazosport Turning Basin, and the Stauffer Turning Basin. The UPRR provides direct service to these facilities, with approximately 50,000 railcar transits per year at Port Freeport (Port Freeport, 2006).

2.3 Aesthetics

The term aesthetics deals with the subjective perception of natural beauty in a landscape by attempting to define and measure an area's scenic qualities. Consideration of the visual environment includes a determination of aesthetic values (where the major potential effect of a project on the resource is considered visual) and recreational values (where the location of a proposed project could potentially affect the scenic enjoyment of the area). Aesthetic values considered in this study, which combine to give an area its aesthetic identity, include:

- topographical variation (hills, valleys, etc.);
- prominence of water in the landscape (rivers, lakes, etc.);
- vegetation variety (woodlands, meadows, etc.);
- diversity of scenic elements;
- degree of human development or alteration; and
- overall uniqueness of the scenic environment compared to the larger region.

The study area consists of a variety of terrain characterized by varying levels of aesthetic quality. The topography of the area is mostly flat to gently rolling, with very few outstanding elevational changes. Generally, the study area consists mostly of undeveloped areas. Within the southern portion of the study area, landscapes with water as a major element are generally considered visually pleasing, and this is the case for recreational land adjacent to these water features. However, the study area has also seen widespread urban development that can detract or add, depending on the type and scale, to the overall aesthetic quality. The southern portion of the study area includes a variety of land uses, including residential development, commercial development, public and private marinas, parkland, relatively undisturbed natural areas, fishing and tourism-related businesses, civic uses, transportation systems (highways and railways), port facilities, and heavy industry areas. Generally, the study area is considered to be visually pleasing, with the exception of industrial and port facilities located in the southern portion along

the Freeport Harbor. However, the area is distinguished in aesthetic quality from other adjacent areas within the region that lack the vast waterbodies and many of the outdoor recreational amenities. The landscape exhibits a generally moderate to high level of impact from human activities. No designated scenic views or scenic roadways were identified from the literature review.

2.4 Future Development

Throughout Brazoria County, future projects include expansion of highways, new schools, new businesses, and improvements to water and sewer projects in communities such as Surfside Beach. Big industrial employers, including Freeport LNG, BASF, Dow Chemical, and ConocoPhillips, plan to expand with major projects. Freeport will become BASF Corporation's manufacturing base for nylon intermediates and polymers in North America, with a new plant to be constructed on-site (*The Alliance*, 2005a). Food companies such as GrupoSOS began construction of the first phase of their $200 million expansion in 2006 (*The Alliance*, 2006d).

The City of Freeport is discussing the possible annexation of 122 acres along the GIWW adjoining the Bridge Harbor subdivision. If the annexation is approved, the 1-mile-long, 1,000-foot-wide parcel would likely be used for residential/commercial development (*The Alliance*, 2007a). Subsequently, Freeport has plans for a marina to be built on the Old Brazos River, which would potentially attract restaurants and hotels around the site (*The Alliance*, 2006e). In May 2007, the Velasco Drainage District gave the City of Freeport permission to make two cuts in the Old Brazos River levee for the dry-stack boat storage facility (*The Alliance*, 2007b).

Future development in Surfside includes a proposed 9-acre, 260-slip, dry dock marina that would be located off the SH 322 Intracoastal Bridge. The Surfside Marina would cater to the sport fishing and yachting community and would include a restaurant, retail shops, showers, and a laundry facility. In addition, the Surfside Marina would have 17-foot-deep water and two helipads (*The Alliance*, 2006e) as well as 16 acres of wetlands (*The Alliance*, 2007c). A joint venture among Surfside Beach, Brazoria County, and Texas Parks and Wildlife Department (TPWD) is planned to construct a four-bay boat ramp between Village Hall and the Coast Guard Station (*The Alliance*, 2007d).

Industrial construction and/or expansion projects include the construction of Shintech's new 500-acre site near current industrial plants in the Chocolate Bayou area. The plant is anticipated to produce 825,000 tons of vinyl chloride monomer and 550,000 tons of caustic soda per year (*The Alliance*, 2007e). Air Liquide plans to construct an air separation unit on 2 acres adjacent to its current Oyster Creek plant for the transmission of oxygen and nitrogen gas and liquid to its customers (*The Alliance*, 2007f).

There are approximately 8,000 acres of land adjacent to the Gulf available for future development in Port Freeport. Future expansion of Port Freeport includes an LNG facility (under construction), construction of new berths, and the building of a transit shed. The $750 million LNG facility would receive and store LNG, convert the product back to a gas, and transport it to commercial and industrial users via pipeline. The project is expected to be completed in 2009 and is expected to generate increased funding for the port and provide facilities for the local petrochemical industry. In addition, the port has begun engineering design for Transit Shed 6 adjacent to Dock 5. The 125,000-square-foot facility would include rail service and may attract new business to the port (Port Freeport, 2006).

A multi-modal facility is planned for Parcel 14 located south of SH 36. Long-term use will include on-site warehouses and rail (Port Freeport, 2009).

In addition, future development of property located adjacent to Navigation Boulevard and the Brazos Harbor Entrance Channel (Parcel No. 25) would expand Port Freeport's warehousing and rail facilities (Port Freeport, 2006). With the increasing warehousing capabilities of the port, companies like Reliance Bulk Carriers of Houston (RBC) will be able to utilize the storage facilities. RBC could likely lease 30 acres to store parts of giant mills destined for West Texas, Oklahoma, and other regions (*The Alliance*, 2007g).

Transportation improvement projects include the construction of a four-lane County Road (CR) 220 from FM 521 to SH 288, widening of existing CR 220 from SH 288 to FM 523, widening of SH 332 from FM 521 to SH 288, construction of a six-lane toll highway (SH 99) from the Harris County line to FM 1093, the reconstruction of FM 2351 (CR 129) to a four-lane divided highway from SH 35 to the Galveston County line, widening of FM 523 from FM 2004 to SH 332, and the replacement of the CR 160 bridge at the Gulf Coast Water Canal (Texas Department of Transportation, 2007). Enhancements to highway and rail capabilities in the area will include widening SH 36 from two lanes to four lanes to facilitate hurricane evacuations and passenger and freight movement (*The Alliance,* 2009c). There will also be improvements made to SH 288, the main direct north-south route between Freeport and Houston. Enhancements to rail capabilities will include replacement of a rail bridge over the old Brazos River channel in downtown Freeport to serve increasing cargo volumes from Port Freeport (*The Alliance*, 2006f). In addition, Union Pacific plans to construct a new rail line through Angleton. The new line will parallel the existing track for 1.2 miles, starting at Loop 274 and ending just before Downing Street (*The Alliance*, 2006g).

Table 1
Population Trends 1980–2000

	Population			Percent Change		
Place	**1980**	**1990**	**2000**	**1980–1990**	**1990–2000**	**1980–2000**
Alvin	16,515	19,220	21,413	16	11	30
Angleton	13,929	17,140	18,130	23	6	30
Bailey's Prairie	NA	634	694	NA	9	NA
Bonney	NA	339	384	NA	13	NA
Brazoria	3,025	2,717	2,787	-10	3	-8
Brookside Village	NA	1,470	1,960	NA	33	NA
Clute	9,577	8,910	10,424	-7	17	9
Danbury	NA	1,447	1,611	NA	11	NA
Freeport	13,444	11,389	12,708	-15	12	-5
Hillcrest	NA	695	722	NA	4	NA
Holiday Lakes	NA	1,039	1,095	NA	5	NA
Iowa Colony	NA	675	804	NA	19	NA
Jones Creek	NA	2,160	2,130	NA	-1	NA
Lake Jackson	19,102	22,776	26,386	19	16	38
Liverpool	NA	396	404	NA	2	NA
Manvel	3,549	3,733	3,046	5	-18	-14
Oyster Creek	NA	912	1,192	NA	31	NA
Pearland	13,248	18,697	37,640	41	101	184
Quintana	NA	51	38	NA	-25	NA
Richwood	2,591	2,732	3,012	5	10	16
Surfside Beach	NA	611	763	NA	25	NA
Sweeny	3,538	3,297	3,624	-7	10	2
West Columbia	4,109	4,372	4,255	6	-3	4
Brazoria County	169,587	191,707	241,767	13	26	43
State of Texas	14,225,513	16,986,510	20,851,820	19	23	47

Source: U.S. Census Bureau (1990, 2000a).

Table 2
Population Projections 2009–2040

	Population					Percent Change				
Place	**2009**	**2010**	**2020**	**2030**	**2040**	**2009–2010**	**2010–2020**	**2020–2030**	**2030–2040**	**2009–2040**
Alvin	24,584	23,231	25,123	26,935	28,605	-5	8	7	6	16
Angleton	20,133	18,951	19,805	20,623	21,377	–6	5	4	4	6
Bailey's Prairie	789	744	795	844	889	-6	7	6	5	13
Brazoria	3,120	2,845	2,906	2,964	3,017	–9	2	2	2	–3
Brookside Village	2,197	2,282	2,618	2,939	3,235	4	16	12	10	47
Clute	11,720	11,217	12,043	12,834	13,563	–4	8	7	6	16
Danbury	1,783	1,747	1,888	2,023	2,148	-2	8	7	6	20
Freeport	13,677	15,794	19,006	22,082	24,917	15	24	16	13	82
Hillcrest	766	744	767	789	810	-3	3	3	3	6
Holiday Lakes	1,204	1,141	1,189	1,235	1,278	–5	4	4	3	6
Iowa Colony	978	911	1,022	1,129	1,227	-7	12	10	9	25
Jones Creek	2,294	2,130	2,130	2,130	2,130	–7	0	0	0	–7
Lake Jackson	29,205	29,383	32,502	35,488	38,241	1	11	9	8	31
Manvel	6,444	3,046	3,046	3,046	3,046	–53	0	0	0	–53
Oyster Creek	1,429	1,424	1,666	1,897	2,110	-<1	17	14	11	48
Pearland	83,594	66,049	83,462	99,342	114,034	–21	26	19	15	36
Richwood	3,663	3,244	3,486	3,717	3,930	–11	7	7	6	7
Surfside Beach	922	889	1,020	1,146	1,262	-4	15	12	10	37
Sweeny	3,985	3,895	4,177	4,447	4,696	–2	7	6	6	18
West Columbia	4,519	4,158	4,057	3,960	3,871	–8	–2	–2	–2	–14
Brazoria County	304,844	285,850	331,731	375,664	416,157	–6	17	14	12	37
State of Texas	24,538,335	24,915,388	29,117,537	33,052,506	36,893,267	2	15	14	12	50

Source: TWDB (2005); Texas State Data Center (2010).

Table 3
Household Composition, 2000

Area	Number of Households	Family Households	% Family Households	Nonfamily Households	% Non-family Households	Average Household Size	Average Family Size
Alvin	7,826	5,600	72	2,226	28	2.71	3.22
Angleton	6,508	4,891	75	1,617	25	2.75	3.19
Bailey's Prairie	237	202	85	35	15	2.93	3.18
Bonney	126	101	80	25	20	3.05	3.45
Brazoria	1,063	737	69	326	31	2.62	3.18
Brookside Village	655	536	82	119	18	2.99	3.22
Clute	3,674	2,564	70	1,110	30	2.79	3.35
Danbury	554	442	80	112	20	2.91	3.30
Freeport	4,163	3,099	74	1,064	26	3.05	3.59
Hillcrest	262	222	85	40	15	2.76	3.02
Holiday Lakes	342	261	76	81	24	3.20	3.71
Iowa Colony	279	219	79	60	22	2.88	3.29
Jones Creek	772	607	79	165	21	2.76	3.14
Lake Jackson	9,588	7,344	77	2,244	23	2.74	3.18
Liverpool	152	115	76	37	24	2.66	3.03
Manvel	1,085	870	80	215	20	2.80	3.13
Oyster Creek	440	304	69	136	31	2.64	3.14
Pearland	13,192	10,654	81	2,538	19	2.84	3.17
Quintana	20	11	55	9	45	1.90	2.18
Richwood	1,138	825	73	313	28	2.65	3.13
Surfside Beach	352	197	56	155	44	2.15	2.68
Sweeny	1,338	974	73	364	27	2.65	3.14
West Columbia	1,607	1,099	68	508	32	2.60	3.19
Brazoria County	81,954	63,128	77	18,826	23	2.82	3.23
State of Texas	7,393,354	5,247,794	71	2,145,560	29	2.74	3.28

Source: U.S. Census Bureau (2000b).

Table 4
Study Area Household Tenure, 2000

Area	# Occupied Housing Units	# Owner-Occupied Units	% Owner-Occupied Units	# Renter-Occupied Units	% Renter-Occupied Units
Alvin	7,826	4,292	55	3,534	45
Angleton	6,508	4,499	69	2,009	31
Bailey's Prairie	237	227	96	10	4
Bonney	126	66	52	60	48
Brazoria	1,063	712	67	351	33
Brookside Village	655	519	79	136	21
Clute	3,674	1,605	44	2,069	56
Danbury	554	419	76	135	24
Freeport	4,163	2,373	57	1,790	43
Hillcrest	262	250	95	12	5
Holiday Lakes	342	295	86	47	14
Iowa Colony	279	246	88	33	12
Jones Creek	772	661	86	111	14
Lake Jackson	9,588	6,821	71	2,767	29
Liverpool	152	127	84	25	16
Manvel	1,085	964	89	121	11
Oyster Creek	440	300	68	140	32
Pearland	13,192	10,480	79	2,712	21
Quintana	20	10	50	10	50
Richwood	1,138	645	57	493	43
Surfside Beach	352	207	59	145	41
Sweeny	1,338	901	67	437	33
West Columbia	1,607	987	61	620	39
Brazoria County	81,954	60,674	74	21,280	26
State of Texas	7,393,354	4,716,959	64	2,676,395	36

Source: U.S. Census Bureau (2000b).

Table 5
Age Characteristics of the Study Area, 2000

	Years of Age							
Place	**% Under 5**	**% 5 to 14**	**% 15 to 19**	**% 20 to 34**	**% 35 to 49**	**% 50 to 64**	**% 65 and over**	**Total Persons**
Alvin	8.8	16.1	7.9	23.4	21.3	13.0	9.4	21,413
Angleton	7.7	16.6	8.4	19.5	24.2	12.7	10.8	18,130
Bailey's Prairie	6.5	15.4	8.1	10.7	29.1	22.6	7.6	694
Bonney	9.4	18.2	10.7	19.0	28.6	9.6	4.4	384
Brazoria	8.3	16.6	7.2	20.7	21.7	13.7	11.7	2,787
Brookside Village	4.9	15.8	7.4	18.7	26.1	14.1	13.0	1,960
Clute	9.9	16.8	8.2	26.9	19.8	10.8	7.6	10,424
Danbury	8.0	17.4	9.9	18.7	23.5	14.2	8.3	1,611
Freeport	10.0	20.1	9.0	22.0	20.2	10.6	8.1	12,708
Hillcrest	5.3	12.7	7.8	10.8	23.5	24.1	15.8	722
Holiday Lakes	9.5	20.0	9.7	20.3	20.1	13.2	7.3	1,095
Iowa Colony	7.1	16.5	6.8	18.2	25.0	16.2	10.2	804
Jones Creek	6.9	16.7	7.7	15.1	21.7	19.6	12.3	2,130
Lake Jackson	7.4	17.7	8.0	17.6	25.7	13.7	9.9	26,386
Liverpool	6.7	14.4	7.7	21.3	25.0	15.3	9.7	404
Manvel	6.5	14.9	6.8	15.7	28.0	19.5	8.5	3,046
Oyster Creek	8.6	15.9	8.0	19.0	22.5	15.3	10.7	1,192
Pearland	8.0	16.0	7.5	19.8	26.7	13.6	8.4	37,640
Quintana	0.0	7.9	5.3	10.5	36.8	23.7	15.8	38
Richwood	8.8	15.0	8.5	24.8	23.7	13.0	6.0	3,012
Surfside Beach	4.6	10.9	4.8	16.6	31.1	21.0	11.1	763
Sweeny	7.2	16.5	8.8	17.9	21.2	12.3	16.1	3,624
West Columbia	7.9	15.7	8.0	18.5	22.3	14.5	13.1	4,255
Brazoria County	7.7	16.0	7.7	20.2	25.6	13.9	8.8	241,767
State of Texas	7.8	15.8	7.8	22.5	22.7	12.4	11.0	20,851,820

Source: U.S. Census Bureau (2000b).

Table 6
Income Characteristics of the Study Area, 2000

Place	Number of Persons	Per Capita Income ($)	Median Household Income ($)	Number Below Poverty	Percent Below Poverty
Alvin	21,413	17,106	38,576	2,852	13.2
Angleton	18,130	17,915	42,184	1,993	11.1
Bailey's Prairie	694	32,267	73,125	29	4.3
Bonney	384	15,368	41,750	11	3.0
Brazoria	2,787	16,666	36,058	373	13.3
Brookside Village	1,960	18,609	44,650	316	16.1
Clute	10,424	14,008	32,622	1,838	18.2
Danbury	1,611	17,565	50,536	124	7.6
Freeport	12,717	12,426	30,245	2,896	22.9
Hillcrest	722	25,055	63,889	35	5.0
Holiday Lakes	1,095	12,463	33,938	175	15.8
Iowa Colony	804	18,935	47,019	48	6.1
Jones Creek	2,130	20,023	42,378	239	10.7
Lake Jackson	26,386	25,877	60,901	1,675	6.4
Liverpool	404	19,492	48,750	26	6.6
Manvel	3,046	23,751	57,344	88	3.0
Oyster Creek	1,200	15,000	35,144	225	19.2
Pearland	37,640	26,306	64,156	1,744	4.7
Quintana	44	15,900	25,500	8	18.2
Richwood	3,012	19,181	45,000	316	10.5
Surfside Beach	764	24,081	37,778	94	12.6
Sweeny	3,624	16,755	36,497	346	9.9
West Columbia	4,255	15,647	31,115	836	20.0
Brazoria County	241,767	20,021	48,632	23,465	10.2
State of Texas	20,851,820	19,617	39,927	3,117,609	15.4

Source: U.S. Census Bureau (2000b).

Table 7
Educational Attainment of the Study Area, 2000 (Percent)

Place	Less than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate	Some College	Associates Degree	Bachelor's Degree	Graduate or Professional Degree
Alvin	8.8	14.1	29.0	27.5	7.1	9.2	4.3
Angleton	7.8	12.7	29.7	24.7	7.9	12.9	4.2
Bailey's Prairie	1.7	8.1	18.0	31.4	10.3	18.4	12.2
Bonney	0.9	7.5	36.2	33.3	11.7	7.0	3.3
Brazoria	6.8	17.9	36.6	23.8	9.0	2.9	2.9
Brookside Village	14.2	19.8	26.5	20.2	6.6	7.5	5.1
Clute	13.6	21.7	28.7	22.4	5.4	6.3	1.9
Danbury	7.8	10.6	36.0	29.1	7.4	7.1	1.9
Freeport	22.6	22.3	28.0	18.3	3.4	3.3	2.1
Hillcrest	1.3	5.0	22.1	27.5	8.2	23.9	12.0
Holiday Lakes	22.3	25.7	30.8	15.5	3.2	1.9	0.7
Iowa Colony	9.9	15.4	28.5	25.9	7.3	8.5	4.4
Jones Creek	7.7	11.2	38.1	25.5	7.7	8.1	1.8
Lake Jackson	1.6	6.5	20.1	27.3	9.2	25.1	10.3
Liverpool	4.7	15.1	30.6	25.6	14.0	4.7	5.4
Manvel	8.6	10.8	30.9	31.9	5.7	8.8	3.3
Oyster Creek	8.9	24.8	35.2	21.5	4.5	3.1	1.9
Pearland	4.2	7.9	22.7	29.1	7.0	21.9	7.2
Quintana	18.2	27.3	15.9	38.6	0.0	0.0	0.0
Richwood	4.6	9.2	30.0	30.0	8.6	11.7	6.0
Surfside Beach	2.3	17.0	27.7	32.3	5.4	8.4	6.8
Sweeny	6.7	15.2	23.0	35.3	6.7	10.7	2.5
West Columbia	11.0	15.8	32.2	24.3	5.2	8.1	3.3
Brazoria County	7.8	12.6	27.2	25.8	6.9	13.8	5.9
State of Texas	11.5	12.9	24.8	22.4	5.2	15.6	7.6

Source: U.S. Census Bureau (2000b).

Table 8
Public Services and Utilities for Study Area, 2007

	Electric Utility Service	Natural Gas Service	Water	Wastewater	Solid Waste Disposal Service
City of Alvin	Texan Electric Choice	CenterPoint Energy	City of Alvin	City of Alvin	IESI Solid Waste Management
City of Angleton	First Choice Power	CenterPoint Energy	City of Angleton/ Brazosport Water Authority	City of Angleton	Republic Waste
City of Brookside Village	Reliant	CenterPoint Energy	Wells	Individual Septic System	NA
City of Clute	Reliant	CenterPoint Energy	City of Clute	City of Clute	City of Clute
City of Danbury	Reliant	None	City of Danbury	City of Danbury	Waste Management
City of Freeport	Reliant	CenterPoint Energy	City of Freeport	City of Freeport	City of Freeport
Village of Jones Creek	Reliant	CenterPoint Energy	Trent Waterworks	Trent Waterworks	Waste Management
City of Lake Jackson	Direct Energy	CenterPoint Energy	City of Lake Jackson	City of Lake Jackson	City of Lake Jackson
City of Manvel	Reliant	Reliant	City of Manvel	City of Manvel	City of Manvel
City of Oyster Creek	Luminant	None	Oyster Creek	Oyster Creek	Oyster Creek
City of Pearland	Reliant	CenterPoint Energy	City of Pearland	City of Pearland	City of Pearland
Village of Quintana	Reliant	CenterPoint Energy	Village of Quintana	Individual Septic System	IESI Solid Waste Management
City of Richwood	Reliant	CenterPoint Energy	Brazosport Water Authority	Brazosport Water Authority	City of Clute
City of Surfside Beach	Luminant	None	Surfside Beach	Surfside Beach	Surfside Beach
City of Sweeny	First Choice Power	City of Sweeny	City of Sweeny	City of Sweeny	Republic Waste Services
City of West Columbia	Texas-New Mexico	CenterPoint Energy	City of West Columbia	City of West Columbia	City of West Columbia

Source: Bricker (2007); CenterPoint Energy (2007); City of Freeport (2006b); City of Sweeny (2007); City of West Columbia (2007); Damian (2007); Gardner (2007); Greater Angleton Chamber of Commerce (2003); Kubeczka (2007); Murray (2007); Ortiz (2007); Pace (2007); Reliant Energy (2007); White (2007).

Table 9
Class of Worker in the Study Area, 2000 (Percent)

Place	Private Wage and Salary Workers	Government Workers	Self-employed Workers (not incorporated business)	Unpaid Family Workers
Alvin	80.6	14.2	4.9	0.3
Angleton	71.6	21.4	6.6	0.4
Bailey's Prairie	61.4	29.2	9.4	0.0
Bonney	38.2	56.0	5.8	0.0
Brazoria	83.5	12.3	4.2	0.0
Brookside Village	81.4	10.6	6.7	1.2
Clute	87.1	9.8	2.5	0.7
Danbury	80.7	15.2	3.9	0.1
Freeport	83.7	10.5	4.7	1.0
Hillcrest	71.9	19.0	9.2	0.0
Holiday Lakes	80.1	13.5	6.5	0.0
Iowa Colony	77.7	13.3	9.0	0.0
Jones Creek	76.5	14.9	8.6	0.0
Lake Jackson	80.7	13.7	5.5	0.1
Liverpool	79.6	12.4	8.1	0.0
Manvel	80.0	11.5	7.5	1.0
Oyster Creek	79.7	12.2	8.1	0.0
Pearland	79.3	15.2	5.2	0.2
Quintana	76.9	0.0	23.1	0.0
Richwood	81.6	12.1	4.8	1.5
Surfside Beach	77.1	10.9	10.9	1.2
Sweeny	77.5	15.5	7.0	0.0
West Columbia	78.5	17.5	3.3	0.7
Brazoria County	79.0	14.6	6.0	0.3
State of Texas	78.0	14.6	7.1	0.3

Source: U.S. Census Bureau (2000b).

Table 10
Study Area Major Employers, 2009

Top 20 Study Area Employers	Number of Employees
Dow Chemical USA (TX Operations)	4,300
Texas Dept. of Criminal Justice	2,641
Alvin ISD	2,379
Pearland ISD	2,196
Brazosport ISD	2,073
Infinity Group	1,957
Brand Energy Solutions, LLC	1,914
Wal-Mart	1,757
TEI Staffing	1,600
Brazoria County Government	1,432
Buc-cees	1,015
Angleton ISD	960
Schlumberger	950
ConocoPhillips	940
Dish Network	909
Kroger	903
Zachary Construction Co.	880
Miken Specialties	825
Gulf States	746
BASF	675

Source: Economic Development Alliance of Brazoria County (2010).

Table 11
Place of Work for Workers in the Study Area, 2000 (Percent)

Place	Work in State of Residence	Work Outside State of Residence	Work in County of Residence	Work Outside County of Residence	Work in Place of Residence	Work Outside Place of Residence
Alvin	99.7	0.3	52.8	46.9	32.7	67.3
Angleton	99.2	0.8	84.8	14.4	35.6	64.4
Bailey's Prairie	100.0	0.0	86.7	13.3	6.9	93.1
Bonney	100.0	0.0	78.3	21.7	41.1	58.9
Brazoria	99.7	0.3	89.9	9.8	17.2	82.8
Brookside Village	99.4	0.6	35.0	64.5	6.4	93.6
Clute	99.1	0.9	89.7	9.4	25.8	74.2
Danbury	99.6	0.4	78.3	21.3	10.1	89.9
Freeport	96.8	3.2	89.7	10.3	40.2	59.8
Hillcrest	98.7	1.3	48.6	50.2	3.2	96.8
Holiday Lakes	99.4	0.6	76.9	22.6	3.3	96.7
Iowa Colony	99.1	0.9	33.4	65.7	7.2	92.8
Jones Creek	99.8	0.2	90.6	9.1	7.4	92.6
Lake Jackson	99.3	0.7	88.1	11.2	24.5	75.5
Liverpool	100.0	0.0	50.0	50.0	4.4	95.6
Manvel	97.7	2.3	30.2	67.5	10.5	89.5
Oyster Creek	99.4	0.6	90.3	9.7	9.9	90.1
Pearland	98.8	1.2	29.6	69.3	18.9	81.1
Quintana	100.0	0.0	100.0	0.0	23.0	76.9
Richwood	100.0	0.0	91.0	9.0	8.1	91.9
Surfside Beach	99.0	1.0	78.5	21.5	16.0	84.0
Sweeny	100.0	0.0	87.2	12.8	30.3	69.7
West Columbia	100.0	0.0	90.6	9.4	28.1	71.9
Brazoria County	99.1	0.9	59.7	40.3	24.3	75.6
State of Texas	99.0	1.0	78.6	20.4	55.4	44.6

Source: U.S. Census Bureau (2000b).

Table 12
Property Tax Jurisdictions, Brazoria County – 2009

Tax Jurisdictions	Tax Rate per $100 of Appraised Valuation
Brazoria County	0.366286
R&B Fund	0.06
Brazoria County Emergency Service District #2	0.03
Brazoria County Emergency Service District #1	0.08
Brazoria County Emergency Service District #3	0.093700
Brazos River Harbor Navigation District	0.0535
Brazoria County FWD #1	0.295
Alvin ISD	1.3041
Angleton ISD	1.4552
Brazosport ISD	1.2285
Damon ISD	1.17
Danbury ISD	1.1439
Pearland ISD	1.4194
Sweeny ISD	1.2117
Columbia-Brazoria ISD	1.2965
Alvin Community College	0.19983
Brazosport Junior College	0.175754
Angleton Drainage District	0.1839
Velasco Drainage District	0.08713
Brazoria County C&R #3	0.15
Brazoria County Drainage District #4	0.143845
Iowa Colony Drainage District	0.189727
Danbury Drainage District	0.366
West Brazoria County Drainage District #11	0.02
Sweeny Community Hospital	0.349917
Angleton-Danbury Hospital	0.2465
City of Alvin	0.8036
City of Angleton	0.706
City of Brazoria	0.7283
Village of Brookside	0.46
City of Clute	0.672
City of Danbury	0.762014
City of Freeport	0.708266
Hillcrest Village	0.374512
Town of Holiday Lakes	0.950737
Village of Jones Creek	0.4
City of Lake Jackson	0.39
City of Liverpool	0.236852
City of Manvel	0.587863
Village of Oyster Creek	0.401142
City of Pearland	0.6526
Town of Quintana	0.033365

Table 12 (Cont'd)

Tax Jurisdictions	Tax Rate per $100 of Appraised Valuation
City of Richwood	0.69366
Village of Surfside Beach	0.442056
City of Sweeny	0.741595
City of West Columbia	0.8319
Commodore Cove Improvement District	0.620318
Oak Manor Municipal Water District (MUD)	0.451178
Treasure Island MUD	1.258218
Varner Creek MUD	0.858
Brazoria County MUD #1	
Brazoria County MUD #2	0.5
Brazoria County MUD #3	0.63
Brazoria County MUD #4	0.63
Brazoria County MUD #6	0.63
Brazoria County MUD #16	0.95
Brazoria County MUD #17	0.6
Brazoria County MUD #18	0.56
Brazoria County MUD #19	0.63
Brazoria County MUD #21	1.45
Brazoria County MUD #22	Not Collecting
Brazoria County MUD #23	0.8
Brazoria County MUD #24	Not Collecting
Brazoria County MUD #25	1.1
Brazoria County MUD #26	0.71
Brazoria County MUD #28	0.82
Brazoria County MUD #29	0.8
Brazoria County MUD #31	1.3
Brazoria County MUD #34	0.85
Brazoria County MUD #35	0.89
Brazoria County MUD #36	0.7
Brazoria/Ft. Bend MUD #1	0.85

Source: Brazoria County Appraisal District (2010).

Table 13
Detailed 2000 Population Characteristics in Study Area

		Population of One Race/Not Hispanic or Latino (%)								
Area	Total Population	White	Black or African American	American Indian/ Alaskan Native	Asian	Native Hawaiian or Other Pacific Islander	Hispanic or Latino of Any Race	Total Minority Population (%)	Median Household Income ($)	% Below Poverty
Alvin	21,413	67.3	2.0	0.3	0.8	0.1	28.1	32.7	38,576	13.3
Angleton	18,130	63.2	11.2	0.3	1.1	<0.1	23.2	36.8	42,184	11.1
Bailey's Prairie	694	75.8	12.7	0.3	0.1	0.3	10.1	24.2	73,125	4.3
Bonney	384	56.3	10.2	0.8	1.3	0.0	29.9	43.7	41,750	3.0
Brazoria	2,787	76.4	10.3	0.6	0.7	0.0	11.4	23.6	36,058	13.3
Brookside Village	1,960	51.7	3.1	0.5	0.8	0.0	43.6	48.3	44,650	16.1
Clute	10,424	42.4	7.3	0.2	0.9	<0.1	48.1	57.6	32,622	18.2
Danbury	1,611	83.1	0.6	0.0	0.3	0.0	15.5	16.9	50,536	7.6
Freeport	12,717	33.0	13.2	0.1	0.3	0.1	51.6	67.0	30,245	22.9
Hillcrest	722	92.1	0.6	0.0	0.4	0.0	6.0	7.9	63,889	5.0
Holiday Lakes	1,095	47.9	2.6	0.9	0.0	0.0	47.2	52.1	33,938	15.8
Iowa Colony	804	60.0	6.7	0.1	7.3	0.0	25.1	40.0	47,019	6.1
Jones Creek	2,130	78.5	0.5	0.2	0.6	0.0	18.2	21.5	42,378	10.7
Lake Jackson	26,386	77.6	3.8	0.3	2.5	<0.1	14.7	22.4	60,901	6.4
Liverpool	404	87.4	0.0	0.2	0.2	0.0	9.9	12.6	48,750	6.6
Manvel	3,046	83.3	2.3	0.3	0.5	0.0	12.9	16.7	57,344	3.0
Oyster Creek City	1,200	75.7	4.7	0.4	0.4	0.0	17.6	24.3	35,144	19.2
Pearland	37,640	73.4	5.2	0.3	3.6	<0.1	16.2	26.6	64,156	4.7
Quintana	44	81.8	0.0	0.0	0.0	0.0	18.2	18.2	25,500	18.2
Richwood	3,012	66.5	8.3	0.2	0.5	0.1	23.4	33.5	45,000	10.5
Surfside Beach	764	90.1	3.1	0.3	0.0	0.0	2.4	9.9	37,778	12.6
Sweeny	3,624	69.0	15.5	0.5	0.4	0.0	13.7	31.0	36,497	9.9
West Columbia	4,255	60.6	19.3	0.4	0.4	<0.1	18.0	39.4	31,115	20.0
Brazoria County	241,767	65.3	8.3	0.4	1.9	< 0.1	22.8	34.7	48,632	10.2
CT 6639	2,175	43.1	6.1	0.2	0.5	0.0	49.6	56.9	39,509	11.8
CT 6641	5,323	65.5	4.8	0.4	0.5	<0.1	28.1	34.5	40,271	13.6
CT 6642	2,307	82.4	2.8	1.0	0.7	0.1	10.9	17.6	38,542	16.6
CT 6643	5,452	25.8	14.7	0.3	0.1	<0.1	58.0	74.2	23,415	27.3
CT 6644	7,092	38.2	11.8	0.3	0.4	0.0	48.4	61.8	34,592	19.5
CT 6645	5,378	75.0	9.4	0.1	0.3	0.0	13.5	25.0	42,083	11.2
State of Texas	20,851,820	52.4	11.3	0.3	2.6	< 0.1	32.0	47.6	39,927	15.4

Source: U.S. Census Bureau (2000b).

Table 14
Percentage of Limited English Proficiency Persons 5 Years Old and Older in the Study Area

Area	Percent of Persons that Speak English "Not Well"	Percent of Persons that Speak English "Not at All"
Alvin	2.8	1.5
Angleton	2.5	0.8
Bailey's Prairie	0.5	0.0
Bonney	0.0	0.6
Brazoria	2.2	0.2
Brookside Village	5.7	9.8
Clute	8.6	2.3
Danbury	2.3	1.0
Freeport	8.9	5.1
Hillcrest	0.3	0.0
Holiday Lakes	9.4	2.0
Iowa Colony	4.4	1.2
Jones Creek	2.3	0.8
Lake Jackson	0.9	0.3
Liverpool	0.8	0.0
Manvel	0.0	0.0
Oyster Creek City	1.1	0.5
Pearland	1.7	0.5
Quintana	0.0	0.0
Richwood	2.2	0.6
Surfside Beach	1.2	0.0
Sweeny	1.2	0.8
West Columbia	4.7	2.1
Brazoria County	3.0	1.2
State of Texas	4.7	2.7

Source: U.S. Census Bureau (2000b).

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Appendix G

Clean Water Act Section 404(b)(1) Evaluation

Document No. 070283
Job No. 441901

APPENDIX G
FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT
BRAZORIA COUNTY, TEXAS
SECTION 404(B)(1) EVALUATION

U.S. Army Corps of Engineers, Galveston District
2000 Fort Point Road
Galveston, Texas 77550

October 2010

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APPENDIX G
FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT
BRAZORIA COUNTY, TEXAS
SECTION 404(b)(1) EVALUATION

I. PROJECT DESCRIPTION

a. Location

The project area for the Freeport Harbor Channel Improvement Project (FHCIP) is located within Brazoria County, Texas, near Freeport, and is defined as areas that would be directly affected by implementation of the project (i.e., the proposed dredging footprint, existing and proposed placement areas [PAs] identified in Section 2.5 of the Environmental Impact Statement [EIS], and mitigation areas).

The project area for the proposed project is located on the mid to upper Texas coast in Brazoria County, Texas, and encompasses the communities of Surfside, Quintana, Oyster Creek City, and the city of Freeport. Freeport Harbor Channel provides deepwater access from the Gulf of Mexico (Gulf) to Port Freeport. Specifically, the existing Freeport Harbor channels begin approximately 4.9 miles seaward of the coastal jetty tips at the 47-foot depth contour in the Gulf, continuing upstream through the Freeport Harbor Outer Bar and Jetty channels, and winding westward for approximately 3.5 miles into Freeport to the Stauffer Channel Turning Basin. Upland and offshore PAs for disposal of dredged material from the proposed improvements are also included in the project area (see Figure 3.1-1 in the EIS).

Further descriptions of the FHCIP and study area can be found in Section 3.0 of the FHCIP EIS.

b. General Description

This Section 404(b)(1) evaluation addresses the discharge of dredged or fill material into the waters of the United States. The objectives of the FHCIP include improvements to the efficiency and safety of the deep-draft navigation system, and maintenance or enhancement of the quality of the area's coastal and estuarine resources. Maintenance and enhancement of the area's coastal and estuarine resources are associated with potential for reduced accidents and oil spills; beneficial use of dredged material, where feasible; minimization of effects to valuable habitats; and avoiding areas of known cultural resources.

Several alternatives were analyzed including a No Action Alternative, a National Economic Development (NED) Plan Alternative, and the Locally Preferred Plan (LPP) Alternative, which is the U.S. Army Corps of Engineers' (USACE) tentatively Recommended Plan; this 404(b)(1) evaluation only focuses on the LPP Alternative.

To achieve navigation efficiency and safety objectives, the USACE plans to widen the Freeport Harbor Entrance Channel (including the Outer Bar and Jetty channels) to 600 feet and deepen to 55 feet, deepen the Main Channel to 55 feet from the Lower Turning Basin to above the Brazosport Turning Basin and to 500 feet up-channel through the Upper Turning Basin, widen Lower Stauffer Channel to 300 feet and deepen to 50 feet, and redredge Upper Stauffer Channel to a 25-foot depth. Construction of the LPP Alternative would generate approximately 17.3 million cubic yards (mcy) of dredged material. Maintenance of the deepened and widened channel is calculated to generate a total of 175.9 mcy of maintenance-dredged material over the 50-year evaluation period. Material dredged from the Entrance Channel during construction would be placed in the new work ODMDS and the remainder of the new work material would be placed in PAs 1, 8, and 9. Material dredged from the Outer Bar and Jetty channels and the Lower Turning Basin during maintenance cycles would be placed in the maintenance material Ocean Dredged Material Disposal Site (ODMDS), and material from the remainder of the channel would be placed in PAs 1, 8, and 9.

c. Authority and Purpose

The existing Freeport Harbor Project was authorized by the River and Harbors Acts of May 1950 and July 1958, providing for an Entrance Channel of 38-foot depth and 300-foot wide from the Gulf to inside the jetties and for interior channels of 36-foot depth and 200-foot wide up to and including the Upper Turning Basin. In 1970, Congress passed Section 101 of the River and Harbors Act of 1970 (PL 91-611; House Document 289, 93rd Congress – 2nd Session, 31 December 1975), and in 1974, the President authorized the relocation and deepening of the Jetty Channel to a 45-foot depth and 400-foot width and the Outer Bar Channel to a 47-foot depth and 400-foot width, with an extension of approximately 4.6 miles into the Gulf.

Since the completion of the Freeport Harbor Channel 45-Foot Project, the size of ships using the waterway has steadily increased so that many vessels currently have to be light-loaded to traverse the waterway. The current channel depth requires that large crude carriers remain offshore and transfer their cargo into smaller crude tankers for the remainder of the voyage. This lightering operation takes place in the Gulf where the two ships, the mother ship and the lightering ship, come together so that the cargo transfer can take place. Although this operation has been going on for years, the possibility for a collision, oil spill, fire, or other adverse environmental consequences is always present. Deepening the channel will reduce the number of lightering operations. Current projections suggest that crude imports will increase in the near future. As the imports increase, the number of lightering vessels and product carriers will also increase, adding to the shipping delays, congestion, and risk of collision or spill.

As a concurrent action, USACE and Port Freeport (non-Federal sponsor) propose to improve the navigation channels servicing Freeport Harbor as a Federal action by deepening and widening the current channel alignment, starting offshore at the 60-foot-depth contour, and terminating at the Stauffer Channel Turning Basin. The proposed project will also provide for the creation of two new upland confined PAs (PAs 8 and 9), adjacent to the Brazos River.

d. General Description of Dredged or Fill Material

(1) General Characteristics of Material

It is estimated that the new work dredged material will consist of 72 percent clay, 21 percent silt, and 7 percent sand/shell. A description of the new work material and the existing maintenance material can be found in sections 3.5 and 4.3 of the EIS.

(2) Quantity of Material

It is estimated that approximately 17.3 mcy of new work material would be generated by dredging the LPP project, with 12.7 mcy of new work material to be placed at the existing New Work ODMDS, and the remainder to be placed at two new upland PAs, PA 8 (1.9 mcy) and PA 9 (2.7 mcy). Also, on the average, a total of 3.2 mcy of future maintenance dredged material per maintenance cycle will be placed in the existing Maintenance ODMDS, and 0.04 mcy, 0.12 mcy, and 0.19 mcy would be placed in PAs 1, 8, and 9, respectively, on a 3-year cycle.

e. Description of the Proposed Discharge

(1) Location

New work and maintenance material from the LPP Alternative would be placed into the designated ODMDSs and PAs 1, 8, and 9 (see Figure 3.1-1 in the EIS).

(2) Size

Two new PAs have been proposed for the project. These are PAs 8 and 9, located across the Brazos River diversion channel and slightly north from PA 1 (see Figure 2.5-1 in the EIS). These two PAs occur on adjacent real estate tracts Eight (254 acres) and Nine (442 acres), which are geographically separated by County Road 217 (CR 217). Tract Nine is situated north of CR 217, and Tract Eight lies south of CR 217, with its southern boundary bordering State Highway 36 (SH 36).

Approximately 5.82 mcy of new work dredged material from proposed channel improvements is targeted for confined, upland placement on these tracts. The footprint of PA 8 is approximately 168 acres, and the footprint of PA 9 is approximately 250 acres.

(3) Type of Site and Habitat

The ODMDSs are offshore ocean bottom. The inland PAs (8 and 9) comprise 21 acres of forest, 39 acres of wetlands, and 358 acres of grassland.

(4) Time and Duration of Discharge

Construction is estimated to take 2 years. Maintenance will be ongoing; estimates for the LPP Alternative include a 50-year project life.

f. Description of Disposal Method

Hydraulic pipeline dredges will be used and Best Management Practices (BMPs) will be implemented where appropriate to control and reduce turbidity during dredging and discharge from upland PAs. Dewatering structures would drain PAs 8 and 9 into the Brazos River. BMPs will also be employed during construction of temporary containment levees and spill boxes for restoration sites. Hopper dredges with BMPs to reduce impacts to threatened and endangered sea turtles would be used for material destined for offshore placement

II. FACTUAL DETERMINATIONS

a. Physical Substrate Determinations

(1) Substrate Elevation and Slope

Maximum mound height for ODMDS substrates would range from 8.5 and 12 feet for maintenance and new work material, respectively. Both sites are expected to return to ambient bathymetry within a reasonable time period, since these are dispersive sites (Appendix B of the EIS).

(2) Sediment Type

Dredged material will consist of 72 percent clay, 21 percent silt, and 7 percent sand/shell. A description of the new work material and the existing maintenance material can be found in sections 3.5 and 4.3 of the EIS.

(3) Dredged/Fill Material Movement

Physical oceanographic parameters were used to (1) develop the necessary buffer zones for the exclusion analysis, and (2) determine the minimum size of the preferred site in U.S. Environmental Protection Agency (EPA) (1989). Predominant longshore currents, and thus predominant longshore transport, is to the southwest. Steady longshore transport and occasional storms, including hurricanes, should remove the placed material from the ODMDSs. The sizes of the ODMDSs were modeled using MDFATE, which includes vertical mixing, to ensure that they were large enough to prevent significant mounding.

Upland PAs will have containment levees to control fill movement after deposition; small amounts of suspended solids may be present in the discharge. BMPs will be implemented to control and reduce discharge turbidity.

(4) Physical Effects on Benthos

Impacts to benthic organisms and their Gulf and estuarine water-bottom habitats would occur; however, benthic organisms are expected to quickly rebound from the short-term impacts of channel dredging, and the use of an ODMDS. BMPs will be used where appropriate to contain and control sediment and dredged material movement.

(5) Other Effects

None known.

(6) Actions Taken to Minimize Impacts

This project was fully coordinated with State and Federal resource agencies, and responses to their comments have been incorporated into the development of the dredged material PAs. Any unavoidable losses will be mitigated.

b. Water Circulation, Fluctuation, and Salinity Determinations

(1) Water

The use of the ODMDSs and PAs 1, 8, and 9 are expected to have only minor, short-term impacts on water quality in the area. Impacts to water quality are discussed more fully in Section 4.2 and Appendix B of the EIS.

(a) Salinity

The USACE has determined that salinity changes are not expected to result from the FHCIP because the channel is already as saline as the Gulf (Section 4.2 and Appendix B of the EIS).

(b) Water Chemistry

There are no indications of water or elutriate problems in the Freeport Harbor Jetty and Outer Bar channels (sections 3.4 and 4.2 and Appendix B of the EIS).

(c) Clarity

There will be some temporary increase in local turbidity during dredging and placement operations. Water clarity is expected to return to normal background levels shortly after operations are completed.

(d) Color

Water immediately surrounding the construction area will become discolored temporarily due to disturbance of the sediment. BMPs will be implemented to reduce and control turbidity.

(e) Odor

The new work material is not expected to be anoxic, so there should be no odors associated with dredging and placement, nor are any expected from ODMDS placement. Negligible amounts of hydrogen sulfide may be expected. There should be no change in the maintenance material.

(f) Taste

No detectable impacts in the marine environment.

(g) Dissolved Gas Levels

Negligible amounts of hydrogen sulfide may be expected.

(h) Nutrients

Nutrient levels may be slightly and temporarily elevated near the PAs since new work material is low in organics. Some maintenance material will be dredged along with the new work material. There should be no change in the maintenance material.

(i) Eutrophication

Nutrients are not expected to reach levels high enough for periods long enough to lead to eutrophication of the surrounding waters.

(j) Others as Appropriate

None known.

(2) Current Patterns and Circulation

The ODMDSs were not shown to significantly affect currents or circulation patterns (Appendix B of the EIS).

(a) Current Patterns and Flow

No impacts are expected.

(b) Velocity

No impacts are expected.

(c) Stratification

No impacts are expected.

(d) Hydrologic Regime

No impacts are expected.

(3) Normal Water Level Fluctuations

Negligible effects are expected (Section 4.2 of the EIS).

(4) Salinity Gradients

The USACE has determined that salinity changes are not expected (Section 4.2 of the EIS).

(5) Actions That Will Be Taken to Minimize Impacts

In addition to alternatives analyses, the selected dredged material placement areas avoid impacts to various resources such as threatened and endangered sea turtles, cultural resources, and essential fish habitat. BMPs will be implemented during construction and maintenance activities.

c. Suspended Particulate/Turbidity Determination

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site

An increase in suspended particulates and the concomitant turbidity levels is expected during dredging and placement operations of new work and maintenance material (Section 4.2 and Appendix B of the EIS). These are temporary and localized events.

(2) Effects on Chemical and Physical Properties of the Water Column

(a) Light Penetration

Turbidity levels will be temporarily increased during dredging and placement operations of new work and maintenance material associated with the ODMDSs.

(b) Dissolved Oxygen

No adverse impacts to dissolved oxygen are expected.

(c) Toxic metals and organics

No cause for concern is indicated for the construction material from any portion of the Freeport Ship Channel. However, during the Preconstruction, Engineering, and Design (PED) phase of the project, the USACE plans additional sampling of construction material from both the Stauffer Channel and from the extension of the Entrance Channel (Section 3.4 of the EIS). No cause for concern has been indicated by repeated testing of maintenance material.

(d) Pathogens

None expected or found.

(e) Aesthetics

The ODMDSs have been designed and selected in coordination with resource agencies to minimize environmental impacts and reduce or eliminate adverse aesthetic qualities.

(f) Others as Appropriate

None known.

(3) Effects on Biota

No impacts are expected on photosynthesis, suspension/filter feeders, and sight feeders, except for temporary impacts from dredging (e.g., temporary increases in local turbidity levels) or placement operations (e.g., burial of benthos).

(4) Actions Taken to Minimize Impacts

Construction and placement plans for the materials have been closely coordinated with the resource agencies to assure minimal impacts. BMPs will be applied to reduce and control turbidity and sediment discharge and impacts to threatened and endangered sea turtles.

d. Contaminant Determinations

No increase in contaminant levels is expected during construction and placement operations. The potential for contaminants has been evaluated through chemical analyses, grain-size analyses, and some bioassays and bioaccumulation tests (sections 3.4 and 4.2 and Appendix B of the EIS). However, during the PED phase of the project, the USACE plans additional sampling of construction material from both the Stauffer Channel and from the extension of the Entrance Channel.

e. Aquatic Ecosystem and Organism Determinations

(1) Effects on Plankton

Construction and placement operations are expected to have only minor temporary, local impacts on plankton from increased turbidity levels.

(2) Effects on Benthos

Impacts to benthic organisms and their Gulf and estuarine water-bottom habitats would occur; however, benthic organisms are expected to quickly rebound from the short-term impacts of channel dredging, and the use of offshore PAs. Repeated use of the new work ODMDS for the Widening Project and FHCIP could temporarily change the benthic community composition at the site (Section 4.12.1 of the EIS).

(3) Effects on Nekton

Wright (1978) indicates that nekton is not directly affected by dredged material placement since they can avoid areas of high turbidity. The benthos at the PAs, which would have been used as a food source, would be detrimentally affected, but PAs are relatively small in area compared to offshore areas near Freeport. The elutriate analyses with undisturbed virgin sediment yielded no expectation of short-term water column impacts from dredging or placement operations, except from increased turbidity. Therefore, no significant impacts to the nekton of the area from the proposed dredging and placement operations are expected.

(4) Effects on Aquatic Food Web

The estuarine and Gulf food web may temporarily benefit from greater productivity associated with creation of ODMDSs through structural diversity in the form of a topographical high (Clarke and Kasul, 1994), but benthos at the sites would be buried and the community would likely change. Reductions in primary productivity from turbidity would be localized around the immediate area of the construction and maintenance dredge operations and would be limited to the duration of the plume at a given site.

(5) Effects on Special Aquatic Sites

Construction of the LPP would impact 39 acres of wetlands by construction of PAs 8 and 9 and that these impacts would be fully compensated by the mitigation plan presented in FEIS Appendix H.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination

Testing has demonstrated that adequate mixing exists to dilute the concentrations of effluents from the ODMDSs (Section 4.2 and Appendix B of the EIS). Mixing is not required due to the lack of contaminants.

(2) Determination of Compliance with Applicable Water Quality Standards

Sediment analyses of new work and maintenance material have been performed, and testing of elutriates prepared with the maintenance and construction material has not demonstrated any violation of applicable water quality standards. The State of Texas has issued a water quality certificate for current maintenance dredging of Freeport Harbor, indicating that water quality standards are being met.

(3) Potential Effects on Human Use Characteristics

(a) Municipal and Private Water Supply

No apparent private, public, or industrial water wells registered with the Texas Water Development Board (2006) would be destroyed and/or affected based on

their proximal distances and completed depths below surface grade (Section 4.8 of the EIS).

(b) Recreational and Commercial Fisheries

Topographic highs created through ODMDSs would provide temporary structural diversity; otherwise, no long-term effects to recreational or commercial fisheries are anticipated as a result of the LPP Alternative.

(c) Water-related Recreation

The project will improve overall safety of navigation traffic, which may improve water-related recreation.

(d) Aesthetics

The project is designed to minimize any adverse impacts to the environment and aesthetic qualities in the area. Construction of two new PAs would change the aesthetics in the immediate vicinity. However, the PAs are consistent with current land uses in the area.

(e) Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves

No parks, national or historic monuments, national seashores, wilderness areas, or research sites will be negatively impacted by the project.

g. Determination of Cumulative Effects on the Aquatic Ecosystem

The project is not expected to result in negative cumulative impacts in the aquatic ecosystem. A Habitat Evaluation Procedure was performed to ensure adequate replacement of habitats and functions.

h. Determination of Secondary Effects on the Aquatic Ecosystem

No adverse significant secondary effects on the aquatic ecosystem should occur as a result of the recommended project.

REFERENCES

Clark D., and R. Kasul. 1994. Habitat value of offshore dredged material berms for fishery resources. Proc 2nd Int. Conf. on Dredging and Dredged Material Placement, Florida, ASCE.

Texas Water Development Board. 2006. Groundwater Database Reports, Brazoria County. Web Site: www.twdb.state.tx.us.

U.S. Environmental Protection Agency (EPA). 1989. Draft Environmental Impact Statement, Freeport Harbor (45-foot Project), Ocean Dredged Material Disposal Site Designation, EPA 906/01-80-003. U.S. EPA Region VI, Dallas, Texas.

Wright, T.C. 1978. Aquatic dredged material disposal impacts. U.S. Army Engineers Water Experiment Station Environmental Laboratory, Vicksburg, Mississippi. Technical Report DS-78-1.

FINDINGS OF COMPLIANCE WITH SECTION 404 (b) (1) GUIDELINES FREEPORT HARBOR CHANNEL IMPROVEMENTS PROJECT BRAZORIA COUNTY, TEXAS

1. No significant adaptations of the Guidelines were made relative to the evaluation for this project.

2. The tentatively Recommended Plan is the result of evaluation of a preliminary array of several alternatives and thorough evaluation of three.

3. The tentatively Recommended Plan will not violate any applicable State or Federal water quality criteria or toxic effluent standards of Section 307 of the Clean Water Act.

4. The tentatively Recommended Plan will not jeopardize the existence of any federally or State-listed threatened or endangered species or their critical habitat or violate any protective measures for any sanctuary. Various resource agencies, including FWS and NMFS, have been consulted regarding potential issues of any federally or State-listed threatened or endangered species or their critical habitat (e.g., sea turtle avoidance measures will be implemented during operations).

5. The tentatively Recommended Plan will not result in adverse effects on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. There are no significant adverse impacts expected to the estuarine ecosystem diversity, productivity, and stability or recreational, aesthetic, and economic values.

6. Appropriate steps to minimize potential adverse impacts on the estuarine system include close coordination with State and Federal resource agencies during final design prior to construction to incorporate all valid suggestions. Several habitats affected by channel widening, deepening, and expansion will be mitigated.

7. Based on the guidelines, the preferred alternative is specified as complying with the requirements of the Section 404(b)(1) guidelines.

March 16, 2011

Ms. Carolyn Murphy
for Chief, Environmental Section
U.S. Army Corps of Engineers, Galveston District

Date

Bryan W. Shaw, Ph.D., *Chairman*
Buddy Garcia, *Commissioner*
Carlos Rubinstein, *Commissioner*
Mark R. Vickery, P.G., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

February 2, 2011

Ms. Janelle Stokes
U.S. Army Corps of Engineers
Galveston District CESWG-PE-RE
P.O. Box 1229
Galveston, Texas 77553-1229

Re: USACE Project No. SWG-2004-02311 - Freeport Harbor Channel Improvement Project
Draft Feasibility Report and Draft Environmental Impact Statement

Dear Ms. Stokes:

As described in the Public Notice, dated December 23, 2010, the applicant, Port Freeport, proposes the Freeport Harbor Channel Improvement Project (FHCIP) to deepen and widen the Freeport Harbor Channel. The project is located along the middle Texas Gulf Coast, south of the city of Freeport, Brazoria County, Texas.

In addition to the information contained in the public notice, the following information is needed for review of the proposed project. Responses to this letter may raise other questions that will need to be addressed before a water quality certification determination can be made.

1. Title 30, Texas Administrative Code (TAC), Chapter 279.11(c)(1), states that "No discharge shall be certified if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, ..." As noted in the Draft Feasibility Report and Draft Environmental Impact Statement, the proposed widening of the Outer Bay and Jetty channels (Widening Project) is approved and permitted for construction. The FHCIP, as proposed, will include deepening of the Outer Bay and Jetty channels and the widening and/or deepening of the Main Channel reaches, Brazos Harbor and Stauffer Channel. Since the FHCIP project boundaries completely overlap the Widening Project boundaries, economic and environmental impacts associated with the two projects can be substantially minimized through coordination and planning efforts that maximize the uses of available resources for the two projects. Please provide an overview of project design and coordination alternatives that would result in the least adverse impact to the aquatic ecosystem and maximum use of limited available resources.

2. FHCIP dredged material from the Outer Bar and Jetty Channels would be placed in the existing New Work Ocean Dredged Material Disposal Site (New Work ODMDS) and confined placement area (PA) 1 and proposed PAs 8 and 9. Development and construction of PAs 8 and 9 would result in the unavoidable adverse impact to 21 acres of riparian forest and 39.5 acres of wetlands. Proposed mitigation for adverse impacts to riparian forest and wetlands are based on the results of evaluations using Habitat Evaluation Procedures (HEP) and a habitat suitability index (HSI) value for the gray squirrel and veery. 30 TAC

Chapter 279.2(b) states that the policy of the commission is "to achieve no overall net loss of the existing wetlands resource base with respect to wetlands functions and values." It is recommended that a functional assessment methodology such as the Hydrogeomorphic (HGM) approach be used to adequately assess the aquatic resource function and values and appropriate compensatory mitigation of unavoidable adverse impacts.

3. Texas Commission on Environmental Quality (TCEQ) requires that total suspended solids (TSS) concentrations in effluent associated with dredging activities be controlled to a maximum of 300 milligrams per liter (mg/L). Please provide a list of best management practices (BMPs) and operational procedures that will be used to minimize TSS levels during dredging operations and the placement of dredged material.

4. Chinese tallow is identified in the DEIS as an invasive species in forested riparian habitats. In addition to tallow removal, the DEIS should include long-term management protocols (mechanical and manual removal; selective herbicide applications, etc.) to minimize the occurrence of the species, especially at mitigation sites.

5. Proposed mitigation is presented in Appendix H-1 of the DEIS. Continuity of adjacent mitigation parcels is critical for wildlife habitat. It is recommended that mitigation parcels be located as closely as possible to maximize wildlife habitat and resource function. It is also recommended that all mitigation parcels be protected in perpetuity by a conservation easement.

The TCEQ looks forward to receiving and evaluating other agency or public comments. Please provide any agency comments, public comments, as well as the applicant's comments, to Mr. Robert Hansen of the Water Quality Division MC-150, P.O. Box 13087, Austin, Texas 78711-3087. Mr. Hansen may also be contacted by e-mail at *Robert.Hansen@tceq.texas.gov*, or by telephone at (512) 239-4583.

Sincerely,

Charles W. Maguire, Director
Water Quality Division
Texas Commission on Environmental Quality

CWM/RSH/evm

Enclosure

cc: Mr. Ben Rhame, Secretary, Coastal Coordination Council, P.O. Box 12873, Austin, Texas 78711-2873

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

February 23, 2011

Environmental Section

Mr. Charles W. Maguire
Director
Water Quality Division
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Dear Mr. Maguire,

Reference is made to your letter dated February 2, 2011 regarding the Freeport Harbor Channel Improvement Project (FHCIP) Draft Feasibility Study and Draft Environmental Impact Statement (DEIS), issued for public and agency review on December 23, 2010. We offer the following information in response to your comments.

1. You requested that USACE provide an overview of efforts to coordinate the design of the proposed FHCIP and the previously-permitted Port Freeport Widening Project (Widening Project) to demonstrate that the recommended plan would result in the least adverse impact to the aquatic ecosystem. The FHCIP project boundaries overlap the Widening Project in the Jetty and Outer Bar Channels, only. The FHCIP includes an offshore channel extension and inland channels and turning basins that are not part of the Widening Project. Offshore, the FHCIP project includes a channel extension that is needed for the proposed 57-foot deep channel to reach the corresponding depth in the Gulf of Mexico. Inland channel reaches and basins not included in the Widening Project are the Lower Turning Basin, the Channel to the Brazosport, and the Brazosport Turning Basin (all to be deepened to 55 feet), the Upper Turning Basin (to be deepened to 50 feet), and the Stauffer Channel (the lower 3,700 feet to be deepened to 50 feet and widened to 300 feet-wide, and the remainder deepened to 25 feet). Planning for both projects was coordinated to minimize adverse impacts to the greatest extent possible. The same New Work and Maintenance Offshore Dredge Material Disposal Sites (ODMDS) will be utilized for both projects. No upland placement areas were required for the Widening Project; all material will be placed in the ODMDS or used beneficially for beach nourishment at Quintana Beach. Sediment suitable for beach nourishment will be available from the surficial sediments to be dredged by the Widening Project, unlike the FHCIP which excavates deeper sediments that do not contain beach-quality sands. Hydraulic dredging of the FHCIP inland channels would require the use of upland, confined placement areas (PA). Only one existing PA with remaining capacity is located near the channels that would be deepened (PA 1), and it does not provide sufficient capacity for all material resulting from the proposed FHCIP, thereby requiring the development of new PAs 8 and 9. There is no practicable alternative to the proposed project that would have less adverse impact on the aquatic ecosystem.

2. You recommended that a functional assessment methodology such as the Hydrogeomorphic (HGM) approach be used, citing that it is the policy of the commission (30 TAC Chapter 279.2(b)) "to achieve no overall net loss of the existing wetlands resource base with respect to wetlands functions and values." The FHCIP is a USACE Civil Works water resources project; it does not require a Federal license or permit. USACE policy also requires that Federal projects result in no net loss of wetlands, but our policy requires the use of a habitat-based methodology to evaluate impacts and quantify necessary mitigation. The HEP methodology quantifies habitat quality and quantity, and as such evaluates the functional habitat suitability of the evaluated species. The evaluation of impacts and proposed mitigation for FHCIP adverse impacts to wetlands was based on HEP-based mottled duck and great egret HSI models. Impacts to riparian forest were evaluated using gray squirrel and veery HSI models. USFWS and TPWD participated in the selection and application of these HSI models. The appropriateness of the HEP methodology and the results of this specific application were evaluated and approved by an Agency Technical Review and an Independent External Peer Review. USACE believes that the ecological modeling utilized for the FHCIP has adequately captured impacts and quantified mitigation. The recommended mitigation will result in no net loss of wetlands, and fulfills requirements of USACE policy and applicable Federal laws and regulations.

3. You requested that we provide a list of best management practices (BMPs) and operational procedures that will be used to minimize total suspended solids (TSS) during dredging operations and the placement of dredged material. The TCEQ requirement that TSS concentrations in effluent associated with dredging activities be controlled to a maximum of 300 milligrams per liter would be met by the use outlet structures in PAs 1, 8 and 9 to control the ponding of water and the settling of TSS before release. Systematic elutriate and water sampling would be conducted during and after dredging contracts to ensure TCEQ requirements are met.

4. You recommended that protocols for the long-term management of chinese tallow be included to minimize the occurrence of this invasive species, especially at mitigation sites. Upland areas managed in conjunction with the FHCIP would be limited to the proposed mitigation areas and PAs 1, 8 and 9. Tallow control at the PAs would be accomplished during regular levee maintenance, and seedlings growing inside the PAs would be controlled by regular PA use. The Mitigation Monitoring and Contingency Plan (presented in Appendix H-2 of the DEIS) includes an annual invasive or exotic plant control program for the mitigation sites. This program provides for long-term controls over the growth of chinese tallow in proposed mitigation sites.

5. You recommended that mitigation sites be located as close together as possible to maximize habitat and resource function, and that mitigation sites be protected in perpetuity by a conservation easement. The mitigation proposed for the project, as described in Chapter 5, and Appendices H-1 and H-2 of the FHCIP DEIS, already meets these recommendations. A contiguous tract of riparian forest (approximately 131 acres in size) would be preserved under a permanent conservation easement with Texas Parks and Wildlife or another appropriate organization. A total of 12 acres of riparian forest would be reestablished in six natural clearings or tallow-dominated areas within this131-acre area, along with a 3-acre wetland pond. The proposed mitigation sites and pond would be connected to the surrounding riparian forest and therefore would maximize connectivity and habitat resource and function.

In conclusion, we hope this additional information will be helpful in your review. We trust that that we have provided sufficient information for you to provide §401 State Water Quality

certification. However, we would be happy to meet with you to provide further information if needed. All public and agency comments on the DEIS and our responses will be available for your review when they are presented in the FEIS. Please do not hesitate to contact Ms. Janelle Stokes at 409/766-3039 should you need further assistance.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Bryan W. Shaw, Ph.D., *Chairman*
Buddy Garcia, *Commissioner*
Carlos Rubinstein, *Commissioner*
Mark R. Vickery, P.G., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

March 28, 2011

Ms. Janelle Stokes
Galveston District CESWG-PE-RE
U.S. Army Corps of Engineers
P.O. Box 1229
Galveston, Texas 77553-1229

Re: USACE Permit Application Number SWG-2004-02311

Dear Ms. Stokes:

This letter is in response to the United States Army Corps of Engineers – Galveston District (Corps) correspondence dated February 23, 2011, requesting §401 Water Quality Certification and the Public Notice dated December 23, 2010 for review and comments on the Freeport Harbor Channel Improvement Project (FHCIP) Draft Feasibility Report and Draft Environmental Impact Statement (DEIS). The project is located along the middle Texas Gulf Coast, south of the city of Freeport, Brazoria County, Texas.

The Texas Commission on Environmental Quality (TCEQ) has reviewed the public notice and related application information provided by the Corps. On behalf of the Executive Director and based on our evaluation of the information contained in these documents, the TCEQ certifies that there is reasonable assurance that the project will be conducted in a way that will not violate water quality standards.

The applicant, Port Freeport, proposes the FHCIP to deepen and widen the Freeport Harbor Channel, including the deepening of the Outer Bay and Jetty channels and the widening and/or deepening of the Main Channel reaches, Brazos Harbor and Stauffer Channel. FHCIP dredged material from the Outer Bay and Jetty Channels would be placed in the existing New Work Ocean Dredged Material Disposal Site (New Work ODMDS) and confined placement area (PA)1 and proposed PAs 8 and 9. Development and construction of PAs 8 and 9 would result in the unavoidable adverse impact to 21 acres of riparian forest and 39.5 acres of wetlands.

Three mitigation sites adjacent to the proposed PAs are identified in the DEIS for compensatory mitigation for unavoidable adverse impacts. Mitigation Site 1 includes 117 acres of riparian forest, 5 acres of cleared forest, and approximately 9.8 acres of grassland. Riparian forest mitigation at this site would include the clearing of invasive tallows and planting a total of 12 acres with new native tree species. A three-acre ephemeral wetland pond would also be created at Mitigation Site 1. Mitigation Site 2 includes 9.5 acres of riparian forest and 5 acres of mixed tallow and scrub shrub vegetation. The 5-acre mixed tallow and shrub site would be cleared and replanted with hard-mast and flood tolerant native trees. Mitigation Site 3 includes 112 acres of riparian forest and 12.7 acres of dense

tallow and scrub shrub vegetation. Approximately 30 percent of the site would be cleared and replanted with hard-mast native and flood tolerant native trees. A 3-acre ephemeral wetland pond would also be created within the scrub shrub area of the mitigation site. Impacts and the compensatory mitigation plan were evaluated and developed by the Corps using Habitat Evaluation Procedures (HEP) and based on field data obtained with the assistance of the United States Fish and Wildlife Service (USFWS) and Texas Parks and Wildlife Department (TPWD).

The TCEQ has reviewed this proposed action for consistency with the Texas Coastal Management Program (CMP) goals and policies in accordance with the regulations of the Coastal Coordination Council and has determined that the proposed action is consistent with the applicable CMP goals and policies.

This certification was reviewed for consistency with the CMP's development in critical areas policy {Title 31, Texas Administrative Code (TAC), Chapter (§) 501.23} and dredging and dredged material disposal and placement policy {31 TAC §501.25}. This certification complies with the CMP goals {31 TAC §501.12(1, 2, 3, 5)} applicable to these policies.

No review of property rights, location of property lines, nor the distinction between public and private ownership has been made, and this certification may not be used in any way with regard to questions of ownership.

If you require additional information or further assistance, please contact Mr. Robert Hansen, Water Quality Assessment Section, Water Quality Division (MC-150), at (512) 239-4583.

Sincerely,

Charles W. Maguire, Director
Water Quality Division
Texas Commission on Environmental Quality

CWS/RSH/mve

Attachment

cc: Mr. Ben Rhame, Secretary, Coastal Coordination Council, P.O. Box 12873
Austin, Texas 78711-2873

WORK DESCRIPTION: As described in the public notice dated December 23, 2010, and additional information provided by the Corps, dated February 23, 2011.

SPECIAL CONDITIONS: None

GENERAL: This certification, issued pursuant to the requirements of Title 30, Texas Administrative Code, Chapter 279, is restricted to the work described in the December 23, 2010, Draft Environmental Impact Statement and Draft Feasibility Report. This certification may be extended to any minor revision of the Environmental Impact Statement (EIS) when such change(s) would not result in an impact on water quality. The Texas Commission on Environmental Quality (TCEQ) reserves the right to require full joint public notice on a request for minor revision. The applicant is hereby placed on notice that any activity conducted pursuant to the EIS and Corps project authorization which results in a violation of the state's surface water quality standards may result in an enforcement proceeding being initiated by the TCEQ or a successor agency.

STANDARD PROVISIONS: These following provisions attach to any permit issued by the Corps and shall be followed by the permittee or any employee, agent, contractor, or subcontractor of the permittee during any phase of work authorized by the Corps.

1. The water quality of wetlands shall be maintained in accordance with all applicable provisions of the Texas Surface Water Quality Standards including the General, Narrative, and Numerical Criteria.

2. The applicant shall not engage in any activity which will cause surface waters to be toxic to man, aquatic life, or terrestrial life.

3. Permittee shall employ measures to control spills of fuels, lubricants, or any other materials to prevent them from entering a watercourse. All spills shall be promptly reported to the TCEQ by calling the State of Texas Environmental Hotline at 1-800-832-8224.

4. Sanitary wastes shall be retained for disposal in some legal manner. Marinas and similar operations which harbor boats equipped with marine sanitation devices shall provide state/federal permitted treatment facilities or pump out facilities for ultimate transfer to a permitted treatment facility. Additionally, marinas shall display signs in appropriate locations advising boat owners that the discharge of sewage from a marine sanitation device to waters in the state is a violation of state and federal law

5. Materials resulting from the destruction of existing structures shall be removed from the water or areas adjacent to the water and disposed of in some legal manner.

6. A discharge shall not cause substantial and persistent changes from ambient conditions of turbidity or color. The use of silt screens or other appropriate methods is encouraged to confine suspended particulates.

7. The placement of any material in a watercourse or wetlands shall be avoided and placed there only with the approval of the Corps when no other reasonable alternative is available. If work within a wetland is unavoidable, gouging or rutting of the substrate is prohibited. Heavy equipment shall be placed on mats to protect the substrate from gouging and rutting if necessary.

8. Dredged Material Placement: Dredged sediments shall be placed in such a manner as to prevent any sediment runoff onto any adjacent property not owned by the applicant. Liquid runoff from the disposal area shall be retained on-site or shall be filtered and returned to the watercourse from which the dredged materials were removed. Except for material placement authorized by this permit, sediments from the project shall be placed in such a manner as to prevent any sediment runoff into waters in the state, including wetlands.

9. If contaminated spoil that was not anticipated or provided for in the permit application is encountered during dredging, dredging operations shall be immediately terminated and the TCEQ shall be contacted by calling the State of Texas Environmental Hotline at 1-800-832-8224. Dredging activities shall not be resumed until authorized by the Commission.

10. Contaminated water, soil, or any other material shall not be allowed to enter a watercourse. Noncontaminated storm water from impervious surfaces shall be controlled to prevent the washing of debris into the waterway.

11. Storm water runoff from construction activities that result in a disturbance of one or more acres, or are a part of a common plan of development that will result in the disturbance of one or more acres, must be controlled and authorized under Texas Pollutant Discharge Elimination System (TPDES) general permit TXR150000. A copy of the general permit, application (notice of intent), and additional information is available at: http://www.tceq.state.tx.us/nav/permits/wq_construction.html or by contacting the TCEQ Storm Water & Pretreatment Team at (512) 239-4671.

12. Upon completion of earthwork operations, all temporary fills shall be removed from the watercourse/wetland, and areas disturbed during construction shall be seeded, riprapped, or given some other type of protection to minimize subsequent soil erosion. Any fill material shall be clean and of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters.

13. Disturbance to vegetation will be limited to only what is absolutely necessary. After construction, all disturbed areas will be revegetated to approximate the pre-disturbance native plant assemblage.

14. Where the control of weeds, insects, and other undesirable species is deemed necessary by the permittee, control methods which are nontoxic to aquatic life or human health shall be employed when the activity is located in or in close proximity to water, including wetlands.

15. Concentrations of taste and odor producing substances shall not interfere with the production of potable water by reasonable water treatment methods, impart unpalatable flavor to food fish including shellfish, result in offensive odors arising from the water, or otherwise interfere with reasonable use of the water in the state.

16. Surface water shall be essentially free of floating debris and suspended solids that are conducive to producing adverse responses in aquatic organisms, putrescible sludge deposits, or sediment layers which adversely affect benthic biota or any lawful uses.

17. Surface waters shall be essentially free of settleable solids conducive to changes in flow characteristics of stream channels or the untimely filling of reservoirs, lakes, and bays.

18. The work of the applicant shall be conducted such that surface waters are maintained in an aesthetically attractive condition and foaming or frothing of a persistent nature is avoided. Surface waters shall be maintained so that oil, grease, or related residue will not produce a visible film of oil or globules of grease on the surface or coat the banks or bottoms of the watercourse.

19. This certification shall not be deemed as fulfilling the applicant's/permittee's responsibility to obtain additional authorization/approval from other local, state, or federal regulatory agencies having special/specific authority to preserve and/or protect resources within the area where the work will occur.

Appendix H

Mitigation and HEP/Cost Analysis Report

Appendix H-1

Mitigation and HEP/Cost Analysis Report

APPENDIX H-1
MITIGATION AND HEP COST REPORT

1.0 INTRODUCTION

Mitigation is required for the proposed Freeport Harbor Channel Improvement Project (FHCIP). Although channel improvements will not produce impacts that will require mitigation, the development of two new upland placement areas (PAs), PAs 8 and 9, will result in both wetland and riparian forest impacts. The PAs are being developed on land owned or leased by the project Sponsor, Port Freeport (Port) designated as tracts Eight and Nine (Figure 1). PAs 8 (168 acres) and 9 (250 acres) fall within tracts Eight (254 acres) and Nine (442 acres), respectively, and will contain approximately 19.3 million cubic yards (mcy) of new work and maintenance material from the proposed channel improvements. Impacts to these areas were evaluated using Habitat Evaluation Procedures (HEP) and IWR-Plan to develop a project mitigation plan.

Tracts Eight and Nine are currently degraded pasture with ephemeral wetland swales that are seasonally dry, and some second-growth riparian forest adjacent to the Brazos River Diversion Channel (Diversion Channel). Both tracts are overgrazed and contain substantial numbers of non-native invasives including pasture grasses and Chinese tallow trees (tallow), and native species indicative of disturbance. The wetland swale located in the southern part of Tract Eight is the most prominent swale on the properties, and PA 8 was designed to avoid this swale. The swales contain water seasonally, and are often dry, possessing minimal wetland habitat value.

Construction of PAs 8 and 9, including pipeline corridors and effluent ditches, will impact 418 acres of land, including 21 acres of secondary riparian forest, 39 acres of ephemeral wetlands, and 358 acres of degraded pasture with some scrub/shrub (Table 1). Of these habitats, mitigation is proposed for the riparian forest and wetland impacts.

Table 1
Project Impacts by Habitat Types

Project Feature	Habitat Impacts		
Proposed Upland Placement Areas	**Riparian Forest (Acres)**	**Wetlands (Acres)**	**Pasture (Acres)**
PA 8	0	23	145
PA 9	21	16	213
Totals	21	39	358

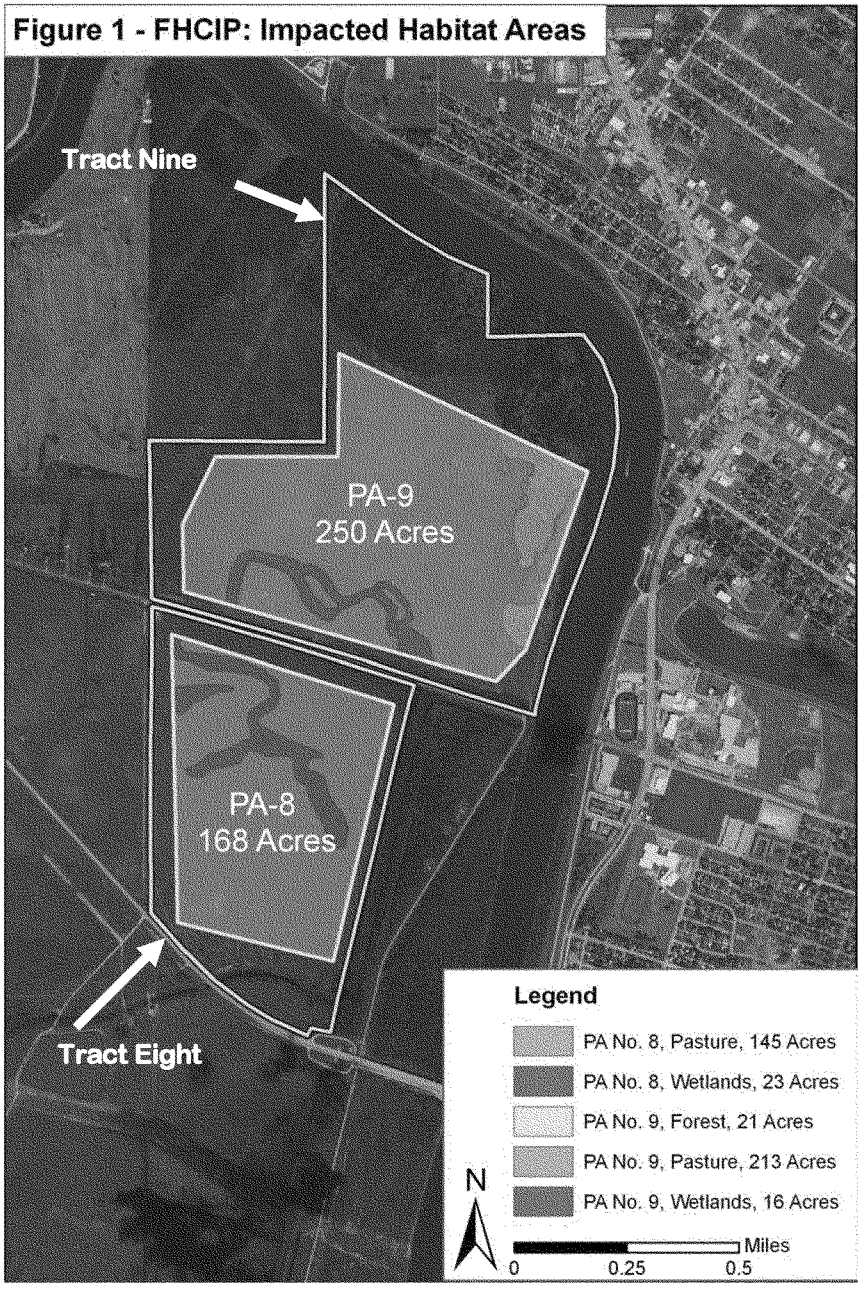


Figure 1 - FHCIP: Impacted Habitat Areas
Tract Nine
PA-9
250 Acres
PA-8
168 Acres
Tract Eight
Legend
PA No. 8, Pasture, 145 Acres
PA No. 8, Wetlands, 23 Acres
PA No. 9, Forest, 21 Acres
PA No. 9, Pasture, 213 Acres
PA No. 9, Wetlands, 16 Acres
N
Miles
0
0.25
0.5

2.0 RESOURCE AGENCY COORDINATION

Resource agency personnel from the U.S. Fish and Wildlife Service (USFWS) and the Texas Parks and Wildlife Department (TPWD) participated in site visits and in collecting the required field data for conducting the HEP analysis for impacted wetlands and riparian forest, and provided valuable advice in completing the analysis. The agencies also provided significant input for siting and design of project mitigation for losses to forest and wetland habitats. During agency coordination for siting project mitigation features, emphasis was placed on in-kind mitigation located in close proximity to impacted habitats. Therefore, available mitigation lands situated immediately adjacent to impacted habitats were sites of primary consideration. Areas considered for project mitigation and coordinated with the resource agencies included land to the north and east of PA 9 adjacent to the Diversion Channel, and land east of Tract 8 to the Diversion Channel (Figure 2). The area between the proposed PAs and the Diversion Channel contains riparian forest and areas appropriate for wetland mitigation.

The agencies made a number of recommendations we could not concur with for project mitigation. For example, USFWS recommended that the entire riparian forest between the PAs and the Diversion Channel be selectively cleared of tallow, replanted with a combination of hard mast and flood-tolerant native trees, and be protected in perpetuity by a conservation easement. As demonstrated below, however, this would have resulted in excessive mitigation for project impacts and will not be implemented.

TPWD requested preservation in perpetuity of a 5-acre ephemeral wetland swale located between PA 8 and SH 36 as a mitigation feature. However, the Port does not wish to make this property available for project mitigation. The resource agencies also requested mitigation for the 358 acres of pasture impacted by PAs 8 and 9. The agencies classify these pastures as wet-coastal prairie. We do not concur with this habitat classification. Although the land may have at one time been coastal prairie, it is now degraded grassland primarily consisting of non-native pasture grasses of limited wildlife habitat value that does not merit mitigation.

3.0 USACE GUIDANCE CONCERNING ENVIRONMENTAL MITIGATION AND DEVELOPMENT OF THE MITIGATION PLAN

A project mitigation plan to address unavoidable impacts to significant habitat resulting from the construction of PAs 8 and 9 was developed that satisfies the USACE's cost effectiveness and incremental cost analysis requirements as outlined in ER 1105-2-100. The plan considers the quality and regional significance of the impacted habitats and focuses on mitigating impacts to high-quality habitat while minimizing additional land acquisition costs. HEP models were considered adequate for both the riparian forest and wetland habitats impacted by this project.

4.0 POTENTIAL MITIGATION SITES

Once unavoidable project impacts had been identified, several tracts of land owned by the Port were considered for mitigation:

Peach Point: This land is owned by the Port and is located west of Freeport near Jones Creek in Brazoria County. The 408 acres offered by the Port for potential mitigation consists primarily of tidally influence wetlands near the Gulf Intracoastal Waterway (GIWW), which are brackish to saline in nature. These wetlands would not provide acceptable mitigation because they are out-of-kind mitigation substitutes for the freshwater ephemeral wetlands impacted by the project and were not considered further. Two additional sites near Peach Point were also considered for mitigation, but were dropped because they too would have provided out-of-kind mitigation like Peach Point.

Tracts Eight and Nine: Tract Eight is owned and Tract Nine is leased by the Port from Dow Chemical (Dow) for confined dredged material disposal and environmental mitigation purposes. All FHCIP mitigation could be located within and immediately adjacent to these tracts. One advantage of using this land is that no additional real estate acquisition costs would be incurred for the project. Potential mitigation sites 1, 2, and 3 (see Figure 2) were identified on these Tracts and are discussed in more detail in later sections of this document. From an ecological standpoint, this land provides for in-kind, on-site mitigation, which is desirable. In addition, the Port is willing to obtain a conservation easement from Dow, which will protect the riparian forest in Tract Nine in perpetuity. Given the potential of tracts Eight and Nine to provide not only PA sites but also mitigation lands, these tracts were selected. A detailed evaluation of tracts Eight and Nine based on HEP modeling is documented below. HEP modeling was used to quantify project impacts and mitigation compensation. Cost effectiveness (CE) and incremental cost analysis (ICA) was also performed to identify an optimal mitigation plan that fully compensates for project impacts.

5.0 HABITAT EVALUATION PROCEDURE

An HEP analysis was used to determine the amount of mitigation required to compensate for project impacts. HEP uses evaluation species as representative of habitat quality by determining a Habitat Suitability Index (HSI) for each species using a particular habitat. Each species has an associated HSI model, which is based upon the assumption that a positive relationship exists between the HSI and habitat carrying capacity, and that habitat suitability can be summarized on a scale ranging from 0.0 to 1.0 (USFWS, 1996). Data from field measurements of habitat variables are run through the respective suitability index model to generate a baseline HSI for each species or group of species utilizing the same habitats.

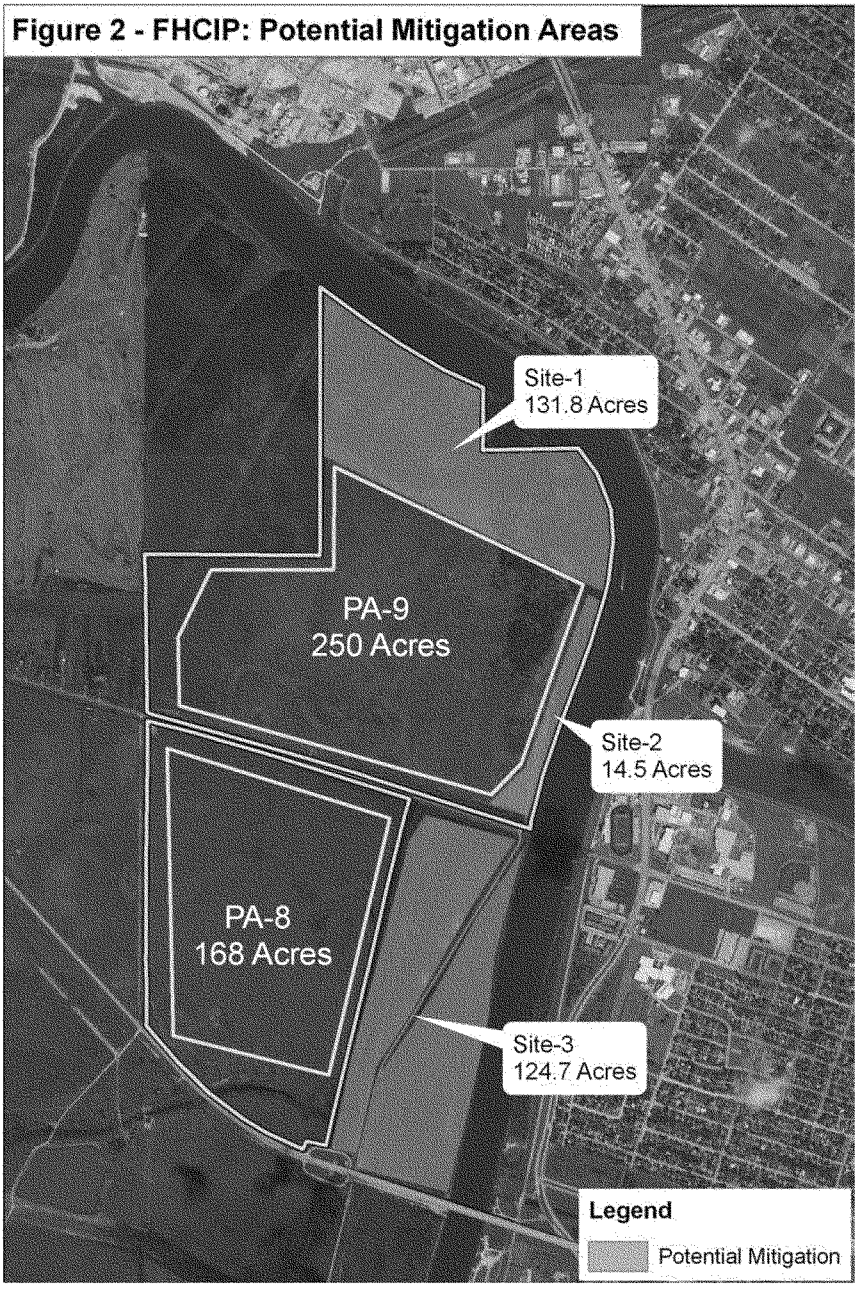


Figure 2 - FHCIP: Potential Mitigation Areas
Site-1
131.8 Acres
PA-9
250 Acres
Site-2
14.5 Acres
PA-8
168 Acres
Site-3
124.7 Acres
Legend
Potential Mitigation

The number of habitat units (HU) available in the habitat is calculated by multiplying the HSI by the area of habitat being analyzed. The final step in the process is to project the condition of the habitat into the future, over the period of analysis, and determine what the value of the habitat will be at certain points in time (target years – TY), when a change in habitat conditions is likely to occur. HUs are then summed for each species and divided by the years in the period of analysis.

The foregoing procedure provides the average annual habitat units (AAHUs) that can be compared to the AAHUs calculated for the same habitat type and species, at different locations or different conditions (management plans) at the same location. AAHUs for the future without project (FWOP) and future with project (FWP) conditions are calculated in this manner. The difference between these two conditions is used to calculate project impact and determine the mitigation needed to compensate for habitat losses to the evaluation species.

It should be noted that for this project, the focus of the mitigation is to replace the riparian forest and ephemeral wetland habitats lost through project construction and maintenance with another forest or wetlands of nearly equal value, using the evaluation species only as surrogates for quantifying habitat quality. No attempt is made to replace the habitat for each evaluation species. The assumptions and procedures used to calculate the AAHUs for the FWOP and FWP conditions are described below.

6.0 SITE DESCRIPTIONS AND SELECTION OF EVALUATION SPECIES

Tract Eight is utilized as a pasture. The site retains perhaps 30 percent of its original prairie habitat function and value and is vegetated by a large number of non-native invasives and species indicative of pasture maintenance, such as mowing. Species found at the site include rattlebox (*Sesbania drummondii*), Gulf cordgrass (*Spartina spartinae*), St. Augustine grass (*Stenotaphrum secundatum*), sedges (*Juncus* sp.), and tallow (*Sapium sebiferum*). Sparse concentrations of seacoast sumpweed (*Iva annua* L.), Carolina wolfberry (*Lycium carolinianum* var. *quadrifidum*), marsh-hay cordgrass (*Spartina patens*), sea ox-eye daisy (*Borrichia frutescens*), and frogfruit (*Phyla lanceolata*) were also observed. Evidence of overgrazing exists. Tract Eight also contains two small stock ponds. At the time of the site visit, these ponds were dry and vegetated with common arrowhead (*Sagittaria* L.), seacoast sumpweed (*Iva annua* L.), tallow (*Sapium sebiferum*), and were surrounded by Gulf cordgrass (*Spartina spartinae*), marsh-hay cordgrass (*Spartina patens*), and scattered native flowers.

Tract Nine is adjacent to the Diversion Channel and, although similar to Tract 8, is drier and the ground cover is sparser. The majority of the site consists of heavily overgrazed pasture vegetated with bermudagrass (*Cynodon dactylon*), rattlebox (*Sesbania drummondii*), frogfruit (*Phyla lanceolata*), and scattered Gulf cordgrass (*Spartina spartinae*). The pasture retains perhaps 10 percent of its original prairie habitat function and value and is considered substantially

degraded. Tract Nine also includes two areas of riparian forest totaling 21 acres, both of which are situated adjacent to the Diversion Channel. The riparian forest is an open, second-growth, mixed-species forest, approximately 40 years in age, with a grazed understory. The forest consists of a diverse range of non-native invasive and native tree and brush species including sugar hackberry (*Celtis laevigata.*), cedar elm (*Ulmus crassifolia*), tallow (*Sapium sabiferum*), toothache tree (*Zanthoxylum fraxineum*), pecan trees (*Carya illinoinensis*), red mulberry (*Morus rubra* L.), honey locust (*Gleditsia aquatica*), gum bumelia (*Sideroxylon lanuginosum*), Jerusalem tree (*Parkinsonia aculeata*), chinaberry (*Melia azedarach*), yaupon holly (*Ilex vomitoria*), palmetto (*Serenoa repens*), green briar (*Smilax* sp.), peppervine (*Ampelopsis brevipedunculata*), trumpet creeper (*Campsis radicans*), poison ivy (*Toxicodendron radicans*), dewberry (*Rubus eubatus*), blackberry (*Rubus* sp.), native chili peppers (*Capsicum annuum* L.), iron weed (*Iva* sp.), Turk's cap (*Malvaviscus arboreus*), and frogfruit (*Phyla lour*). The height of this mixed-species canopy reaches 35 feet, and its density, maturity, diversity, and location along the Diversion Channel near the Gulf of Mexico adds to its value as a neotropical migrant songbird "fallout" site.

Tracts Eight and Nine Wildlife Species included the northern bobwhite (*Colinus virginianus*), marsh harrier (*Circus aeruginosus*), black-shouldered kite (*Elanus axillaris*), great egret (*Egretta alba*), snowy egret (*Egretta garzetta*), great blue heron (*Ardea herodias*), eastern meadowlark (*Sturnella magna*), red-winged blackbird (*Agelaius phoeniceus*), and others. Species seen in the forested portion of Tract Nine included the red-shouldered hawk (*Buteo lineatus*), black-crowned night heron (*Nycticorax nycticorax*), northern mockingbird (*Mimus polyglottos*), northern cardinal (*Cardinalis cardinalis*), white-eyed vireo (*Vireo griseus*), tufted titmouse (*Baelophus bicolor*), and Brewer's blackbird (*Euphagus cyanocephalus*).

For purposes of habitat evaluation, the HSI models for the mottled duck (*Anas fulvigula maculosa*) and great egret (*Egretta alba*) were used. These species served as surrogates for calculating the quality of the ephemeral wetlands at PAs 8 and 9. Ephemeral wetland swales at these sites generally consist of a semipermanent water regime, with water depths possibly approaching 3–5 inches during wet winter months, and drying up during the summer months.

Two evaluation species, the gray squirrel (*Sciurus carolinensis*) and veery (*Catharus fuscescens*), were used as surrogates to calculate the quality of the riparian forest The eastern meadowlark (*Sturnella magna*) was used as an evaluation species for calculating the quality of the grasslands, and only the HSI value for the food component of its model was used in the HEP analysis.

While the gray squirrel, veery, and mottled duck were not observed in the riparian forest or wetland habitats during the site visit, the forest may support squirrels and could provide fallout sanctuary for the veery. Similarly, the mottled duck could use the stock ponds and ephemeral swales and potholes within the project area. It should be noted that use of an HSI model for a

species does not necessarily mean that the species occurs in the project area. The model only provides an estimate of the relative suitability of habitat in the project area for that species.

Field measurements were collected by USACE assisted by USFWS and TPWD biologists at PAs 8 and 9 on December 4, 2006. Data were collected from representative sampling sites in the riparian forest and at wetland and grassland areas to assess the suitability of these habitats for their respective evaluation species. The initial field data collected from this site visit was compiled by USFWS to establish baseline HSI values for the evaluation species, and was reviewed by TPWD and USACE.

7.0 HEP MODELING

Future Without Project (FWOP). Table 2 provides the average baseline condition HSI values and HUs for each evaluation species in each of the three habitats. The HSI was obtained by averaging the HSI values for each of the habitats surveyed. Before performing calculations for AAHUs, anticipated changes that will occur in the quality or quantity of each habitat must be determined and expressed as target years, over the designated period of analysis, which is 50 years for this project.

Table 2
Average HSI Values and HUs for All Habitats in Project Impact Areas
(Baseline Conditions)

Evaluation Species	Area of Available Habitat (Acres)	Average HSI Values	Habitat Units
Forest			
Gray Squirrel	21	0.21	4.4
Veery	21	0.47	9.9
Average HSI:		0.34	7.14
Wetlands			
Mottled Duck	39	0.13	5
Great Egret	39	0.29	11.3
Average HSI:		0.21	8.15
Grasslands			
Eastern Meadowlark	358	0.39	139.6

When determining the target years for the FWOP condition, it was assumed that the forest habitat on PA 9 would not likely experience any meaningful changes (losses) in habitat quality or quantity resulting from tree removal or other activities for development.

Currently, the forested areas function in part as a buffer for Dow operations, and, according to Port Freeport, will continue providing that function. Also, the current use of grasslands as maintained pasture for cattle would likely continue. However, the wetland and grassland habitats

on PA 8 are expected to experience a change in habitat value for each evaluation species for the FWOP condition, due to planned development actions by the Port on Tract Eight. According to Port officials, these changes would probably occur approximately 15 years into the future. Prior to this potential development time frame, the wetlands and grasslands on PA 8 are assumed to experience no change in habitat value for each evaluation species.

In general, the assumption of no change in wetlands for both PAs 8 and 9 is due to their control by the Port and Dow. No change to the grasslands is expected because they are maintained pasture and periodically mowed, preventing any meaningful successional change. Table 3 provides the target years and area of impact for the FWOP condition, based on the assumptions described above.

Table 3
Future Without Project Target Years and Impact Area for Each Habitat in the Construction Areas

Habitat	Target Years	Area (Acres)
Forest	Baseline	21
	1	21
	15	21
	25	21
	51	21
Wetlands	Baseline	39
	1	39
	2	39
	15	16
	51	16
Grasslands	Baseline	358
	1	358
	2	358
	15	213
	51	213

The final step in calculating the AAHUs for each habitat is to calculate the HUs contained in a habitat for each evaluation species at each target year, and summing all HUs to get cumulative HUs. The cumulative HUs are then divided by the period of analysis (50 years) to derive the AAHUs, which can be compared with similar habitats in a mitigation plan to ensure adequate compensation for project impacts (losses). Table 4 presents the HUs calculated for the evaluation species in each habitat, the cumulative HUs for all evaluation species in a habitat, and the AAHUs for the FWOP condition.

Table 4 shows that without the project in place, the forests will retain a habitat value of approximately 7.4 AAHUs for the two evaluation species over the 50-year period of analysis.

The wetlands and the grasslands will have approximate values of 1.1 and 67 AAHUs, respectively.

Table 4
FWOP AAHUs in Evaluation Species' Habitats

Habitat	Species	Target Years (TY) Compared	Acres	HSI Values	Habitat Units Between TY	Average Annual Habitat Units
Forest	Gray Squirrel and Veery	$TY_1 - TY_0$	21	0.34	7.14	
		$TY_{15} - TY_1$	21	0.46	81.20	
		$TY_{25} - TY_{15}$	21	0.55	74.23	
		$TY_{51} - TY_{25}$	21	0.58	210.50	
Cumulative Habitat Units:					373.07	
AAHUs:						7.4
Wetlands	Mottled Duck and Great Egret	$TY_1 - TY_0$	39	0.21	9.2	
		$TY_2 - TY_1$	39	0.20	9.00	
		$TY_{15} - TY_2$	16	0	39.36	
		$TY_{51} - TY_{15}$	16	0	0	
Cumulative Habitat Units:					57.56	
AAHUs:						1.15
Grasslands	Eastern Meadowlark	$TY_1 - TY_0$	358	0.39	138.7	
		$TY_2 - TY_1$	358	0.39	138.7	
		$TY_{15} - TY_2$	358	0.39	317.5	
		$TY_{51} - TY_{15}$	213	0.4	2755	
Cumulative Habitat Units:					3350	
AAHUs:						67.0

Future With Project (FWP). The next step in the HEP analysis involves calculating the AAHUs for each habitat with the dredged material disposal action in place. Because the analysis examines only the construction areas where dredged material placement will occur, resulting in displacement of all surface features (habitats), we would expect that the AAHUs for this condition will be very low. At the end of TY_1 when project construction terminates and when project features are in place, the habitat will not recover, so no habitat units exist from this point through the period of analysis, which is 50 years with the project features in place. The AAHUs are calculated using the same formula as in the FWOP analysis, and the results are presented in Table 5.

Table 5
FWP AAHUs in Evaluation Species' Habitats

Habitat	Species	Target Years (TY) Compared	Acres	HSI Values	Habitat Units Between TY	Average Annual Habitat Units
Forest	Gray Squirrel and Veery	TY_1 - TY_0	21	0.34	2.38	
		TY_{15} - TY_1	0	0	0	
		TY_{25} - TY_{15}	0	0	0	
		TY_{51} - TY_{25}	0	0	0	
Cumulative Habitat Units:					2.38	
AAHUs:						0.047
Wetlands	Mottled Duck and Great Egret	TY_1 - TY_0	39	0.21	3.15	
		TY_2 - TY_1	0	0	0	
		TY_3 - TY_2	0	0	0	
		TY_{51} - TY_3	0	0	0	
Cumulative Habitat Units:					3.15	
AAHUs:						0.063
Grasslands	Eastern Meadowlark	TY_1 - TY_0	358	0.39	46.3	
		TY_2 - TY_1	0	0	0	
		TY_3 - TY_2	0	0	0	
		TY_{51} - TY_3	0	0	0	
Cumulative Habitat Units:					46.3	
AAHUs:						0.93

As expected, with project implementation, the AAHUs are greatly diminished compared to the without-project condition. AAHUs for the FWP conditions range from 0.047 for the forest habitat, to 0.063 for the wetlands, and 0.93 for the grasslands.

8.0 PROPOSED MITIGATION STRATEGIES FOR FOREST AND WETLANDS

To determine the amount of new habitat required for compensating project impacts to riparian forests and wetlands, the AAHUs for each habitat in the FWOP condition are subtracted from the AAHUs for each habitat in the FWP condition. Based on this calculation, the approximate AAHUs required in the new habitats to offset project losses are:

- Riparian Forests: 7.41
- Wetlands: 1.1

Three sites located on project lands adjacent to the proposed PAs were selected for project mitigation planning and were used for developing the CE/ICA. The CE/ICA identifies the most-cost-effective plans for accomplishing the required levels of mitigation at these sites. The three alternative mitigation sites and their associated measures are:

Mitigation Site 1 (Riparian and wetland mitigation; see Figure 1; riparian forest area north of PA 9 and adjacent pasture area bordering the forest's southern edge). This 131.8-acre site includes 117 acres of riparian forest, 5 acres of cleared forest, and about 9.8 acres of grassland. It is large enough for both wetland and riparian mitigation features (Figure 3), and is supported by the resource agencies as a mitigation site because it will be protected by a conservation easement. Field surveys revealed that approximately 10 percent of the riparian forest in Mitigation Site 1 (11 acres) is composed of tallows. Riparian mitigation at this site would consist of clearing the tallows, primarily around natural openings in the forest, and planting native trees. After clearing, the openings would be planted with a variety of small, hard-mast and flood-tolerant native seedlings or sapling trees to enhance the existing forest. Additionally, 1 acre of these native tree species would be planted around the perimeter of a proposed wetland creation area, described below. A total of 12 acres of new native trees would be planted for riparian mitigation at this site, and the entire 117-acre riparian forest would be preserved as part of the proposed project mitigation plan.

Wetland mitigation would be accomplished by creating a 3-acre ephemeral wetland (pond) in the grassland area of Site 1 (see Figure 3). The pond would be sloped to reach a maximum center depth of about 12 inches, the limit of accessibility of the mottled duck, and will have areas of between 4 to 9 inches in depth as required by the great egret for wade feeding. A variety of wetland plant species plugs (submerged and emergent) would be planted on 5- to 6-foot centers on the slopes and water's edge of the pond at different elevations, dependent upon the aquatic plant species, for a medium-density planting.

Mitigation Site 2 (Riparian mitigation; see Figure 1; riparian forest located east of PA 9). This 14.5-acre site includes 9.5 acres of riparian forest and 5 acres of mixed tallow and scrub/shrub vegetation. The 5-acre tallow and scrub/shrub area would be cleared and planted with small, hard-mast and flood-tolerant native seedlings or sapling trees for riparian forest mitigation.

Mitigation Site 3 (Riparian and wetland mitigation; see Figure 1; riparian forest located east of PA 8). This 124.7-acre site includes 112 acres of riparian forest and 12.7 acres of very dense tallow stands and scrub/shrub. Riparian forest mitigation would be accomplished by clearing tallows from 30 percent (33 acres) of the 112-acre riparian forest. This 33-acre area would then be planted with small, hard-mast native and flood-tolerant seedlings or sapling trees. Additionally, 1 acre of native trees would be planted around the perimeter of the proposed wetland creation area at this site, for a total of 34 acres of newly planted trees. A 3-acre

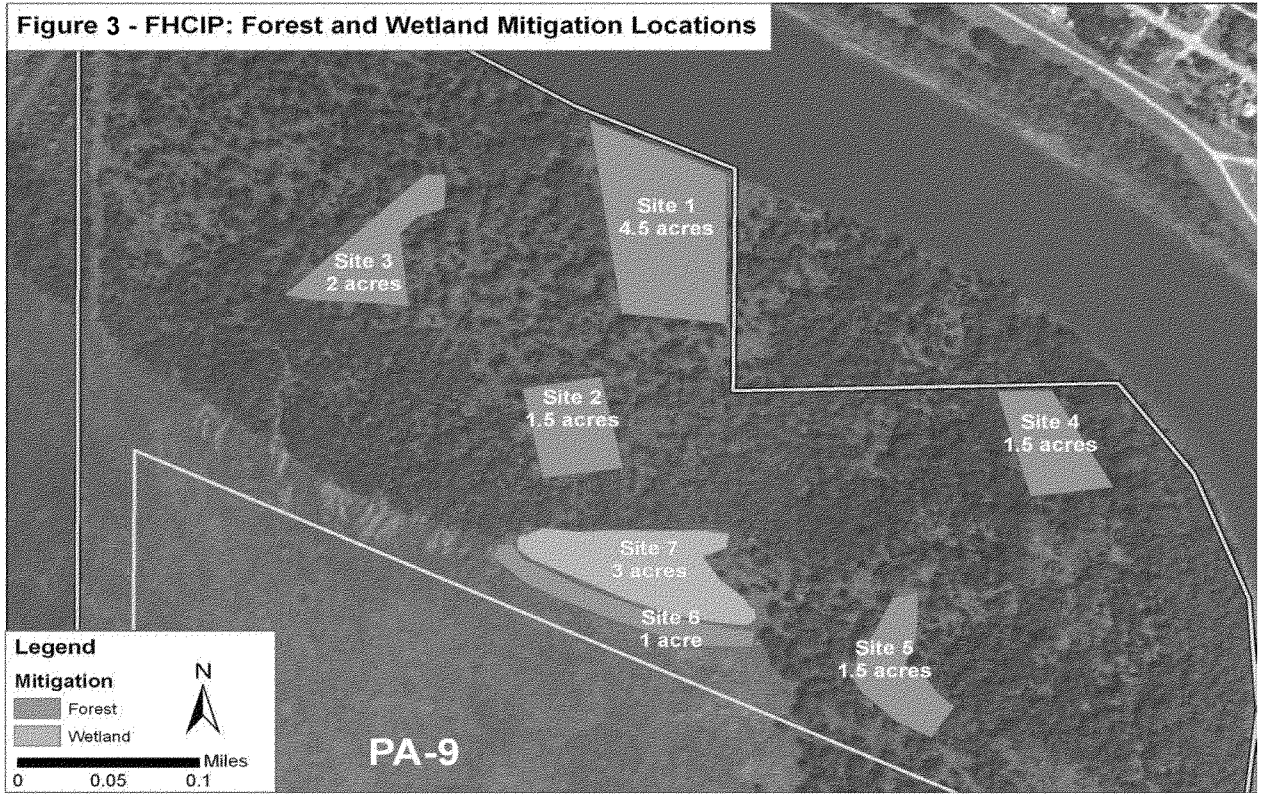


Figure 3 - FHCIP: Forest and Wetland Mitigation Locations
Site 1
4.5 acres
Site 3
2 acres
Site 2
1.5 acres
Site 4
1.5 acres
Site 7
3 acres
Site 6
1 acre
Site 5
1.5 acres
PA-9
Legend
Mitigation
Forest
Wetland
N
Miles
0
0.05
0.1

ephemeral wetland area (pond) would be created within the scrub/shrub area of the site. The same design features and aquatic planting scheme proposed at Site 1 for pond creation would be used.

Native tree and wetland vegetation that could be used for mitigation planting include water oak, willow oak, overcup oak, pecan, green ash, planar tree, water hickory, bald cypress, black willow, red maple, smart weed, common or soft rush, sawgrass, sedge, pickerel weed, Gulf cordgrass, and swamp lily.

9.0 COST EFFECTIVENESS (CE) AND INCREMENTAL COST ANALYSIS (ICA)

Based on the initial assessment of the three mitigation site alternatives described above, a CE/ICA analysis was performed to determine which of the three sites or combinations of sites would be the most-cost-effective and incrementally justified.

Forest Mitigation (Scales and Assumptions). Sufficient acreage exists between mitigation sites (sites 1, 2, and 3) for planting a mixture of tree species to compensate for project losses. To determine the AAHUs the mitigation forest and mitigation wetlands contain, certain TYs representing the time of expected change in habitat values were chosen to measure the gains in habitat value over the 50-year period of analysis. Habitat gains will be reflected in AAHUs calculated for each evaluation species as the trees mature.

Scales. Two scales of trees were considered for planting at the sites: seedlings and saplings. For seedlings, a mixture of tree species would be utilized. The seedlings would be 0.5 to 1 inch in diameter; 2 to 4 feet tall; planted at a density of 150 trees per acre; and spaced as forest openings permit. Tree mortality for this size is expected to approach 30 to 40 percent over the 50-year period of analysis, with most of the mortality occurring within the first 2 years after planting. The more expensive saplings would range between 1.5- to 2-inch-diameter plants; 5–7 feet in height; and be planted at a density of 40 trees per acre as forest openings permit. Mortality for this size tree is expected to approach 25 percent over the 50-year period of analysis, with most of the mortality occurring within the first 2 years after planting.

In a straight cost comparison, the seedlings are less expensive than the saplings, but the saplings are expected to provide value to the forest habitat earlier due to their size. While the larger and more expensive saplings may initially provide a faster recovery of the forest habitat compared to seedlings, the differences between these two tree sizes with respect to their contribution of value to the existing forest would be negligible over the 50-year period of analysis. Therefore, both tree sizes are deemed to provide the same habitat value, and this was reflected in the HEP analysis by assigning them both the same HSI scores. Specific tree species and management details will be coordinated with the resource agencies prior to actual mitigation construction.

A review of the variables that influence habitat quality for the two forest evaluation species revealed that the most important variables common to these species are:

- Percent canopy closure of trees that produce hard mast, which are greater than or equal to 10 inches diameter at breast height (dbh);
- Percent of tree canopy closure;
- Number and diversity of tree species that produce hard mast; and
- Soil moisture regime.

Assumptions. The variables listed above for the evaluation species were used to identify the TYs for the HEP analysis. The soil moisture regime variable is dependent in part on prevailing climate conditions and rainfall, and on land elevation. In general, the proposed mitigation forest areas have damp conditions due to their location on mostly flat or low-lying terrain. The other three variables depend on forest maturity and will increase as the trees grow in diameter and canopy cover increases as tree crowns increase in size. While growth is highly variable among species and even among individuals of the same species, it is not unreasonable to expect some of the faster growing trees, such as the oaks, to achieve large crowns that could easily approach 25–30 feet in diameter within 20 years. Therefore, with a mixture of species in the plantings and about a 25–30 percent mortality rate, it is not unreasonable to expect a 40–60 percent canopy closure in about 25 years.

9.1 Forest Assumptions: Mitigation Using Seedling Trees

Baseline (TY_0) – Assume the habitat value for the first year is zero. Existing shrub crown cover consisting of approximately 32 percent is unchanged.

TY_1 – It is assumed there will be little measurable change in forest habitat value after planting of seedlings following construction. Existing shrub crown cover consisting of approximately 32 percent will be reduced to about 20 percent as a result of tallow removal, because some shrubs and tallows are entwined in some areas of the forest.

TY_{15} – Forest is composed of 6–8 inch trees (dbh). Canopy closure of trees is about 30 percent (for the original plantings and any new volunteers and progeny of the original plantings), with about 20 percent canopy closure of the hard-mast-producing trees. Existing shrub crown cover will have increased to approximately 25 percent.

TY_{25} – Forest is composed of 10–12 inch trees (dbh). Canopy closure of trees is approximately 40 percent, with about 35 percent canopy closure of the hard-mast-producing trees. Existing shrub crown cover will have increased to approximately 30 percent.

TY_{51} – Forest overstory is composed of 20-inch dbh trees. Younger trees vary from saplings to 12–14 inches or more dbh. Canopy closure of trees is about 50–60 percent with hard-mast-

producing trees having a canopy closure of about 45 percent. Existing shrub crown cover may be as much as 35 percent.

9.2 Forest Assumptions: Mitigation Using Sapling Trees

As noted earlier, the overall value added to the forest habitat is approximately the same as for the seedlings over the 50-year period of analysis, but costs are higher for sapling planting.

Using all the above assumptions, the habitat value was calculated for each evaluation species, and a cost for mitigation for each site was developed. Table 6 presents the FWOP and projected FWP HSI values for each species for each target year used in the analysis. It also displays FWOP AAHUs at each of the proposed sites and projects FWP mitigation AAHUs for the proposed sites, if the planting scheme for seedlings was implemented.

Table 6
AAHUs for Forest Species at Proposed Mitigation Sites
FWOP vs. FWP Mitigation

Site 1 (Seedlings) Gray Squirrel and Veery	Target Years (TY) Compared	Acres (FWOP)	HSI Value (FWOP)	Habitat Units Between TYs (FWOP)	Average Annual Habitat Units (FWOP)	Acres (FWP)	HSI Value (FWP)	Habitat Units Between TYs (FWP)	Average Annual Habitat Units (FWP)	AAHUs Gained at Site 1 (FWP minus FWOP AAHUs)
	$TY_1 - TY_0$	117	0.34	39.78		117	0.34	39.9		
	$TY_{15} - TY_1$	117	0.47	460.8		118	.55	507.6		
	$TY_{25} - TY_{15}$	117	0.56	425.8		118	.66	499.7		
	$TY_{51} - TY_{25}$	117	0.6	1204		118	0.75	1469.6		
AAHUs:					42.6				50.3	7.73
Site 2 (Seedlings) Gray Squirrel and Veery	**Target Years (TY) Compared**	**Acres (FWOP)**	**HSI Value (FWOP)**	**Habitat Units Between TYs (FWOP)**	**Average Annual Habitat Units (FWOP)**	**Acres (FWP)**	**HSI Value (FWP)**	**Habitat Units Between TYs (FWP)**	**Average Annual Habitat Units (FWP)**	**AAHUs Gained at Site 2 (FWP minus FWOP AAHUs)**
	$TY_1 - TY_0$	9.5	0.34	3.2		9.5	0.34	4.0		
	$TY_{15} - TY_1$	9.5	0.25	27		14.5	0.35	48.3		
	$TY_{25} - TY_{15}$	9.5	0.36	20.4		14.5	0.46	41.1		
	$TY_{51} - TY_{25}$	9.5	0.40	64.2		14.5	0.52	126.1		
AAHUs:					2.3				4.39	2.09
Site 3 (Seedlings) Gray Squirrel and Veery	**Target Years (TY) Compared**	**Acres (FWOP)**	**HSI Value (FWOP)**	**Habitat Units Between TYs (FWOP)**	**Average Annual Habitat Units (FWOP)**	**Acres (FWP)**	**HSI Value (FWP)**	**Habitat Units Between TYs (FWP)**	**Average Annual Habitat Units (FWP)**	**AAHUs Gained at Site 3 (FWP minus FWOP AAHUs)**
	$TY_1 - TY_0$	112.7	0.07	7.8		112.7	0.07	7.9		
	$TY_{15} - TY_1$	112.7	0.08	81.7		113.7	0.25	175.8		
	$TY_{25} - TY_{15}$	112.7	0.10	71.0		113.7	0.40	260.0		
	$TY_{51} - TY_{25}$	112.7	0.11	214.0		113.7	0.55	959.1		
AAHUs:					7.49				28.0	20.51

9.3 Wetland Mitigation (Scales and Assumptions)

Sufficient acreage is available at all proposed mitigation sites, except for Site 2, for wetland creation. Site 2 will not be considered for any wetland habitat creation due to reasons stated earlier.

In determining the AAHUs the mitigation wetlands contain, certain TYs representing the time of expected change in habitat value were chosen to measure the gains in habitat value over the 50-year period of analysis. Habitat gains will be reflected in AAHUs calculated for each evaluation species as the wetland vegetation matures.

9.4 Assumptions for Habitat Evaluation and Future with Project Wetland Mitigation

Fewer common variables exist between the two evaluation species for wetland habitat than for the forest. The mottled duck is more dependent in the HSI model on the density of potential nesting and brooding sites. The variable of most importance to the great egret at the mitigation sites is the availability of feeding habitat, consisting of substrate zones with 4–9 inches of water depth, covered by submerged or emergent vegetation.

Many factors affect the amount of time required for a created wetland to become functional. However, existing data suggest that most aquatic plant species are fast growing and will achieve coverage and density equivalent to naturally occurring wetlands after about 2 years, which is the assumption used for this planting scheme.

Wetland Assumptions – Mitigation Planting (medium density) with Mixed Wetland Plant Species:

Baseline (TY_0) – Assume the habitat value for the first year is zero as wetlands are nonexistent.

TY_1 –Some habitat value may be found in the wetland after initial planting following construction, but it is assumed the value is insignificant.

TY_2 – Aquatic plants would cover approximately 40–60 percent of the wetland substrate, producing approximately 50 percent of the wildlife value required for the evaluation species.

TY_3 – Approximately 85–100 percent of the wetland substrate would be covered by submerged or emergent vegetation. Aquatic plants would be producing nearly 100 percent of the wildlife value required for the evaluation species.

TY_{51} – The wetland substrate would essentially be covered by submerged or emergent vegetation, and the habitat will have reached its optimal, long-term value.

Using these assumptions, the habitat value was calculated for each evaluation species and a cost of mitigation for each site was developed. Table 7 presents the FWOP and projected FWP HSI values for the evaluation species for each target year used in the analysis. It also displays FWOP AAHUs at each of the proposed sites, and projects FWP mitigation AAHUs for the proposed sites, if the wetland creation scheme was implemented.

Table 7
AAHUs for Wetland Species at Proposed Mitigation Sites
FWOP vs. FWP Mitigation

Site 1 (Wetlands) Mottled Duck and Great Egret	Target Years (TY) Compared	Acres (FWOP)	HSI Value (FWOP)	Habitat Units Between TYs (FWOP)	Average Annual Habitat Units (FWOP)	Acres (FWP)	HSI Value (FWP)	Habitat Units Between TYs (FWP)	Average Annual Habitat Units (FWP)	AAHUs Gained at Site 1 (FWP minus FWOP AAHUs)
	$TY_1 - TY_0$	0	0	0		3	0.13	0.13		
	$TY_2 - TY_1$	0	0	0		3	0.45	0.87		
	$TY_3 - TY_2$	0	0	0		3	0.71	1.74		
	$TY_{51} - TY_3$	0	0	0		3	0.79	72.9		
AAHUs:					0				1.5	1.5
Site 3 (Wetlands) Mottled Duck and Great Egret	**Target Years (TY) Compared**	**Acres (FWOP)**	**HSI Value (FWOP)**	**Habitat Units Between TYs (FWOP)**	**Average Annual Habitat Units (FWOP)**	**Acres (FWP)**	**HSI Value (FWP)**	**Habitat Units Between TYs (FWP)**	**Average Annual Habitat Units (FWP)**	**AAHUs Gained at Site 3 (FWP minus FWOP AAHUs)**
	$TY_1 - TY_0$	0	0	0		3	0.13	0.13		
	$TY_2 - TY_1$	0	0	0		3	0.45	0.87		
	$TY_3 - TY_2$	0	0	0		3	0.71	1.74		
	$TY_{51} - TY_3$	0	0	0		3	0.79	72.9		
AAHUs:					0				1.5	1.5

Based upon hydrologic evaluation of the proposed project, it is anticipated that the grasslands and/or forest surrounding the ephemeral pond would periodically flood, but inundation of the ephemeral pond and fringing area proposed for planting would likely not exceed 5 days duration in any flood event. The suggested plants, once established, can tolerate this duration of flooding without significant impacts to their growth and use for wildlife. Occasionally, some impacts to nesting species like the mottled duck might occur on the land near the ephemeral pond; however, the frequency of such events would not greatly disrupt overall habitat values that would develop.

IWR-PLAN. IWR-PLAN software was used to perform a cost analysis of the proposed woodland seedling-tree planting and the wetland aquatic planting schemes at each of the proposed alternative mitigation sites. The software identifies combinations of mitigation measures that produce alternative plans that are cost effective and/or incrementally justified. Plans are identified as cost effective, or as Best Buy Plans which are also cost-effective plans.

IWR-PLAN analyzed each of the proposed mitigation sites and measures and generated 27 possible plan combinations. A total of four cost-effective and four Best Buy mitigation plans were identified and are presented in Table 8. Table 9 provides incremental costs for Best Buy Plan combinations, and Figure 4 compares the Best Buy Plan of interest to other identified Best Buy Plans.

Table 8
IWR-PLAN Analysis
Costs and Outputs for Cost-effective and Best Buy Plans

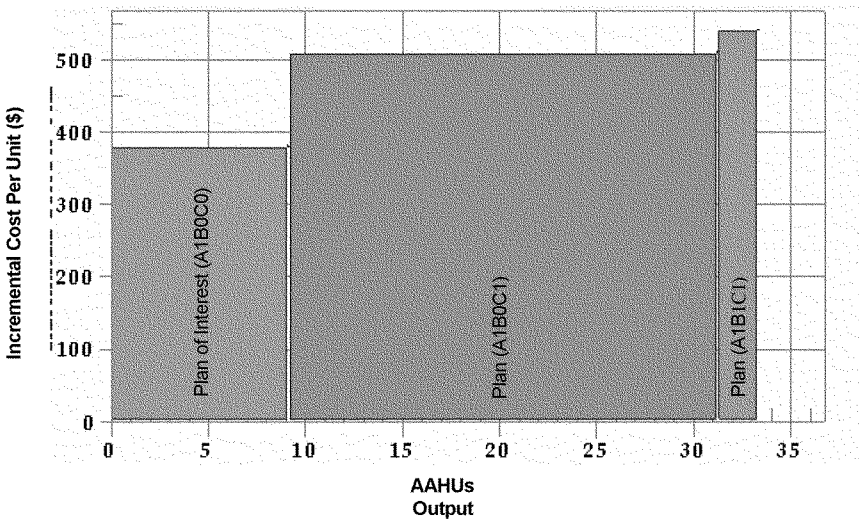
Plan (Alternative)	Total Annual Cost ($)	Forest Output (AAHUs)	Wetland Output (AAHUs)	Total Output (AAHUs)	Cost Effective
No Action Plan	0	0	0	0	Best Buy
A1B0C0	3,484	7.7	1.5	9.2	Best Buy
A2B0C0	6,485	7.7	1.5	9.2	No
A0B1C0	1,134	2.1	0	2.1	Yes
A0B2C0	2,385	2.1	0	2.1	No
A1B1C0	4,618	9.8	1.5	11.3	Yes
A2B1C0	7,619	9.8	1.5	11.3	No
A1B2C0	5,869	9.8	1.5	11.3	No
A2B2C0	8,870	9.8	1.5	11.3	No
A0B0C1	11,240	20.6	1.5	22.1	Yes
A0B0C2	19,744	20.6	1.5	22.1	No
A1B0C1	14,724	28.3	3	31.3	Best Buy
A2B0C1	17,725	28.3	3	31.3	No
A1B0C2	23,228	28.3	3	31.3	No
A2B0C2	26,229	28.3	3	31.3	No
A0B1C1	12,374	22.7	1.5	24.2	Yes
A0B2C1	13,625	22.7	1.5	24.2	No
A0B1C2	20,878	22.7	1.5	24.2	No
A0B2C2	22,129	22.7	1.5	24.2	No
A1B1C1	15,858	30.4	3	33.4	Best Buy
A2B1C1	18,859	30.4	3	33.4	No
A1B2C1	17,109	30.4	3	33.4	No
A2B2C1	20,110	30.4	3	33.4	No
A1B1C2	24,362	30.4	3	33.4	No
A2B1C2	27,363	30.4	3	33.4	No
A1B2C2	25,613	30.4	3	33.4	No
A2B2C2	28,614	30.4	3	33.4	No

KEY: A1=Site 1 - North of PA 9 (seedling and wetland measures); A2=Site 1 - North of PA 9 (sapling and wetland measures); B1=Site 2 - East of PA 9 (seedling measure only); B2=Site 2 - East of PA 9 (sapling measure only); C1=Site 3 - East of PA 8 (seedling and wetland measures); C2=Site 3 - East of PA 8 (sapling and wetland measures).

Table 9
Incremental Cost of Best Buy Plan Combinations
(Ordered By Output)

Plan (Alternative)	Total Output (AAHUs)	Cost ($1)	Average Cost ($1/AAHUs)	Incremental Cost ($1)	Incremental Output (AAHUs)	Incremental Cost Per Output
No Action Plan	0.00	0.00				
A1B0C0	9.20	3,484.00	378.69	3,484.00	9.20	378.69
A1B0C1	31.30	14,724.00	470.41	11,240.00	22.10	508.59
A1B1C1	33.40	15,858.00	474.79	1,134.00	2.10	540.00

Figure 4
Planning Set CE/ICA for Wetlands and Forest
(Incremental Cost and Total Output)
Best Buy Plan Alternatives



IWR-Plan results indicate that implementation of the woodland seedling and wetland planting schemes would be a Best Buy Plan at one individual site and also leads to additional Best Buy Plans when other sites are combined. To fully compensate for project impacts to riparian/hardwood forests and ephemeral wetland habitats, 7.41 and 1.1 AAHUs, respectively, were required for mitigation.

Table 9 shows that Plan A1B0C0 (Site 1) is the most cost effective of all Best Buy Plans presented. Table 8 reveals that this plan contributes approximately 7.7 AAHUs to the forest habitat, and generates about 1.5 AAHUs for newly created wetland habitat, at a total annual cost of $3,484. The incremental cost per AAHU (see Table 9) is $378.69. The AAHU outputs

provided adequately compensate for the losses to forest and wetland habitats resulting from project impacts. The projected first-cost of implementing this plan is approximately $46,500.

9.5 Cost Effectiveness and Incremental Cost Analysis Summary

Based on the analysis that was conducted, it was concluded that establishing woodlands on Site 1 by planting mixed tree species consisting of about 150 seedling trees per acre would compensate for the woodland impacts of 7.41 AAHUs on 21 acres, by providing 7.7 AAHUs of woodlands on about 12 acres. In addition, establishing wetlands on Site 1 by creating a 3-acre pond planted with a variety of aquatic plant plugs on 5- to 6-foot centers would compensate for wetland impacts of 1.1 AAHUs on 39 acres, by providing 1.5 AAHUs for wetland habitat on about 3.0 acres. The first cost for implementing the mitigation plan at Site 1, based on the updated October 2009 cost basis, is $192,000 for planting seedling trees and creating wetlands. Operation and Maintenance (O&M) for the 50-year period of analysis would consist of additional tallow tree clearing from the mitigation forest area, replanting seedling trees and aquatic vegetation to offset expected mortality, and implementation of mitigation monitoring and contingency plans. These O&M costs would amount to approximately $495,770 for the period of analysis.

10.0 REFERENCES

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Appendix H-2

Mitigation Monitoring and Contingency Plans

APPENDIX H-2
MITIGATION MONITORING AND CONTINGENCY PLANS

1.0 INTRODUCTION

Monitoring of mitigation sites is a critical part of the mitigation process. The purpose of monitoring is to:

- obtain an objective assessment of project progress towards predetermined project goals and success criteria;
- identify and correct problems through an adaptive management approach; and
- ensure that U.S. Army Corps of Engineers (USACE) Galveston District and Port Freeport (local sponsor) meet their compensatory mitigation obligations.

Monitoring of the mitigation sites developed for this proposed project will be a cooperative process. According to ER 1105-2-100, Section C-3(e) (10), the local sponsor is primarily responsible for mitigation monitoring to determine the success of mitigation measures. While the local sponsor is responsible for implementing the monitoring plan, the Galveston District will lead initial monitoring efforts, in cooperation with the local sponsor and the resource agencies (U.S. Fish and Wildlife Service [USFWS] and Texas Parks and Wildlife Department [TPWD]), to ensure successful establishment of the mitigation features (i.e., riparian tree planting and creation of a pond with aquatic vegetation). The Galveston District will review monitoring results and will make decisions regarding corrective actions.

The local sponsor (Port Freeport) has stated its intent to enter into an agreement with TPWD under terms of a "land conservation easement." The conservation easement would protect and preserve all created mitigation features and would protect the entire 117-acre riparian forest, which would encompass the proposed mitigation seedling plantings. All mitigation lands would be managed and monitored as one continuous ecological unit and would be protected in perpetuity from future development. Under the terms of the conservation easement, TPWD would be responsible for conducting long-term monitoring, once mitigation features are successfully established, to ensure continued success of these features.

2.0 SUCCESS CRITERIA

Success criteria are used to objectively evaluate the progress of mitigation projects in achieving predetermined objectives and to determine whether corrective actions need to be implemented. Because habitat functions are difficult to measure directly, success criteria may be based on an assessment of the structural attributes of restored habitats. In this way, structural attributes serve

as surrogate measures of habitat function. Once site conditions have met or surpassed the predetermined structural thresholds, it is assumed that the desired functions are either currently being provided or will be provided given time.

Separate success criteria have been established for riparian and aquatic pond vegetation plantings. For the riparian forest mitigation feature, success criteria would be based on tree seedling survival. For the aquatic pond plantings, success criteria would be based on area of aquatic plant cover.

2.1 RIPARIAN TREE PLANTINGS

2.1.1 Establishment Year

The initial contract for the riparian plantings would require the survival of 90 percent of seedling trees at the end of the first year after completion of planting. To ensure successful establishment, seedlings would be regularly watered, mulched, and fertilized during the first year. A program of pest/invasive plant control within the seedling planting areas would also be maintained for the establishment year. If the 90 percent targeted survival rate is not met, replacement seedlings would be planted to reach the original planting density of 150 trees per acre. Costs for this survival warranty would be included in the cost of the initial planting contract. Following the establishment year, a 15-year postestablishment monitoring plan would begin.

2.1.2 Postestablishment Monitoring

Success criteria for tree seedling survivability are:

- Annually for 5 years after the end of the establishment year, a minimum survival target of 80 percent of original planting density
- At 10 years after the end of the establishment year, a minimum survival target of 75 percent of original planting density
- At 15 years after the end of the establishment year, a minimum survival target of 70 percent of original planting density

Tree mortality for seedlings is expected to approach 30 to 40 percent over the 50-year period of analysis. Supplemental seedling planting to offset tree mortality would occur in years 1–5, 10, and 15 if monitoring indicates that the minimum survival targets for the respective years have not been met. See Section 3.1 for more information on the adaptive management plan.

Success criteria for invasive or exotic plants is:

- Annually for 15 years after the end of the establishment year, invasive or exotic plants cover a maximum of 5 percent of the total acreage planted with tree seedlings

Inasmuch as a known invasive (Chinese tallow) is already present in the mitigation area, it is assumed that monitoring will confirm the presence of invasive/exotic plants in excess of the target maximum in the early years of the monitoring program. Therefore, costs for an annual plant control program are included in the mitigation monitoring cost estimate. Control methods, determined in consultation with resource agencies, would be developed to address specific species of concern.

2.1.3 Monitoring Methods, Timing, and Duration

The goal for the monitoring program for the riparian tree plantings is to determine the survival rate of the planted seedlings and document the presence/extent of invasive/exotic plant species. Monitoring for survivability would be conducted in years 1–5, 10, and 15 after the end of the establishment year. Monitoring for invasive/exotic species would be conducted annually after the establishment year for 15 years. Field data would be compared to success criteria to determine whether the project has met or exceeded predetermined criteria.

Seedling survival would be recorded by pedestrian survey and photo-documentation. Monitoring data sheets would also document other relevant information such as general site conditions, damage by herbivory or vandalism, and erosion. Photographic monitoring would be conducted (1) prior to project implementation to document preexisting site conditions; (2) following project implementation; and (3) at the end of annual monitoring of the growing season. Key project areas would be photographed from fixed photo-points (i.e., same station, same angle) to provide a consistent basis for visually comparing seedling growth and development through time. The exact number and location of photo-monitoring stations would be determined in the field during project implementation.

The extent of invasive/exotic species coverage would be documented annually for 15 years after the end of the establishment year by pedestrian survey and photographic monitoring, using the methodology described for tree seedling monitoring above.

2.1.4 Project Closure

The riparian mitigation component could be certified as successful at the end of 15 years with a minimum tree seedling survival rate of 70 percent and maximum invasive/exotic plant cover of 5 percent of the total acreage planted with tree seedlings.

2.2 AQUATIC POND VEGETATION

2.2.1 Establishment Year

The initial contract for the creation and planting of a wetland pond would require the survival of 60 percent of the planted aquatic vegetation clumps or plugs 1 year after pond creation. Viable herbaceous and grass plants shall be indicated by the evidence of one or more new live plant

shoots arising from each separate plant plug or clump. Plugs/clumps would be watered as necessary, and invasive/exotic plants would be removed as needed during the establishment year. If the 60 percent targeted survival rate is not met, replacement plugs/clumps would be replanted to reach the original medium planting density. Corrective actions for pond size, depth, or slope, if needed, would be accomplished during the establishment year. Costs for corrective construction and the plant survivability warranty would be included in the cost of the initial construction and planting contracts. Following the establishment year, a 5-year postestablishment monitoring plan would begin.

2.2.2 Postestablishment Monitoring

Success criteria for aquatic plant survivability are:

- At 1 year after the end of the establishment year, a minimum of 30–35 percent aquatic vegetation cover over the pond's total acreage
- At 3 years after the end of the establishment year, a minimum of 65–70 percent aquatic vegetation cover over the pond's total acreage
- At 5 years after the end of the establishment year, a minimum of 70–75 percent aquatic vegetation cover over the pond's total acreage

Supplemental planting to offset aquatic plant mortality or failure to spread naturally would occur in years 1, 3, and 5 if monitoring indicates that the minimum percentage coverage targets for the respective years have not been met. See Section 3.2 for more information on the adaptive management plan.

Success criteria for invasive or exotic plants

- Annually for 5 years after the end of the establishment year, invasive or exotic plants cover a maximum of 5 percent of the total pond acreage

Inasmuch as a known invasive (Chinese tallow) is already present in the mitigation area, it is assumed that monitoring will confirm the presence of invasive/exotic plants in excess of the target maximum in the early years of the monitoring program. Therefore, costs for an annual plant control program are included in the mitigation monitoring cost estimate. Control methods, determined in consultation with resource agencies, would be developed to address specific species of concern.

2.2.3 Monitoring Methods, Timing, and Duration

The monitoring goal for evaluation of aquatic pond vegetation is to determine whether the percentage cover of aquatic vegetation is meeting the success criteria for target years. Monitoring would determine whether the aquatic vegetation is establishing itself along the pond perimeter

and within the pond by natural colonization, or whether efforts to assist development of aquatic vegetation may be necessary in order to meet minimum percentage cover targets.

Evaluation of aquatic pond vegetation would entail visually assessing and documenting development of vegetation areas within and along the perimeter of the pond, along with the substrates that support aquatic vegetation establishment. Monitoring would include (1) determining area of cover of aquatic vegetation and invasive/exotic species, and (2) documenting overall site conditions through same-station, same-angle photo-monitoring. These monitoring tasks would be performed by pedestrian survey and photographic documentation. Key locations would be photographed from fixed photo-points (i.e., same station, same angle) to provide a consistent basis for visually comparing vegetation growth and development through time. The exact number and location of photo-monitoring stations would be determined in the field during project implementation.

Monitoring for percentage cover of desirable aquatic vegetation would be conducted at years 1, 3, and 5 after the end of the establishment year. Monitoring for invasive/exotic species would be conducted annually after the establishment year for 5 years. Field data would be compared to the success criteria to determine whether the project has met or exceeded predetermined criteria.

2.2.4 Project Closure

The aquatic pond mitigation component could be certified as successful at the end of 5 years with a minimum percentage aquatic plant cover of 70–75 percent and maximum invasive/exotic plant cover of 5 percent of the total pond acreage.

3.0 CORRECTIVE ACTIONS (ADAPTIVE MANAGEMENT)

Corrective actions are actions or measures undertaken to address expected plant mortality as well as unforeseen changes to the mitigation features resulting from natural or anthropogenic causes. Corrective actions will be implemented where necessary in order to meet predetermined success criteria to ensure survival of the mitigation measures.

3.1 RIPARIAN TREE PLANTINGS

If monitoring indicates that the minimum tree seedling survival rates for the respective monitoring years have not been met, supplemental plantings would be conducted according to original planting specifications. However, the original species composition may be altered to favor those species exhibiting the highest survival rates based on monitoring data. A maximum of two curative replanting responses could be performed, using original planting specifications to achieve success criteria.

3.2 AQUATIC PLANTINGS

If monitoring indicates that the minimum percentage aquatic vegetation cover for the respective monitoring years has not been met, supplemental plantings would be conducted using original planting specifications. Replanted areas would be inspected within 60 days following replanting to determine whether those replanting efforts meet the threshold of a satisfactory stand. "Satisfactory stand" is defined as planting areas with at least a 50–60 percent survival rate within 60 calendar days following the planting effort. Viable herbaceous and grass plants shall be indicated by the evidence of one or more new live plant shoots arising from each separate plant plug or clump.

3.3 ADAPTIVE MANAGEMENT COSTS

Adaptive management costs are included in the operations and maintenance (O&M) cost for the mitigation plan and described in the Operations and Maintenance Manual. Potential adaptive management costs for the 50-year period of analysis are contained in Table 1 below.

Table 1
Adaptive Management Costs

Task Description	Frequency	Cost ($)
Replant Trees (12 acres @50 trees/acre)	Twice (As Required)	31,680
Replant Aquatic Vegetation for Pond (3 acres using original planting specifications)	Twice (As Required)	7,920
	Total	39,600

4.0 MONITORING REPORTS

4.1 ANNUAL MONITORING REPORTS

Monitoring reports would be prepared by the local sponsor and submitted to the Galveston District annually during the 15-year and 5-year monitoring periods for the riparian trees and aquatic vegetation, respectively. Copies of this report would be provided to representatives of the consulting State and Federal agencies. Monitoring would continue until it has been demonstrated that the mitigation has met the ecological success criteria as documented by the District Engineer and determined by the Division Commander. It is anticipated that ecological success criteria for the riparian tree and aquatic vegetation planting would be met by Year 15 and Year 5, respectively, and that monitoring will cease when certification is achieved.

Monitoring reports would contain all monitoring data and photographs, and all annual results will be presented in cumulative fashion. Monitoring reports would be submitted to the Galveston District within 3 months of when the monitoring was conducted.

The first report would be submitted after initial mitigation construction has been completed (i.e., riparian tree planting and planting of aquatic vegetation). This report would document and detail the mitigation effort. Any variances from the work plan or standard practices described in the mitigation plan would be noted in this document. A summary of work activities and their respective start and completion dates would be included.

Monitoring reports would consist of introduction, methods, results, and discussion sections. The introduction would include a brief narrative description of existing conditions, a site location map, maps showing key sampling locations (i.e., transects, photo-stations, etc.), and a review of success criteria. The methods section of the report would detail the methodology used to assess project performance for the mitigation features. Results from monitoring riparian tree plantings and aquatic vegetation would be summarized in the results section in tables and/or as text. Monitoring data sheets would be included as an appendix. The results section would also include one set of labeled photographs taken at each of the fixed-point photo-monitoring stations.

The discussion section of monitoring reports for both the riparian and aquatic components would include an assessment of project success based on the monitoring results directly related to set success criteria. The need for any corrective actions (i.e., supplemental planting) would also be identified in this section. If necessary, a proposed schedule for implementing corrective actions would be included. The discussion section would also include a description of any problems observed within the project site including, but not limited to, excessive inundation, drought, invasion by undesirable plant species, herbivory damage, plant diseases, excessive erosion, and evidence of vandalism or inadvertent damage.

4.2 FINAL CLOSE-OUT MONITORING REPORT

A final "close-out" monitoring report would be submitted following certification that success criteria have been met for the riparian trees and aquatic vegetation mitigation areas. This report would include data and a description of the final monitoring evaluation. It would also provide a summary and analyses of annual monitoring results for the monitoring period for the entire mitigation site.

5.0 MITIGATION MONITORING AND REPORTING COSTS

Monitoring and reporting costs would be included in the O&M cost for the mitigation plan and described in the Operations and Maintenance Manual. Projected monitoring and reporting costs for the 50-year period of analysis are found in Table 2.

Table 2
Mitigation Monitoring and Reporting Costs

Task Description	Monitoring Interval	Cost ($)
Monitoring of Trees/Pond	Annual (Years 1–5, 10, 15)	44,330
Monitoring of Pond Aquatic Vegetation	(Years 1, 3 and 5)	27,280
Invasive Plant Control	Years 1, 2, 3, 4, and 5 (estimated)	66,000
Monitoring Report	Annual	82,500
	Total	220,110

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December 21, 2009

Colonel David Weston
U. S. Army Corps of Engineers
Galveston District
P. O. Box 1229
Galveston, Texas 77553-1229

Re: Freeport Harbor Improvement Project Feasibility Study
Proposed Conservation Easement

Dear Colonel Weston,

As part of the Freeport Harbor Improvement Project, environmental mitigation will be required to offset for the loss of habitat in the area of the proposed Upland Confined Dredged Material Placement Site Nos. 8 and 9 as shown in the Draft Environmental Impact Statement. It is the Port's intention that should the project proceed into the Construction Phase to grant a conservation easement for the portion of the lands used for mitigation to one of the regulatory agencies (probably Texas Parks & Wildlife Services) or a recognized nature conservancy.

Sincerely,

Phyllis Saathoff
Managing Director
Port Freeport

PS/dmk

PORT COMMISSION

JAMES F. BROWN, JR., CHAIRMAN; THOMAS S. PERRYMAN, VICE CHAIRMAN; RAVI K. SINGHANIA, SECRETARY; BILL TERRY, ASSISTANT SECRETARY;
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Appendix I

Biological Assessment

Document No. 070270
Job No. 441901

FINAL
BIOLOGICAL ASSESSMENT FOR THE PROPOSED FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT BRAZORIA COUNTY, TEXAS

Prepared for:

U.S. Army Corps of Engineers
Galveston District
2000 Fort Point Road
Galveston, Texas 77550

October 2010

Printed on recycled paper

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Acronyms and Abbreviations

AOU	American Ornithologist's Union
BA	Biological Assessment
BO	Biological Opinion
CR	County Road
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FHCIP	Freeport Harbor Channel Improvement Project
FR	Federal Register
FWOP	Future without Project
GIWW	Gulf Intracoastal Water Way
GRBO	Gulf of Mexico Regional Biological Opinion
Gulf	Gulf of Mexico
HEP	Habitat Evaluation Procedure
km	kilometer(s)
LPP	Locally Preferred Plan
mcy	million cubic yards
MMPA	Marine Mammal Protection Act
NED	National Economic Development
NFWL	National Fish and Wildlife Laboratory
NMFS	National Marine Fisheries Service
NPS	National Park Service
NRC	National Research Council
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
ODMDS	Ocean Dredged Material Disposal Site
PA	placement area
SH	State Highway
STSSN	Sea Turtle Stranding and Salvage Network
TED	turtle excluder device
TPWD	Texas Parks and Wildlife Department
TXNDD	Natural Diversity Database
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

1.0 INTRODUCTION

1.1 PURPOSE OF THE BIOLOGICAL ASSESSMENT

This Biological Assessment (BA) has been prepared to fulfill the Galveston District U.S. Army Corps of Engineers' (USACE) requirements as outlined under Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended. The Federal action requiring this assessment is the proposed deepening and widening of Port Freeport (formerly Freeport Harbor) navigation project in Brazoria County, Texas. Section 216 of the Flood Control Act of 1970, Public Law 91-611, authorizes the proposed improvements to the existing navigation project. For the purposes of this BA, the study area encompasses Brazoria County and a 10-mile radius into the Gulf of Mexico (Gulf) (Figure 1). The project area is defined as the areas where actual dredging would take place with a 1-mile buffer and where impacts from dredged material placement might be expected (existing and proposed upland placement areas [PAs] and existing open-water PAs) (Figure 2). This BA evaluates the potential impacts the proposed Freeport Harbor Channel Improvement Project (FHCIP) may have on federally listed threatened and endangered species identified by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS).

Agency coordination (Appendix A) was initiated with the NMFS and USFWS to determine which species protected under the ESA should be included in this BA. The NMFS identified 11 species: smalltooth sawfish (*Pristis pectinata*), green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), Kemp's ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), blue whale (*Balaenoptera musculus*), finback whale (*B. physalus*), humpback whale (*Megaptera novaengliae*), sei whale (*B. borealis*), and sperm whale (*Physeter macrocephalus*). The five whale species receive additional protection under the Marine Mammal Protection Act (MMPA) (NMFS, 2007a). The USFWS identified several of the same marine species and the following two additional species: piping plover (*Charadrius melodus*) and whooping crane (*Grus americana*). Agency coordination letters and the subsequent Biological Opinion (BO) for the Freeport Widening Project (similar project area and impacts) were also reviewed (NMFS, 2007b).

Additional federally protected species are listed by Texas Parks and Wildlife Department (TPWD) as potentially occurring in Brazoria County (Appendix B: Annotated County List): Eskimo curlew (*Numenius borealis*), Gulf Coast jaguarundi *(Herpailurus yaguarondi cacomitli)*, Louisiana black bear (*Ursus americanus luteolus*), ocelot (*Leopardus pardalis*), red wolf (*Canis rufus*) (extirpated), and West Indian manatee (*Trichechus manatus*) (TPWD, 2007a). These additional species are not covered in this BA as they are not likely to occur in the study area and were not identified by the jurisdictional Federal agencies (NMFS and USFWS). Recently removed from the Federal list of threatened and endangered species, the American peregrine

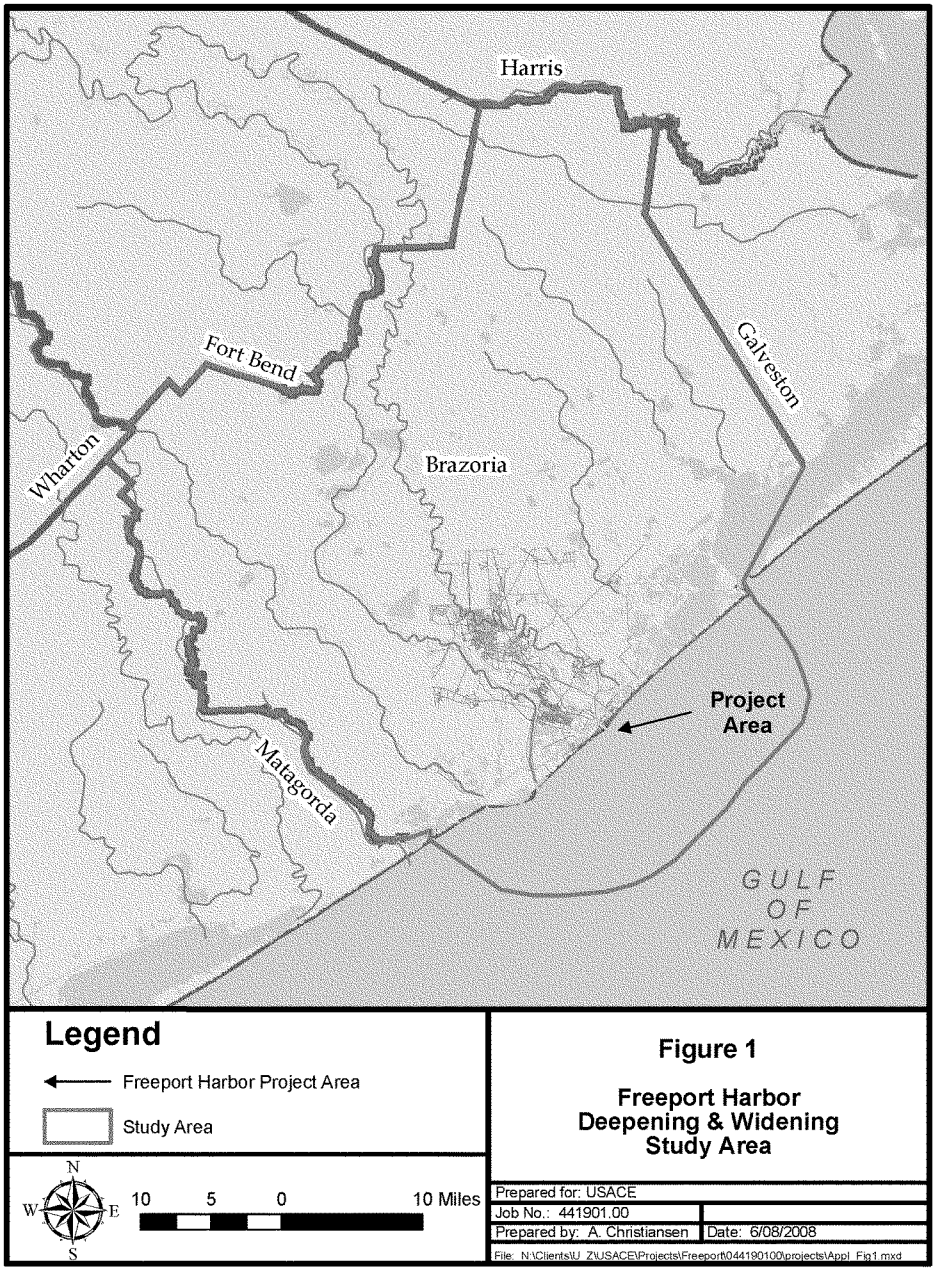
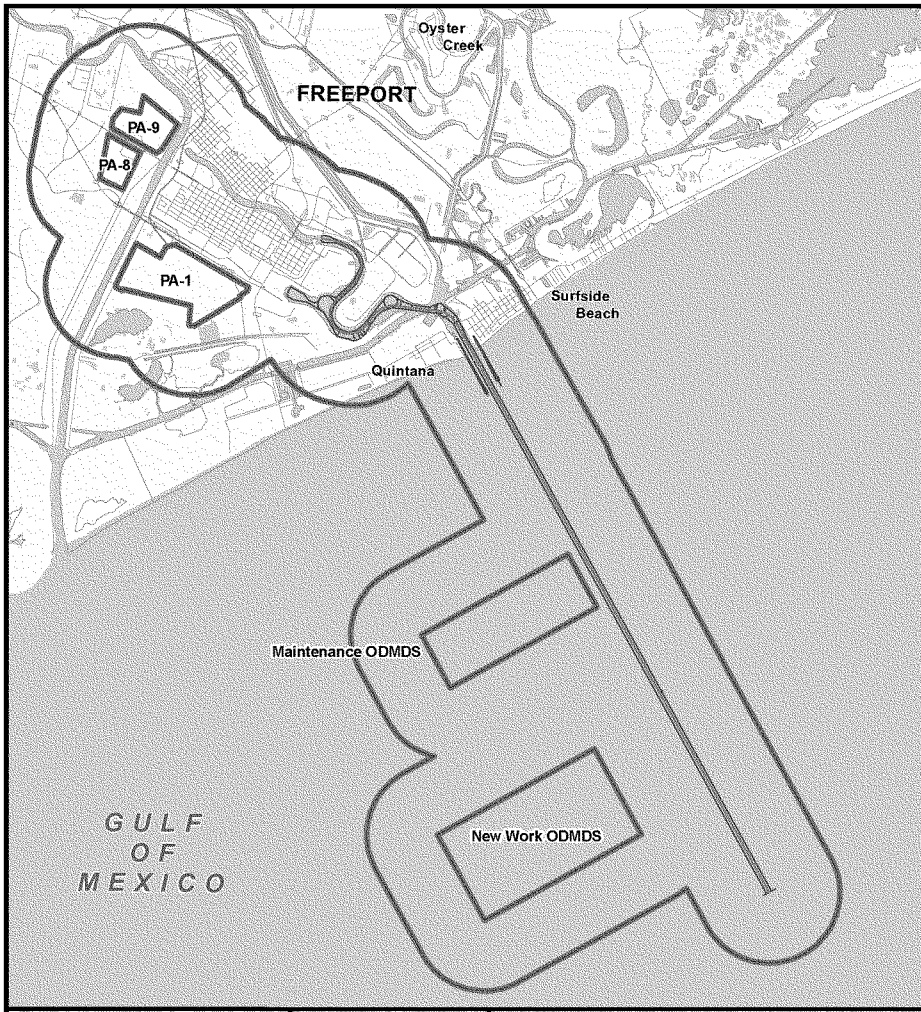


Figure 1

Freeport Harbor Deepening & Widening Study Area

Prepared for: USACE	
Job No.: 441901.00	
Prepared by: A. Christiansen	Date: 6/08/2008
File: N:\Clients\U_Z\USACE\Projects\Freeport\044190100\projects\Appl_Fig1.mxd	



Legend

Channel Centerline

Project Area Components

N
W
E
S

0 0.45 0.9 1.8
Miles

Figure 2

Freeport Harbor Deepening & Widening Project Area

Prepared for: USACE Galv	
Job No.: 044190100	
Prepared by: A.Christiansen	Date: 6/08/2008

File: N:/Clients/U_Z/USACE/Projects/Freeport/044190100/projects/Appl_Fig2.mxd

falcon, Arctic peregrine falcon, peregrine falcon, brown pelican, and bald eagle are protected under the Migratory Bird Treaty Act, and the bald eagle continues to receive additional protection under the Bald and Golden Eagle Protection Act (64 *Federal Register* [FR] 164:46542–46558; 72 FR 130:37346–37372); however, these bird species are not included in this BA as they are no longer protected under the ESA. Table 1 presents a list of the 13 federally listed threatened and endangered species that are addressed in this BA.

This BA also describes the avoidance, minimization, and conservation measures proposed for this project relative to habitat and species covered in the BA. This BA is offered to assist USFWS and NMFS personnel in fulfilling their obligations under the ESA. An Environmental Impact Statement (EIS) has been prepared to further address the potential effects resulting from the proposed project.

TABLE 1
FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES

Common Name[1]	Scientific Name[1]	Status[2]	
		USFWS	NMFS
FISH			
Smalltooth sawfish	*Pristis pectinata*	E	E
REPTILES			
Green sea turtle	*Chelonia mydas*	T	T
Hawksbill sea turtle	*Eretmochelys imbricata*	E	E
Kemp's ridley sea turtle	*Lepidochelys kempii*	E	E
Leatherback sea turtle	*Dermochelys coriacea*	E	E
Loggerhead sea turtle	*Caretta caretta*	T	T
BIRDS			
Piping plover	*Charadrius melodus*	T w/CH	NA
Whooping crane	*Grus americana*	E, EXPN	NA
MAMMALS			
Blue whale	*Balaenoptera musculus*		E/D
Finback whale	*B. physalus*		E/D
Humpback whale	*Megaptera novaengliae*		E/D
Sei whale	*B. borealis*		E/D
Sperm whale	*Physeter macrocephalus*		E/D

[1] Nomenclature follows American Ornithologist's Union (AOU, 1998, 2000, 2002, 2003, 2004, 2005, 2006), Crother et al. (2000, 2001, 2003), TPWD (2007a), USFWS (2007), and NMFS (2007a).

[2] USFWS – U.S. Fish and Wildlife Service; NMFS – National Marine Fisheries Service.

D – Depleted, as defined by the Marine Mammal Protection Act; E – Endangered; T – Threatened; w/CH – with designated Critical Habitat; NA – Status Not Applicable for that Agency; EXPN – Experimental Population.

1.2 ALTERNATIVES CONSIDERED

This section summarizes alternatives considered during the preparation of the proposed FHCIP EIS. Deepening and widening navigation improvement alternatives and dredged material placement alternatives were addressed in the EIS alternatives analysis. The No Action Alternative always remains an alternative to the proposed action.

1.2.1 No Action Alternative

The No Action Alternative is the existing project. The 45-foot Project depth would be maintained throughout the Freeport Harbor Entrance and Jetty channels. The remainder of the Freeport Harbor Main Channel, turning basins, and Stauffer Channel would remain as they are currently. Under the No Action Alternative, current navigation restrictions would continue and Freeport Harbor would not benefit from the elimination of the existing operational constraints. Vessels entering Freeport Harbor would continue to be delayed by one-way traffic and daylight-only restrictions, and vessel safety would not be improved. Dredged material would continue to be placed at current designated locations.

1.2.2 Future without Project (FWOP) Alternative

The FWOP is defined as the No Action Alternative combined with permit widening (the Widening Project). Construction of channel widening by the Port will occur before Federal construction of the FHCIP, in the event the permit is issued. Under the FWOP, the channel would be maintained at the authorized depth of 45 feet, with a permitted width of up to 600 feet for the Outer Bar and Jetty channels. The Freeport Harbor Jetty Channel from Channel Station 63+46 would be gradually widened, at the authorized depth, from 400 to 550 feet up to Channel Station 43+00. From that station to Channel Station 38+00, the channel width would be between 550 and 600 feet. The remainder of the Jetty Channel and the entire Freeport Harbor Entrance Channel (to approximately Channel Station –300+00) would be approximately 600 feet wide. The 45-foot Project depth would be maintained throughout the Freeport Harbor Outer Bar and Jetty channels. The remainder of the Freeport Harbor Main Channel, turning basins, and Stauffer Channel would remain as they are currently. For the FHCIP, the FWOP is the condition against which all proposed project alternatives are evaluated, rather than the No Action Alternative.

1.2.3 Channel Improvement Alternatives

Several channel configuration combinations were considered by USACE to identify the National Economic Development (NED) Plan. Although several channel improvement alternatives were considered in a preliminary screening analysis, only two alternatives in addition to the No Action and FWOP alternatives were identified for thorough analysis and evaluation in the EIS: the NED

Plan and the Locally Preferred Plan (LPP). The total channel length proposed for improvement is approximately 60,600 feet (11.5 miles).

The National Economic Development (NED) Plan generally proposes a 60-foot-deep by 540-foot-wide channel resulting in 23.2 million cubic yards (mcy) of new work dredged material. The LPP proposes to deepen and widen the channel to approximately 55 feet deep by 600 feet wide using a combination of mechanical, pipeline, and hopper dredges. Construction of the Locally Preferred Plan (LPP) would generate approximately 17.3 mcy of new work material, which includes the quantity for a constant advance maintenance prism of 2 feet and a constant allowable overdepth of 2 feet for the entire length of the channel.

The LPP is the USACE tentatively Recommended Plan (Preferred Alternative) in the EIS and is, therefore, the alternative evaluated in this BA. Specifically, the LPP proposes to do the following:

- Restore the Stauffer Turning Basin to 25-foot depth and 500-foot diameter;
- Reauthorize and improve the upper reach of the Stauffer Channel to 25 feet by 200 feet;
- Reauthorize and improve the lower reach of the Stauffer Channel to 50 feet by 300 feet;
- Deepen the Upper Turning Basin to 50 feet;
- Improve the Channel to Upper Turning Basin (52) to 50 feet by 400 feet;
- Increase the footprint of the Brazosport Turning Basin to 1,200 feet in diameter and deepen to 55 feet;
- Deepen the Channel to Brazosport Turning Basin to 55 feet;
- Deepen the Lower Turning Basin to 55 feet;
- Widen the Jetty Channel up to 600 feet and deepen to 55 feet;
- Widen the Outer Bar Channel to 600 feet and deepen to 57 feet; and
- Extend the Outer Bar Channel from the present offshore terminus to the 57-foot contour.

All dredged material will be placed in an existing upland PA (PA 1), two newly designated PAs (PA 8 and PA 9), a new work material ocean dredged material disposal site (ODMDS), and a maintenance material ODMDS (see Figure 2).

Dredged material placement alternatives considered by the USACE during the process of identifying the NED Plan included beneficial use, placement in existing upland confined PAs, placement in new upland confined PAs, and placement in ODMDSs. Several combinations of placement alternatives were considered in a preliminary screening analysis. Combinations that provided the most benefit at the least cost were incorporated into the LPP and NED Plans.

1.2.4 Dredged Material Placement Area Alternatives

Implementation of the proposed channel improvements under the LPP (Preferred Alternative) would result in approximately 14.6 mcy of new work dredged material and approximately 6.03 mcy of maintenance material each maintenance dredging cycle.

1.3 HABITAT IMPACTS

The study area is located within the Upper Coast division (Hatch et al., 1999) of the Gulf Coast Prairies and Marshes Ecoregion (Gould, 1975). This ecoregion is a nearly level plain less than 250 feet in elevation, covering approximately 10 million acres. The Gulf Coast Prairies include the coastal plain that extends approximately 30–80 miles inland, while the Gulf Marshes are located in a narrow strip of lowlands adjacent to the coast and barrier islands (Hatch et al., 1999).

The communities of Surfside and Quintana Beach, to the northeast and southwest of the Entrance Channel, respectively, are adjacent to the Port Freeport Ship Channel. Very little undeveloped area occurs in the immediate vicinity of the ship channel other than the beach and dunes complex. This complex includes the Gulf shoreline and interior wetlands that are hydrologically connected to the ship channel via natural and manmade (e.g., Gulf Intracoastal Waterway [GIWW]) channels.

The LPP (Preferred Alternative) project area encompasses the proposed channel improvement area, one existing and two new upland PAs, and two previously designated ODMDSs (see Figure 2). Presently, it is anticipated that the existing PA 1 and newly designated PA 8 and PA 9 will accommodate dredged material removed from the Lower Turning Basin upstream through the channel to the Stauffer Turning Basin. Dredged materials removed from the Jetty Channel and the Entrance Channel seaward to the proposed channel extension near the vicinity of the 60-foot depth contour in the Gulf would be placed in an existing one-time-use ODMDS, provided concurrence is obtained from the U.S. Environmental Protection Agency (EPA). Placement of dredged material may impact areas within and immediately adjacent to the project area. Maintenance dredging is anticipated to stay on the current cycle for the existing Freeport Channel; material from these activities will be placed in the previously designated maintenance material ODMDS and three upland PAs (PA 1, PA 8, and PA 9).

The existing PA 1 lies south of Freeport, east of State Highway (SH) 288, and south of SH 36. It has limited existing capacity already designated for use; therefore, two new upland confined PAs are proposed as part of the LPP (Preferred Alternative), PA 8 and PA 9. These PAs are located west of the terminus of the Freeport Channel on land referred to as tracts Eight and Nine. Tract Eight is 254 acres south of County Road (CR) 217, bordered by SH 36 to the south, and will contain PA 8 (168 acres). Tract Nine is 442 acres north of CR 217 and will contain PA 9 with a footprint of 250 acres. Both parcels can be predominantly classified as grasslands with some wetland and forest habitat. Habitat on these two parcels has been classified by the USFWS and

TPWD as wet-coastal prairie. Potential impacts from construction of PA 8 and PA 9 include the total conversion of approximately 350 acres of grassland, almost 40 acres of freshwater ephemeral wetlands, and just over 20 acres of riparian forested habitat. The USACE coordinated with the USFWS and TPWD to apply a Habitat Evaluation Procedure (HEP) and Cost Effectiveness/Incremental Cost Analysis on proposed plans to identify the preferred mitigation plan for unavoidable impacts of the LPP.

2.0 STATUS OF THE LISTED SPECIES

To assess the potential impacts of the proposed project on federally listed threatened and endangered species, PBS&J personnel (1) requested the list of species from the NMFS and USFWS to include in this BA; (2) reviewed the TPWD Natural Diversity Database (TXNDD), NMFS and USFWS literature, and other scientific data to determine species distributions, habitat needs, and other biological requirements; (3) interviewed recognized experts on the listed species, including local and regional authorities and Federal and State wildlife personnel; and (4) conducted an on-site evaluation, where possible, of the biological resources within the project area.

Literature sources consulted for this report include the USFWS series on endangered species of the seacoast of the U.S. (National Fish and Wildlife Laboratory [NFWL], 1980), Federal status reports and recovery plans, TPWD Federal aid project reports, peer-reviewed journals, and other standard references including agency websites. Habitat assessments were initially based on aerial photography and National Wetlands Inventory (NWI) mapping and then field-verified. The USACE, Galveston District provided information on the two proposed upland PAs including a description of habitats, HEP analysis, and an evaluation of mitigation alternatives. Input was also solicited from State and Federal resource agency personnel.

Species identified by the USFWS and NMFS for this BA are listed in Table 1 (Section 1.1). The following sections present the natural history of each considered species relevant to its potential occurrence in the study area. Section 3.0 presents the potential of the LPP (Preferred Alternative) to affect these species and USACE determinations.

2.1 SMALLTOOTH SAWFISH

2.1.1 Reasons for Status

Smalltooth sawfish (*Pristis pectinata*) populations have declined due to commercial fisheries (bycatch) and recreational fisheries (unsuccessful catch and release, "trophy" pursuits, and injury from saw removal), habitat loss and degradation (decline/loss of mangrove shoreline habitats, modified freshwater inflows affecting salinities, agricultural and urban development and runoff, commercial activities, channel dredging, and boating), and entanglement in marine debris, pollution, and disturbance of natural behavior by divers and other marine activities. Sawfish are slow growing, late maturing, and produce small numbers of young; hence, recovery will take decades, even if all threats are effectively eliminated (NMFS, 2006).

2.1.2 Habitat

Shallow coastal waters of tropical and temperate seas and estuaries along the Atlantic Coast (New York to Brazil) and the Gulf (primarily Louisiana to southern Florida) provide habitats for the sawfish. Sawfish are found in shallow waters very close to shore over muddy and sandy bottoms, sheltered bay areas, shallow banks, and in estuaries or river mouths. Mangrove habitats are key to juvenile success. Larger individuals of this species are also found offshore at depths up to at least 122 meters (NMFS, 2006).

2.1.3 Range

Smalltooth sawfish distribution is circumtropical. Historically, in U.S. waters this species was more common in the Texas and northern inshore Gulf and lower river segments than in the Atlantic area north of Florida. Additionally, this species was known from Mexican waters; however, there is no evidence of a remaining resident population (NMFS, 2006). As of 2006, NMFS has determined that this species' range has contracted by approximately 90 percent, now restricted primarily to the extreme southern portion of peninsular Florida between the Caloosahatchee River and the Florida Keys.

2.1.4 Distribution in Texas

Between 1971 and 2006, there have been only three published or museum reports of smalltooth sawfish captured from the Texas-Florida Gulf region; all of these have been from Texas. Potential mangrove habitats for juveniles exist only infrequently along the Texas Gulf Coast in Jefferson, Galveston, Calhoun, Aransas, Nueces, Kleberg, and Cameron counties (U.S. Department of Agriculture, 2007).

2.1.5 Presence in the Study Area

The smalltooth sawfish is unlikely to occur in the project area as the declining population currently remains only off the coast of Florida and suitable habitats are limited within the project area.

2.2 GREEN SEA TURTLE

2.2.1 Reasons for Status

The green turtle (*Chelonia mydas*) was listed on July 28, 1978, as threatened except for Florida and the Pacific Coast of Mexico (including the Gulf of California) where it was listed as endangered (43 FR 32808). The greatest cause of decline in green turtle populations is commercial harvest for eggs and food. Other turtle parts are used for leather and jewelry, and small turtles are sometimes stuffed for curios. Incidental catch during commercial shrimp trawling is a continued source of mortality that adversely affects recovery. It is estimated that

before the implementation of turtle excluder devices (TEDs) requirements, the offshore commercial shrimp fleet captured about 925 green turtles a year, of which approximately 225 would die. Most turtles killed are juveniles and subadults. Various other fishing operations also negatively affect this species (NMFS, 2007c). Epidemic outbreaks of fibropapilloma, or "tumor" infections, recently have occurred on green sea turtles, especially in Hawaii and Florida, posing a severe threat. The cause of these outbreaks is largely unknown, but it could be caused by a viral infection (Barrett, 1996). This species is also subject to various negative impacts shared by sea turtles in general.

2.2.2 Habitat

The green turtle primarily utilizes shallow habitats such as lagoons, bays, inlets, shoals, estuaries, and other areas with an abundance of marine algae and seagrasses. Individuals observed in the open ocean are believed to be migrants en route to feeding grounds or nesting beaches (Meylan, 1982). Hatchlings often float in masses of sea plants (e.g., rafts of sargassum) in convergence zones. Coral reefs and rocky outcrops near feeding pastures often are used as resting areas. The adults are primarily herbivorous, while the juveniles consume more invertebrates. Foods consumed include seagrasses, macroalgae and other marine plants, mollusks, sponges, crustaceans, and jellyfish (Mortimer, 1982).

Terrestrial habitat is typically limited to nesting activities, although in some areas, such as Hawaii and the Galápagos Islands, they will bask on beaches (Balazs, 1980). They prefer high-energy beaches with deep sand, which may be coarse to fine, with little organic content. At least in some regions, they generally nest consistently at the same beach, which is apparently their natal beach (Allard et al., 1994; Meylan et al., 1990), although an individual might switch to a different nesting beach within a single nesting season.

2.2.3 Range

The green turtle is a circumglobal species in tropical and subtropical waters. In U.S. Atlantic waters, it occurs around the U.S. Virgin Islands, Puerto Rico, and continental U.S. from Massachusetts to Texas. Major nesting activity occurs on Ascension Island, Aves Island (Venezuela), Costa Rica, and in Surinam. Relatively small numbers nest in Florida, with even smaller numbers in Georgia, North Carolina, and Texas (Hirth, 1997; NMFS and USFWS, 1991a).

2.2.4 Distribution in Texas

The green turtle in Texas inhabits shallow bays and estuaries where its principal foods, the various marine grasses, grow (Bartlett and Bartlett, 1999). Its population in Texas has suffered a decline similar to that of its world population. In the mid to late nineteenth century, Texas waters supported a green turtle fishery. Most of the turtles were caught in Matagorda Bay, Aransas Bay,

and the lower Laguna Madre, although a few also came from Galveston Bay. Many live turtles were shipped to places such as New Orleans or New York and from there to other areas. Others were processed into canned products such as meat or soup prior to shipment. By 1900, however, the fishery had virtually ceased to exist. Turtles continued to be hunted sporadically for a while, the last Texas turtler hanging up his nets in 1935. Incidental catches by anglers and shrimpers were sometimes marketed prior to 1963, when it became illegal to do so (Hildebrand, 1982).

Green turtles still occur in these same bays today but in much-reduced numbers (Hildebrand, 1982). While green turtles prefer to inhabit bays with seagrass meadows, they may also be found in bays that are devoid of seagrasses. The green turtles in these Texas bays are mainly small juveniles. Adults, juveniles, and even hatchlings are occasionally caught on trotlines or by offshore shrimpers or are washed ashore in a moribund condition.

Green turtle nests are rare in Texas. Five nests were recorded at the Padre Island National Seashore in 1998, none in 1999, and one in 2000 (National Park Service [NPS], 2006; Shaver, 2000). Between 2001 and 2005, up to five nests per year were recorded from the Texas coast (Shaver, 2006). Two green turtle nests were recorded each year at Padre Island National Seashore during 2006 and 2007 (NPS, 2007). Green turtles, however, nest more in Florida and in Mexico. Since long migrations of green turtles from their nesting beaches to distant feeding grounds are well documented (Green, 1984; Meylan, 1982), the adult green turtles occurring in Texas may be either at their feeding grounds or in the process of migrating to or from their nesting beaches. The juveniles frequenting the seagrass meadows of the bay areas may remain there until they move to other feeding grounds or, perhaps, once having attained sexual maturity, return to their natal beaches outside of Texas to nest.

2.2.5 Presence in the Study Area

The USACE Sea Turtle Data Warehouse (USACE, 2010) maintains records of documented incidental takes of sea turtles as a result of hopper dredging activities throughout southeastern coastal waters. Incidences involving impacts to two green sea turtle individuals within Freeport Harbor Channel were recorded in 2006. One incident regarding impact to an individual green sea turtle within the Freeport Harbor Entrance Channel was documented in 2007. These documented events provide clear indication of the likelihood of these turtles occurring within the project area. No green turtle nests have been recorded from the study area (NPS, 2007; Shaver, 2006).

2.3 HAWKSBILL SEA TURTLE

2.3.1 Reasons for Status

The hawksbill sea turtle (*Eretmochelys imbricata*) was federally listed as endangered on June 2, 1970 (35 FR 8495) with critical habitat designated in Puerto Rico on May 24, 1978 (43 FR 22224). The greatest threat to this species is harvest to supply the market for tortoiseshell and

stuffed turtle curios (Meylan and Donnelly, 1999). Hawksbill shell (bekko) commands high prices. Japanese imports of raw bekko between 1970 and 1989 totaled 713,850 kilograms, representing more than 670,000 turtles. The hawksbill is also used in the manufacture of leather, oil, perfume, and cosmetics (NMFS, 2007c).

Other threats include destruction of breeding locations by beach development, incidental take in lobster and Caribbean reef fish fisheries, pollution by petroleum products (especially oil tanker discharges), entanglement in persistent marine debris (Meylan, 1992), and predation on eggs and hatchlings. In American Samoa, most sea turtles and eggs encountered by villagers are harvested (Tuato'o-Bartley et al., 1993). See USFWS (1998) for detailed information on certain threats, including beach erosion, beach armoring, beach nourishment, sand mining, artificial lighting, beach cleaning, increased human presence, recreational beach equipment, predation, and poaching. In 1998, NMFS designated critical habitat near Isla Mona and Isla Monito, Puerto Rico, seaward to 5.6 kilometers (km) (63 FR 46693–46701).

2.3.2 Habitat

Hawksbills generally inhabit coastal reefs, bays, rocky areas, passes, estuaries, and lagoons, where they occur at depths of less than 70 feet. Like some other sea turtle species, hatchlings are sometimes found floating in masses of marine plants (e.g., sargassum rafts) in the open ocean (NFWL, 1980). Hawksbills re-enter coastal waters when they reach a carapace length of approximately 20 to 25 centimeters. Coral reefs are widely recognized as the resident foraging habitat of juveniles, subadults, and adults. This habitat association is undoubtedly related to their diet of sponges, which need solid substrate for attachment. Hawksbills also occur around rocky outcrops and high-energy shoals, which are also optimum sites for sponge growth. In Texas, juvenile hawksbills are associated with stone jetties (NMFS, 2007c).

While this species is omnivorous, it prefers invertebrates, especially encrusting organisms, such as sponges, tunicates, bryozoans, mollusks, corals, barnacles, and sea urchins. Pelagic species consumed include jellyfish and fish, and plant material such as algae, sea grasses and mangroves have been reported as food items for this turtle (Carr, 1952; Mortimer, 1982; Musick, 1979; Pritchard, 1977; Rebel, 1974). The young are reported to be somewhat more herbivorous than adults (Ernst and Barbour, 1972).

Terrestrial habitat is typically limited to nesting activities. The hawksbill, which is typically a solitary nester, nests on undisturbed, deep-sand beaches, from high-energy ocean beaches to tiny pocket beaches several meters wide bounded by crevices of cliff walls. Typically, the sand beaches are low energy, with woody vegetation, such as sea grape (*Coccoloba uvifera*), near the waterline (National Research Council [NRC], 1990).

2.3.3 Range

The hawksbill is circumtropical, occurring in tropical and subtropical seas of the Atlantic, Pacific, and Indian oceans (Witzell, 1983). This species is probably the most tropical of all marine turtles, although it does occur in many temperate regions. The hawksbill sea turtle is widely distributed in the Caribbean Sea and western Atlantic Ocean, with representatives of at least some life history stages regularly occurring in southern Florida and the northern Gulf (especially Texas), south to Brazil (NMFS, 2007c). In the continental U.S., the hawksbill largely nests in Florida where it is sporadic at best (NFWL, 1980). However, a major nesting beach exists on Mona Island, Puerto Rico. Elsewhere in the western Atlantic, hawksbills nest in small numbers along the Gulf Coast of Mexico, the West Indies, and along the Caribbean coasts of Central and South America (Musick, 1979).

2.3.4 Distribution in Texas

Texas is the only state outside of Florida where hawksbills are sighted with any regularity. Most of these sightings involve posthatchlings and juveniles, and are primarily associated with stone jetties. These small turtles are believed to originate from nesting beaches in Mexico (NMFS, 2007c). On 13 June 1998, the first hawksbill nest recorded on the Texas coast was found at Padre Island National Seashore. This nest remains the only documented hawksbill nest on the Texas coast (NPS, 2007; Shaver, 2006).

2.3.5 Presence in the Study Area

No documented records of hawksbills exist from Brazoria County, Texas (Dixon, 2000); however, this species is of potential occurrence in the study area (TPWD, 2007a).

2.4 KEMP'S RIDLEY SEA TURTLE

2.4.1 Reasons for Status

Kemp's ridley sea turtle (*Lepidochelys kempii*) was listed as endangered throughout its range on December 2, 1970 (35 FR 18320). Populations of this species have declined since 1947, when an estimated 42,000 females nested in one day (Hildebrand, 1963), to a total nesting population of approximately 1,000 in the mid-1980s. The decline of this species was primarily due to human activities including collection of eggs, fishing for juveniles and adults, killing adults for meat and other products, and direct take for indigenous use. In addition to these sources of mortality, Kemp's ridleys have been subject to high levels of incidental take by shrimp trawlers (NMFS, 2007c; USFWS and NMFS, 1992). The NRC Committee on Sea Turtle Conservation estimated in 1990 that 86 percent of the human-caused deaths of juvenile and adult loggerheads and Kemp's ridleys resulted from shrimp trawling (Campbell, 1995). Before the implementation of TEDs, estimates showed that the commercial shrimp fleet killed between 500 and 5,000 Kemp's

ridleys each year (NMFS, 2007c). Kemp's ridleys have also been taken by pound nets, gill nets, hook and line, crab traps, and longlines.

Another problem shared by adult and juvenile sea turtles is the ingestion of manmade debris and garbage. Postmortem examinations of sea turtles found stranded on the south Texas coast from 1986 through 1988 revealed 54 percent (60 of the 111 examined) of the sea turtles had eaten some type of marine debris. Plastic materials were most frequently ingested and included pieces of plastic bags, Styrofoam, plastic pellets, balloons, rope, and fishing line. Nonplastic debris such as glass, tar, and aluminum foil were also ingested by the sea turtles examined. Much of this debris comes from offshore oil rigs, cargo ships, commercial and recreational fishing boats, research vessels, naval ships, and other vessels operating in the Gulf. Laws enacted during the late 1980s to regulate this dumping are difficult to enforce over vast expanses of water. In addition to trash, pollution from heavy spills of oil or waste products poses additional threats (Campbell, 1995).

Further threats to this species include collisions with boats, explosives used to remove oil rigs, and entrapment in coastal power plant intake pipes (Campbell, 1995). Dredging operations affect Kemp's ridley turtles through incidental take and by degrading the habitat. Incidental take of ridleys has been documented with hopper dredges. In addition to direct take, channelization of the inshore and nearshore areas can degrade foraging and migratory habitat through spoil dumping, degraded water quality/clarity, and altered current flow (USFWS and NMFS, 1992).

Sea turtles are especially subject to human impacts during the time the females come ashore for nesting. Modifications to nesting areas can have a devastating effect on sea turtle populations. In many cases, prime sea turtle nesting sites are also prime real estate. If a nesting site has been disturbed or destroyed, female turtles may nest in inferior locations where the hatchlings are less likely to survive, or they may not lay any eggs at all. Artificial lighting from developed beachfront areas often disorients nesting females and hatchling sea turtles, causing them to head inland by mistake, often with fatal results. Adult females may also avoid brightly lit areas that would otherwise provide suitable nesting sites.

Kemp's ridley appears to be in the earliest stages of recovery. Approximately 6,000 Kemp's ridley nests were recorded on Mexican beaches during the 2000 nesting season (Shaver, 2000); just over 10,000 nests were recorded there during the 2005 nesting season (Shaver, 2006). Similarly, increased nesting activity has been recorded on the Texas beaches in the last decade or so from 4 nests in 1995 to 51 nests in 2005 (NPS, 2006; Shaver, 2006). Some of these nests were from head-started ridleys. Of 46 Kemp's ridley nests encountered in the continental U.S. during 2004, 42 were on Texas beaches (NPS, 2006). The increase can likely be attributed to two primary factors: full protection of nesting females and their nests in Mexico, and the requirement to use TEDs in shrimp trawls both in the U.S. and in Mexico (NMFS, 2007c).

2.4.2 Habitat

Kemp's ridleys inhabit shallow coastal and estuarine waters, usually over sand or mud bottoms. Adults are primarily shallow-water benthic feeders that specialize on crabs, especially portunid crabs, while juveniles feed on sargassum (*Sargassum* sp.) and associated infauna, and other epipelagic species of the Gulf (USFWS and NMFS, 1992). In some regions the blue crab (*Callinectes sapidus*) is the most common food item of adults and juveniles. Other food items include shrimp, snails, bivalves, sea urchins, jellyfish, sea stars, fish, and occasional marine plants (Campbell, 1995; Pritchard and Marquez, 1973; Shaver, 1991).

2.4.3 Range

Adults are primarily restricted to the Gulf, although juveniles may range throughout the Atlantic Ocean since they have been observed as far north as Nova Scotia (Musick, 1979) and in coastal waters of Europe (Brongersma, 1972). Important foraging areas include Campeche Bay, Mexico, and Louisiana coastal waters.

Almost the entire population of Kemp's ridleys nests on an 11-mile stretch of coastline near Rancho Nuevo, Tamaulipas, Mexico, approximately 190 miles south of the Rio Grande. A secondary nesting area occurs at Tuxpan, Veracruz, and sporadic nesting has been reported from Mustang Island, Texas, southward to Isla Aquada, Campeche. Several scattered isolated nesting attempts have occurred from North Carolina to Colombia.

Because of the dangerous population decline at the time, a head-starting program was carried out from 1978 to 1988. Eggs were collected from Rancho Nuevo and placed into polystyrene foam boxes containing Padre Island sand so that the eggs never touched the Ranch Nuevo sand. The eggs were flown to the U.S. and placed in a hatchery on Padre Island and incubated. The resulting hatchlings were allowed to crawl over the Padre Island beaches into the surf for imprinting purposes before being recovered from the surf and taken to Galveston for rearing. They were fed a diet of high-protein commercial floating pellets for 7 to 15 months before being released into Texas or Florida waters (Caillouet et al., 1995). This program has shown some results. The first nesting from one of these head-started individuals occurred at Padre Island in 1996, and more nesting has occurred since (Shaver, 2000).

2.4.4 Distribution in Texas

Kemp's ridley occurs in Texas in small numbers and in many cases may well be in transit between crustacean-rich feeding areas in the northern Gulf and breeding grounds in Mexico. It has nested sporadically in Texas in the last 50 years. Nests were found near Yarborough Pass in 1948 and 1950, and in 1960 a single nest was located at Port Aransas. The number of nestings, however, has increased in recent years: 1995 (4 nests); 1996 (6 nests); 1997 (9 nests); 1998 (13 nests); 1999 (16 nests); 2000 (12 nests); 2001 (8 nests); 2002 (38 nests); 2003 (19 nests); 2004

(42 nests); 2005 (51 nests); and 2006 (102 nests) (NPS, 2007; Shaver, 2000, 2006; Yeargan, 2006, 2007). As noted above, some of these nests were from head-started ridleys. Of the 102 Kemp's ridley nests recorded for Texas in 2006, 64 were at the Padre Island National Seashore (NPS, 2007). In 2007, 128 Kemp's ridley nests were recorded on Texas beaches, already surpassing the total for 2006 (NPS, 2007). Such nestings, together with the proximity of the Rancho Nuevo rookery, probably account for the occurrence of hatchlings and subadults in Texas. According to Hildebrand (1982, 1986, 1987), sporadic ridley nesting in Texas has always been the case. This is in direct contradiction, however, to Lund (1974), who believed that Padre Island historically supported large numbers of nesting Kemp's ridleys, but that the population became extirpated because of excessive egg collection.

2.4.5 Presence in the Study Area

Kemp's ridley has been recorded from the study area. In 1994, a head-started ridley was accidentally caught by a fisherman on a rod and reel in the GIWW and released alive (TPWD, 2006). This species has also nested in the study area. One nest was found on Quintana Beach in 2002, a second was found near Surfside Beach in 2003, and another was found on Surfside Beach in 2006 (Yeargan, 2006, 2007). Two of the 128 Kemp's ridley nests recorded to date in 2007 are from Surfside Beach and one is from Bryan Beach (NPS, 2007). The USACE Sea Turtle Data Wharehouse (USACE, 2010) documents the taking of two Kemp's ridley turtles within the Freeport Harbor Entrance Channel in 2007.

2.5 LEATHERBACK SEA TURTLE

2.5.1 Reasons for Status

The leatherback sea turtle (*Dermochelys coriacea*) was listed as endangered throughout its range on June 2, 1970 (35 FR 8495), with critical habitat designated in the U.S. Virgin Islands on September 26, 1978, and March 23, 1979 (43 FR 43688–43689 and 44 FR 17710–17712, respectively). In 1999, in a rule conforming and consolidating various regulations, NMFS amended and redesignated this habitat while also establishing a "conservation zone" extending from Cape Canaveral to the Virginia-North Carolina border and including all inshore and offshore waters; this zone is subject to shrimping closures when high abundance of leatherbacks is documented (64 FR 14067, March 23, 1999).

This species' decline is attributable to overexploitation and incidental mortality, generally associated with commercial shrimping and fishing activities. Use of turtle meat for fish bait and the consumption of litter by turtles are also causes of mortality, the latter phenomenon apparently occurring when plastic is mistaken for jellyfish (Rebel, 1974). Egg collection, nest destruction, and habitat degradation are major adverse impacts to the species' nesting beaches and hatch success (NatureServe, 2006). Because leatherbacks nest in the tropics during hurricane season, a potential exists for storm-generated waves and wind to erode nesting beaches, resulting in nest

loss (NMFS and USFWS, 1992). This species may be susceptible to drowning in shrimp trawlers equipped with TEDs because adult leatherbacks are too large to pass through the TED exit opening. Mortality associated with the swordfish gillnet fisheries in Peru and Chile represents the single largest source of mortality for East Pacific leatherbacks (Eckert and Sarti, 1997).

2.5.2 Habitat

The leatherback sea turtle is mainly pelagic, inhabiting the open ocean, and seldom approaches land except for nesting (Eckert, 1992). It is most often found in coastal waters only when nesting or when following concentrations of jellyfish (TPWD, 2007b), when it can be found in inshore waters, bays, and estuaries. It dives almost continuously, often to great depths.

Despite their large size, the diet of leatherbacks consists largely of jellyfish and sea squirts. They also consume sea urchins, squid, crustaceans, fish, blue-green algae, and floating seaweed (NFWL, 1980). The leatherback typically nests on beaches with a deep-water approach (Pritchard, 1971).

2.5.3 Range

The leatherback is probably the most wide-ranging of all sea turtle species. It occurs in the Atlantic, Pacific, and Indian oceans; as far north as British Columbia, Newfoundland, Great Britain, and Norway; as far south as Australia, Cape of Good Hope, and Argentina; and in other waterbodies such as the Mediterranean Sea (NFWL, 1980). Leatherbacks nest primarily in tropical regions; major nesting beaches include Malaysia, Mexico, French Guiana, Surinam, Costa Rica, and Trinidad (Ross, 1982). Leatherbacks nest only sporadically in some of the Atlantic and Gulf states of the continental U.S., with one nesting reported as far north as North Carolina (Schwartz, 1976). In the Atlantic and Caribbean, the largest nesting assemblages occur in the U.S. Virgin Islands, Puerto Rico, and Florida (NMFS, 2007c).

The leatherback migrates farther and ventures into colder water than any other marine reptile. Adults appear to engage in routine migrations between boreal, temperate, and tropical waters, presumably to optimize both foraging and nesting opportunities. The longest-known movement is that of an adult female that traveled 5,900 km to Ghana, West Africa, after nesting in Surinam (NMFS and USFWS, 1992). During the summer, leatherbacks tend to occur along the east coast of the U.S. from the Gulf of Maine south to the middle of Florida.

2.5.4 Distribution in Texas

Apart from occasional feeding aggregations such as the large one of 100 animals reported by Leary (1957) off Port Aransas in December 1956, or possible concentrations in the Brownsville Eddy in winter (Hildebrand, 1983), leatherbacks are rare along the Texas coast, tending to keep to deeper offshore waters where their primary food source, jellyfish, occurs. In the Gulf, the

leatherback is often associated with two species of jellyfish: cabbagehead (*Stomolophus* sp.) and moon (*Aurelia* sp.) (NMFS and USFWS, 1992). According to USFWS (1981), leatherbacks have never been common in Texas waters. No nests of this species have been recorded in Texas for at least 70 years (NPS, 2007). The last two, one from the late 1920s and one from the mid-1930s, were both from Padre Island (Hildebrand, 1982, 1986).

2.5.5 Presence in the Study Area

A leatherback was caught by a relocation trawler in a shipping channel approximately 1.5 miles north of Aransas Pass in 2003 (i.e., south of the project area; NMFS, 2003). This species is unlikely to occur in the study area.

2.6 LOGGERHEAD SEA TURTLE

2.6.1 Reasons for Status

The loggerhead sea turtle (*Caretta caretta*) was listed by the USFWS as threatened throughout its range on July 28, 1978 (43 FR 32808). The decline of the loggerhead, like that of most sea turtles, is the result of overexploitation by man, inadvertent mortality associated with fishing and trawling activities, and natural predation. The most significant threats to its population are coastal development, commercial fisheries, and pollution (NMFS, 2007c).

2.6.2 Habitat

The loggerhead sea turtle occurs in the open seas as far as 500 miles from shore, but mainly over the continental shelf, and in bays, estuaries, lagoons, creeks, and mouths of rivers. It favors warm temperate and subtropical regions not far from shorelines. The adults occupy various habitats, from turbid bays to clear waters of reefs. Subadults occur mainly in nearshore and estuarine waters. Hatchlings move directly to sea after hatching, and often float in masses of sargassum. They may remain associated with sargassum for perhaps 3 to 5 years (NMFS and USFWS, 1991b).

Commensurate with their use of varied habitats, loggerheads consume a wide variety of both benthic and pelagic food items, which they crush before swallowing. Conches, shellfish, horseshoe crabs, prawns and other crustacea, squid, sponges, jellyfish, basket stars, fish (carrion or slow-moving species), and even hatchling loggerheads have all been recorded as loggerhead prey (Hughes, 1974; Mortimer, 1982; Rebel, 1974). Adults forage primarily on the bottom, but also take jellyfish from the surface. The young feed on prey concentrated at the surface such as gastropods, fragments of crustaceans, and sargassum.

Nesting occurs usually on open sandy beaches above the high-tide mark and seaward of well-developed dunes. They nest primarily on high-energy beaches on barrier islands adjacent to

continental land masses in warm-temperate and subtropical regions. Steeply sloped beaches with gradually sloped offshore approaches are favored. In Florida, nesting on urban beaches was strongly correlated with the presence of tall objects (trees or buildings), which apparently shield the beach from city lights (Salmon et al., 1995).

2.6.3 Range

The loggerhead is widely distributed in tropical and subtropical seas, being found in the Atlantic Ocean from Nova Scotia to Argentina, Gulf of Mexico, Indian and Pacific oceans (although it is rare in the eastern and central Pacific), and the Mediterranean Sea (Iverson, 1986; Rebel, 1974; Ross, 1982). In the continental U.S., loggerheads nest along the Atlantic coast from Florida to as far north as New Jersey (Musick, 1979) and sporadically along the Gulf Coast. In recent years, a few have nested on barrier islands along the Texas coast. The loggerhead is the most abundant sea turtle species in U.S. coastal waters (NMFS, 2007c).

2.6.4 Distribution in Texas

The loggerhead is the most abundant turtle in Texas marine waters, preferring shallow inner continental shelf waters and occurring only very infrequently in the bays. It often occurs near offshore oil rig platforms, reefs, and jetties. Loggerheads are probably present year-round but are most noticeable in the spring when a favored food item, the Portuguese man-of-war (*Physalia physalis*), is abundant. Loggerheads constitute a major portion of the dead or moribund turtles washed ashore (stranded) on the Texas coast each year. A large proportion of these deaths are the result of accidental capture by shrimp trawlers, where caught turtles drown and their bodies are dumped overboard. Before 1977, no positive documentation of loggerhead nests in Texas existed (Hildebrand, 1982). Since that time, several nests have been recorded along the Texas coast. In 1999, two loggerhead nests were confirmed in Texas, while in 2000, five loggerhead nests were confirmed (Shaver, 2000). Between 2001 and 2005, up to five loggerhead nests per year were recorded from the Texas coast (Shaver, 2006). Two loggerhead nests were recorded in 2006: one at Padre Island National Seashore and the other on South Padre Island; and six loggerhead nests were recorded on Texas beaches in 2007 (NPS, 2007). Like the worldwide population, the population of loggerheads in Texas has declined. Prior to World War I, the species was taken in Texas for local consumption and a few were marketed (Hildebrand, 1982). Today, even with protection, insufficient loggerheads exist to support a fishery.

2.6.5 Presence in the Study Area

This species has been recorded in the study area. Between 1995 and 2000, eight loggerheads were caught in Freeport Harbor Channel, and during the Freeport Harbor Project (July 13 to September 24, 2002), a relocation trawler captured one loggerhead (NMFS, 2003). More recently, an additional loggerhead was incidentally taken in the Freeport Harbor Entrance

Channel in 2006 as a result of dredging activities (USACE, 2010). No nests have been recorded in the study area.

2.7 PIPING PLOVER

2.7.1 Reasons for Status

The USFWS listed the piping plover (*Charadrius melodus*) as threatened and endangered on December 11, 1985 (50 FR 50726–50734). The piping plover is a federally listed endangered species in the Great Lakes watershed, while the birds breeding on the Atlantic Coast and northern Great Plains are federally listed as threatened. Piping plovers wintering in Texas and Louisiana are part of the northern Great Plains and Great Lakes populations.

Shorebird hunting during the early 1900s caused the first known major decline of piping plovers (Bent, 1929). Since then, loss or modification of habitat resulting from commercial, residential, and recreational developments, dune stabilization, damming and channelization of rivers (eliminating sandbars, encroachment of vegetation, and altering water flows), and wetland drainage have further contributed to the decline of the species. Additional threats include human disturbances through recreational use of habitat and predation of eggs by feral pets (USFWS, 1995).

2.7.2 Habitat

Piping plovers typically inhabit shorelines of oceans, rivers, and inland lakes. Nest sites include sandy beaches, especially where scattered tufts of grass are present; sandbars; causeways; bare areas on dredge-created and natural alluvial islands in rivers; gravel pits along rivers; silty flats; and salt-encrusted bare areas of sand, gravel, or pebbly mud on interior alkali lakes and ponds (Haig and Elliott-Smith, 2004). On the wintering grounds, these birds use beaches, mudflats, sandflats, dunes, and offshore spoil islands (AOU, 1998; USFWS, 1995).

2.7.3 Range

The piping plover breeds on the northern Great Plains (Iowa, northwestern Minnesota, Montana, Nebraska, North and South Dakota, Alberta, Manitoba, and Saskatchewan), in the Great Lakes (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin, and Ontario), and along the Atlantic Coast from Newfoundland to Virginia and (formerly) North Carolina. It winters on the Atlantic and Gulf coasts from North Carolina to Mexico, including coastal Texas, and, less commonly, in the Bahamas and West Indies (AOU, 1998; 50 FR 50726, December 11, 1985). Migration occurs both through the interior of North America east of the Rocky Mountains (especially in the Mississippi Valley) and along the Atlantic Coast (AOU, 1998). Few data exist on the migration routes of this species.

2.7.4 Distribution in Texas

Approximately 35 percent of the known global population of piping plovers winters along the Texas Gulf Coast, where they spend 60 to 70 percent of the year (Campbell, 1995; Haig and Elliott-Smith, 2004). The species is a common migrant and rare to uncommon winter resident on the upper Texas coast (Lockwood and Freeman, 2004; Richardson et al., 1998). Piping plover concentrations in Texas occur in the following counties: Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kleberg, Matagorda, Nueces, San Patricio, and Willacy (USFWS, 1988). In Louisiana, the piping plover is a rare migrant statewide and uncommon winter resident along the Gulf Coast in Cameron and Jefferson parishes (USFWS, 1994). Piping plovers may occur in the study area, but suitable habitat is of limited extent.

2.7.5 Presence in the Study Area

Because of a lawsuit, USFWS has designated critical habitat for the species in its nesting and wintering range (65 FR 41781–41812, 6 July 2000). Designation of critical habitat became final on July 10, 2001 (66 FR 17:36038–36143), and was modified in 2009 (74 FR 23475–23600). Critical habitat includes the land from the seaward boundary of mean lower low water to where densely vegetated habitat, not used by the species, begins and where the constituent elements no longer occur.

Critical Habitat Unit TX-33 encompasses approximately 211 acres between the mouth of the Brazos River and Farm-to-Market Road 1495 and includes Bryan Beach and adjacent beach habitat (74 FR 23475–23600, May 19, 2009), just southwest of the project area. TPWD TXNDD data (2006) show no documented records within the project area. However, wintering piping plovers are of potential occurrence on beaches and sand and mudflats along the bay margins within the study area.

2.8 WHOOPING CRANE

2.8.1 Reasons for Status

The whooping crane (*Grus americana*) was federally listed as endangered on March 11, 1967 (32 FR 4001). Critical habitat has been designated in Aransas, Calhoun, and Refugio counties in Texas, and includes the Aransas National Wildlife Refuge (NWR). Two experimentally introduced flocks are listed as experimental nonessential populations: in Florida (FR, January 22, 1993) and New Mexico (62 FR 38932). The main factors for the decline of the whooping crane were loss of habitat to agriculture, human disturbance of nesting areas, uncontrolled hunting, and collisions with power lines (NatureServe, 2006). Biological factors, such as delayed sexual maturity and small clutch size, prevent rapid population recovery. Drought during the breeding season presents serious hazards to this species (Campbell, 1995). Whooping cranes are vulnerable to loss of habitat along their long migration route (NatureServe, 2006), along which

they are still subject to cataclysmic weather events, accidental shooting, collision with power lines, and predators. They are susceptible to avian tuberculosis, avian cholera, and lead poisoning (Campbell, 1995). Exposure to disease is a special problem when large numbers of birds are concentrated in limited areas, as often happens during times of drought.

While in Texas, the main population is at risk from chemical spills along the GIWW, which passes through the center of their winter range (Campbell, 1995). The presence of contaminants in the food base is another potential problem on their wintering grounds (Oberholser, 1974), and a late-season hurricane or other weather event could be disastrous to this concentrated population.

2.8.2 Habitat

Nesting habitat in Canada is freshwater marshes and wet prairies (NatureServe, 2006), interspersed with numerous potholes and narrow-wooded ridges. Whooping cranes use a variety of habitats during migration (Campbell, 1995). They feed on grain in croplands (Lewis, 1995), and large wetland areas are used for feeding and roosting. Riverine habitats, such as submerged sandbars, are often used for roosting. The principal winter habitat in Texas is brackish bays, marshes, and salt flats, although whooping cranes sometimes feed in upland sites characterized by oak mottes, grassland swales, and ponds on gently rolling sandy soils (Campbell, 1995).

Summer foods include large insect nymphs or larvae, frogs, rodents, small birds, minnows, and berries. During the winter in Texas, they eat a wide variety of plant and animal foods. Blue crabs, clams, and berries of Carolina wolfberry (*Lycium carolinianum*) compose the diet. Foods taken at upland sites include acorns, snails, crayfish, and insects (Campbell, 1995).

2.8.3 Range

Whooping cranes were originally found throughout most of North America. In the nineteenth century, the main breeding area was from the Northwest Territories to the prairie provinces in Canada, and the northern prairie states to Illinois. A nonmigratory flock existed in Louisiana, but is now extirpated. Whooping cranes wintered from Florida to New Jersey along the Atlantic Coast, along the Texas Gulf Coast, and in the high plateaus of central Mexico. They now breed in isolated, marshy areas of Wood Buffalo National Park, Northwest Territories, and Canada. They winter primarily in the Aransas NWR and adjacent areas of the central Texas Gulf Coast (USFWS, 1995). During migration they use various stopover areas in western Canada and the American Midwest.

Two experimental flocks have been established by incubating eggs and rearing the young in captivity before releasing them into the wild. Cranes were introduced in Grays Lake NWR in Idaho in 1975; these birds winter at Bosque del Apache NWR in central New Mexico. This population is not successfully breeding and will become extirpated. Introduction of another flock

to Kissimmee Prairie in Florida began in 1993. The Florida population will be nonmigratory (NatureServe, 2006).

2.8.4 Distribution in Texas

The natural wild population of whooping cranes spends its winters at the Aransas NWR, Matagorda Island, Isla San Jose, portions of the Lamar Peninsula, and Welder Point on the east side of San Antonio Bay (NatureServe, 2006). The main stopover points in Texas for migrating birds are in the central and eastern Panhandle (USFWS, 1995).

2.8.5 Presence in the Project Area

Brazoria County is within the species' migration corridor; however, the species is unlikely to occur in the study area because of the absence of suitable habitat. TPWD's TXNDD (2006) indicates documented records of whooping cranes from marshes west of the Brazos River; however, these likely represent vagrant birds, and no wintering populations are present in the project area.

2.9 WHALES

The NMFS identified five whale species of potential occurrence in the Gulf (see Appendix A). These species are generally restricted to offshore waters; therefore, it is unlikely that any of these five species would occur in the study area and furthermore unlikely in the project area.

3.0 EFFECTS ANALYSIS AND AVOIDANCE, MINIMIZATION, AND CONSERVATION MEASURES

In this document, the USACE presents their determinations about each species potentially occurring within the affected area of the FHCIP, using language recommended by USFWS:

- *No effect* – USACE determines that its proposed action will not affect a federally listed species or critical habitat;
- *May affect, but not likely to adversely affect* – USACE determines that the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial; or
- *Likely to adversely affect* – USACE determines adverse effects to listed species and/or critical habitat may occur as a direct result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or completely beneficial. Under this determination, an additional determination is made whether the action is likely to jeopardize the continued survival and eventual recovery of the species.

Once the USACE has made the effect determinations of this project on federally listed species and provides them to the USFWS and NMFS, the agencies will review the information and complete the Section 7 consultation process under the ESA.

The following sections provide the USACE's findings and species-specific avoidance, minimization, and conservation measures that support the effect determinations.

3.1 SMALLTOOTH SAWFISH

This species is highly unlikely to occur in the project area; therefore, no effect on this species is anticipated from the proposed action.

3.2 MARINE (SEA) TURTLES

Sea turtles may be present in the project area during certain times of the year; therefore, construction, postconstruction maintenance, and operational activities may result in impacts to sea turtles.

3.2.1 Channel Construction Dredging (New Work) and Maintenance

New work and maintenance dredging for the FHCIP LPP (Preferred Alternative) are combined in this section as these actions are implemented with similar equipment. For the channel widening and deepening (new work), a pipeline dredge may be used in the upper project area and a hopper dredge will most likely be used for the Entrance Channel construction (new work) and ongoing maintenance. Sea turtles easily avoid pipeline dredges because of the slow movement of

the dredge; however, hopper dredge incidental take is possible. The potential adverse effects to sea turtles from dredges are well studied and documented in previous NMFS-issued BOs for other Gulf navigation projects, including the "Biological Opinion on Dredging of Gulf of Mexico Navigation Channels and Sand Mining ("Borrow") Areas Using Hopper Dredges by Corps of Engineers, Galveston, New Orleans, Mobile, and Jacksonville Districts (Consultation Number F/SER/2000/01287)" (also known as the Gulf of Mexico Regional Biological Opinion or GRBO). NMFS first issued the GRBO in 2003 and amended the document in 2005; the 2005 amendment was superceded by the 2007 amendment (NMFS, 2003, 2005, 2007d). This is discussed further in Section 3.2.3 below.

Green, loggerhead, Kemp's ridley, and hawksbill sea turtles may occur in the study area. Of the five species of sea turtle known to potentially occur in Texas waters, the leatherback is the least likely to occur in the project area due to its pelagic nature. USACE, Galveston District turtle incidental take monitoring began in fiscal year 1995 (USACE, 2010). Between 1995 and 2008, a total of 73 turtles have been taken as a result of Gulf-wide hopper dredging, in decreasing order by species: loggerheads (29), greens (29), Kemp's ridley (15); hawksbills and leatherbacks are not known to have been caught in hopper dredges since monitoring began (USACE, 2010). In the Texas coastal area (Galveston District), the total annual (fiscal year) documented incidental take by injury or mortality during hopper dredging under the GRBO is expected to be 7 Kemp's ridleys, 5 green, 1 hawksbill, and 15 loggerhead sea turtles (NMFS, 2007d). This level of take is the same as that authorized by previous BOs, including the original 2003 NMFS GRBO. Documented incidental takes during hopper dredge operations in Freeport Harbor (including Entrance and Jetty channels) are listed in Table 2. Although the level of Freeport Channel hopper dredging has increased over time, the Galveston District has never exceeded the anticipated annual level of take for any sea turtle species (NMFS, 2003).

The LPP (Preferred Alternative) hopper dredging may cause incidental take to individual sea turtles. Based on past incidental take reporting, the most likely affected species are the loggerhead and green sea turtles; Kemp's ridley and hawksbill sea turtles may occur in the study area and may also be affected. For these four species, hopper dredging is likely to adversely affect individuals, but is not anticipated to jeopardize the continued existence of the species. Because the leatherback sea turtle is not likely to be present in the project area, dredging activities may affect, but are not likely to adversely affect, individuals; additionally, dredging activities are not anticipated to jeopardize the continued existence or recovery of this species.

TABLE 2
FREEPORT HARBOR (including Entrance and Jetty Channels)
INCIDENTAL MARINE TURTLE TAKES, 1995–2007

Incidental Take Date	Marine Turtle Species
November 10, 2009	Green
November 23, 2008	Green
October 25, 2008	Green
October 23, 2008	Loggerhead
November 4, 2007	Kemp's ridley
November 3, 2007	Kemp's ridley
November 2, 2007	Green
November 14, 2006	Loggerhead
January 17, 2006	Green
February 2, 2006	Green
August 10, 2000	Loggerhead
August 15, 2000	Loggerhead
October 29, 1998	Loggerhead
July 22, 1996	Loggerhead
July 13, 1996	Loggerhead
July 11, 1996	Loggerhead
June 28, 1996	Loggerhead
October 9, 1995	Loggerhead

USACE (2010).

3.2.2 Placement of Dredged Materials

Kemp's ridley is known to nest in the study area: one nest was found on Quintana Beach in 2002; a second was found near Surfside Beach in 2003; and another was found on Surfside Beach in 2006 (Yeargan, 2006, 2007). Two of the 128 Kemp's ridley nests recorded on Texas beaches in 2007 are from Surfside Beach and 1 is from Bryan Beach (NPS, 2007). Both the loggerhead and green sea turtles have been recorded from the study area (USACE, 2010) and both species nest in Texas (NPS, 2007); therefore, these species could potentially nest in the study area. One hawksbill nest has been recorded in Texas (NPS, 2007; Shaver, 2006); however, this species is unlikely to nest in the study area. No nests of the leatherback sea turtle have been recorded in Texas for at least 70 years (NPS, 2007).

Existing (PA 1) and proposed (PA 8 and PA 9) upland PA activities are not on beach areas (potential turtle nesting sites), and no beach nourishment activities are proposed as part of the LPP (Preferred Alternative); therefore, upland placement of dredged materials will not affect sea turtles. The effects of placing dredged material at the proposed ODMDSs may include (1) potential collision with placement vessel traffic; (2) the deposition of dredged material on turtles and forage areas; and (3) the possibility of trash and debris from the dredge operation. The

effects from dredged material placement in ODMDSs would be confined to a relatively small area over a limited time period. Factoring in sea turtle mobility and the lack of limestone ledges in the proposed ODMDSs, the turtles should be able to avoid a descending depositional plume, and although temporarily affected, available food sources should not be seriously reduced. Dredged maintenance material placement activities currently being conducted and proposed to be continued may affect, but are unlikely to adversely affect, sea turtles (NMFS, 2003). The new use of the ODMDSs may affect, but is not likely to adversely affect, sea turtles.

3.2.3 Avoidance, Minimization, and Conservation Measures

In other navigation project BOs, the NMFS anticipated incidental take, either by injury or mortality, due to dredging activities. To address potential incidental take during maintenance and other dredging activities, the USACE and NMFS collaborated on avoidance, minimization, and other conservation measures, formalized by NMFS in the GRBO (NMFS, 2003, 2007d).

The GRBO was based on review of regular maintenance dredging of navigation channels and offshore sand mining for beach nourishment and restoration activities; it addresses, among other species, the five sea turtles that could potentially occur in the LPP study area. Any maintenance activities following implementation of the proposed LPP (Preferred Alternative) would be covered under the GRBO; the GRBO does not address channel improvement projects that have not been authorized by Congress.

Proposed avoidance and minimization measures include reasonable and prudent precautions and actions that have largely been incorporated in USACE regulatory and civil works projects throughout the Gulf for more than a decade and are acknowledged by the USFWS and NMFS to reduce impacts to marine turtles. These measures, implemented in full, are necessary and appropriate to authorize any incidental take of marine turtles during construction of the LPP (Preferred Alternative). The Galveston District has demonstrated a commitment to such measures. During Galveston District hopper dredging activities since 1995, operations have had 100 percent observer coverage, 100 percent inflow/overflow screening, rigid deflector dragheads, and dragarm operators have attempted to disengage dredge pumps when dragheads were suspended in the water column (NMFS, 2003). The bulleted list below is a summary of avoidance, minimization, and conservation measures that would be employed during hopper dredging operations (NMFS, 2007b, 2007d):

- *Seasonal Hopper Dredging Window*: Hopper dredging in the Gulf and up to 1 mile in river channels will be completed, whenever possible, between December 1 and March 31, when sea turtle abundance is lowest throughout Gulf coastal waters due to temperature of offshore waters.

- *Nonhopper-type Dredging*: Pipeline or hydraulic dredges, which are not known to take turtles, must be used whenever possible between April 1 and November 30 in Gulf waters up to 1 mile into rivers.

- *Observers*: The USACE will arrange for NMFS-approved protected species observers to be aboard the hopper dredges to monitor the hopper bin, screening, and dragheads for sea turtles and their remains. Observer coverage sufficient for 100 percent monitoring (i.e., two observers) of hopper dredging operations will be implemented between April 1 and November 30 and/or if the surface water temperatures are 11°C or greater.

- *Screening*: 100 percent 4-inch inflow screening of dredged material is required. If conditions prevent 100 percent inflow screening using 4-inch mesh, the Galveston District, observers, and draghead operator must consult and USACE must notify NMFS before reducing or eliminating inflow screening and provide details regarding effective overflow screening. If deemed necessary, screening may be modified gradually (increasing mesh size to 6 inch by 6 inch, then 9 inch by 9 inch, then 12 inch by 12 inch). If clogging is still an issue after gradual changes, then effective 100 percent overflow screening is required.

- *Sea Turtle Deflecting Draghead and Dredging Pumps*: A state-of-the-art rigid deflector draghead will be used on all hopper dredges at all times of the year. Dredging pumps will be disengaged by the operator when the dragheads are not firmly on the bottom, to prevent impingement or entrainment of sea turtles within the water column (especially important during dredging cleanup).

- *Dredge Lighting*: From May 1 through October 1, all lighting aboard hopper dredges and hopper dredge pumpout barges operating within 3 nautical miles of sea turtle nesting beaches will be limited to the minimal lighting necessary to comply with U.S. Coast Guard and/or Occupational Safety and Health Administration requirements. Nonessential lighting will be minimized through reduction, shielding, lowering, and appropriate placement to minimize illumination of nesting beaches and reduce disorientation effects on female sea turtles and hatchlings.

- *Dredge Take Reporting*: Observer reports of incidental take by hopper dredges will be submitted by fax or email to NMFS Southeast Regional Office by onboard protected species observers within 24 hours of any observed sea turtle take. An end-of-project summary report of the hopper dredging results and any documented sea turtle takes will be submitted to NMFS Southeast Regional Office within 30 working days of completion of the dredging project. USACE will submit an annual report to NMFS Southeast Regional Office summarizing hopper dredging projects and documented incidental takes. This report must include a complete explanation why alternative dredges (other than hopper dredges) were not used for maintenance dredging, if that activity occurs between April and November.

- *Sea Turtle Stranding and Salvage Network (STSSN) Notification*: USACE or its representative will notify the STSSN state representative of start-up and completion of hopper dredging, bed-leveler dredging, and relocation trawling operations and ask to be

notified of any turtle strandings in the project area that may bear the signs of draghead impingement or entrainment or interaction with a bed-leveling type dredge. Dredge-relevant stranding information will be reported in the end-of-project summary report and end of year annual report (these strandings will not be counted against USACE take limit during maintenance).

- *Relocation Trawling*: Relocation trawling will be implemented as circumstances dictate in a manner consistent with the GRBO and as outlined in the BO for construction. Handling of sea turtles captured during relocation trawling in association with hopper dredging would be conducted by NMFS-approved protected species observers in a manner designed to ensure their safety and viability. When safely possible, not jeopardizing the health of the individual turtle, scientific measurements/procedures may be taken (see GRBO for details). An end-of-project report would be generated upon completion and incorporated into the hopper dredging annual summary report.

- *Operations*: During periods when hopper dredges are operating and NMFS-approved protected species observers are not required, USACE will (1) advise inspectors, operators, and vessel captains that take, harm, and harassment of turtles is prohibited; (2) instruct the hopper dredge captain to avoid any turtles during travel or activity and to immediately contact USACE if turtles are seen in the vicinity; (3) notify NMFS if sea turtles are observed in the dredging area to coordinate further take-avoidance precautions; and (4) notify NMFS if a sea turtle (or any other protected species) is taken by the dredge.

3.2.4 Effect Determinations

In summary, construction and postconstruction maintenance hopper dredging activities may result in incidental take of individual sea turtles, although upland and ocean placement of dredged materials are not expected to impact sea turtles. Feeding opportunities within the proposed channel and nearby nesting beaches could attract sea turtles, where they might be exposed to additional cumulative risks from boat traffic, contaminants, fishing and fishing gear, and accumulated plastic debris. Because there are no beach impacts related to the LPP (Preferred Alternative), there is no effect to nesting sea turtles. Effect determinations, based on the information presented in this document and in the EIS, are presented in Table 3. The likelihood of adverse effects, including incidental take, during construction and maintenance are greatly reduced by full implementation of the avoidance, minimization, and conservation measures outlined above. Incidental take, if it occurs, is not likely to jeopardize the continued existence or potential recovery of any of the sea turtle species.

TABLE 3
SEA TURTLE EFFECT DETERMINATIONS RELATIVE TO THE PROPOSED LPP

Common Name[1]	Scientific Name[1]	Dredging Activity Determination	Placement of Dredged Materials Determination
Green sea turtle	*Chelonia mydas*	Likely to adversely affect*	May affect, but not likely to adversely affect
Hawksbill sea turtle	*Eretmochelys imbricata*	Likely to adversely affect*	May affect, but not likely to adversely affect
Kemp's ridley sea turtle	*Lepidochelys kempii*	Likely to adversely affect*	May affect, but not likely to adversely affect
Leatherback sea turtle	*Dermochelys coriacea*	May affect, but not likely to adversely affect	May affect, but not likely to adversely affect
Loggerhead sea turtle	*Caretta caretta*	Likely to adversely affect*	May affect, but not likely to adversely affect

*The likelihood of adverse effects (incidental take) of sea turtles due to dredging activities is greatly reduced by implementation and adherence to the conservation measures. Adverse effects are not expected to jeopardize the continued survival or recovery of the species.

[1] Nomenclature follows AOU (1998, 2000, 2002, 2003, 2004, 2005, 2006), Crother et al. (2000, 2001, 2003), TPWD (2007a), and USFWS (2007).

3.3 PIPING PLOVER

Open-water dredging would not directly affect the piping plover. Wintering piping plovers are of potential occurrence on beaches and sand and mudflats along the open-water Gulf margins within the study area. USFWS-designated critical habitat for the piping plover (Critical Habitat Unit TX-33) encompasses approximately 211 acres between the mouth of the Brazos River and FM 1495 and includes portions of Bryan Beach and other adjacent beach habitat (74 FR 23475–23600, May 19, 2009). The LPP (Preferred Alternative) does not include beach nourishment, which would affect piping plover principal wintering habitats. Wintering piping plovers have been observed using upland PAs for resting between placement activities. PA 1 is currently used every 10 months for maintenance-dredged material placement, and no change in that placement schedule is anticipated. The habitats found in tracts Eight and Nine are not the types typically used by piping plovers; therefore, potential loss of habitat from construction of PA 8 and PA 9 is not expected to adversely affect piping plovers in the project area. Once PA 8 and PA 9 are constructed and in use, piping plovers may use these areas for resting. The proposed LPP (Preferred Alternative) will have no effect on the piping plover.

3.4 WHOOPING CRANE

This species is not expected to occur in the project area; therefore, no effect is anticipated from the proposed action.

3.5 WHALES

None of the five whale species are expected to occur in the project area; therefore, no effects to the five whale species are anticipated from the proposed action.

4.0 SUMMARY

Table 4 presents a summary of effect determinations for the federally threatened and endangered species covered in this BA. Potential adverse effects from hopper dredging activities would be avoided and minimized to the greatest extent possible through adherence to the measures outlined in this document. Although some adverse affects are expected, none of the actions proposed with the LPP (Preferred Alternative) is anticipated to jeopardize the continued existence and potential recovery of these species.

TABLE 4
EFFECT DETERMINATIONS SUMMARY For The PROPOSED LPP

Common Name[1]	Scientific Name[1]	Dredging Activity	Placement of Dredged Materials
FISHES			
Smalltooth sawfish	*Pristis pectinata*	No effect	No effect
REPTILES			
Green sea turtle	*Chelonia mydas*	Likely to adversely affect*	May affect, but not likely to adversely affect
Hawksbill sea turtle	*Eretmochelys imbricata*	Likely to adversely affect*	May affect, but not likely to adversely affect
Kemp's ridley sea turtle	*Lepidochelys kempii*	Likely to adversely affect*	May affect, but not likely to adversely affect
Leatherback sea turtle	*Dermochelys coriacea*	May affect, but not likely to adversely affect	May affect, but not likely to adversely affect
Loggerhead sea turtle	*Caretta caretta*	Likely to adversely affect*	May affect, but not likely to adversely affect
BIRDS			
Piping plover**	*Charadrius melodus*	No effect	No effect
Whooping crane	*Grus americana*	No effect	No effect
MAMMALS			
Blue whale	*Balaenoptera musculus*	No effect	No effect
Finback whale	*B. physalus*	No effect	No effect
Humpback whale	*Megaptera novaengliae*	No effect	No effect
Sei whale	*B. borealis*	No effect	No effect
Sperm whale	*Physeter macrocephalus*	No effect	No effect

*The likelihood of adverse effects (incidental take) of sea turtles due to dredging activities is greatly reduced by implementation and adherence to the conservation measures. Adverse effects are not expected to jeopardize the continued survival or recovery of the species.

**No effect to piping plover critical habitat is expected.

[1]Nomenclature follows AOU (1998, 2000, 2002, 2003, 2004, 2005, 2006), Crother et al. (2000, 2001, 2003), TPWD (2007a), and USFWS (2007).

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Appendix A

Agency Coordination

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Ave. South
St. Petersburg, FL 33701
(727) 824-5312, FAX (727) 824-5309
http://sero.nmfs.noaa.gov

F/SER3:TM

OCT - 2 2007

Ms. Carolyn Murphy
Chief, Environmental Branch
Department of the Army
Galveston District, Corps of Engineers
P.O. Box 1229
Galveston, TX 77553-1229

Dear Ms. Murphy:

This correspondence responds to the Department of the Army's letter dated September 20, 2007, regarding an Environmental Assessment Statement to address proposed improvements to the Freeport Harbor 40-Foot Navigation Project located on the mid to upper Texas coast in Brazoria County, Texas.

As requested, enclosed is a list of federally-protected species under the jurisdiction of the National Marine Fisheries Service for the state of Texas.

We look forward to continued cooperation with the Army in conserving our endangered and threatened resources. If you have any questions regarding the BSA consultation process, please contact Mr. Robert Hoffman, fishery biologist, at (727) 824-5312, or by e-mail at Robert.Hoffman@noaa.gov.

Sincerely,

David M. Bernhart
Assistant Regional Administrator
Protected Resources Division

Enclosure

File: 1514-22.F.1.TX

Endangered and Threatened Species and Critical Habitats
under the Jurisdiction of the NOAA Fisheries Service

Texas

Listed Species	Scientific Name	Status	Date Listed
Marine Mammals			
blue whale	*Balaenoptera musculus*	Endangered	12/02/70
finback whale	*Balaenoptera physalus*	Endangered	12/02/70
humpback whale	*Megaptera novaengliae*	Endangered	12/02/70
sei whale	*Balaenoptera borealis*	Endangered	12/02/70
sperm whale	*Physeter macrocephalus*	Endangered	12/02/70
Turtles			
green sea turtle	*Chelonia mydas*	Threatened[1]	07/28/78
hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	06/02/70
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	12/02/70
leatherback sea turtle	*Dermochelys coriacea*	Endangered	06/02/70
loggerhead sea turtle	*Caretta caretta*	Threatened	07/28/78
Fish			
smalltooth sawfish	*Pristis pectinata*	Endangered	04/01/03

Designated Critical Habitat
None

Species Proposed for Listing
None

Proposed Critical Habitat
None

[1] Green turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered

Texas

Candidate Species[2]	Scientific Name
none	

Species of Concern[3]	Scientific Name
Fish	
dusky shark	*Carcharhinus obscurus*
largetooth sawfish	*Pristis pristis*
night shark	*Carcharhinus signatus*
saltmarsh topminnow	*Fundulus jenkinsi*
sand tiger shark	*Carcharias taurus*
speckled hind	*Epinephelus drummondhayi*
Warsaw grouper	*Epinephelus nigritus*
white marlin	*Tetrapturus albidus*
Invertebrates	
ivory bush coral	*Oculina varicosa*

[2] The Candidate Species List has been renamed the Species of Concern List. The term "candidate species" is limited to species that are the subject of a petition to list and for which NOAA Fisheries Service has determined that listing may be warranted (69 FR 19975).
[3] Species of Concern are not protected under the Endangered Species Act, but concerns about their status indicate that they may warrant listing in the future. Federal agencies and the public are encouraged to consider these species during project planning so that future listings may be avoided.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
17629 El Camino Real #211
Houston, Texas 77058-3051

February 2007

This responds to your request for threatened and endangered species information in the Clear Lake Ecological Services Field Office's area of responsibility. According to Section 7(a)(2) of the Endangered Species Act and the implementing regulations, it is the responsibility of each federal agency to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any federally listed species. Therefore, we are providing information to assist you in meeting your obligations under the Endangered Species Act.

A county by county listing of federally listed threatened and endangered species that occur within this office's work area can be found at http://www.fws.gov/southwest/es/EndangeredSpecies/lists/ListSpecies.cfm. You should use the county by county listing and other current species information to determine whether suitable habitat for a listed species is present at your project site. If suitable habitat is present, a qualified individual should conduct surveys to determine whether a listed species is present.

After completing a habitat evaluation and/or any necessary surveys, you should evaluate the project for potential effects to listed species and make one of the following determinations:

No effect – the proposed action will not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area). No coordination or contact with the Service is necessary. However, if the project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.

Is not likely to adversely affect – the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects. You should seek written concurrence from the Service that adverse effects have been eliminated. Be sure to include all of the information and documentation you used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.

Is likely to adversely affect – adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species but also is likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires formal Section 7 consultation with this office.

Regardless of your determination, the Service recommends that you maintain a complete record of the evaluation, including steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related articles.

TAKE PRIDE IN AMERICA

The Service's Consultation Handbook is available online to assist you with further information on definitions, process, and fulfilling Endangered Species Act requirements for your projects at http://endangered.fws.gov/consultations/s7hndbk/s7hndbk.htm.

If we can further assist you in understanding your obligations under the Endangered Species Act, please contact Kathy Nemec, Edith Erfling, or Catherine Yeargan at 281/286-8282.

Sincerely,

Stephen D. Parris

Stephen D. Parris
Field Supervisor, Clear Lake Field Office

U.S. Fish & Wildlife Service

Endangered Species List

Back to Start

List of species by county for Texas:

Counties Selected: Brazoria

Select one or more counties from the following list to view a county list:

Anderson
Andrews
Angelina
Aransas
Archer

View County List

Brazoria County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critical Habitat	More Info
bald eagle	*Haliaeetus leucocephalus*	Birds	DM				P
brown pelican	*Pelecanus occidentalis*	Birds	DM, E				P
green sea turtle	*Chelonia mydas*	Reptiles	E, T				P
hawksbill sea turtle	*Eretmochelys imbricata*	Reptiles	E				P
Kemp's ridley sea turtle	*Lepidochelys kempii*	Reptiles	E				P
leatherback sea turtle	*Dermochelys coriacea*	Reptiles	E				P
loggerhead sea turtle	*Caretta caretta*	Reptiles	T				P
piping Plover	*Charadrius melodus*	Birds	E, T				P
whooping crane	*Grus americana*	Birds	E, EXPN				P

Appendix B

Annotated County List of Rare Species, Brazoria County

BRAZORIA COUNTY

BIRDS

		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	DL	E

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	T

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Bald Eagle	*Haliaeetus leucocephalus*	DL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Black Rail	*Laterallus jamaicensis*		

salt, brackish, and freshwater marshes, pond borders, wet meadows, and grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous year's dead grasses; nest usually hidden in marsh grass or at base of Salicornia

Brown Pelican	*Pelecanus occidentalis*	LE	E

largely coastal and near shore areas, where it roosts and nests on islands and spoil banks

Eskimo Curlew	*Numenius borealis*	LE	E

historic; nonbreeding: grasslands, pastures, plowed fields, and less frequently, marshes and mudflats

Henslow's Sparrow	*Ammodramus henslowii*		

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Peregrine Falcon	*Falco peregrinus*	DL	E T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

Piping Plover	*Charadrius melodus*	LT	T

wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats

Reddish Egret	*Egretta rufescens*		T

resident of the Texas Gulf Coast; brackish marshes and shallow salt ponds and tidal flats; nests on ground or in trees or bushes, on dry coastal islands in brushy thickets of yucca and prickly pear

BRAZORIA COUNTY

BIRDS

		Federal Status	State Status
Snowy Plover	*Charadrius alexandrinus*		

formerly an uncommon breeder in the Panhandle; potential migrant; winter along coast

Sooty Tern	*Sterna fuscata*		T

predominately 'on the wing'; does not dive, but snatches small fish and squid with bill as it flies or hovers over water; breeding April-July

Southeastern Snowy Plover	*Charadrius alexandrinus tenuirostris*		

wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats

Western Snowy Plover	*Charadrius alexandrinus nivosus*		

uncommon breeder in the Panhandle; potential migrant; winter along coast

White-faced Ibis	*Plegadis chihi*		T

prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

White-tailed Hawk	*Buteo albicaudatus*		T

near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March-May

Whooping Crane	*Grus americana*	LE	E

potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties

Wood Stork	*Mycteria americana*		T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

FISHES

		Federal Status	State Status
American eel	*Anguilla rostrata*		

coastal waterways below reservoirs to gulf; spawns January to February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; most aquatic habitats with access to ocean, muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries; diet varies widely, geographically, and seasonally

Sharpnose shiner	*Notropis oxyrhynchus*	C	

endemic to Brazos River drainage; also, apparently introduced into adjacent Colorado River drainage; large turbid river, with bottom a combination of sand, gravel, and clay-mud

MAMMALS

		Federal Status	State Status
Jaguarundi	*Herpailurus yaguarondi*	LE	E

BRAZORIA COUNTY

MAMMALS

		Federal Status	State Status
thick brushlands, near water favored; 60 to 75 day gestation, young born sometimes twice per year in March and August, elsewhere the beginning of the rainy season and end of the dry season			
Louisiana black bear	*Ursus americanus luteolus*	LT	T
possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas			
Ocelot	*Leopardus pardalis*	LE	E
dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November			
Plains spotted skunk	*Spilogale putorius interrupta*		
catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie			
Red wolf	*Canis rufus*	LE	E
extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies			
West Indian manatee	*Trichechus manatus*	LE	E
Gulf and bay system; opportunistic, aquatic herbivore			

MOLLUSKS

		Federal Status	State Status
False spike mussel	*Quincuncina mitchelli*		
substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins			
Pistolgrip	*Tritogonia verrucosa*		
stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins			
Rock pocketbook	*Arcidens confragosus*		
mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins			
Smooth pimpleback	*Quadrula houstonensis*		
small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins			
Texas fawnsfoot	*Truncilla macrodon*		
little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins			

BRAZORIA COUNTY

REPTILES

		Federal Status	State Status
Alligator snapping turtle	*Macrochelys temminckii*		T

perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Atlantic hawksbill sea turtle	*Eretmochelys imbricata*	LE	E

Gulf and bay system

Green sea turtle	*Chelonia mydas*	LT	T

Gulf and bay system; shallow water seagrass beds, open water between feeding and nesting areas, barrier island beaches; adults are herbivorous feeding on sea grass and seaweed; juveniles are omnivorous feeding initially on marine invertebrates, then increasingly on sea grasses and seaweeds

Gulf Saltmarsh snake *Nerodia clarkii*

saline flats, coastal bays, and brackish river mouths

Kemp's Ridley sea turtle	*Lepidochelys kempii*	LE	E

Gulf and bay system

Leatherback sea turtle	*Dermochelys coriacea*	LE	E

Gulf and bay system

Loggerhead sea turtle	*Caretta caretta*	LT	T

Gulf and bay system

Texas diamondback terrapin *Malaclemys terrapin littoralis*

coastal marshes, tidal flats, coves, estuaries, and lagoons behind barrier beaches; brackish and salt water; burrows into mud when inactive; may venture into lowlands at high tide

Texas horned lizard	*Phrynosoma cornutum*		T

open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September

Timber/Canebrake rattlesnake	*Crotalus horridus*		T

swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

PLANTS

		Federal Status	State Status
Coastal gay-feather	*Liatris bracteata*		

endemic; black clay soils of prairie remnants; flowering in fall

Giant sharpstem umbrella-sedge	*Cyperus cephalanthus*		

BRAZORIA COUNTY

PLANTS

Federal Status State Status

remnant coastal prairies in poorly to moderately drained sites

Texas meadow-rue *Thalictrum texanum*

endemic; mesic woodlands or forests, including wet ditches on partially shaded roadsides; flowering March-May

Texas windmill-grass *Chloris texensis*

endemic; sandy to sandy loam soils in open to sometimes barren areas in prairies and grasslands, including ditches and roadsides; flowering in fall

Threeflower broomweed *Thurovia triflora*

endemic; black clay soils of remnant grasslands, also tidal flats; flowering July-November

Appendix J

Compliance with the Texas Coastal Management Program

Document No. 070284
Job No. 441901

APPENDIX J
COMPLIANCE WITH GOALS AND POLICIES – DREDGING AND DREDGED MATERIAL DISPOSAL AND PLACEMENT
FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT
BRAZORIA COUNTY, TEXAS
TEXAS COASTAL MANAGEMENT PROGRAM
CONSISTENCY DETERMINATION

U.S. Army Corps of Engineers, Galveston District
2000 Fort Point Road
Galveston, Texas 77550

October 2010

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Appendix J

Compliance with Goals and Policies – Section 501.25 (a)–(f)
Dredging and Dredged Material Disposal and Placement
Freeport Harbor Channel Improvement Project
Environmental Impact Statement
Brazoria County, Texas
Texas Coastal Management Program

INTRODUCTION

To achieve navigation efficiency and safety objectives, the U.S. Army Corps of Engineers (USACE) plans to widen the Freeport Harbor Entrance Channel (including the Outer Bar and Jetty channels) to 600 feet and deepen to 57 feet, deepen the Main Channel to 55 feet from the Lower Turning Basin to above the Brazosport Turning Basin and to 50 feet up channel through the Upper Turning Basin, widen Lower Stauffer Channel to 300 feet and deepen to 50 feet, and redredge Upper Stauffer Channel to a 25-foot depth. Construction of the proposed project would generate approximately 17.3 million cubic yards (mcy) of dredged material. Maintenance of the deepened and widened channel would generate a total of 175.9 mcy of maintenance-dredged material over the 50-year evaluation period. Material dredged from the Outer Bar and Jetty channels during construction would be placed in the new work Ocean Dredged Material Disposal Site (ODMDS), and the remainder of the new work material would be placed in dredged material placement areas (PAs) 1, 8, and 9. Material dredged from the Outer Bar and Jetty channels and from the Lower Turning Basin during maintenance cycles would be placed in the maintenance material ODMDS, and material from the remainder of the channel would be placed in PAs 1, 8, and 9. Several alternatives were analyzed including a No Action Alternative, a National Economic Development (NED) Plan Alternative, and the Locally Preferred Plan (LPP) Alternative, which is the USACE tentatively Recommended Plan.

The existing Freeport Harbor Channel 45-Foot Project (45-foot Project) was authorized by the Rivers and Harbor Acts (RHA) of May 1950 and July 1958, providing for an Entrance Channel of 38-foot depth and 300-foot width from the Gulf to inside the jetties and for interior channels of 36-foot depth and 200-foot width up to and including the Upper Turning Basin. In 1970, Congress passed Section 101 of RHA of 1970 (PL 91-611; House Document 289, 93rd Congress – 2nd Session, 31 December 1975), and in 1974, the President authorized the relocation and deepening of the Jetty Channel to a 45-foot depth and 400-foot width and the Outer Bar Channel to a 47-foot depth and 400-foot width, with an extension of approximately 4.6 miles into the Gulf.

Since the completion of the 45-foot Project, the size of ships using the waterway has steadily increased so that many vessels currently have to be light-loaded to traverse the waterway. The

current channel depth requires that large crude carriers remain offshore and transfer their cargo into smaller crude tankers for the remainder of the voyage. This lightering operation takes place in the Gulf where the two ships, the mother ship and the lightering ship, come together so that the cargo transfer can take place. Although this operation has been going on for years, the possibility for a collision, oil spill, fire, or other adverse environmental consequences is always present. Deepening the channel will reduce the number of lightering operations. Current projections suggest that crude imports will increase in the near future. As the imports increase, the number of lightering vessels and product carriers will also increase, adding to the shipping delays, congestion, and risk of collision or spill.

The USACE and the Brazoria County Navigation District (referred to as Port Freeport), as the non-Federal sponsor, propose to improve the navigation channels servicing Freeport Harbor as a Federal action by deepening and widening the current channel alignment, starting at the 57-foot depth contour, and terminating at the Stauffer Channel Turning Basin. This project is referred to as the Freeport Harbor Channel Improvement Project (FHCIP). The proposed FHCIP will also provide for the creation of two new upland confined PAs (8 and 9), adjacent to the Brazos River. The LPP Alternative, as described above, has been adopted by the USACE and Port Freeport as the tentatively Recommended Plan.

IMPACTS ON COASTAL NATURAL RESOURCE AREAS

Several of the Coastal Natural Resource Areas (CNRAs) listed in 31 TAC §501.3 are found reasonably close to the areas discussed in the Environmental Impact Statement (EIS). A short description of each CNRA near the project and of methods to minimize or avoid potential impacts is provided below.

Waters of the Open Gulf of Mexico

New work and future dredged maintenance material generated from portions of the FHCIP will be placed in two ODMDSs. An ODMDS site analysis describing the evaluated alternatives has been prepared for the proposed new ocean disposal site designations, and is included in the EIS as Appendix B. In total, the area within the existing new work ODMDS footprint will be disturbed during construction, and the footprint of the existing maintenance ODMDS will be disturbed intermittently for the life of the project, as it has since designation in 1990. The overall footprint of these offshore PAs will be minimized by mounding the dredged material vertically to the maximum extent practical. These offshore PAs are dispersive by nature and will likely revert to the in situ topography prior to the next maintenance dredged material disposal sequence.

Waters Under Tidal Influence

The entire project is located in a region that experiences tidal influence. For the proposed FHCIP, dredging and placement activities represent a minimal impact because the release of

suspended solids is minimized by using upland confined PAs and compliance with the required State §401 Certification.

Submerged Lands

The LPP Alternative project footprint occurs in areas characterized as submerged lands. Dredging and placement activities represent a minimal impact because the release of suspended solids is minimized by using upland confined PAs. The ODMDSs are located in submerged lands, but these offshore PAs are dispersive by nature, have been used previously, and will likely revert to the in situ topography prior to their next dredged material disposal.

Coastal Wetlands

Although coastal wetlands occur within the study area, no coastal wetlands would be directly affected by the LPP Alternative. Hydrosalinity changes associated with the LPP Alternative may indirectly affect project area coastal wetlands in a minor way.

Submerged Aquatic Vegetation

This navigation project is located near areas characterized as being devoid of expanses of seagrasses. There will be no direct adverse impacts to seagrass beds as a result from the LPP Alternative.

Tidal Sand and Mud Flats

The LPP entirely avoids tidal sand or mud flats. There are tidal sand/mud flats along the North Jetty Channel shoreline, near the U.S. Coast Guard Station, but they will not be impacted (EIS Section 4.10.2.2.1).

Oyster Reefs

There are no oyster reefs identified within the LPP Alternative footprint.

Hard Substrate Reefs

There are no naturally occurring hard substrate formations in the vicinity of the project. The closest serpulid worm reefs within Texas waters are located much farther south in the Laguna Madre and Baffin Bay.

Coastal Barriers

The coastal barrier downdrift of the project area primarily consists of National Refuge areas, which are undeveloped with marshes in the backshore and with narrow beaches and overwash

terrace on the foreshore. Dredging and dredged material placement operations are not expected to have any adverse impacts to the coastal barriers.

Coastal Shore Areas

These resource areas function as buffers, protecting upland habitats from erosion and storm damage and adjacent marshes and waterways from water quality degradation. Deepening and widening the channel may slightly increase the potential for storm damage or water quality degradation.

Gulf Beaches

The USACE Engineer and Research Development Center (ERDC) conducted a study to determine potential impacts from the FHCIP to longshore sediment transport rates on adjacent shorelines in the project area (ERDC, 2007). Results show that erosional dynamics along project area shorelines would be slightly altered due to the project. All impacts are considered negligible, and specific conclusions of the study include:

- The primary conclusion from this analysis is that if deepening of the Freeport Entrance Channel is implemented, the wave-induced sediment transport impacts on the adjacent shorelines will be so slight as to not be noticeable and will be dwarfed by the interannual variability in shoreline position.
- The model indicates that minor impacts will not extend farther than 3 to 4 miles (5 to 6 kilometers [km]) to either side of the Freeport jetties.

Critical Dune Areas

The Gulf beaches of the study area include dune systems. Since the dredged material is not destined to be placed directly or indirectly onto the beaches, adverse impacts to the dune complexes are not expected to occur as a result of dredging and dredged material placement operations.

Special Hazard Areas

Special hazard areas are areas designated by the Administrator of the Federal Insurance Administration under the National Flood Insurance Act as having special flood, mudslide, and/or flood-related erosion hazards. The project area is covered under the Flood Insurance Studies for Brazoria County, Texas. The land along the channel within the area studied is predominantly located in or adjacent to the 100-year floodplain. Project dredging and placement activities do not affect these low-lying areas because dredging is within and adjacent to the existing channel and placement is within contained upland sites and ODMDSs.

Critical Erosion Areas

These areas are those Gulf and bay shorelines that are undergoing erosion and are designated by the Commissioner of the General Land Office under Texas Natural Resources Code, §33.601(b). Although no critical erosion areas are affected by the LPP Alternative, channel changes associated with the LPP Alternative may indirectly affect nearby critical erosion areas by potentially altering the hydrological regime.

Coastal Historic Areas

Research demonstrated that PAs 8 and 9 have the potential to harbor intact historic and prehistoric period cultural deposits. Additional investigation of PAs 8 and 9 identified a potential Civil War site on PA 9. A draft programmatic agreement (Appendix E to the EIS) among the USACE, the State Historic Preservation Officer (SHPO), and Port Freeport to guide implementation of the proposed undertaking makes stipulations to take into account the effects of the undertaking on historic properties and satisfy the USACE Section 106 responsibilities for all individual aspects for the undertaking.

Three anomalies/sonar targets resembling submerged watercraft were discovered during a nautical remote-sensing survey conducted in February 2006 for the Freeport Harbor Navigation Channel Improvement Project (Borgens et al., 2007). Additional analysis of the anomalies concluded that they do not represent historic shipwrecks and require no further investigation or coordination. In response to the USACE letter dated January 22, 2010 (Appendix A-3 to the EIS), the SHPO concurred with this finding on February 1, 2010.

As with the impacts to the terrestrial PAs, the impacts to the three nautical anomalies/sonar targets that were identified during the remote-sensing survey will be addressed as per the conditions of the programmatic agreement (Appendix E to the EIS).

Coastal Preserves

This natural resource includes State Parks and National Wildlife Refuges (NWR). There are several preserves within the vicinity of the coastal shoreline and include the Brazoria NWR, Bryan Beach State Park, and San Bernard NWR. No coastal preserves would be affected by the LPP Alternative.

COMPLIANCE WITH GOALS AND POLICIES

The following goals and policies of the Texas Coastal Management Program (TCMP) were reviewed for compliance.

- §501.15 – Policy for Major Actions

- §501.25 – Dredging and Dredged Material Disposal and Placement

§501.15 – Policy for Major Actions

(a) *For purposes of this section, "major action" means an individual agency or subdivision action listed in §505.11 of this title (relating to Actions and Rules Subject to the Coastal Management Program), §506.12 of this title (relating to Federal Actions Subject to the Coastal Management Program), or §505.60 of this title (relating to Local Government Actions Subject to the Coastal Management Program), relating to an activity for which a Federal environmental impact statement under the National Environmental Policy Act, 42 United States Code Annotated, §4321, et seq. is required.*

(b) *Prior to taking a major action, the agencies and subdivisions having jurisdiction over the activity shall meet and coordinate their major actions relating to the activity. The agencies and subdivisions shall, to the greatest extent practicable, consider the cumulative and secondary adverse effects, as described in the Federal environmental impact assessment process, of each major action relating to the activity.*

(c) *No agency or subdivision shall take a major action that is inconsistent with the goals and policies of this chapter. In addition, an agency or subdivision shall avoid and otherwise minimize the cumulative adverse effects to coastal natural resource areas of each of its major actions relating to the activity.*

Compliance: This project involves action subject to §506.12 and constitutes a major action. Therefore, a Federal EIS is required under the National Environmental Policy Act, 42 USC, §4321, et seq. A review of potential beneficial uses (BUs) of dredged material for the proposed Widening Project, which included an interagency panel review, did not identify any cost-effective BUs in the project area. This was based on the characteristics of the dredged material, cost to transport the material, impacts associated with placement and manipulation of the material, and impacts to existing resources. Thus, no BU is proposed for the FHCIP. The purpose of this appendix to the EIS (which considers cumulative and secondary adverse effects of the project) is to demonstrate that the LPP Alternative is consistent with the TCMP. All project planning has made efforts to avoid and otherwise minimize the cumulative adverse effects to coastal natural resource areas relating to the activity.

§501.25 – Dredging and Dredged Material Disposal and Placement

(a) *Dredging and the disposal and placement of dredged material shall avoid and otherwise minimize adverse effects to coastal waters, submerged lands, critical areas, coastal shore areas, and Gulf beaches to the greatest extent practicable. The policies of this section are supplemental to any further restrictions or requirements relating to the beach access and*

use rights of the public. In implementing this section, cumulative and secondary adverse effects of dredging and the disposal and placement of dredged material and the unique characteristics of affected sites shall be considered.

Compliance: Dredged material will be placed in three upland confined PAs and two ODMDSs. Placement within the ODMDSs would result in placement of dredged material within submerged lands, but these offshore PAs are dispersive by nature, have been previously used, and will likely revert to the in situ topography prior to the next dredged material disposal. With the exception of submerged lands, which would be temporarily impacted, all critical areas, shore areas, and Gulf beaches are avoided.

(1) Dredging and dredged material disposal and placement shall not cause or contribute, after consideration of dilution and dispersion, to violation of any applicable surface water quality standards established under §501.21 of this title.

Compliance: Samples have been taken from both maintenance and virgin sediments in the project area (sections 4.2 and 4.3 and Appendix B of this EIS) and subjected to elutriate preparation and suspended particulate bioassays. No Texas Water Quality Standards or U.S. Environmental Protection Agency Water Quality Criteria were exceeded, and nothing in the results of the bioassays indicates any cause for concern. For all PAs, adequate dilution and dispersion occurs so that applicable surface water standards are not violated (EIS Section 4.2 and Appendix B).

(2) Except as otherwise provided in paragraph (4) of this subsection, adverse effects on critical areas from dredging and dredged material disposal or placement shall be avoided and otherwise minimized, and appropriate and practicable compensatory mitigation shall be required, in accordance with §501.23 of this title.

Compliance: The LPP Alternative Dredged Material PAs avoids adverse effects on critical areas.

(3) Except as provided in paragraph (4) of this subsection, dredging and the disposal and placement of dredged material shall not be authorized if:

(A) there is a practicable alternative that would have fewer adverse effects on coastal waters, submerged lands, critical areas, coastal shore areas, and Gulf beaches, so long as that alternative does not have other significant adverse effects;

Compliance: Several alternatives were analyzed including a No Action Alternative, a NED Plan Alternative, and the LPP Alternative. Development of the LPP Alternative and

associated Dredged Material PAs resulted in an avoidance of detrimental impacts to coastal natural resources such as estuarine wetlands, oyster reefs, etc., to reduce impacts.

(B) all appropriate and practicable steps have not been taken to minimize adverse effects on coastal waters, submerged lands, critical areas, coastal shore areas, and Gulf beaches; or

Compliance: All practicable steps, including upland placement to the extent practicable, utilization of existing PAs, and minimum channel size to meet the project needs have been taken to minimize adverse affects on these resources. See Section 2.5 of the EIS for a discussion of all PAs that were evaluated and associated minimization of adverse effects.

(C) Significant degradation of critical areas under §501.23(a)(7)(E) of this title would result.

Compliance: Critical areas are avoided and degradation of such areas is not anticipated as a result of the LPP Alternative.

(4) A dredging or dredged material disposal or placement project that would be prohibited solely by application of paragraph (3) of this subsection may be allowed if it is determined to be of overriding importance to the public and national interest in light of economic impacts on navigation and maintenance of commercially navigable waterways.

Compliance: Dredging and placement is not precluded by paragraph (3), as noted above.

(b) Adverse effects from dredging and dredged material disposal and placement shall be minimized as required in subsection (a) of this section. Adverse effects can be minimized by employing the techniques in this subsection where appropriate and practicable.

Compliance: Adverse effects of dredging and disposal, as described in this EIS, and associated Dredged Material PA, have been minimized as described under "Compliance" for paragraph (1) of this subsection. See Section 2.5 of the EIS for a discussion of all PAs that were evaluated and associated minimization of adverse effects.

(1) Adverse effects from dredging and dredged material disposal and placement can be minimized by controlling the location and dimensions of the activity. Some of the ways to accomplish this include:

(A) locating and confining discharges to minimize smothering of organisms;

(B) locating and designing projects to avoid adverse disruption of water inundation patterns, water circulation, erosion and accretion processes, and other hydrodynamic processes;

(C) using existing or natural channels and basins instead of dredging new channels or basins, and discharging materials in areas that have been previously disturbed or used for disposal or placement of dredged material;

(D) limiting the dimensions of channels, basins, and disposal and placement sites to the minimum reasonably required to serve the project purpose, including allowing for reasonable overdredging of channels and basins, and taking into account the need for capacity to accommodate future expansion without causing additional adverse effects;

(E) discharging materials at sites where the substrate is composed of material similar to that being discharged;

(F) locating and designing discharges to minimize the extent of any plume and otherwise control dispersion of material; and

(G) avoiding the impoundment or drainage of critical areas.

Compliance: PAs have been selected to minimize impacts by using existing upland confined PAs or existing and previously authorized ODMDSs, wherever practical. Changes in water circulation and salinity should have minimal impacts to fisheries. Discharges will be confined with reinforced levees, where applicable. Only proper material will be used for certain substrates and uses. No impoundment or draining of critical areas will occur. No new channels are required to access existing or proposed PAs (upland and ODMDS).

(2) Dredging and disposal and placement of material to be dredged shall comply with applicable standards for sediment toxicity. Adverse effects from constituents contained in materials discharged can be minimized by treatment of or limitations on the material itself. Some ways to accomplish this include:

(A) disposal or placement of dredged material in a manner that maintains physiochemical conditions at discharge sites and limits or reduces the potency and availability of pollutants;

(B) limiting the solid, liquid, and gaseous components of material discharged;

(C) adding treatment substances to the discharged material; and

(D) adding chemical flocculants to enhance the deposition of suspended particulates in confined disposal areas.

<u>Compliance:</u> Sediments to be dredged from the LPP Alternative have been tested for a variety of chemical parameters, and there appears to be no cause for concern relative to placing these sediments in the Gulf or upland confined PAs (Section 4.3 and Appendix B of the EIS).

(3) Adverse effects from dredging and dredged material disposal or placement can be minimized through control of the materials discharged. Some ways of accomplishing this include:

(A) use of containment levees and sediment basins designed, constructed, and maintained to resist breaches, erosion, slumping, or leaching;

(B) use of lined containment areas to reduce leaching where leaching of chemical constituents from the material is expected to be a problem;

(C) capping in-place contaminated material or, selectively discharging the most contaminated material first and then capping it with the remaining material;

(D) properly containing discharged material and maintaining discharge sites to prevent point and nonpoint pollution; and

(E) timing the discharge to minimize adverse effects from unusually high water flows, wind, wave, and tidal actions.

<u>Compliance:</u> Discharges will be confined with reinforced levees where applicable. Only proper material will be used for certain substrates and uses. Additionally, the timing of discharge would be planned in a manner to reduce or avoid adverse impacts from unusually high water flows, wind, wave, and tidal actions.

(4) Adverse effects from dredging and dredged material disposal or placement can be minimized by controlling the manner in which material is dispersed. Some ways of accomplishing this include:

(A) where environmentally desirable, distributing the material in a thin layer;

(B) orienting material to minimize undesirable obstruction of the water current or circulation patterns;

(C) using silt screens or other appropriate methods to confine suspended particulates or turbidity to a small area where settling or removal can occur;

(D) using currents and circulation patterns to mix, disperse, dilute, or otherwise control the discharge;

(E) minimizing turbidity by using a diffuser system or releasing material near the bottom;

(F) selecting sites or managing discharges to confine and minimize the release of suspended particulates and turbidity and maintain light penetration for organisms; and

(G) setting limits on the amount of material to be discharged per unit of time or volume of receiving waters.

Compliance: All of the sites minimize or avoid adverse dispersal effects to the greatest extent practicable. At ODMDSs, studies indicate adequate dispersion and dilution would occur during discharge. Sequenced discharge points will be used to disperse material across the ODMDSs. There are no sediments of concern.

(5) Adverse effects from dredging and dredged material disposal or placement operations can be minimized by adapting technology to the needs of each site. Some ways of accomplishing this include:

(A) using appropriate equipment, machinery, and operating techniques for access to sites and transport of material, including those designed to reduce damage to critical areas;

(B) having personnel on site adequately trained in avoidance and minimization techniques and requirements; and

(C) designing temporary and permanent access roads and channel spanning structures using culverts, open channels, and diversions that will pass both low and high water flows, accommodate fluctuating water levels, and maintain circulation and faunal movement.

Compliance: Where applicable, all sites in this project meet this requirement. Contracts will be written to ensure compliance with all standards. ODMDSs are accessed by vessel and all upland sites can be accessed by land-based equipment without damaging critical areas.

(6) Adverse effects on plant and animal populations from dredging and dredged material disposal or placement can be minimized by:

(A) avoiding changes in water current and circulation patterns that would interfere with the movement of animals;

(B) selecting sites or managing discharges to prevent or avoid creating habitat conducive to the development of undesirable predators or species that have a competitive edge ecologically over indigenous plants or animals;

(C) avoiding sites having unique habitat or other value, including habitat of endangered species;

(D) using planning and construction practices to institute habitat development and restoration to produce a new or modified environmental state of higher ecological value by displacement of some or all of the existing environmental characteristics;

(E) using techniques that have been demonstrated to be effective in circumstances similar to those under consideration whenever possible and, when proposed development and restoration techniques have not yet advanced to the pilot demonstration stage, initiating their use on a small scale to allow corrective action if unanticipated adverse effects occur;

(F) timing dredging and dredged material disposal or placement activities to avoid spawning or migration seasons and other biologically critical time periods; and

(G) avoiding the destruction of remnant natural sites within areas already affected by development.

Compliance: Proper coordination with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), under the requirements of the Endangered Species Act, was implemented, and no impacts to endangered species or their habitats are anticipated, except for potential impacts to sea turtles during hopper dredging. Impacts to sea turtles, a primary wildlife concern, will be avoided or minimized via: (1) hopper dredging will be limited to the cooler months, when possible, when sea turtle activity and abundance is lowest; (2) dredges will employ trawls to safely remove sea turtles before being adversely affected by dredge equipment; and (3) qualified turtle observers will be used to document any turtles that become entrained by the hopper dredge dragheads, and all information will be submitted accordingly to USFWS and NMFS. A Habitat Evaluation Procedure (HEP) was implemented to mitigate habitats directly affected by the two new PAs, 8 and 9. Permanent impacts would be mitigated, and invasive species, such as tallow trees, will be removed. Lastly, the LPP Alternative would have minor, temporary impacts to wildlife in the area due to noise and physical disturbance during dredging and placement operations.

(7) Adverse effects on human use potential from dredging and dredged material disposal or placement can be minimized by:

(A) selecting sites and following procedures to prevent or minimize any potential damage to the aesthetically pleasing features of the site, particularly with respect to water quality;

(B) selecting sites which are not valuable as natural aquatic areas;

(C) timing dredging and dredged material disposal or placement activities to avoid the seasons or periods when human recreational activity associated with the site is most important; and

(D) selecting sites that will not increase incompatible human activity or require frequent dredge or fill maintenance activity in remote fish and wildlife areas.

Compliance: Temporary and minor adverse effects to fisheries may result from altering or removing productive fishing grounds and interfering with fishing activity near or in the ODMDSs and within the project area during construction and maintenance. Additionally, existing PAs were used to avoid additional impacts to resources. New PAs were located in a manner that did not impact valuable aquatic areas or recreational use areas.

(8) Adverse effects from new channels and basins can be minimized by locating them at sites:

(A) that ensure adequate flushing and avoid stagnant pockets; or

(B) that will create the fewest practicable adverse effects on CNRAs from additional infrastructure such as roads, bridges, causeways, piers, docks, wharves, transmission line crossings, and ancillary channels reasonably likely to be constructed as a result of the project; or

(C) with the least practicable risk that increased vessel traffic could result in navigation hazards, spills, or other forms of contamination that could adversely affect CNRAs;

(D) provided that, for any dredging of new channels or basins subject to the requirements of §501.15 of this title (relating to Policy for Major Actions), data and information on minimization of secondary adverse effects need not be produced or evaluated to comply with this paragraph if such data and information is produced and evaluated in compliance with §501.15(b)(1) of this title.

<u>Compliance:</u> The LPP Alternative constitutes new work dredging to the existing ship channel for increased vessel safety (i.e., to minimize navigation hazards, spills, or other forms of contamination that could adversely affect CNRAs). The LPP Alternative will not impact any CNRAs (except submerged lands at the ODMDSs, which are expected to return to ambient bathymetry since the ODMDSs are dispersive sites).

(c) Disposal or placement of dredged material in existing contained dredge disposal sites identified and actively used as described in an environmental assessment or environmental impact statement issued prior to the effective date of this chapter shall be presumed to comply with the requirements of subsection (a) of this section unless modified in design, size, use, or function.

<u>Compliance:</u> All new upland PAs (PAs 8 and 9) were reviewed by the HEP, and no further environmental review was recommended for the existing, actively used PA 1. PAs 8 and 9 would impact 39 acres of wetlands and 21 acres of forest. Avoidance and minimization was employed during project planning. The HEP identified a site to compensate for both wetland and forest impacts. Details regarding the Dredged Material PAs can be found in the EIS, Section 2.4, and the HEP analysis, including mitigation, can be found in Appendix H of the EIS.

(d) Dredged material from dredging projects in commercially navigable waterways is a potentially reusable resource and must be used beneficially in accordance with this policy.

<u>Compliance:</u> New work and future maintenance dredged material to be generated by the LPP Alternative consist of 72 percent clay. This substrate is not conducive for the BU that is most important for this area (i.e., beach nourishment, which requires high sand content). Also, some BU alternatives that may have been feasible (given substrate composition) were considered early in the project planning process but eliminated through alternatives analyses. Section 3.5 of the EIS provides more detail regarding sediment quality analyses.

(1) If the costs of the BU of dredged material are reasonably comparable to the costs of disposal in a non-beneficial manner, the material shall be used beneficially.

(2) If the costs of the BU of dredged material are significantly greater than the costs of disposal in a non-beneficial manner, the material shall be used beneficially unless it is demonstrated that the costs of using the material beneficially are not reasonably proportionate to the costs of the project and benefits that will result. Factors that shall be considered in determining whether the costs of the BU are not reasonably proportionate to the benefits include, but are not limited to:

(A) environmental benefits, recreational benefits, flood or storm protection benefits, erosion prevention benefits, and economic development benefits;

(B) the proximity of the BU site to the dredge site; and

(C) the quantity and quality of the dredged material and its suitability for BU.

(3) Examples of the BU of dredged material include, but are not limited to:

(A) projects designed to reduce or minimize erosion or provide shoreline protection;

(B) projects designed to create or enhance public beaches or recreational areas;

(C) projects designed to benefit the sediment budget or littoral system;

(D) projects designed to improve or maintain terrestrial or aquatic wildlife habitat;

(E) projects designed to create new terrestrial or aquatic wildlife habitat, including the construction of marshlands, coastal wetlands, or other critical areas;

(F) projects designed and demonstrated to benefit benthic communities or aquatic vegetation;

(G) projects designed to create wildlife management areas, parks, airports, or other public facilities;

(H) projects designed to cap landfills or other waste disposal areas;

(I) projects designed to fill private property or upgrade agricultural land, if cost-effective public BUs are not available; and

(J) projects designed to remediate past adverse impacts on the coastal zone.

Compliance: Numerous BUs were considered during project planning. BUs of dredged material are discussed in the EIS, Section 2.4 and Section 3.5 (Sediment Quality); however, new work dredged material to be generated by the LPP Alternative consist of 72 percent clay. This substrate is not conducive for the BU that is most important for this area (i.e., beach nourishment, which requires high sand content). Also, some BU alternatives that may have been feasible (given substrate composition) were considered early in the project planning process but eliminated through alternatives analyses.

(e) If dredged material cannot be used beneficially as provided in subsection (d)(2) of this section, to avoid and otherwise minimize adverse effects as required in subsection (a) of this section, preference will be given to the greatest extent practicable to disposal in:

(1) contained upland sites;

(2) other contained sites; and

(3) open water areas of relatively low productivity or low biological value.

<u>Compliance:</u> New work and future maintenance dredged material whose sediment characteristics preclude being used beneficially will be placed in either the ODMDSs or upland confined PAs.

(f) For new sites, dredged materials shall not be disposed of or placed directly on the boundaries of submerged lands or at such location so as to slump or migrate across the boundaries of submerged lands in the absence of an agreement between the affected public owner and the adjoining private owner or owners that defines the location of the boundary or boundaries affected by the deposition of the dredged material.

<u>Compliance</u>: PAs are designed to prevent impacts to adjoining private lands. All property rights and boundaries associated with submerged lands will be observed.

(g) Emergency dredging shall be allowed without a prior consistency determination as required in the applicable consistency rule when:

(1) there is an unacceptable hazard to life or navigation;

(2) there is an immediate threat of significant loss of property; or

(3) an immediate and unforeseen significant economic hardship is likely if corrective action is not taken within a time period less than the normal time needed under standard procedures. The council secretary shall be notified at least 24 hours prior to commencement of any emergency dredging operation by the agency or entity responding to the emergency. The notice shall include a statement demonstrating the need for emergency action. Prior to initiation of the dredging operations the project sponsor or permit-issuing agency shall, if possible, make all reasonable efforts to meet with council's designated representatives to ensure consideration of and consistency with applicable policies in this subchapter. Compliance with all applicable policies in this subchapter shall be required at the earliest possible date. The permit-issuing agency and the applicant shall submit a consistency determination within 60 days after the emergency operation is complete.

<u>Compliance</u>: The project would comply with *section (g)* in the event that emergency dredging is necessary.

(h) *There will be no mining of sand, shell, marl, gravel, or mudshell for project purposes. Dredged new work and maintenance material will be placed within ODMDSs, which are located within submerged lands, and shall be prohibited unless there is an affirmative showing of no significant impact on erosion within the coastal zone and no significant adverse effect on coastal water quality or terrestrial and aquatic wildlife habitat within any CNRA.*

<u>Compliance</u>: Placement within the ODMDSs would result in placement of dredged material within submerged lands, but these offshore PAs are dispersive by nature, have been previously used, and will likely revert to the in situ topography prior to the next dredged material disposal. With the exception of submerged lands, which would be temporarily impacted, all CNRAs are avoided.

(i) *The GLO and the SLB shall comply with the policies in this section when approving oil, gas, and other mineral lease plans of operation and granting surface leases, easements, and permits and adopting rules under the Texas Natural Resources Code, Chapters 32, 33, and 51 - 53, and Texas Water Code, Chapter 61, for dredging and dredged material disposal and placement. TxDOT shall comply with the policies in this subchapter when adopting rules and taking actions as local sponsor of the Gulf Intracoastal Waterway under Texas Transportation Code, Chapter 51. The TCEQ and the RRC shall comply with the policies in this section when issuing certifications and adopting rules under Texas Water Code, Chapter 26, and the Texas Natural Resources Code, Chapter 91, governing certification of compliance with surface water quality standards for Federal actions and permits authorizing dredging or the discharge or placement of dredged material. The TPWD shall comply with the policies in this section when adopting rules at Chapter 57 of this title (relating to Fisheries) governing dredging and dredged material disposal and placement. The TPWD shall comply with the policies in subsection (h) of this section when adopting rules and issuing permits under Texas Parks and Wildlife Code, Chapter 86, governing the mining of sand, shell, marl, gravel, and mudshell.*

<u>Compliance</u>: This project does not pertain to oil, gas, and other mineral lease plans of operation and granting surface leases, easements, and permits; *section (i)* is not applicable.

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Borgens, Amy, Sara Hoskins, Jenna Enright, and Robert L. Gearhart II. 2007. Remote-sensing survey of proposed channel modifications for historic properties, Freeport Harbor Navigation Channel Improvement Project, Freeport Harbor, Brazoria County, Texas. Prepared for the U.S. Army Corps of Engineers, Galveston District. Document No. 060218. PBS&J, Austin.

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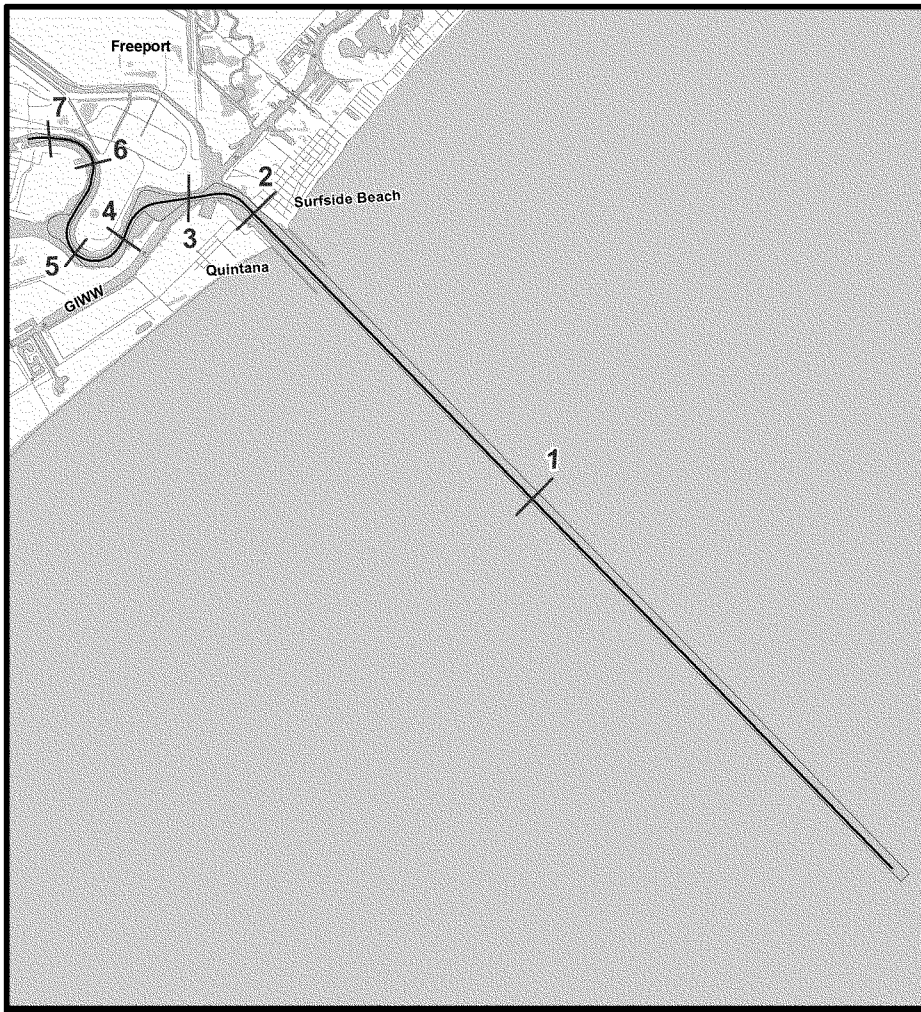
Appendix K

Cross Sections for 45-Foot Project, NED, LPP, and Jetty Stability



Legend

- Representative of Channel Stations
- Channel Centerline
- Proposed Channel Alignment

N W E S

0 3,600 7,200 14,400 Feet

Figure K
Freeport Harbor Channel Improvement Project
Existing, NED, and LPP Channel Cross-Section Locations

Prepared for: USACE	
Job No.: 044190100	Scale: 1 inch equals 7,000 feet
Prepared by: A. Christiansen	Date: 3/19/2008

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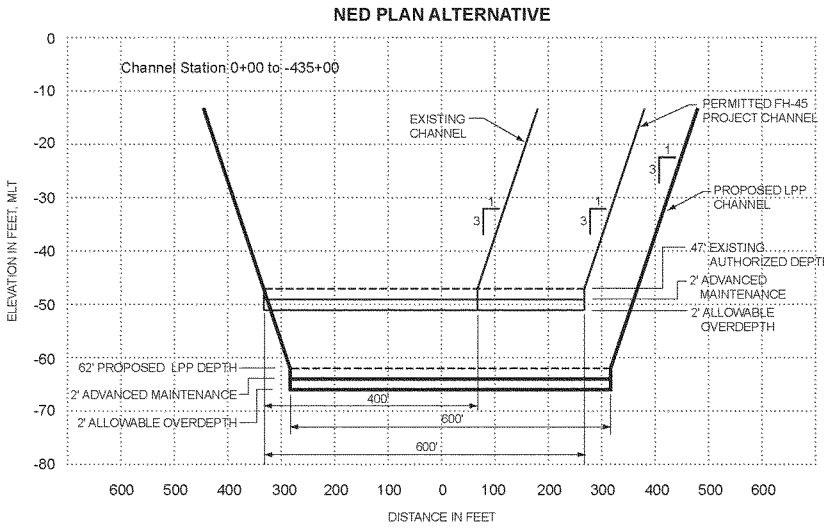

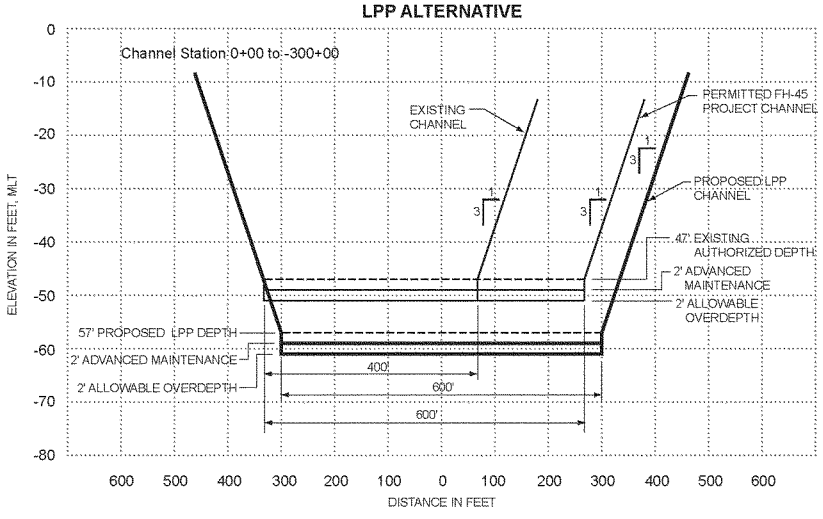

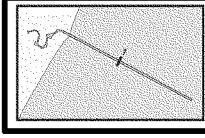

Outer Bar Channel

Figure K-1
Freeport Harbor Channel Improvement Project
Existing, NED, and LPP Channel Alternatives
Channel Dimensions Cross Section 1

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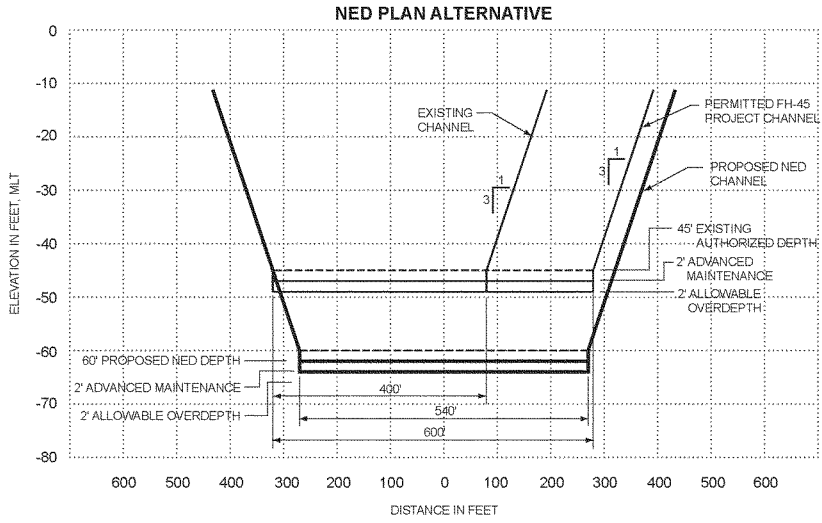

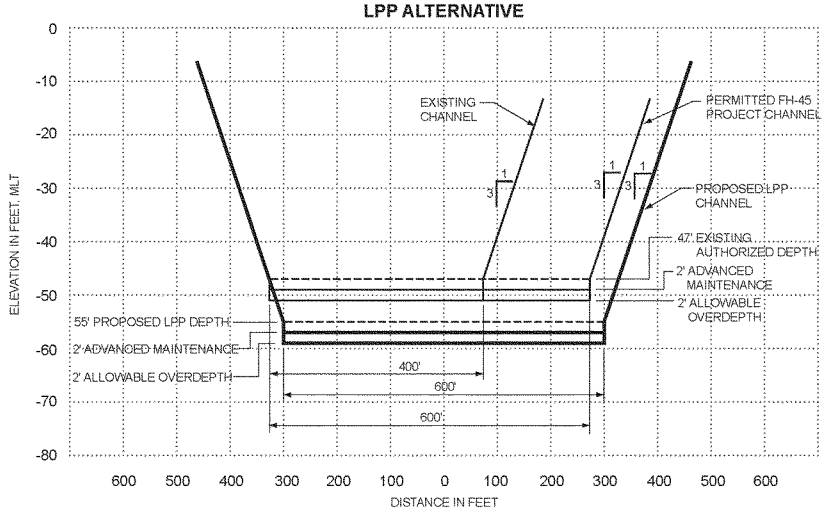

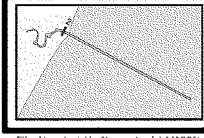

Jetty Channel

Channel Station 0+00 to 71+52

Figure K-2
Freeport Harbor Channel Improvement Project
Existing, NED, and LPP Channel Alternatives
Channel Dimensions Cross Section 2

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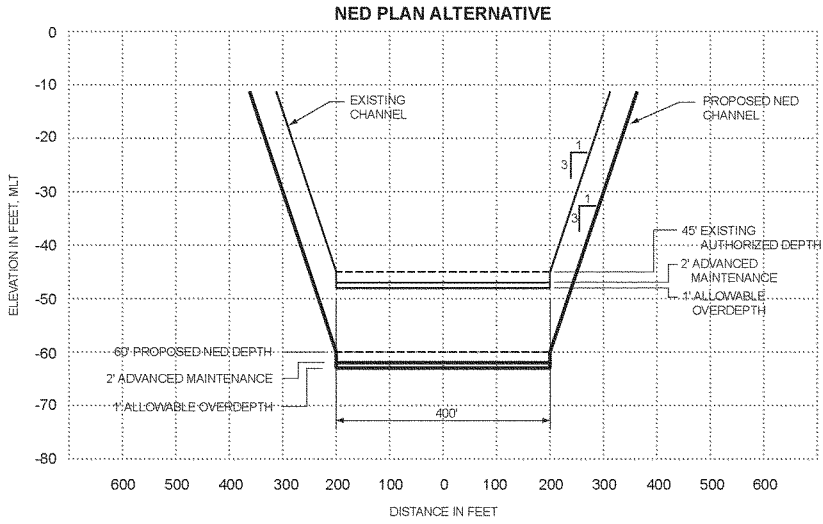

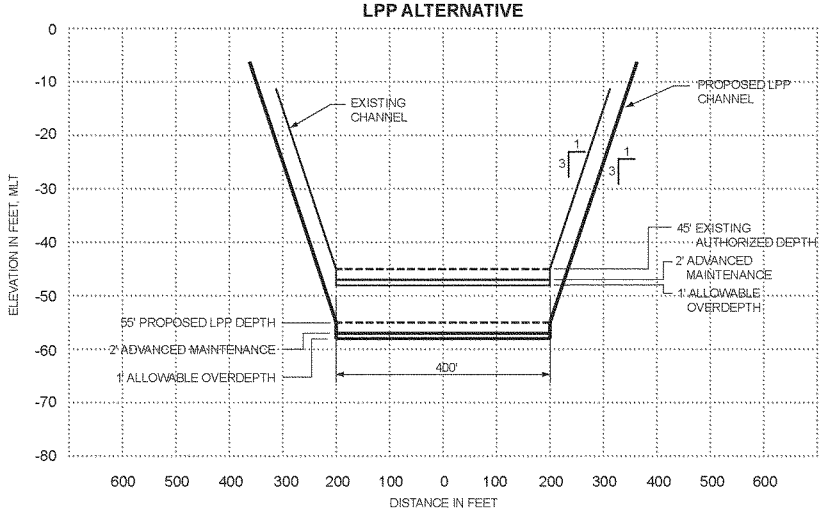

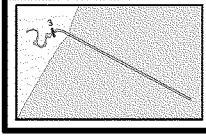

Channel to Brazosport Turning Basin

Channel Station 78+52 to 101+00

Figure K-3
Freeport Harbor Channel Improvement Project
Existing, NED, and LPP Channel Alternatives
Channel Dimensions Cross Section 3

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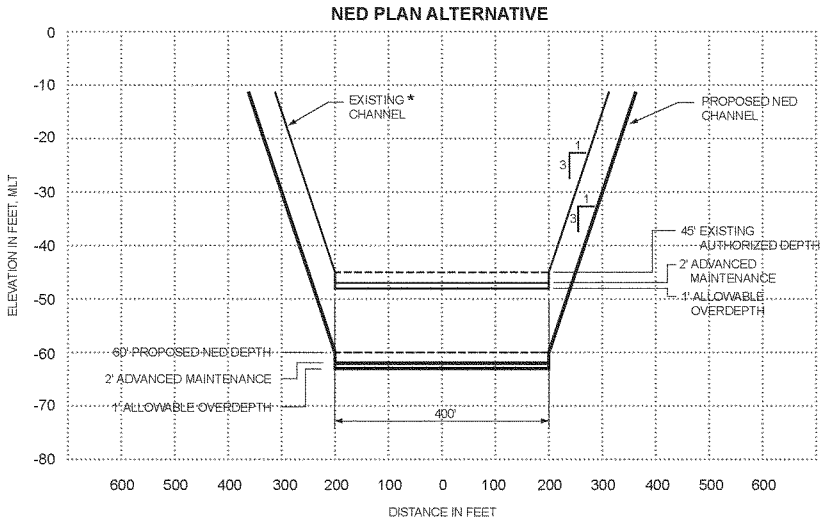

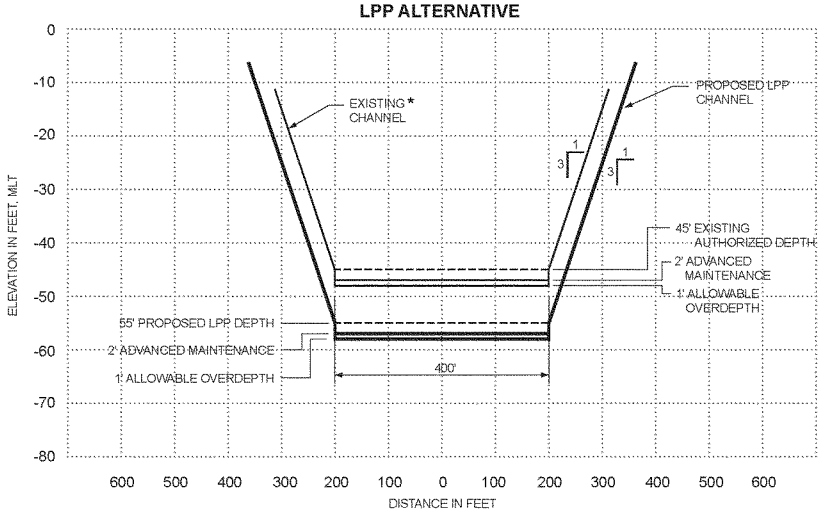

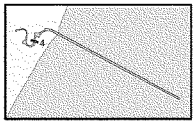

Channel to Upper Turning Basin Lower Reach

Channel Station 115+00 to 132+66

***Existing Bottom Widths vary between 300ft and 600ft. Channel Improvement would not modify width.**

Figure K-4
Freeport Harbor Channel Improvement Project
Existing, NED, and LPP Channel Alternatives
Channel Dimensions Cross Section 4

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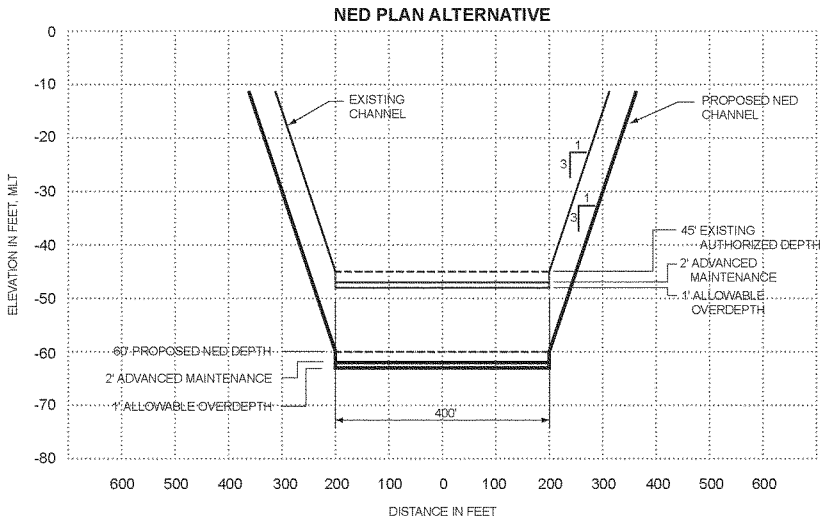

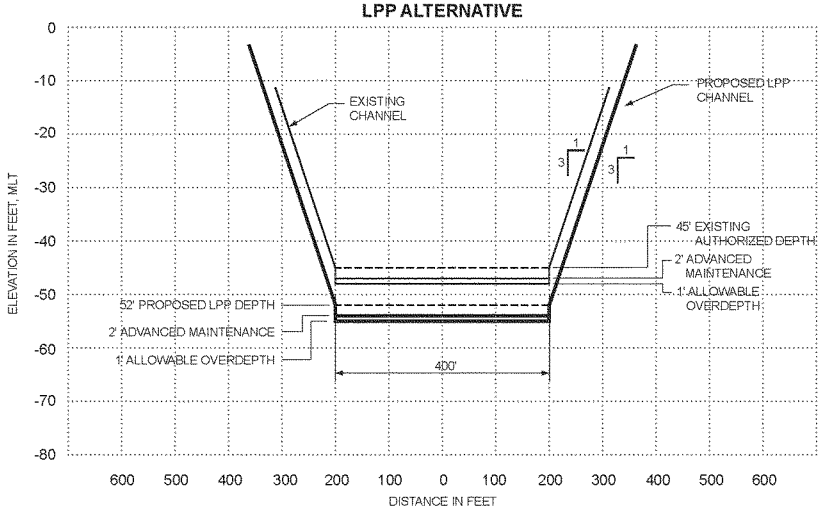

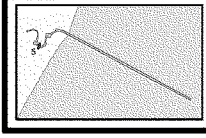

Channel to Upper Turning Basin
Upper Reach

Channel Station 132+66 to 174+00

Figure K-5
Freeport Harbor Channel Improvement Project
Existing, NED, and LPP Channel Alternatives
Channel Dimensions Cross Section 5

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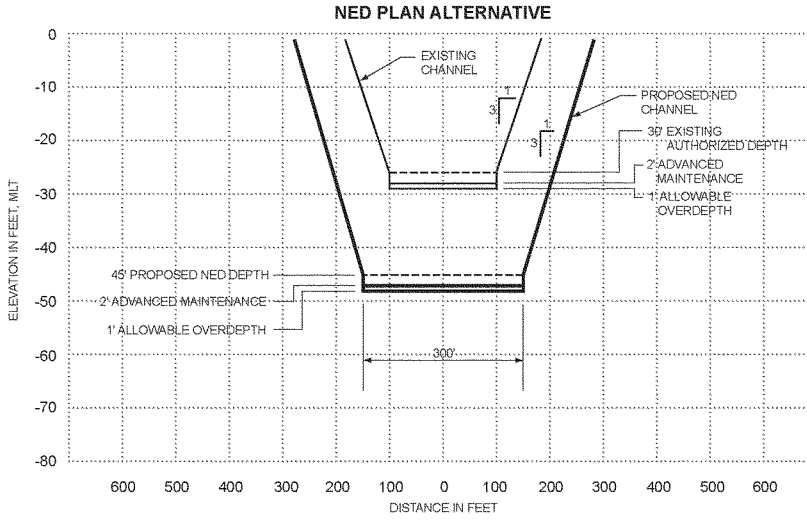

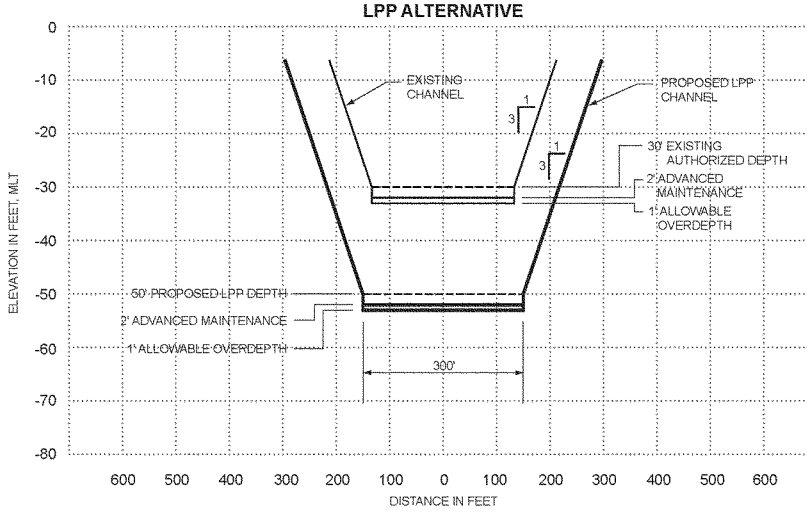

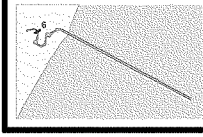

Stauffer Channel
Lower Reach

Channel Station 186+00 to 222+00

Figure K-6
Freeport Harbor Channel Improvement Project
Existing, NED, and LPP Channel Alternatives
Channel Dimensions Cross Section 6

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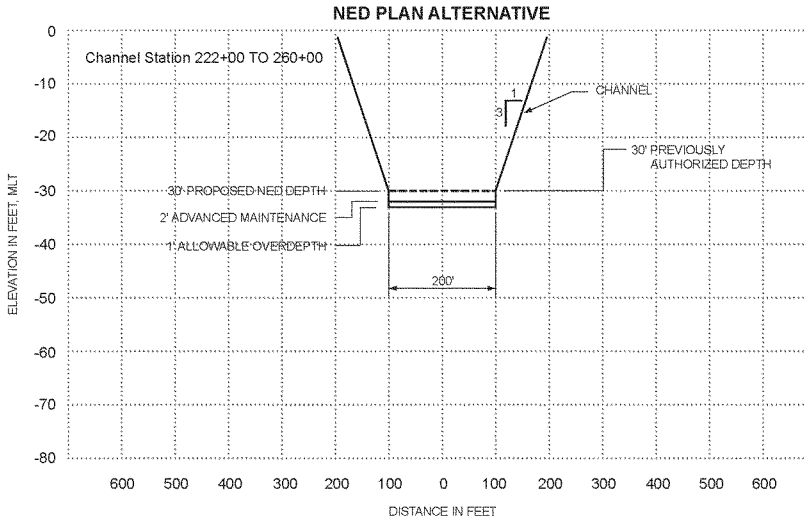

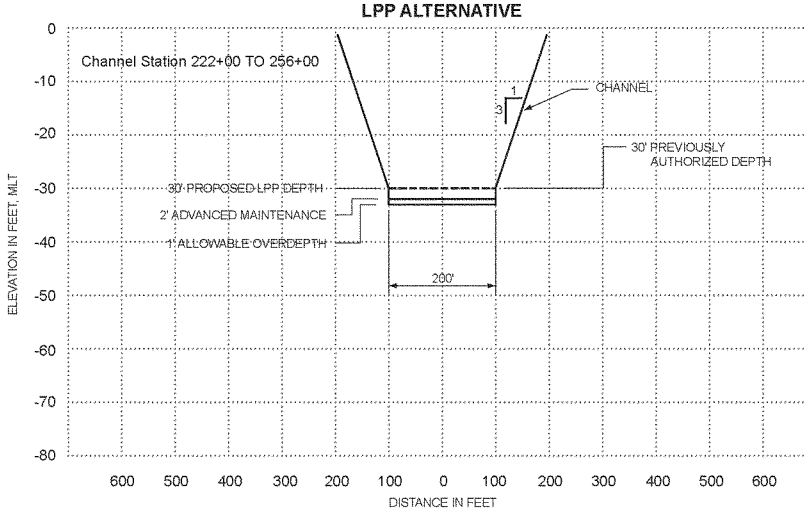

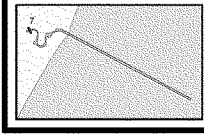

Stauffer Channel Upper Reach

Figure K-7
Freeport Harbor Channel Improvement Project
Existing, NED, and LPP Channel Alternatives
Channel Dimensions Cross Section 7

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Appendix L

Relative Sea Level Rise

APPENDIX L
RELATIVE SEA LEVEL RISE FOR FREEPORT, TEXAS: ADDRESSING THE MOST RECENT CORPS GUIDANCE

INTRODUCTION

New U.S. Army Corps of Engineers (USACE) guidance (Engineering Circular [EC] 1165-2-211, July 2009) specifies the following procedures for incorporating relative sea level rise (RSLR) into the project impacts.

Evaluate alternatives using "low," "intermediate," and "high" rates of future sea level change:

- Use the historic rate of local mean sea level change as the "low" rate. (The guidance further states that historic rates of sea level rise are best determined by local tide records.)
- Estimate the "intermediate" rate of local mean sea level change using the modified National Research Council (NRC) Curve I. Consider both the most recent Intergovernmental Panel on Climate Change (IPCC) projections and the NRC projections and add those to the local rate of vertical land movement.
- Estimate the "high" rate of local mean sea level change using the modified NRC Curve III. Consider both the most recent IPCC projections and the NRC projections and add those to the local rate of vertical land movement.

The Modified NRC curves are based on the curves published by the NRC in 1987 with modifications of the coefficients suggested in the IPCC 4th Assessment Report (AR4) (IPCC, 2007).

The Modified NRC equation is given below:

$$\eta(t)=(0.0017+M)t+bt^2 \qquad (1)$$

Where

$\eta(t)$ = the relative sea level rise for year t (meters)

t = the elapsed time since the baseline year of 1986 (years)

M = the local rate of subsidence (+) or uplift (–) (meters/year)

b = the rate of acceleration of eustatic sea level rise (meters/year^2)

The values of b are chosen such that the sea level due to eustatic rise at year 2100 is equal to 0.5, 1.0, and 1.5 meters, respectively. These values are given in Table 1.

Table 1
Values of the Rate of Acceleration of Eustatic Sea Level Rise for Each of the Modified NRC Curves

NRC Curve	b (meters/year^2)
NRC I	2.35611E-05
NRC II	6.20345E-05
NRC III	1.0051 E-04

This document addresses this new guidance for the Freeport Harbor, Texas, system.

Historic RSLR

The recent historic rate of local RSLR rise can be obtained from local tide records with reasonably high confidence. This rate can be extracted from National Oceanic and Atmospheric Administration (NOAA) tide gage data at Freeport. It is equal to 4.35 ± 1.12 millimeters (mm)/year (0.0143 ± 0.003 feet/year) with a 95 percent confidence interval (NOAA, 2008). If we assume a historic eustatic rate equal to the globally averaged rate given for the Modified NRC curves (= 1.7 mm/year (0.0056 foot/year)), this results in an estimated observed subsidence rate of 4.35 – 1.7 = 2.65 mm/year (0.0087 foot/year).

To date, there is no scientific consensus on what the local subsidence rate should be for future projections. The relative influence of historic anthropogenic activities, such as oil extraction and groundwater withdrawal, are difficult to quantify. If these activities have contributed significantly to recent observations of subsidence, then the cessation of these activities may result in a rapid deceleration of subsidence rates, returning them to the long-term average rates.

Since the cessation of most of these anthropogenic activities occurred in the Freeport vicinity within the last 20 to 30 years, there is not yet sufficient tide gage data to determine whether or not the local rate of subsidence has decelerated.

Several studies of basal peat layers have been conducted in the Texas and Louisiana coastal region to determine estimates of the long-term average rates of subsidence. These rates are generally on the order to 0.5 mm/year (0.0016 foot/year) (Törnqvist et al., 2006). This rate is significantly lower than the observed tide gage rates. Therefore, if historic anthropogenic activities are largely responsible for the accelerated rates observed in the tide records, then one would expect the projected rates to decelerate rapidly over the next several decades.

New RSLR Analysis as per the Updated USACE Guidance

According to the most recent guidance, the subsidence rate should be chosen based on the tidal record analysis. However, the regional scientific debate concerning the validity of these tidal records with respect to projection of future subsidence rates indicates that the basal peat rates should also be considered.

Figure 1 gives the computed sea level rise based on the new guidance for the low (historic) rate, the intermediate (Modified NRC Curve I) rate, and the high (Modified NRC Curve III) rate. The computed sea level rise given here assumed a 50-year project life, and gives the predicted rise for the years 2012–2062. The rates are given for subsidence values that correspond to both the observed tidal gage values (rapid subsidence) and the observed basal peat values (moderate subsidence).

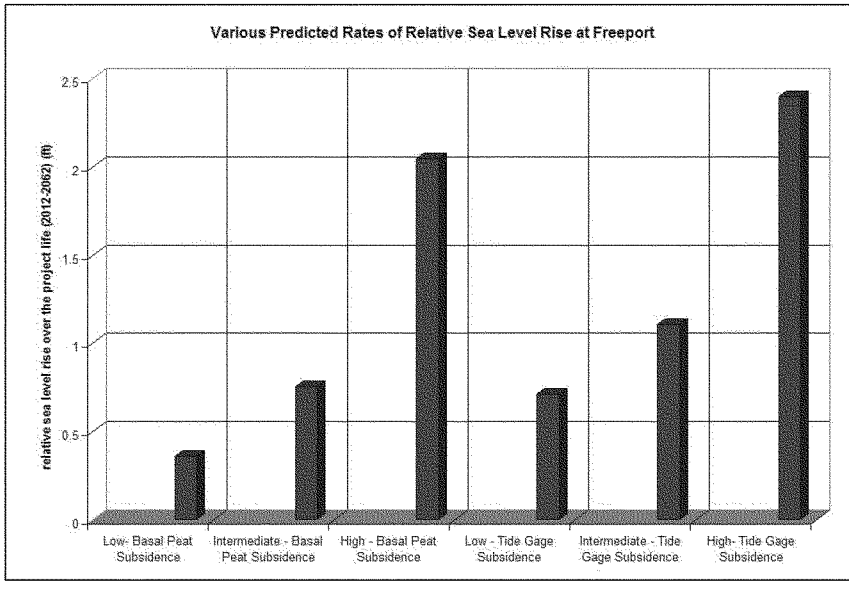

Figure 1: Various Predicted Rates of Relative Sea Level Rise for 2012–2062.

These values are given in Table 2.

Table 2
Estimates of Future Relative Sea Level Rise (2012–2062)

Subsidence Rate	Low (foot [cm*])	Intermediate (foot [cm])	High (foot [cm])
Basal Peat (0.0016 foot/year or 0.5 mm/year)	0.36 (11.0)	0.76 (23.2)	2.04 (62.2)
Tide gage (0.0087 foot/year or 2.65 mm/year)	0.71 (21.6)	1.11 (33.8)	2.40 (73.2)

*cm = centimeters

Project-related RSLR Impacts in the Freeport Harbor

The potential for RSLR impacts in the Freeport Harbor project area include impacts on wetlands and other sensitive low-lying areas due to higher water levels, impacts on vessel traffic due to changes in current velocities in the area, and impacts on surge levels.

Numerical model experiments performed for this project show that the changes from the Base, or existing, conditions to the Locally Preferred Plan (LPP) and National Economic Development Plan (NED) (both also referred to as the Plan conditions) include changes in the velocities in the harbor, the tides in the harbor, and the surge values. The depth-averaged velocities in the harbor show, for both plans, a decrease in peak ebb and flood velocities of from 0.0 to 0.18 foot/second (sec) (5.4 centimeters [cm]/sec), the decrease becoming less as one moves up into the harbor. Tidal differences include advancement of the flood and ebb tides by approximately 30 minutes in this diurnal system and an increase in the mean tide range of about 0.3 percent, or 0.01 foot (0.2 cm). The two plans give tidal results that are essentially identical. The surge values for the plans are about 0.16 foot (5 cm) higher with the plans than without them. These differences in tidal velocities, tidal timing and tide range, and surge are the result of physical changes to the system in the plans. The plan changes are of two types. One change involves an increase in the area of the harbor through the removal of parts of the southwest peninsula separating the harbor from the GIWW; the other change is the deepening and widening of the channels.

Both types of changes tend to increase the coupling of the harbor to the Gulf. The excavation of portions of the southwest peninsula will increase the tidal prism of the harbor by about 0.05 percent. This increased tidal prism results in more water moving into and out of the system during each tidal cycle. Since more water is entering and leaving the system during each tidal cycle, peak velocities are expected to increase as a result. Deepening and widening of the Jetty Channel and the inner basin also result in a stronger coupling between the Gulf and the harbor. This deepening and widening of the harbor results in increases in the volume of the harbor of from 5.8 percent (Plan 5) to 6.4 percent (Plan 4). The increased cross-sectional area for the water to flow into the system will result in decreased peak velocities. Detailed numerical modeling shows that the net effect of these competing processes is to lower the peak velocities, up to 0.18 foot/sec (5.4 cm/sec), in the harbor, as one would expect from the relative size of the effects.

With the projected RSLR, the system is, in effect, deepened from 0.36 foot (11.0 cm) to 2.4 feet (73.2 cm) further, depending on the RSLR and subsidence scenario. This additional "deepening" will result in further, though slight, decreases in peak velocities by further increasing the cross section of the channel.

The increased coupling also affects the tide. The advancement of the timing of the tide means that, with the deeper and wider channel, the tide can move into and out of the harbor more easily, and thus, the timing of the tide will change. Deepening of this type generally also causes an increase in the tide range inside a waterway; the range of the driving Gulf tide is diminished less as it experiences relatively less friction, due to the deeper water, as it travels up into the system. In this case, however, the system in its existing condition is already well coupled to the Gulf, as evidenced by the similarity of the tides in the jetties to those in the harbor. And, given the lack of resonant behavior in the short channel (about 3 miles [5 kilometers] from the jetties to the end of the deepened portion of the channel), only small increases in the tide range, predicted to be about 0.3 percent, or 0.01 foot (0.2 cm) for a mean tide of 1.64 feet (50 cm), can be expected with further deepening and widening. Again, with the projected RSLR for this system, no additional increase in tidal range is expected since the incremental change, due to RSLR, decreases the relative differences between the Base and Plan conditions.

The increased coupling due to the project also affects the surge, increasing the surge levels by about 0.16 foot (5 cm) locally. The percent differences of water level in the system between the with-plan and without-plan cases for RSLR of 0.36 foot (11.0 cm) to 2.4 feet (73.2 cm) will be smaller than without RSLR. The differences in surge height are thus expected to be less as well. Additionally, the effects of increased surge due to the project are local, and, given the general inundation of the greater Freeport area during a significant surge, the additional water elevation due to the project, with or without RSLR, is expected to be small.

Given the above discussion, impacts on wetlands in the Freeport Harbor are thus expected to be negligible for two reasons. First, there are no tidal wetlands in the system to be impacted. Second, changes in tidal range are expected to be small and difficult to measure, being in the millimeter range. Since the Freeport Harbor is a highly developed industrial area with no tidal wetlands, water level changes due to RSLR will have an effect on the harbor similar to that of a deepening. As seen in the modeling and an examination of the tide data, the harbor is already, at current depths and cross sections, closely coupled to the Gulf so that any further increases in depth will result in very small increases in tide range. Thus, RSLR is expected to result in an insignificant difference between the existing channel conditions and the plans.

Impacts on navigation are also expected to be negligible, with currents likely decreasing, with RSLR, even further from the decreases expected with the project. RSLR, being in this case essentially a deepening, means that an even larger effective cross-sectional area will be available for the flooding and ebbing tides, meaning that the peak velocities will decrease further. Hence,

RSLR is expected to cause an insignificant difference between the existing channel and the plans.

Finally, impact differences on the surge levels due to the project, with and without RSLR, are expected to be very small and local.

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Appendix M

Field Survey for the Presence of Nesting Colonial Waterbirds

APPENDIX M
FIELD SURVEY FOR THE PRESENCE OF NESTING COLONIAL WATERBIRDS
FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT

A field survey was conducted by Galveston District personnel on June 18, 2010, at the inner portion of the Freeport Harbor Channel Improvement Project area, to assess the potential presence of nesting colonial waterbirds at Rookeries 610-101 and 610-102. U.S. Fish and Wildlife Service (USFWS) and Texas Parks and Wildlife Department resource agency personnel were not able to participate in the field survey. According to the USFWS Texas Colonial Waterbird Census, these sites have been absent of any nesting activity for at least the last 10 years of surveys. The field survey did not reveal any nesting activity at either of these sites.

Rookery 610-101 is located at Bryan Beach State Park, near the intersection of the Freeport Harbor Channel system and the Gulf Intracoastal Waterway. This site consists of intertidal wetland areas dominated by smooth cordgrass (*Spartina alterniflora*), marsh-hay cordgrass (*Spartina patens*), leafy three-square (*Scirpus robustus*), needlerush (*Juncus roemerianus*), saltgrass (*Distichlis spicata*), bushy sea ox-eye daisy (*Borrichia frutescens*), saltwort (*Batis maritima*), annual glasswort (*Salicornia bigelovii*), perennial glasswort (*Salicornia virginica*), high tide bush (*Iva frutescens*), and gulf cordgrass (*Spartina spartinae*). While clapper rails and great egrets were observed feeding in the area, no nests or nesting birds were found.

Rookery 610-102 is located at Bryan Beach Spoil, which is an inactive upland placement area along the south side of the Freeport Channel system, situated on the southwest portion of the Teppco Peninsula. This site is dominated by black willow (*Salix nigra*), Chinese tallow (*Sapium sebiferum*), Brazilian vervain (*Verbena brasiliensis*), southern dewberry (*Rubus trivialis*), eastern baccharis (*Baccharis halimifolia*), giant ragweed (*Ambrosia trifida*), seaside goldenrod (*Solidago sempervirens*), sunflower (*Helianthus* sp.), johnsongrass (*Sorghum halopense*), and bermudagrass (*Cynodon dactylon*). No birds were observed in the area feeding, and no nests were found.

The field survey confirmed that Rookeries 610-101 and 610-102 are presently inactive, based on the absence of nests and nesting birds. Therefore, dredging activities at present would not affect these rookeries.

Appendix N

Greenhouse Gas Emissions and Climate Change

Document No. 110063
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GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE FOR THE PROPOSED FREEPORT HARBOR CHANNEL IMPROVEMENT PROJECT BRAZORIA COUNTY, TEXAS

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1.0 INTRODUCTION

This section describes the Greenhouse Gas Emissions and their related impacts on climate change for the Freeport Harbor Channel Improvement Project (FHCIP) Alternatives. Air emissions from the Project will result from the operation of dredges, tugboats, and land-side construction equipment powered by internal combustion engines that produce exhaust emissions. Emissions from this equipment will result in an increase in Greenhouse Gas (GHG) emissions that could contribute to global climate change. To date, specific thresholds to evaluate adverse impacts pertaining to GHG emissions have not been established by local decision-making agencies, the State, or the Federal government. The Council on Environmental Quality (CEQ) has published "Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions," February 10, 2010. The Draft Guidance suggests that the impacts of projects directly emitting GHGs in excess of 25,000 metric tons or more of carbon dioxide (CO_2)-equivalent (CO_2e) GHG emissions on an annual basis be considered in a qualitative and quantitative manner. However, the guidance stresses that, given the nature of GHGs and their persistence in the atmosphere, climate change impacts should be considered on a cumulative level. For consistency, this section presents a project-level analysis of GHG emissions.

1.1 QUANTIFICATION OF GHG EMISSIONS

An inventory of GHGs was prepared for project-related activities for both the National Economic Development (NED) and Locally Preferred Plan (LPP) alternatives based on the schedule and other assumptions as developed for each alternative. Air emissions estimates were calculated using techniques appropriate for a specific emissions-generating activity or source. The basis, emission factors, and summary of emissions are provided in Appendix A, NED Alternative Emissions Summary, and Appendix B, LPP Alternative Emissions Summary, of this document.

GHG emissions were estimated for emissions of CO_2, methane (CH_4), and nitrous oxides (N_2O), which are GHGs that may result from the combustion of fuel. The emission sources for each project alternative will consist of marine and land-based mobile sources that will be utilized as scheduled for the duration of the project. It is assumed that the marine emission sources will include two types of dredges, hydraulic and hopper, as well as support equipment such as tugboats, survey boats, and trawlers. The land-based emission sources will include both off-road equipment utilized for dredged material placement sites and on-road vehicles for employees commuting to and from the work site. The marine emission sources and off-road equipment will consist primarily of diesel-powered engines. The on-road employee vehicles will consist primarily of gas-powered vehicles.

1.1.1 Methods Used for Estimation of Air Contaminant Emissions

GHG emissions were estimated for each piece of equipment. The emissions were then categorized and totaled and broken out on an annual basis for each year for which dredging is projected to occur.

The basis for emissions included the following:

- Preliminary project description and other information, as provided for each alternative.
- Emissions from marine vessels in support of the dredging activities were estimated for the project duration. The basis for emissions estimates consisted of the operating hours for each specific type of equipment engine, engine load factor, and engine horsepower. Emission rates (tons per hour) from dredges, dredging support equipment, and other harbor vessels were calculated for each criteria pollutant and were derived based on the following formula:

  Emission Rate = Engine Horsepower x 0.746 kilowatt per Engine Horsepower x Engine Load Factor x Emission Factor (grams per horsepower-hour) ÷ 453.59 grams per pounds ÷ 2,000 pounds per ton

  Load factors and emission factors for the different marine equipment were determined based on the U.S. Environmental Protection Agency (EPA) report "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data," February 2000 and information from the "California Climate Action Registry, General Reporting Protocol," January 2009. Emission amounts (tons per year) for each of the pollutants were then calculated based on the following formula:

  Emission Amount (tons/year) = Emission Rate (tons/hr) x Working Hours (hrs/year)

  Emissions of CO_2, CH_4, and N_2O were converted to metric tons, assuming 1 ton is equal to 0.907 metric ton:

  Emission Amount (metric tons/year) = Emission Amount (tons/year) x 0.0907 metric ton per ton

- The EPA, NONROAD emission factor model, was used to predict CO_2 emissions resulting from land-side, off-road construction equipment used for construction and placement in upland PAs with inputs for assumed equipment usage developed for this alternative. This model may be used to predict air emissions for off-road construction

equipment based on information including geographic location, equipment type, and fuel use for specific years that may be selected. It provides an estimate of emissions for different equipment based on equipment population, load factor, available horsepower, deterioration, and applicable standards.

- Mobile on-road emissions associated with employee vehicles were emission factors estimated from data provided in Climate Action Registry (California Climate Action Registry, 2009).

1.1.2 Dredging Activities

Air emissions directly related with the dredging equipment including generators used to drive the dredge pumps and emissions from support equipment such as tugs and runabouts were calculated on an annual basis based on the anticipated type of activity, engine use, horsepower, load factor, and anticipated hours of operation during the construction period.

For the NED Alternative, it was assumed that the FHCIP would include the use of the dredge equipment as follows:

- Hopper Dredge – A hopper dredge would be used to dredge 17,957,000 cubic yards (CY) of material for placement at Ocean Dredged Material Disposal Sites (ODMDSs).
- Cutterhead – A 30-inch hydraulic cutterhead would be used for pumping and onshore placement of 5,211,000 CY of material into new upland placement areas (PAs).

For the LPP Alternative, it was assumed that the widening and deepening project would include the use of the dredge equipment as follows.

- Hopper Dredge – A hopper dredge would be used to dredge 12,733,000 CY of material for placement at ODMDSs.
- Cutterhead – A 24-inch hydraulic cutterhead would be used for pumping and onshore placement of 4,619,000 CY of material into new upland PAs.

When not dredging, air contaminant emissions were also estimated from dredging vessels when sailing as oceangoing vessels, e.g., during periods of mobilization to the dredging site or during transport and placement of the dredged material.

1.1.3 Land-side Dredged Material Placement – Nonroad Equipment

It is anticipated that land-side dredged material placement activities would occur primarily only in support of the mechanical dredging activities and would include working and compacting of the dredged material onshore within a localized area of placement using nonroad construction equipment.

1.1.4 On-Road Mobile – Employee Commuter Vehicles

Mobile source emissions associated with the project construction would be generated from employee commuter vehicles to and from the work-site. It was assumed that commuter vehicles would include a mix of cars and light-duty trucks burning primarily gasoline. Mobile source emission factors were estimated using EPA's mobile-source emissions model, MOBILE6.2, based on vehicle information and other input options specific to Brazoria County as previously provided by the Texas Commission on Environmental Quality's (TCEQ) Air Quality Planning and Implementation Division.

1.1.5 SUMMARY OF GHG EMISSIONS

The estimated annual GHG emissions as CO_2e for the NED Plan Alternative are summarized in Table 1 for each year of the anticipated construction activities.

TABLE 1
NED PLAN ALTERNATIVE – SUMMARY OF GHG EMISSIONS
(metric tons per year as CO_2e)

Activity	2011	2012	2013	2014	2015	2016
Dredging Activities	6,175	51,832	57,073	48,099	33,716	18,504
Land-side Dredged Material Placement	0	698	9	865	731	122
Employee Commuter Vehicles	58	1,252	931	1,248	663	244
Totals	6,233	53,782	58,013	50,212	35,111	18,870

The estimated annual GHG emissions for the LPP Plan Alternative are summarized in Table 2 for each year of the anticipated construction activities.

TABLE 2
LPP ALTERNATIVE – SUMMARY OF GHG EMISSIONS
(metric tons per year as CO_2e)

Activity	2011	2012	2013	2014	2015
Dredging Activities	5,833	45,694	52,306	43,051	13,355
Land-side Dredged Material Placement	0	2,008	2,677	1,421	7
Employee Commuter Vehicles	41	2,104	906	1,081	0
Totals	5,875	49,805	55,890	45,554	13,362

Based on the emissions summary shown in Table 1 and Table 2, total CO_2e would be less for the LPP versus the NED alternative.

2.0 MITIGATION

Measures that may be used to reduce GHG emissions from the proposed action would consider the equipment used for the project over the expected life of the project and the feasibility and practicality of such measures. Alternatives considered for their ability to reduce or mitigate GHG emissions are those that may provide for enhanced energy efficiency, lower GHG-emitting technology, and renewable energy, as appropriate for the dredging and construction equipment to be used.

2.1 DREDGING MITIGATION OPTIONS

- Design of the dredging operation and schedule so as to reduce overall fuel use
- Repowering/refitting with cleaner diesel engines
- Selection of newer dredges with more-efficient engines, if possible.

2.2 LAND-SIDE CONSTRUCTION MITIGATION OPTIONS

- Use of Biodiesel Fuel - Biodiesel can be used directly in the unmodified diesel engines of some construction equipment, trucks, and other heavy vehicles; resultant emissions are considerably cleaner than conventional diesel and it is a greenhouse-neutral fuel. Biodiesel would provide a 7 percent reduction in CO_2 emissions compared to diesel fuel.
- Conversion to compressed natural gas (CNG) or liquid propane gas (LPG) – CNG would provide a 40 percent reduction in CO_2 emissions compared to gasoline, and LPG would provide about a 34 percent reduction.
- Repowering / refitting with cleaner diesel engines
- Selection of newer dredges with more-efficient engines, if possible.

3.0 GHG EMISSIONS CONTRIBUTION TO CLIMATE CHANGE

As shown above, the proposed project would increase GHG emissions with the LPP Alternative producing less total CO_2e than the NED alternative. However, it would be unlikely that GHGs emitted under the NED or LED alternatives would cause an individually discernible impact on global climate change. GHG emissions accumulate in the atmosphere because of their relatively long lifespan. Consequently, their impact on climate change is independent of the point of emission. Because GHGs accumulate in the atmosphere and affect climate change on a global scale, it is not reasonable to predict the impact on climate change based on a project-level evaluation; this analysis is more reasonably done on a regional or global scale.

4.0 REFERENCES:

California Climate Action Registry. 2009. "California Climate Action Registry, General Reporting Protocol," January 2009.

Council on Environmental Quality. 2010. "Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions," February 10, 2010.

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Appendix A

NED Alternative Emissions Summary

APPENDIX A

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Table A-1. Annual Project Emissions Summary
Freeport Harbor Channel Improvement Project
NED Alternative

	(tons per year)			(metric tons per year)			Total CO_2e (metric tons per year)
Year 2011	CO_2	CH_4	N_20	CO_2	CH_4	N_20	CO2e
Dredge & Support Equipment	6,730	1	0	6,105	1	0	6,175
Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0
Employee Vehicles	62.965	0.005	0.003	57.121	0.004	0.002	58
Subtotal	**6,793**	**1**	**0**	**6,162**	**1**	**0**	**6,233**
Year 2012	CO_2	CH_4	N_20	CO_2	CH_4	N_20	CO2e
Dredge & Support Equipment	56,492	7	2	51,249	6	1	51,832
Construction Equipment	762.64	0.06	0.02	691.85	0.05	0.02	698
Employee Vehicles	1,359.81	0.10	0.06	1,233.60	0.09	0.05	1,252
Subtotal	**58,614**	**7**	**2**	**53,174**	**7**	**2**	**53,782**
Year 2013	CO_2	CH_4	N_20	CO_2	CH_4	N_20	CO2e
Dredge & Support Equipment	62,205	8	2	56,432	7	2	57,073
Construction Equipment	0.06	0.07	0.03	0.05	0.07	0.02	9
Employee Vehicles	1,011.31	0.07	0.04	917.45	0.07	0.04	931
Subtotal	**63,217**	**8**	**2**	**57,349**	**7**	**2**	**58,013**
Year 2014	CO_2	CH_4	N_20	CO_2	CH_4	N_20	CO2e
Dredge & Support Equipment	52,425	7	1	47,559	6	1	48,099
Construction Equipment	944.10	0.07	0.02	856.47	0.06	0.02	865
Employee Vehicles	1,356.03	0.10	0.06	1,230.17	0.09	0.05	1,248
Subtotal	**54,725**	**7**	**2**	**49,645**	**6**	**1**	**50,212**
Year 2015	CO_2	CH_4	N_20	CO_2	CH_4	N_20	CO2e
Dredge & Support Equipment	36,748	5	1	33,338	4	1	33,716
Construction Equipment	798.60	0.06	0.02	724.48	0.05	0.02	731
Employee Vehicles	720.57	0.05	0.03	653.69	0.05	0.03	663
Subtotal	**38,268**	**5**	**1**	**34,716**	**4**	**1**	**35,111**
Year 2016	CO_2	CH_4	N_20	CO_2	CH_4	N_20	CO2e
Dredge & Support Equipment	20,168	3	1	18,296	2	1	18,504
Construction Equipment	133.10	0.01	0.00	120.75	0.01	0.00	122
Employee Vehicles	264.78	0.02	0.01	240.20	0.02	0.01	244
Subtotal	**20,566**	**3**	**1**	**18,657**	**2**	**1**	**18,870**
TOTAL (ALL YEARS)	CO_2	CH_4	N_20	CO_2	CH_4	N_20	CO2e
Dredge & Support Equipment	234,768	30	7	212,978	27	6	215,399
Construction Equipment	2,638.50	0.27	0.09	2,393.61	0.24	0.08	2,425
Employee Vehicles	4,775.47	0.35	0.21	4,332.23	0.31	0.19	4,397
	242,182	**30**	**7**	**219,704**	**27**	**6**	**222,221**

Table B-1. Dredging Contract Schedule - Days per Year
Freeport Harbor Channel Improvement Project
NED

Contract No.	Reach	Dredging Duration Months	Dredging Duration Days	Contract Start	Contract Finish	Year 1 2011 days	Year 2 2012 days	Year 3 2013 days	Year 4 2014 days	Year 5 2015 days	Year 6 2016 days
1	New Extention and Part of Outer Bar	35.3	1,059	10/1/2011	9/30/2014	65	261	261	195		
2	Outer Bar and Jetty Channel	41.4	1,242	6/1/2012	11/30/2016		152	261	261	261	239
3	Lower TB, PA1, & Seaway Removel	2	60	4/1/2012	6/1/2012		45				
4	Real Estate	6	180	10/1/2011	3/31/2012	65	65				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	14.5	435	4/1/2012	8/31/2014		196	261	173		
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	3.4	102	9/1/2014	2/28/2016				88	261	41
7	Stauffer Channel	4.4	132	3/1/2016	7/30/2016					109	
8	Mitigation	6	180	4/1/2015	9/30/2015					131	
					TOTAL	130	719	783	717	762	280

Table B-2. Dredge Equipment Engine Horsepower Break-down
Freeport Harbor Channel Improvement Project
NED Alternative

Type	Activity (month)	Hours of Operation	Horse power (HP)
CONTRACT 1: New Extension & Part of Entrance			
DredgingNew Extent (Duration =	**12.3**	**Quantity =**	**2,670,000 CY**
Generic Large Hopper	Dredging	6150	14000
	Idle	2116	
Survey Boat	Dredging	1230	2000
	Idle	423	
Trawlers - 2	Dredging	8610	1200
	Idle	2962	
Dredging Part of Outer Bar (Duration =	**23**	**Quantity =**	**5,550,000 CY**
Generic Large Hopper	Dredging	11500	14000
	Idle	3956	
Survey Boat	Dredging	2300	2000
	Idle	791	
Trawlers - 2	Dredging	16100	1200
	Idle	5538	
Total	**35.3**	**61,676**	
CONTRACT 2: Outer Bar and Jetty Ch			
Dredging Outer Bar (Duration =	**23**	**Quantity =**	**5,550,000 CY**
Generic Large Hopper	Dredging	11500	14000
	Idle	3956	
Survey Boat	Dredging	2300	2000
	Idle	791	
Trawlers - 2	Dredging	16100	1200
	Idle	5538	
Dredging Jetty Ch (Duration =	**18.4**	**Quantity =**	**4,187,000 CY**
Generic Large Hopper	Dredging	9200	14000
	Idle	3165	
Survey Boat	Dredging	1840	2000
	Idle	633	
Trawlers - 2	Dredging	12880	1200
	Idle	4432	
Total	**41.4**	**72,335**	

Table B-2. Dredge Equipment Engine Horsepower Break-down
Freeport Harbor Channel Improvement Project
NED Alternative

Type	Activity (month)	Hours of Operation	Horse power (HP)
CONTRACT 3: Lower TB, PA 1 Work & Seaway Removal			
Dredging Lower TB (Duration =	**2**	**Quantity =**	**318,000 CY**
30" Dredge	Dredging	1000	9000
	Idle	450	3000
Dredging Tugs (3 @ 500hp each)	Dredging	2400	1500
Spill Barge	Dredging	200	165
Crewboat	Construction	200	400
Total	**2**	**4,250**	
CONTRACT 5: Ch to Brz thr Brzpt TB & PA 8			
Dredging Cycle (Duration =	**14.5**	**Quantity =**	**2,316,000 CY**
30" Dredge	Dredging	7250	9000
	Idle	3262.5	3000
Dredging Tugs (3 @ 500hp each)	Dredging	17400	1500
Spill Barge	Dredging	1450	165
Crewboat	Construction	1450	400
Total	**14.5**	**30,813**	
CONTRACT 6: Ch to UTB thr UTB & PA 9			
Dredging Cycle (Duration =	**3.4**	**Quantity =**	**1,037,000 CY**
30" Dredge	Dredging	1700	9000
	Idle	765	3000
Dredging Tugs (3 @ 500hp each)	Dredging	4080	1500
Spill Barge	Dredging	340	165
Crewboat	Construction	340	400
Total	**3.4**	**7,225**	
CONTRACT 7: Stauffer Ch			
Dredging Cycle (Duration =	**4.4**	**Quantity =**	**1,540,000 CY**
30" Dredge	Dredging	2200	9000
	Idle	990	3000
Dredging Tugs (3 @ 500hp each)	Dredging	5280	1500
Spill Barge	Dredging	440	165
Crewboat	Construction	440	400
Total	**4.4**	**9,350**	

Table B-3. Dredging Contract Allocation by Year
Freeport Harbor Channel Improvement Project
NED Alternative

Contract No.	Reach	Dredging Duration Days	Year 1 **2011** percent	Year 2 **2012** percent	Year 3 **2013** percent	Year 4 **2014** percent	Year 5 **2015** percent
1	New Extention and Part of Outer Bar	1,059	8%	33%	33%	25%	
2	Outer Bar and Jetty Channel	1,242		13%	22%	22%	22%
3	Lower TB, PA1, & Seaway Removel	60		100%			
4	Real Estate	180	50%	50%			
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	435		31%	41%	27%	
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	102				23%	67%
7	Stauffer Channel	132					100%
8	Mitigation	180					100%

Table B-4. Dredge Equipment Operating Hours
Freeport Harbor Channel Improvement Project
NED Alternative

Contract No.	Reach	Operating Hours													
		Dredge						Survey Boat		Trawler		Floating Booster	Tug	Spill Barge	Crew Boat
		Dredge Type	Total Dredging	Propelling	Pumping	Power Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
1	New Extension	Generic Large Hopper	6,150	3,998	2,153	6,150	2,116	1,230	423	8,610	2,962				
	Part of Outer Bar	Generic Large Hopper	11,500	7,475	4,025	11,500	3,956	2,300	791	16,100	5,538				
2	Outer Bar	Generic Large Hopper	11,500	7,475	4,025	11,500	3,956	2,300	791	16,100	5,538				
	Jetty Channel	Generic Large Hopper	9,200	5,980	3,220	9,200	3,165	1,840	633	12,880	4,432				
3	Lower TB	30" Dredge	1,000				450						2,400	200	200
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	7,250				3,263						17,400	1,450	1,450
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	1,700				765						4,080	340	340
7	Stauffer Channel	30" Dredge	2,200				990						5,280	440	440
8	Mitigation														

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Table B-5. Typical Hopper Dredging Cycle
Freeport Harbor Channel Improvement Project
NEDAlternative

Contract No.	Reach	Dredging Cycle				
		Dredge Type	Total Dredging Hours	Propelling	Pumping	Power Generating
1	New Extension	Generic Large Hopper	6,150	65%	35%	100%
	Part of Outer Bar	Generic Large Hopper	11,500	65%	35%	100%
2	Outer Bar	Generic Large Hopper	11,500	65%	35%	100%
	Jetty Channel	Generic Large Hopper	9,200	65%	35%	100%

Table B-6. Dredge Equipment Engine Horsepower Break-down
Freeport Harbor Channel Improvement Project
NED Alternative

Contract No.	Location/Disposal Site	Dredge Type	Horsepower (hp)												
			Engine Type					Survey Boat		Trawler		Floating Booster	Tug	Spill Barge	Crew Boat
			Total	Propulsion	Pump	Generator	Generator at Idling	Main Engine	Idling	Main Engine	Idling	Pumping	Propulsion	Main Engine	Propulsion
1	New Extension	Generic Large Hopper	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
	Part of Outer Bar	Generic Large Hopper	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
2	Outer Bar	Generic Large Hopper	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
	Jetty Channel	Generic Large Hopper	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
3	Lower TB	30" Dredge	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
4	Real Estate						3,000						500	165	400
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	9,000				3,000						500	165	400
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	9,000				3,000						500	165	400
7	Stauffer Channel	30" Dredge	9,000				3,000						500	165	400
8	Mitigation						3,000						500	165	400

Table C-1. Marine Equipment Operating Hours
Freeport Harbor Channel Improvement Project
NED Alternative

Operating Hours			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper	511.19	332.27	178.92	511.19	175.88	102.24	35.16	715.65	246.20				
	Part of Outer Bar	Generic Large Hopper	955.88	621.32	334.56	955.88	328.82	191.18	65.75	1,338.24	460.32				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basin and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL		1,467.07	953.60	513.48	1,467.07	504.71	293.41	100.91	2,053.90	706.52				
YEAR 2012															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper	2,052.62	1,334.20	718.42	2,052.62	706.24	410.52	141.18	2,873.67	988.60				
	Part of Outer Bar	Generic Large Hopper	3,838.24	2,494.85	1,343.38	3,838.24	1,320.35	767.65	264.00	5,373.53	1,848.35				
2	Outer Bar	Generic Large Hopper	1,488.93	967.80	521.12	1,488.93	512.19	297.79	102.41	2,084.50	717.02				
	Jetty Channel	Generic Large Hopper	1,191.14	774.24	416.90	1,191.14	409.76	238.23	81.96	1,667.60	573.62				
3	Lower TB	30" Dredge	1,000.00				450.00						2,400.00	200.00	200.00
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	2,259.56				1,015.00						5,413.33	451.11	451.11
6	Channel to Upper Turning Basin through Upper Turning Basin and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		11,828.48	5,571.10	2,999.82	8,570.92	4,413.56	1,714.18	589.55	11,899.29	4,127.79		7,813.33	651.11	651.11
YEAR 2013															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper	2,052.62	1,334.20	718.42	2,052.62	706.24	410.52	141.18	2,873.67	988.60				
	Part of Outer Bar	Generic Large Hopper	3,838.24	2,494.85	1,343.38	3,838.24	1,320.35	767.65	264.00	5,373.53	1,848.35				
2	Outer Bar	Generic Large Hopper	2,555.64	1,661.62	894.83	2,555.64	879.49	511.33	175.85	3,579.30	1,231.19				
	Jetty Channel	Generic Large Hopper	2,045.32	1,329.45	715.86	2,045.32	703.63	409.06	140.73	2,863.44	985.31				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	3,003.57				1,351.61						7,208.57	600.71	600.71
6	Channel to Upper Turning Basin through Upper Turning Basin and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		13,496.39	6,820.33	3,672.49	10,492.82	4,961.31	2,098.56	721.76	14,589.94	5,053.46		7,208.57	600.71	600.71

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Table C-1. Marine Equipment Operating Hours
Freeport Harbor Channel Improvement Project
NED Alternative

Operating Hours			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper	1,533.57	995.82	536.75	1,533.57	527.55	306.71	185.46	2,146.99	738.61				
	Part of Outer Bar	Generic Large Hopper	2,897.65	1,863.97	1,003.68	2,897.65	996.47	573.93	197.24	4,014.71	1,350.96				
2	Outer Bar	Generic Large Hopper	2,556.64	1,661.82	894.83	2,556.64	879.49	511.33	175.85	3,579.30	1,231.19				
	Jetty Channel	Generic Large Hopper	2,045.32	1,329.45	715.86	2,045.32	703.63	409.06	140.73	2,863.44	985.31				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1,990.87				895.89						4,778.10	398.17	398.17
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	383.58				172.62						920.62	76.72	76.72
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2014 TOTAL		11,377.54	5,852.05	3,151.11	9,003.17	4,165.74	1,800.63	619.30	12,504.44	4,336.09		6,698.71	474.89	474.89
YEAR 2015															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper	2,556.64	1,661.82	894.83	2,556.64	879.49	511.33	175.85	3,579.30	1,231.19				
	Jetty Channel	Generic Large Hopper	2,045.32	1,329.45	715.86	2,045.32	703.63	409.06	140.73	2,863.44	985.31				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	1,137.89				511.95						2,730.46	227.54	227.54
7	Stauffer Channel	30" Dredge	2,200.00				990.00						5,280.00	440.00	440.00
8	Mitigation														
	YEAR 2015 TOTAL		7,939.85	2,991.27	1,610.69	4,601.96	3,085.08	920.39	316.58	6,442.74	2,216.50		8,010.46	667.54	667.54
YEAR 2016															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper	2,341.14	1,521.74	819.40	2,341.14	805.35	468.23	161.03	3,277.60	1,127.41				
	Jetty Channel	Generic Large Hopper	1,872.91	1,217.39	655.52	1,872.91	644.32	374.58	128.86	2,622.08	902.26				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	178.72				80.42						428.92	35.74	35.74
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2016 TOTAL		4,392.77	2,739.14	1,474.92	4,214.05	1,530.10	842.81	289.89	5,899.68	2,029.67		428.92	35.74	35.74

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Table C-2. Marine Engine Emission Factors and Fuel Consumption Algorithms
(in g/kW-hr, for all marine engines)
Freeport Harbor Channel Improvement Project

Statistical Parameter	Exponent (x)	Intercept (b)	Coefficient (a)
CO	1	0	0.8378
NO_X	1.5	10.4496	0.1255
PM	1.5	0.2551	0.0059
PM2.5	1.5	0.2551	0.0059
PM10	1.5	0.2551	0.0059
SO_X	n/a	0	2.3735
VOC (HC)	1.5	0	0.0667
CO2	1	648.6	44.1

Notes:

1.) All regressions but SO_2 are in the form of:

Emissions Rate (g/hp-hr) = (a*(Fractional Load)^x + b) * 0.7457
where the conversion factor of 0.7457 kW/hp is used to calculate the emission factor in g/hp-hr

2.) Fractional Load is equal to actual engine output divided by rated engine output.

3.) The SO_2 regression is the form of:

Emissions Rate (g/hp-hr) = a*(Fuel Sulfur Flow in g/hp-hr) + b
where Fuel Sulfur Flow is the Fuel Consumption times the sulfur content of the fuel;
The sulfur content for the fuel consumption regression was set to 3300 parts per million (0.33 wt%)

4.) **Fuel Consumption (g/hp-hr) = (14.12 / (Fractional Load) + 205.717) * 0.7457**

5.) n/a is not applicable, n/s is not statistically significant.

6.) All information shown above is detailed in Table 5-1 of the EPA technical report "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data", EPA 420-R-00-002, February 2000.

Table C-3. Marine Equipment Load Factors and Emission Factors
Freeport Harbor Channel Improvement Project

	Dredge					Crew Boat		Trawler		Floating Booster	Tug	Spill Barge	Crew Boat
Operating Mode	Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
Load Factor	0.8	0.8	0.8	0.8	0.2	0.4	0.2	0.4	0.2	0.8	0.4	0.4	0.4
EF (Gram/hp-hr)													
CO_2	525	525	525	525	648	566	648	566	648	525	566	566	566
CH_4	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067
N_2O	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015

Notes:

1.) The dredge type, engine type, horsepower, and fuel type were based on information provided by project sponsors.

2.) The engine load factors for the dredges and support equipment were determined from Table 5-2 of the EPA Report "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data", February 2000.

A survey of dredge engine sizes along with input from project sponsors was used to determine which operating mode and hence which load factor applied to each engine. The following assumptions applied to the load factor determination:

A.) The main engines on the dredges were assumed to operate at full power (e.g. 0.8 "cruise" load factor from Table 5-2 of EPA report) for all hours of operation.

B.) The generators on the dredges were assumed to operate at 0.2 load factor during idling.

C.) The main engines or propulsion engines on the support equipment were assumed to operate at intermittent times during the dredging operations and were also determined to operate at the 0.4 "slow cruise" load factor.

D.) The auxiliary engines, if any, on the support equipment were assumed to operate sparingly during idling and were determined to operate at the 0.2 "maneuvering" load factor.

3.) The emission factors were calculated according to the algorithm table and formulas detailed on page 5-3 of the EPA report. The emissions Rate formula and algorithm table are also shown on Table A-4, "Marine Engine Emission Factor and Fuel Consumption Data", February 2000.

4.) The Emission Rate in tons/hr is based on the following formula: Emission Rate = hp*LF*EF*(0.0022046 lbs/gram)*(1 ton/2000 lbs).

5.) CH_4 and N_2O emission factors were obtained from "Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories (ICF International 2009).

Table C-4. Marine Equipment CO2 Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

CO_2 (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		1,383.67	248.39	473.12	50.26	51.82	10.05	107.14	21.11				
	Part of Outer Bar	Generic Large Hopper		2,597.72	464.46	884.59	93.96	55.40	18.79	200.34	39.48				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			**3,971.59**	**712.85**	**1,357.71**	**144.22**	**146.42**	**28.83**	**307.48**	**60.57**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		5,556.78	997.37	1,899.75	201.61	204.88	40.34	430.20	84.75				
	Part of Outer Bar	Generic Large Hopper		10,390.69	1,865.00	3,552.37	377.30	383.06	75.44	804.43	158.45				
2	Outer Bar	Generic Large Hopper		4,030.75	723.47	1,378.03	146.35	148.60	29.26	312.06	61.47				
	Jetty Channel	Generic Large Hopper		3,224.60	578.77	1,102.43	117.10	118.88	23.42	249.64	49.19				
3	Lower TB	30" Dredge	8,478.68				128.59								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	9,394.05				435.06						575.33	18.57	45.02
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**15,872.71**	**23,202.80**	**4,164.61**	**7,932.58**	**1,406.22**	**855.40**	**168.47**	**1,796.33**	**353.86**		**575.33**	**18.57**	**45.02**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		5,556.78	997.37	1,899.75	201.61	204.88	40.34	430.20	84.75				
	Part of Outer Bar	Generic Large Hopper		10,390.69	1,865.00	3,552.37	377.30	383.06	75.44	804.43	158.45				
2	Outer Bar	Generic Large Hopper		6,921.23	1,242.27	2,366.23	251.32	255.16	50.25	535.83	105.55				
	Jetty Channel	Generic Large Hopper		5,536.88	993.92	1,892.98	201.07	204.13	40.21	428.67	84.47				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	12,509.43				579.34						899.29	24.73	59.95
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**12,509.43**	**28,405.66**	**5,098.45**	**9,711.34**	**1,610.83**	**1,047.21**	**206.25**	**2,199.13**	**433.21**		**899.29**	**24.73**	**59.95**

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Table C-4. Marine Equipment CO2 Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

CO_2 (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		4,151.60	745.16	1,419.35	150.78	153.05	30.14	321.41	63.32				
	Part of Outer Bar	Generic Large Hopper		7,763.16	1,393.39	2,654.07	281.89	286.20	56.36	601.01	118.38				
2	Outer Bar	Generic Large Hopper		6,921.23	1,242.27	2,366.23	251.32	255.16	50.25	535.83	105.55				
	Jetty Channel	Generic Large Hopper		5,536.98	993.82	1,892.98	201.07	204.13	40.21	428.67	84.47				
3	Lower TB	30" Dredge													
4	Reel Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	8,291.69				384.01						596.08	16.39	39.74
6	Channel to Upper Turning Basin through Upper Turning Basin and PA 9	30" Dredge	1,597.59				73.99						114.85	3.16	7.66
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2014 TOTAL		**9,889.28**	**24,372.97**	**4,374.64**	**8,332.64**	**1,343.05**	**898.54**	**176.97**	**1,886.93**	**371.72**		**710.93**	**19.55**	**47.40**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		6,921.23	1,242.27	2,366.23	251.32	255.16	50.25	535.83	105.55				
	Jetty Channel	Generic Large Hopper		5,536.98	993.82	1,892.98	201.07	204.13	40.21	428.67	84.47				
3	Lower TB	30" Dredge													
4	Reel Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basin and PA 9	30" Dredge	4,738.32				219.44						340.63	9.37	22.71
7	Stauffer Channel	30" Dredge	9,152.67				424.35						658.69	18.11	43.91
8	Mitigation														
	YEAR 2015 TOTAL		**13,890.99**	**12,458.21**	**2,236.09**	**4,259.22**	**1,096.17**	**459.28**	**90.46**	**964.50**	**190.01**		**999.33**	**27.48**	**66.62**

Table C-5. Marine Equipment CH_4 Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

CH_4 (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.1771	0.0316	0.0605	0.0052	0.0081	0.0010	0.0127	0.0022				
	Part of Outer Bar	Generic Large Hopper		0.3311	0.0594	0.1132	0.0097	0.0113	0.0019	0.0238	0.0041				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			0.5081	0.0912	0.1737	0.0149	0.0174	0.0030	0.0365	0.0063				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.7109	0.1276	0.2431	0.0209	0.0243	0.0042	0.0510	0.0088				
	Part of Outer Bar	Generic Large Hopper		1.3294	0.2386	0.4545	0.0391	0.0454	0.0078	0.0954	0.0164				
2	Outer Bar	Generic Large Hopper		0.5157	0.0926	0.1763	0.0152	0.0176	0.0030	0.0370	0.0064				
	Jetty Channel	Generic Large Hopper		0.4126	0.0740	0.1410	0.0121	0.0141	0.0024	0.0296	0.0051				
3	Lower TB	30" Dredge	0.8269				0.0133								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1.2919				0.0451						0.0801	0.0022	0.0053
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		2.0308	2.9686	0.5328	1.0149	0.1457	0.1015	0.0175	0.2131	0.0367		0.0801	0.0022	0.0053
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.7109	0.1276	0.2431	0.0209	0.0243	0.0042	0.0510	0.0088				
	Part of Outer Bar	Generic Large Hopper		1.3294	0.2386	0.4545	0.0391	0.0454	0.0078	0.0954	0.0164				
2	Outer Bar	Generic Large Hopper		0.8855	0.1589	0.3027	0.0260	0.0303	0.0052	0.0636	0.0109				
	Jetty Channel	Generic Large Hopper		0.7084	0.1272	0.2422	0.0208	0.0242	0.0042	0.0509	0.0088				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1.6095				0.0500						0.1067	0.0029	0.0071
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		1.6095	3.6343	0.6523	1.2425	0.1559	0.1242	0.0214	0.2609	0.0449		0.1067	0.0029	0.0071

Table C-5. Marine Equipment CH_4 Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

CH_4 (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.5312	0.0953	0.1616	0.0158	0.0182	0.0031	0.0381	0.0066				
	Part of Outer Bar	Generic Large Hopper		0.8532	0.1783	0.3365	0.0292	0.0349	0.0058	0.0713	0.0123				
2	Outer Bar	Generic Large Hopper		0.8655	0.1589	0.3027	0.0260	0.0303	0.0052	0.0636	0.0109				
	Jetty Channel	Generic Large Hopper		0.7084	0.1272	0.2422	0.0208	0.0242	0.0042	0.0508	0.0088				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1.0609				0.0398						0.0767	0.0018	0.0047
6	Channel to Upper Turning Basin through Upper Turning Basin and PA 9	30" Dredge	0.2044				0.0077						0.0136	0.0004	0.0009
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2014 TOTAL		1.2653	3.1183	0.5597	1.0651	0.1391	0.1066	0.0183	0.2239	0.0385		0.0844	0.0023	0.0056
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		0.8655	0.1589	0.3027	0.0260	0.0303	0.0052	0.0636	0.0109				
	Jetty Channel	Generic Large Hopper		0.7084	0.1272	0.2422	0.0208	0.0242	0.0042	0.0508	0.0088				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basin and PA 9	30" Dredge	0.6062				0.0227						0.0404	0.0011	0.0027
7	Stauffer Channel	30" Dredge	1.1723				0.0440						0.0782	0.0021	0.0052
8	Mitigation														
	YEAR 2015 TOTAL		1.7785	1.5939	0.2861	0.5449	0.1136	0.0545	0.0094	0.1144	0.0197		0.1186	0.0033	0.0079

Table C-6. Marine Equipment N_2O Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

N_2O (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Split Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.0393	0.0871	0.0135	0.0012	0.0013	0.0002	0.0028	0.0005				
	Part of Outer Bar	Generic Large Hopper		0.0736	0.0132	0.0252	0.0022	0.0025	0.0004	0.0053	0.0009				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			**0.1129**	**0.0203**	**0.0386**	**0.0033**	**0.0039**	**0.0007**	**0.0081**	**0.0014**				
YEAR 2012															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.1560	0.0284	0.0540	0.0046	0.0054	0.0009	0.0113	0.0020				
	Part of Outer Bar	Generic Large Hopper		0.2954	0.0530	0.1010	0.0087	0.0101	0.0017	0.0212	0.0036				
2	Outer Bar	Generic Large Hopper		0.1146	0.0208	0.0392	0.0034	0.0039	0.0007	0.0082	0.0014				
	Jetty Channel	Generic Large Hopper		0.0917	0.0165	0.0313	0.0027	0.0031	0.0005	0.0066	0.0011				
3	Lower TB	30" Dredge	0.1842				0.0030								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	0.2671				0.0100						0.0178	0.0005	0.0012
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		**0.4513**	**0.6597**	**0.1184**	**0.2255**	**0.0324**	**0.0226**	**0.0039**	**0.0474**	**0.0081**		**0.0178**	**0.0005**	**0.0012**
YEAR 2013															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.1560	0.0284	0.0540	0.0046	0.0054	0.0009	0.0113	0.0020				
	Part of Outer Bar	Generic Large Hopper		0.2954	0.0530	0.1010	0.0087	0.0101	0.0017	0.0212	0.0036				
2	Outer Bar	Generic Large Hopper		0.1968	0.0353	0.0673	0.0056	0.0067	0.0012	0.0141	0.0024				
	Jetty Channel	Generic Large Hopper		0.1574	0.0283	0.0538	0.0046	0.0054	0.0009	0.0113	0.0019				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	0.3557				0.0133						0.0237	0.0007	0.0016
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		**0.3557**	**0.8076**	**0.1450**	**0.2761**	**0.0371**	**0.0276**	**0.0047**	**0.0580**	**0.0100**		**0.0237**	**0.0007**	**0.0016**

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Table C-6. Marine Equipment N_2O Emissions
Freeport Harbor Channel Improvement Project
NED Alternative

N_2O (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper		0.1180	0.0212	0.0484	0.0035	0.0040	0.0007	0.0085	0.0015				
	Part of Outer Bar	Generic Large Hopper		0.2297	0.0386	0.0755	0.0065	0.0075	0.0013	0.0158	0.0027				
2	Outer Bar	Generic Large Hopper		0.1966	0.0353	0.0673	0.0058	0.0067	0.0012	0.0141	0.0024				
	Jetty Channel	Generic Large Hopper		0.1574	0.0283	0.0538	0.0046	0.0054	0.0009	0.0113	0.0019				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	0.2357				0.0088						0.0157	0.0004	0.0010
6	Channel to Upper Turning Basin through Upper Turning Basin and PA 9	30" Dredge	0.0454				0.0017						0.0030	0.0001	0.0002
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2014 TOTAL		**0.2812**	**0.6930**	**0.1244**	**0.2369**	**0.0309**	**0.0237**	**0.0041**	**0.0499**	**0.0085**		**0.0187**	**0.0005**	**0.0012**
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		0.1966	0.0353	0.0673	0.0058	0.0067	0.0012	0.0141	0.0024				
	Jetty Channel	Generic Large Hopper		0.1574	0.0283	0.0538	0.0046	0.0054	0.0009	0.0113	0.0019				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basin and PA 9	30" Dredge	0.1347				0.0051						0.0090	0.0002	0.0006
7	Stauffer Channel	30" Dredge	0.2605				0.0098						0.0174	0.0005	0.0012
8	Mitigation														
	YEAR 2015 TOTAL		**0.3952**	**0.3942**	**0.0636**	**0.1211**	**0.0252**	**0.0121**	**0.0021**	**0.0254**	**0.0044**		**0.0263**	**0.0007**	**0.0018**

Table C-7. Summary of Marine Equipment Emissions (tpy)
Freeport Harbor Channel Improvement Project
NED Alternative

YEAR 2011

Contract No.	Location/Disposal Site	Dredge	CO2	CH4	N2O
1	New Extension	Generic Large Hopper	2,344.9	0.3	0.1
	Part of Outer Bar	Generic Large Hopper	4,384.8	0.6	0.1
2	Outer Bar	Generic Large Hopper			
	Jetty Channel	Generic Large Hopper			
3	Lower TB	30" Dredge			
4	Real Estate				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge			
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge			
7	Stauffer Channel	30" Dredge			
8	Mitigation				
		YEAR 2011 TOTAL	6,729.8	0.9	0.2

YEAR 2012

Contract No.	Location/Disposal Site	Dredge	CO2	CH4	N2O
1	New Extension	Generic Large Hopper	9,415.8	1.2	0.3
	Part of Outer Bar	Generic Large Hopper	17,606.7	2.2	0.5
2	Outer Bar	Generic Large Hopper	6,830.0	0.9	0.2
	Jetty Channel	Generic Large Hopper	5,464.0	0.7	0.2
3	Lower TB	30" Dredge	6,607.2	0.8	0.2
4	Real Estate				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	10,568.0	1.3	0.3
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge			
7	Stauffer Channel	30" Dredge			
8	Mitigation				
		YEAR 2012 TOTAL	56,491.9	7.1	1.6

YEAR 2013

Contract No.	Location/Disposal Site	Dredge	CO2	CH4	N2O
1	New Extension	Generic Large Hopper	9,415.8	1.2	0.3
	Part of Outer Bar	Generic Large Hopper	17,606.7	2.2	0.5
2	Outer Bar	Generic Large Hopper	11,727.8	1.5	0.3
	Jetty Channel	Generic Large Hopper	9,382.3	1.2	0.3
3	Lower TB	30" Dredge			
4	Real Estate				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	14,072.7	1.8	0.4
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge			
7	Stauffer Channel	30" Dredge			
8	Mitigation				
		YEAR 2013 TOTAL	62,205.5	7.9	1.7

YEAR 2014

Contract No.	Location/Disposal Site	Dredge	CO2	CH4	N2O
1	New Extension	Generic Large Hopper	7,034.8	0.9	0.2
	Part of Outer Bar	Generic Large Hopper	13,154.5	1.7	0.4
2	Outer Bar	Generic Large Hopper	11,727.8	1.5	0.3
	Jetty Channel	Generic Large Hopper	9,382.3	1.2	0.3
3	Lower TB	30" Dredge			
4	Real Estate				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	9,327.9	1.2	0.3
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	1,797.2	0.2	0.1
7	Stauffer Channel	30" Dredge			
8	Mitigation				
		YEAR 2014 TOTAL	52,424.6	6.5	1.5

Table C-7. Summary of Marine Equipment Emissions (tpy)
Freeport Harbor Channel Improvement Project
NED Alternative

YEAR 2015

Contract No.	Location/Disposal Site	Dredge	CO2	CH4	N2O
1	New Extension	Generic Large Hopper			
	Part of Outer Bar	Generic Large Hopper			
2	Outer Bar	Generic Large Hopper	11,727.8	1.5	0.3
	Jetty Channel	Generic Large Hopper	9,382.3	1.2	0.3
3	Lower TB	30" Dredge			
4	Real Estate				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge			
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	5,330.5	0.7	0.1
7	Stauffer Channel	30" Dredge	10,307.7	1.3	0.3
8	Mitigation				
		YEAR 2015 TOTAL	36,748.4	4.6	1.0

YEAR 2016

Contract No.	Location/Disposal Site	Dredge	CO2	CH4	N2O
1	New Extension	Generic Large Hopper			
	Part of Outer Bar	Generic Large Hopper			
2	Outer Bar	Generic Large Hopper	10,739.3	1.4	0.3
	Jetty Channel	Generic Large Hopper	8,591.5	1.1	0.2
3	Lower TB	30" Dredge			
4	Real Estate				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge			
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	837.4	0.1	0.0
7	Stauffer Channel	30" Dredge			
8	Mitigation				
		YEAR 2016 TOTAL	20,168.1	2.6	0.6

TOTAL

Contract No.	Location/Disposal Site	Dredge	CO2	CH4	N2O
1	New Extension	Generic Large Hopper	28,211.4	3.6	0.8
	Part of Outer Bar	Generic Large Hopper	52,752.8	6.7	1.5
2	Outer Bar	Generic Large Hopper	52,752.8	6.7	1.5
	Jetty Channel	Generic Large Hopper	42,202.5	5.3	1.2
3	Lower TB	30" Dredge	6,607.2	0.8	0.2
4	Real Estate				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	33,988.7	4.3	1.0
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	7,965.1	1.0	0.2
7	Stauffer Channel	30" Dredge	10,307.7	1.3	0.3
8	Mitigation				
		PROJECT TOTAL	234,768.2	29.7	6.6

Table C-8. Annual Marine Equipment Emissions (tpy)
Freeport Harbor Channel Improvement Project
NED Alternative

	CO2	CH4	N2O
Year 2011	6,730	0.9	0.2
Year 2012	56,492	7.1	1.6
Year 2013	62,205	7.9	1.7
Year 2014	52,425	6.6	1.5
Year 2015	36,748	4.6	1.0
Year 2016	20,168	2.6	0.6

Table D-1. Construction Equipment Emission Factors
Construction Equipment Emission Factors
Freeport Harbor Channel Improvement Project
NED Alternative

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr) CO_2	CH_4[2]	N_2O[2]
Contract 5: Ch to Brz thr Brzpt TB & PA 8							
EP H25HU005 HYD EXCAV, CRWLR, 97,870 LBS, 3.14 CY BKT	Crawler Tractor/Dozers	Diesel	300	59%	536.005004	0.0390782	0.01373018
EP T45XX021 TRUCK TRAILER, LOWBOY, 90 TON, 4 AXLE	Truck Trailer	--	0	0%	0	0	0
EP T50FO019 TRK,HWY, 43,000 GVW, 6X4, 3 AXLE	Highway Truck	Diesel	230	59%	536.137913	0.03908789	0.01373358
EP T50XX011 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP, 4X4	Highway Truck	Diesel	230	59%	536.137913	0.03908789	0.01373358
GEN B20Z1000 BRUSH CHIPPER, 22" (559 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	Chippers/Stump Grinders	Diesel	650	43%	535.797263	0.03906305	0.01372486
GEN B35Z1140 BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Dragline	Diesel	350	59%	535.745354	0.03905927	0.01372353
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%	685.997007	0.04983406	0.01713046
GEN C75Z2200 CRANE, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 40 TON (36 MT), 84' (25.6 M) BOOM, 4X4	Cranes	Diesel	173	43%	787.85182	0.05743944	0.02018143
GEN H25Z3185 HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23.3' (7.1 M) MAX DIGGING DEPTH	Excavators	Diesel	238	59%	536.039676	0.03908073	0.01373107
GEN L40Z4395 LOADER, FRONT END, WHEEL, ARTICULATED, 2.75 CY (2.1 M3) BUCKET, 4X4,	Tractor/Loader/Backhoe	Diesel	130	21%	623.402943	0.04545007	0.01596694
GEN L60Z4760 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	Log Skidder	Diesel	119	59%	535.743439	0.03905913	0.01372348
GEN L60Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	Log Skidder	Diesel	200	59%	535.855141	0.03906727	0.01372634
GEN T15Z6440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	100	59%	535.903786	0.03907082	0.01372758
GEN T15Z6480 TRACTOR, CRAWLER (DOZER), 101-135 HP (75-101 KW), POWERSHIFT, W/ UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	135	59%	535.903786	0.03907082	0.01372758
GEN T15Z6520 TRACTOR, CRAWLER (DOZER), 181-250 HP (135-186 KW), POWERSHIFT, LGP, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	250	59%	536.005004	0.0390782	0.01373018
GEN T40Z7090 TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Highway Truck	Diesel	230	59%	536.137913	0.03908789	0.01373358
GEN T45Z7280 TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	Highway Truck	Diesel	210	59%	536.137913	0.03908789	0.01373358
GEN T50Z7420 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	Diesel	230	59%	536.137913	0.03908789	0.01373358
GEN T50Z7520 TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	Diesel	310	59%	536.266791	0.03909728	0.01373688
MAP C85MA001 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	Cranes	Diesel	350	43%	530.17646	0.03865326	0.01356087
MAP L15FG001 LANDSCAPING EQUIPMENT, 3,000 GAL, HYDROSEEDER, TRUCK MTD (INCLUDES 56,000 GVW TRUCK)	Highway Truck	Diesel	310	59%	536.266791	0.03909728	0.01373688
Contract 6: Ch to UTB thr UTB & PA 9							
EP H25HU005 HYD EXCAV, CRWLR, 97,870 LBS, 3.14 CY BKT	Crawler Tractor/Dozers	Diesel	300	59%	536.005004	0.0390782	0.01373018
EP T45XX021 TRUCK TRAILER, LOWBOY, 90 TON, 4 AXLE (ADD TOWING TRUCK)	Truck Trailer	--	0	0%		0	0

Table D-1. Construction Equipment Emission Factors
Construction Equipment Emission Factors
Freeport Harbor Channel Improvement Project
NED Alternative

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)		
					CO_2	CH_4[2]	N_2O[2]
EP T50FO019 TRK,HWY, 43,000 GVW, 6X4, 3 AXLE	Highway Truck	Diesel	230	59%	536.137913	0.03908789	0.01373358
EP T50XX011 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP, 4X4	Highway Truck	Diesel	230	59%	536.137913	0.03908789	0.01373358
GEN B20Z1000 BRUSH CHIPPER, 22" (559 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	Chippers/Stump Grinders	Diesel	650	43%	535.797263	0.03906305	0.01372486
GEN B35Z1140 BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Dragline	Diesel	350	59%	535.745354	0.03905927	0.01372353
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%		0	0
GEN C75Z2200 CRANE, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 40 TON (36 MT), 84' (25.6 M) BOOM, 4X4	Cranes	Diesel	250	43%	530.173	0.03865301	0.01358079
GEN H25Z3185 HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23.3' (7.1 M) MAX DIGGING DEPTH	Excavators	Diesel	238	59%	536.039676	0.03908073	0.01373107
GEN L40Z4395 LOADER, FRONT END, WHEEL, ARTICULATED, 2.75 CY (2.1 M3) BUCKET, 4X4,	Tractor/Loader/Backhoe	Diesel	130	21%	623.402943	0.04545007	0.01596894
GEN L60Z4760 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	Log Skidder	Diesel	119	59%	535.743439	0.03905913	0.01372348
GEN L60Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	Log Skidder	Diesel	200	59%	535.855141	0.03906727	0.01372634
GEN T15Z6440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	100	59%	535.903786	0.03907082	0.01372758
GEN L60Z4760 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	Log Skidder	Diesel	119	59%	535.743439	0.03905913	0.01372348
GEN L60Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	Log Skidder	Diesel	200	59%	535.855141	0.03906727	0.01372634
GEN T15Z6440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	100	59%	535.903786	0.03907082	0.01372758
GEN T45Z7280 TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	Highway Truck	Diesel	210	59%	536.137913	0.03908789	0.01373358
GEN T50Z7520 TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	Diesel	310	59%	536.266791	0.03909728	0.01373688
GEN T50Z7700 DUMP TRUCK, HIGHWAY, 10 - 13 CY (7.6 - 9.9 M3) DUMP BODY, 35,000 LBS (15,900 KG) GVW, 2 AXLE, 4X2	Highway Truck	Diesel	205	59%	536.137913	0.03908789	0.01373358
MAP C85MA001 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	Cranes	Diesel	350	43%	530.17646	0.03865326	0.01358087
UPB T15CA004 DOZER,CWLR, D-4H,PS (ADD BLADE)	Crawler Dozers/Tractor	Diesel	80	59%	594.912667	0.04337294	0.01523914
UPB T40XX008 REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)		–	0	0%		0	0
UPB T50KE003 TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	Highway Truck	Diesel	230	59%	536.137913	0.03908789	0.01373358

1. Emission Factors as provided by the EPA's NONROAD Model.
2. NONROAD does not provide emission factors for CH_4 and N_2O. Emission factors for these air contaminants were determined by ratio of emission factors provided for diesel fuel in the Climate Action Registry (California Climate Action Registry, 2009)

Table D-2. Load Factors For Equipment Using Diesel or Gasoline

SCC Code	Equipment	Load Factor[1] Diesel	Gasoline
22xx003010	Aerial Lifts	21%	46%
22xx005015	Agricultural Tractor	59%	62%
22xx006015	Air Compressors	43%	56%
22xx001030	All Terrain Vehicles	42%	100%
22xx002033	Bore/Drill Rigs	43%	79%
22xx002042	Cement & Motar Mixers	43%	59%
22xx004066	Chippers/Stump Grinders	43%	78%
22xx002039	Concrete/Industrial Saws	59%	78%
22xx002045	Cranes	43%	47%
22xx002066	Crawler Dozers/Tractor	59%	80%
22xx002054	Crushing/Procesing Equipment	43%	85%
22xx002078	Dumpers/Tenders	21%	41%
22xx002036	Excavators	59%	53%
22xx007015	Fellers/Bunchers/Skidders	59%	70%
22xx003020	Forklifts	59%	30%
22xx006020	Gas Compressors	43%	85%
22xx006005	Generator Sets	43%	68%
22xx002048	Graders	59%	64%
22xx005050	Hydro Power Units	43%	56%
22xx004056	Lawn and Garden Tractor	43%	44%
22xx002051	Off-Highway Truck	59%	80%
22xx002075	Off-Highway Tractor	59%	70%
22xx004056	Other Agricultural Equipment	59%	55%
22xx002081	Other Construction Equipment	59%	48%
22xx003040	Other General Industrial	43%	54%
22xx003050	Other Material Handling	21%	53%
22xx002003	Pavers	59%	66%
22xx002021	Paving Equipment	59%	59%
22xx002009	Plate Compactors	43%	55%
22xx006030	Pressure Washer	43%	85%
22xx006010	Pumps	43%	69%
22xx003060	Refrigeration/AC	43%	46%
22xx002015	Rollers	59%	62%
22xx002057	Rough Terrain Forklifts	59%	63%
22xx002063	Rubber Tire Dozer	59%	75%
22xx002060	Rubber Tire Loader	59%	71%
22xx002018	Scrapers	59%	70%
22xx002072	Skid Steer Loader	21%	58%
22xx001060	Specialty Vehicle/Carts	21%	58%
22xx002024	Surfacing Equipment	59%	49%
22xx003030	Sweepers/Scrubbers	43%	71%
22xx002006	Tampers/Rammers	43%	55%
22xx003070	Terminal Tractors	59%	78%
22xx005040	Tillers > 6 hp	59%	71%
22xx004026	Timmer/Edger/Brush Cutter	43%	91%
22xx002066	Tractor/Loader/Backhoe	21%	48%
22xx002030	Trenchers	59%	66%
22xx006025	Welders	21%	68%

1. Load Factors from Appendix A of *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, EPA Office of Air and Radiation Report Number NR-005b, December 2002

Table D-3. Emissions Summary

Freeport Harbor Channel Improvement Project
NED Alternative

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	CO_2 Emissions (tons per year)					CH_4 Emissions (tons per year)					N_2O Emissions (tons per year)				
				2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
CONTRACT 5: Ch to Brz thr Brzpt TB & PA 8			23															
EP H25HU005 HYD EXCAV, CRWLR, 97,870 LBS, 3.14 CY BKT	1	24	23	0.9821	1.3995	0.8730			0.0001	0.0001	0.0001			0.0000	0.0000	0.0000		
EP T45XX021 TRUCK TRAILER, LOWBOY, 90 TON, 4 AXLE	1	24	23	-	-	-			-	-	-			-	-	-		
EP T50FC019 TRK,HWY, 43,000 GVW, 6X4, 3 AXLE	1	24	23	0.7532	1.0042	0.6695			0.0001	0.0001	0.0000			0.0000	0.0000	0.0000		
EP T50XX011 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP, 4X4	1	1,136	23	35.6497	47.5329	31.6886			0.0025	0.0035	0.0023			0.0009	0.0012	0.0008		
GEN B20Z1000 BRUSH CHIPPER, 22" (559 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	1	183	23	11.8210	15.7613	10.5076			0.0009	0.0011	0.0008			0.0003	0.0004	0.0003		
GEN B35Z1140 BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1	6,651	23	317.3852	423.1802	282.1201			0.0231	0.0309	0.0206			0.0081	0.0108	0.0072		
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	183	23	0.2534	0.3379	0.2253			0.0000	0.0000	0.0000			0.0000	0.0000	0.0000		
GEN C75Z2200 CRANE, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 40 TON (36 MT), 84' (25.6 M) BOOM, 4X4	1	24	23	0.6997	0.9330	0.6333			0.0000	0.0001	0.0000			0.0000	0.0000	0.0000		
GEN H25Z3165 HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23 3" (7.1 M) MAX DIGGING DEPTH	1	24	23	0.7792	1.0390	0.6926			0.0001	0.0001	0.0001			0.0000	0.0000	0.0000		
GEN L40Z4395 LOADER, FRONT END, WHEEL, ARTICULATED, 2.75 CY (2.1 M3) BUCKET, 4X4,	1	384	23	2.3651	3.0734	2.0489			0.0002	0.0002	0.0001			0.0001	0.0001	0.0001		
GEN L60Z4760 LOG SKIDDER, CABLE, 28,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	1	366	23	3.9382	7.9177	5.2784			0.0004	0.0006	0.0004			0.0002	0.0002	0.0001		
GEN L80Z4860 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	1	366	23	9.9823	13.3098	8.8732			0.0007	0.0010	0.0006			0.0003	0.0003	0.0002		
GEN T15Z0440 TRACTOR, CRAWLER (DOZER), 70-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	183	23	2.4959	3.3277	2.2185			0.0002	0.0002	0.0002			0.0001	0.0001	0.0001		
GEN T15Z0460 TRACTOR, CRAWLER (DOZER), 101-135 HP (75-101 KW), POWERSHIFT, W/ UNIVERSAL BLADE	1	54	23	1.1783	1.5711	1.0474			0.0001	0.0001	0.0001			0.0000	0.0000	0.0000		
GEN T15Z0520 TRACTOR, CRAWLER (DOZER), 181-250 HP (135-186 KW), POWERSHIFT, LGP, W/UNIVERSAL BLADE	1	4,018	23	136.3861	182.5148	121.6768			0.0100	0.0133	0.0089			0.0035	0.0047	0.0031		
GEN T40Z7060 TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1	24	23	0.7532	1.0042	0.6695			0.0001	0.0001	0.0000			0.0000	0.0000	0.0000		
GEN T45Z7280 TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	1	18	23	0.2865	0.3820	0.2547			0.0000	0.0000	0.0000			0.0000	0.0000	0.0000		
GEN T50Z7420 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	85	23	2.6675	3.5568	2.3711			0.0002	0.0003	0.0002			0.0001	0.0001	0.0001		
GEN T50Z7520 TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	18	23	0.4231	0.5641	0.3761			0.0000	0.0000	0.0000			0.0000	0.0000	0.0000		
MAP C65MR001 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1	6,651	23	228.8192	305.2138	203.4757			0.0187	0.0223	0.0148			0.0059	0.0076	0.0052		
MAP L15FG001 LANDSCAPING EQUIPMENT, 3,000 GAL HYDROSEEDER, TRUCK MTD (INCLUDES 56,000 GVW TRUCK)	1	61	23	2.5597	3.4410	2.2940			0.0002	0.0003	0.0002			0.0001	0.0001	0.0001		
Contract 6: Ch to UTB thr UTB & PA 9			16															
EP H25HU005 HYD EXCAV, CRWLR, 97,870 LBS, 3.14 CY BKT	1	24	16		0.6275	1.8624	0.3137			0.0000	0.0001	0.0000			0.0000	0.0000	0.0000	
EP T45XX021 TRUCK TRAILER, LOWBOY, 90 TON, 4 AXLE (ADD TOWING TRUCK)	1	24	16		-	-	-			-	-	-			-	-	-	
EP T50FC019 TRK,HWY, 43,000 GVW, 6X4, 3 AXLE	1	24	16		0.4812	1.4436	0.2406			0.0000	0.0001	0.0000			0.0000	0.0000	0.0000	
EP T50XX011 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP, 4X4	1	1,173	16		23.5180	70.5541	11.7590			0.0017	0.0051	0.0009			0.0008	0.0018	0.0003	
GEN B20Z1000 BRUSH CHIPPER, 22" (559 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	1	191	16		7.8825	23.6474	3.9412			0.0006	0.0017	0.0003			0.0002	0.0006	0.0001	
GEN B35Z1140 BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1	6,966	16		209.3897	628.1691	104.6948			0.0153	0.0458	0.0076			0.0054	0.0161	0.0027	
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	191	16		-	-	-			-	-	-			-	-	-	
GEN C75Z2200 CRANE, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 40 TON (36 MT), 84' (25.6 M) BOOM, 4X4	1	24	16		0.3770	1.1309	0.1885			0.0000	0.0001	0.0000			0.0000	0.0000	0.0000	
GEN H25Z3165 HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23 3" (7.1 M) MAX. DIGGING DEPTH	1	24	16		0.4978	1.4935	0.2489			0.0000	0.0001	0.0000			0.0000	0.0000	0.0000	
GEN L40Z4395 LOADER, FRONT END, WHEEL, ARTICULATED, 2.75 CY (2.1 M3) BUCKET, 4X4,	1	381	16		1.7809	5.3427	0.8905			0.0001	0.0004	0.0001			0.0000	0.0001	0.0000	

Table D-3. Emissions Summary

Freeport Harbor Channel Improvement Project
NED Alternative

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	CO_2 Emissions (tons per year)					CH_4 Emissions (tons per year)					N_2O Emissions (tons per year)				
				2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
GEN L60Z4750 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	1	383	16			3.9701	11.6103	1.8650			0.0003	0.0009	0.0001			0.0001	0.0003	0.0001
GEN L60Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	1	383	16			8.6738	20.0215	3.3369			0.0005	0.0015	0.0002			0.0002	0.0005	0.0001
GEN T15Z8440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	181	16			1.0643	4.0928	0.8321			0.0001	0.0004	0.0001			0.0000	0.0001	0.0000
GEN L60Z4750 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	1	45	16			0.4665	1.3994	0.2332			0.0000	0.0001	0.0000			0.0000	0.0000	0.0000
GEN L60Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	1	45	16			0.7841	2.3524	0.3921			0.0001	0.0002	0.0000			0.0000	0.0001	0.0000
GEN T15Z8440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	25	16			0.2178	0.8535	0.1089			0.0000	0.0000	0.0000			0.0000	0.0000	0.0000
GEN T45Z7280 TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	1	73	16			1.3363	4.0090	0.6682			0.0001	0.0003	0.0000			0.0000	0.0001	0.0000
GEN T5Z7520 TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	73	16			1.9732	5.9195	0.9866			0.0001	0.0004	0.0001			0.0001	0.0002	0.0000
GEN T5Z7700 DUMP TRUCK, HIGHWAY, 10 - 13 CY (7.6 - 9.9 M3) DUMP BODY, 35,000 LBS (15,900 KG) GVW, 2 AXLE, 4X2	1	120	16			2.1444	6.4333	1.0722			0.0002	0.0005	0.0001			0.0001	0.0002	0.0000
MAP C85WA001 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1	45	16			0.9895	2.9685	0.4948			0.0001	0.0002	0.0000			0.0000	0.0001	0.0000
UPB T15CA004 DOZER,CWLR, D-4H,PS (ADD BLADE)	1	80	16			0.6191	1.8572	0.3095			0.0000	0.0001	0.0000			0.0000	0.0000	0.0000
UPB T40XK008 REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	1	40	16			-	-	-			-	-	-			-	-	-
UPB T50KE003 TRK,HWY, 45,000 GVW, 6X4, 3 AXLE	1	40	16			0.8020	2.4059	0.4010			0.0001	0.0002	0.0000			0.0000	0.0001	0.0000
			TOTALS	762.94	1,016.85	944.10	798.60	133.10	0.06	0.07	0.07	0.06	0.01	0.02	0.03	0.02	0.02	0.00

Table D-4. Total Estimated Project Emissions by Year of Construction Activity
Freeport Harbor Channel Improvement Project
NED Alternative
(tons per year)

	2012	2013	2014	2015	2016
CO2	762.64	0.06	944.10	798.60	133.10
CH4	0.06	0.07	0.07	0.06	0.01
N2O	0.02	0.03	0.02	0.02	0.003

Table E-1. Crew Size per Equipment
Freeport Harbor Channel Improvement Project
NED Alternative

	Hopper Dredge		Cutterhead Dredge		
	Hopper Dredge Crew	Shore Crew	Cutterhead Dredge Crew	Shore Crew	Other Construction Equipment
Employees	22	8	46	6	6

Table E-2. Emission Factors for Employee Vehicles
Freeport Harbor Channel Improvement Project

County	Type of Vehicle	Category[1]	Emisson Factor (g/mile)[2]		
			CO2	CH4	N2O
Brazoria	Cars	LDGV	202.3547	0.0147	0.0079
	Pickups	LDGT1	216.1203	0.0157	0.0101

Notes:
1. LDGV=light duty gasoline-fueled vehicles designated for transport of up to 12 people
LDGT1=light duty gasoline-fueled trucks with a gross vehicle weight (GVW) rating of 6000 pounds or less

2. Emission factors estimated from emissions data provided in Climate Action Registry (California Climate Action Registry, 2009).

Table E-3. Summary of Employee Vehicles Emissions (tpy)
Freeport Harbor Channel Improvement Project
NED Alternative

Project Year	Type of Vehicle	EPA Category	Daily Vehicles (/day)	Total (VMT)	Travel Days (days/yr)	Annual Travel (VMT/yr)	Annual Emissions (tpy) CO2	CH4	N2O
2011	Cars	LDGV	21	50.0	130	136,500	30.4469	0.0022	0.0012
	Pickups	LDGT1	21	50.0	130	136,500	32.5181	0.0024	0.0015
						2011 Total Mobile Emission	**62.965**	**0.005**	**0.003**
2012	Cars	LDGV	82	50.0	719	2,947,900	657.5412	0.0478	0.0257
	Pickups	LDGT1	82	50.0	719	2,947,900	702.2719	0.0510	0.0328
						2012 Total Mobile Emission	**1,359.813**	**0.099**	**0.058**
2013	Cars	LDGV	56	50.0	783	2,192,400	489.0238	0.0355	0.0191
	Pickups	LDGT1	56	50.0	783	2,192,400	522.2908	0.0379	0.0244
						2013 Total Mobile Emission	**1,011.315**	**0.073**	**0.044**
2014	Cars	LDGV	82	50.0	717	2,939,700	655.7122	0.0476	0.0256
	Pickups	LDGT1	82	50.0	717	2,939,700	700.3184	0.0509	0.0327
						2014 Total Mobile Emission	**1,356.031**	**0.099**	**0.058**
2015	Cars	LDGV	41	50.0	762	1,562,100	348.4328	0.0253	0.0136
	Pickups	LDGT1	41	50.0	762	1,562,100	372.1357	0.0270	0.0174
						2015 Total Mobile Emission	**720.569**	**0.052**	**0.031**
2016	Cars	LDGV	41	50.0	280	574,000	128.0331	0.0093	0.0050
	Pickups	LDGT1	41	50.0	280	574,000	136.7428	0.0099	0.0064
						2016 Total Mobile Emission	**264.776**	**0.019**	**0.011**

Notes:
1. Total VMT is assumed to be 50 miles/day round trip.
2. Annual travel = Daily vehicles * Total VMT * Travel days/yr.
3. Annual emissions = Emission factor * Annual travel * 1lb/453.6 grams * 1ton/2000lb

Table E-4. Annual Employee Vehicle Emissions
Freeport Harbor Channel Improvement Project
NED Alternative
(tons per year)

Year	CO2	CH4	N2O
Year 2011	62.965	0.005	0.003
Year 2012	1359.81	0.10	0.06
Year 2013	1011.31	0.07	0.04
Year 2014	1356.03	0.10	0.06
Year 2015	720.57	0.05	0.03
Year 2016	264.78	0.02	0.01

Table F-1. NED Alternative - Additional Maintenance Dredging - Assumptions for Marine Equipment Engines
Freeport Harbor Channel Improvement Project
Additional 1,580,000 cy/yr Maintenance Dredging

Activity	Equipment Type	Quantity	Total Installed Power (hp)	Engine Type	Engine Fuel Type	Engine Load Factor	Engine Horsepower (hp)	Hours of Operation per Day (hrs/day)	Daily Engine Usage (%)	Total Days of Operation (days)	Total Engine Hours of Operation (hrs)
Additional 1,580,000 cy/yr Maintenance Dredging	Hopper Dredge	1	14,000	Propulsion - Oceangoing	Diesel	0.8	9,000	20	65%	40	514
				Propulsion - Dredging	Diesel	0.8	9,000	20	35%	40	277
				Dredge Pump(s)	Diesel	0.8	3,000	20	35%	40	277
				Auxiliary - Oceangoing	Diesel	0.8	2,000	20	65%	40	514
				Auxiliary - Idling	Diesel	0.8	2,000	20	35%	40	277
	Survey Boat	1	2,000	Propulsion	Diesel	0.4	2,000	20	100%	8	158
				Auxiliary	Diesel	0.2	2,000	20	100%	8	158
	Shrimp Boat (Turtle Trawl)	2	600	Propulsion	Diesel	0.4	600	24	100%	28	1,330
				Auxiliary	Diesel	0.2	600	24	100%	28	1,330
Total Engine Hours											4,832

Notes:
1. Days of operation are determined assuming 40,000 CY/day production rate for a hopper dredge removing unconsolidated, predominantly silty dredged material.

Table F-2. NED Alternative - Additional Maintenance Dredging - Marine Equipment Hours of Operation
Freeport Harbor Channel Improvement Project
Additional 1,580,000 cy/yr Maintenance Dredging

			Dredge								
			Generic Large Hopper Dredge					Crew/Survey Boat (Runabout)		Shrimp Boats (Total of Two)	
Contract No.	**Additional Volume/Disposal Site**	**Dredge**	Propulsion Ocean Going	Propulsion Dredging	Dredge Pump(s)	Auxiliary Oceangoing	Auxiliary Idling	Propulsion	Secondary	Propulsion	Secondary
Additional Maintenance Dredging	1,580,000 CY of Additional Maintenance Material to ODMS	Hopper	514	277	277	514	277	158	158	1,330	1,330

Table F-3. NED Alternative - Additional Maintenance Dredging - Marine Equipment Estimated Emissions
Freeport Harbor Channel Improvement Project
Additional 1,580,000 cy/yr Maintenance Dredging
(Tons per Year)

Phase No.	Pollutant	Dredge	Dredge									Total Emissions Per Year
			Generic Large Hopper Dredge					Crew/Survey Boat		Shrimp Boat		
			Propulsion Oceangoing	Propulsion - Dredging	Dredge Pump(s)	Auxiliary - Oceangoing	Auxillary - Dredging	Propulsion	Auxiliary	Propulsion	Auxiliary	
Additional 1,580,000 cy/yr Maintenance Dredging	CO2	Hopper	2,138.6839	1,151.5990	383.8663	475.2631	316.0498	78.8449	45.1500	199.0485	113.9837	**4,902**
	CH4	Hopper	0.2736	0.1473	0.0491	0.0608	0.0327	0.0094	0.0047	0.0236	0.0118	**0.613**
	N2O	Hopper	0.0608	0.0327	0.0109	0.0135	0.0073	0.0021	0.0010	0.0052	0.0026	**0.136**

Appendix B

LPP Alternative Emissions Summary

APPENDIX B

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Freeport Harbor Channel Improvement Project
LPP Alternative

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Table A-1. Annual Project Emissions Summary
Freeport Harbor Channel Improvement Project
LPP Alternative

	(tons per year)			(metric tons per year)			Total CO_2e (metric tons per year)
Year 2011	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO2e
Dredge & Support Equipment	6,358	0.80	0.18	5,768	0.73	0.16	5,833
Construction Equipment	0	0.00	0.00	0.00	0.00	0.00	0
Employee Vehicles	45	0.00	0.00	40.801	0.00	0.00	41
Subtotal	**6,403**	**0.81**	**0.18**	**5,809**	**0.73**	**0.16**	**5,875**
Year 2012	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO2e
Dredge & Support Equipment	49,802	6.30	1.40	45,180	5.72	1.27	45,694
Construction Equipment	2,193	0.16	0.06	1,989.08	0.15	0.05	2,008
Employee Vehicles	2,285	0.17	0.10	2,073.17	0.15	0.09	2,104
Subtotal	**54,280**	**6.63**	**1.55**	**49,242**	**6.01**	**1.41**	**49,805**
Year 2013	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO2e
Dredge & Support Equipment	57,010	7.21	1.60	51,719	6.54	1.45	52,306
Construction Equipment	2,923	0.21	0.07	2,652.10	0.19	0.07	2,677
Employee Vehicles	984	0.07	0.04	892.84	0.06	0.04	906
Subtotal	**60,918**	**7.49**	**1.72**	**55,264**	**6.80**	**1.56**	**55,890**
Year 2014	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO2e
Dredge & Support Equipment	46,923	5.93	1.32	42,567	5.38	1.20	43,051
Construction Equipment	1,552	0.11	0.04	1,407.99	0.10	0.04	1,421
Employee Vehicles	1,174	0.09	0.05	1,065.42	0.08	0.05	1,081
Subtotal	**49,649**	**6.13**	**1.41**	**45,041**	**5.56**	**1.28**	**45,554**
Year 2015	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO2e
Dredge & Support Equipment	14,556	1.84	0.41	13,205	1.67	0.37	13,355
Construction Equipment	0	0.06	0.02	0.00	0.05	0.02	7
Employee Vehicles	0	0.00	0.00	0.00	0.00	0.00	0
Subtotal	**363**	**0.03**	**0.02**	**13,205**	**1.72**	**0.39**	**13,362**
	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO2e
TOTAL (ALL YEARS)							
Dredge & Support Equipment	174,649	22.08	4.91	158,439	20.03	4.45	160,240
Construction Equipment	6,668	0.54	0.19	6,049	0.49	0.17	6,113
Employee Vehicles	4,489	0.33	0.19	4,072	0.30	0.18	4,133
TOTAL (ALL YEARS)	**185,806**	**22.95**	**5.29**	**168,560**	**20.82**	**4.80**	**170,486**

Table B-1. Dredging Contract Schedule - Days per Year
Freeport Harbor Channel Improvement Project
LPP Alternative

Contract No.	Reach	Dredging Duration Months	Dredging Duration Days	Contract Start	Contract Finish	Year 1 2011 days	Year 2 2012 days	Year 3 2013 days	Year 4 2014 days	Year 5 2015 days	Year 6 2016 days
1	New Extention and Part of Outer Bar	23.2	696	10/1/2011	10/31/2013	65	261	218			
2	Outer Bar and Jetty Channel	33.2	996	6/1/2012	3/31/2015		152	261	261	64	
3	Lower TB, PA1, & Seaway Removel	1	30	4/1/2012	5/31/2012		44				
4	Real Estate	6	180	10/1/2011	3/31/2012	65	65				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	8	240	4/1/2012	11/30/2014		196	261	238		
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	4	120	12/1/2013	9/30/2014			22	195		
7	Stauffer Channel	6	180	10/1/2014	4/30/2015				66	86	
8	Mitigation	6	180	4/1/2015	9/30/2015					131	
					TOTAL	130	718	762	760	281	0

Table B-2. Dredge Equipment Engine Horsepower Break-down
Freeport Harbor Channel Improvement Project
LPP Alternative

Type	Activity (month)	Hours of Operation	Horse power (HP)
CONTRACT 1: New Extension & Part of Entrance			
DredgingNew Extent (Duration =	**6**	**Quantity =**	**795,000 CY**
Generic Large Hopper	Dredging	3000	14000
	Idle	1032	
Survey Boat	Dredging	600	2000
	Idle	206	
Trawlers - 2	Dredging	4200	1200
	Idle	1444	
Dredging Part of Outer Bar (Duration =	**17.2**	**Quantity =**	**4,145,000 CY**
Generic Large Hopper	Dredging	8600	14000
	Idle	2958	
Survey Boat	Dredging	1720	2000
	Idle	592	
Trawlers - 2	Dredging	12040	1200
	Idle	4142	
Total	**23.2**	**40,534**	
CONTRACT 2: Outer Bar and Jetty Ch			
Dredging Outer Bar (Duration =	**17.2**	**Quantity =**	**4,145,000 CY**
Generic Large Hopper	Dredging	8600	14000
	Idle	2958	
Survey Boat	Dredging	1720	2000
	Idle	592	
Trawlers - 2	Dredging	12040	1200
	Idle	4142	
Dredging Jetty Ch (Duration =	**16**	**Quantity =**	**3,648,000 CY**
Generic Large Hopper	Dredging	8000	14000
	Idle	2752	
Survey Boat	Dredging	1600	2000
	Idle	550	
Trawlers - 2	Dredging	11200	1200
	Idle	3852	
Total	**33.2**	**58,006**	

Table B-2. Dredge Equipment Engine Horsepower Break-down
Freeport Harbor Channel Improvement Project
LPP Alternative

Type	Activity (month)	Hours of Operation	Horse power (HP)
CONTRACT 3: Lower TB, PA 1 Work & Seaway Removal			
Dredging Lower TB (Duration =	**1**	**Quantity =**	**208,000 CY**
30" Dredge	Dredging	500	9000
	Idle	225	3000
Dredging Tugs (3 @ 500hp each)	Dredging	1200	1500
Spill Barge	Dredging	100	165
Crewboat	Construction	100	400
Total	**1**	**2,125**	
CONTRACT 5: Ch to Brz thr Brzpt TB & PA 8			
Dredging Cycle (Duration =	**8**	**Quantity =**	**1,716,000 CY**
30" Dredge	Dredging	4000	9000
	Idle	1800	3000
Dredging Tugs (3 @ 500hp each)	Dredging	9600	1500
Spill Barge	Dredging	800	165
Crewboat	Construction	800	400
Total	**8**	**17,000**	
CONTRACT 6: Ch to UTB thr UTB & PA 9			
Dredging Cycle (Duration =	**4**	**Quantity =**	**881,000 CY**
30" Dredge	Dredging	2000	9000
	Idle	900	3000
Dredging Tugs (3 @ 500hp each)	Dredging	4800	1500
Spill Barge	Dredging	400	165
Crewboat	Construction	400	400
Total	**4**	**8,500**	
CONTRACT 7: Stauffer Ch			
Dredging Cycle (Duration =	**6**	**Quantity =**	**1,814,000 CY**
30" Dredge	Dredging	3000	9000
	Idle	1350	3000
Dredging Tugs (3 @ 500hp each)	Dredging	7200	1500
Spill Barge	Dredging	600	165
Crewboat	Construction	600	400
Total	**6**	**12,750**	

Table B-3. Dredging Contract Allocation by Year
Freeport Harbor Channel Improvement Project
LPP Alternative

Contract No.	Reach	Dredging Duration Days	Year 1 **2011** percent	Year 2 **2012** percent	Year 3 **2013** percent	Year 4 **2014** percent	Year 5 **2015** percent
1	New Extention and Part of Outer Bar	696	12%	48%	40%		
2	Outer Bar and Jetty Channel	996		21%	35%	35%	9%
3	Lower TB, PA1, & Seaway Removel	30		100%			
4	Real Estate	180	50%	50%			
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	240		28%	38%	34%	
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	120			18%	90%	
7	Stauffer Channel	180				37%	57%
8	Mitigation	180					100%

Table B-4. Dredge Equipment Operating Hours
Freeport Harbor Channel Improvement Project
LPP Alternative

Contract No.	Reach	Operating Hours													
		Dredge						Survey Boat		Trawler		Floating Booster	Tug	Spill Barge	Crew Boat
		Dredge Type	Total Dredging	Propelling	Pumping	Power Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
1	New Extension	Generic Large Hopper	3,000	1,950	1,050	3,000	1,032	600	206	4,200	1,444				
	Part of Outer Bar	Generic Large Hopper	8,600	5,590	3,010	8,600	2,958	1,720	592	12,040	4,142				
2	Outer Bar	Generic Large Hopper	8,600	5,590	3,010	8,600	2,958	1,720	592	12,040	4,142				
	Jetty Channel	Generic Large Hopper	8,000	5,200	2,800	8,000	2,752	1,600	550	11,200	3,852				
3	Lower TB	30" Dredge	500				225						1,200	100	100
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	4,000				1,800						9,600	800	800
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	2,000				900						4,800	400	400
7	Stauffer Channel	30" Dredge	3,000				1,350						7,200	600	600
8	Mitigation														

Table B-5. Typical Hopper Dredging Cycle
Freeport Harbor Channel Improvement Project
LPP Alternative

Contract No.	Reach	Dredging Cycle				
		Dredge Type	Total Dredging Hours	Propelling	Pumping	Power Generating
1	New Extension	Generic Large Hopper	3,000	65%	35%	100%
	Part of Outer Bar	Generic Large Hopper	8,600	65%	35%	100%
2	Outer Bar	Generic Large Hopper	8,600	65%	35%	100%
	Jetty Channel	Generic Large Hopper	8,000	65%	35%	100%

Table B-6. Dredge Equipment Engine Horsepower Break-down
Freeport Harbor Channel Improvement Project
LPP Alternative

Contract No.	Location/Disposal Site	Horsepower (hp)													
		Dredge Type	Engine Type					Survey Boat		Trawler		Floating Booster	Tug	Spill Barge	Crew Boat
			Total	Propulsion	Pump	Generator	Generator at Idling	Main Engine	Idling	Main Engine	Idling	Pumping	Propulsion	Main Engine	Propulsion
1	New Extension	Generic Large Hopper	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
	Part of Outer Bar	Generic Large Hopper	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
2	Outer Bar	Generic Large Hopper	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
	Jetty Channel	Generic Large Hopper	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
3	Lower TB	30" Dredge	14,000	9,000	3,000	2,000	2,000	2,000	2,000	600	600				
4	Real Estate						3,000						500	165	400
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	9,000				3,000						500	165	400
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	9,000				3,000						500	165	400
7	Stauffer Channel	30" Dredge	9,000				3,000						500	165	400
8	Mitigation						3,000						500	165	400

Table B-7. Construction Equipment Operating Hours
Freeport Harbor Channel Improvement Project
LPP Alternative

Contract No.	Reach	Dredge Type	Operating Hours Misc Construction Equipment
1	New Extension	Generic Large Hopper	
	Part of Outer Bar	Generic Large Hopper	
2	Outer Bar	Generic Large Hopper	
	Jetty Channel	Generic Large Hopper	
3	Lower TB	30" Dredge	750
4	Real Estate		
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	6,000
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	3,000
7	Stauffer Channel	30" Dredge	4,500
8	Mitigation		131

Table C-1. Marine Equipment Operating Hours
Freeport Harbor Channel Improvement Project
LPP Alternative

Operating Hours			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper	358.46	233.00	125.46	358.46	123.31	71.69	24.81	501.84	172.54				
	Part of Outer Bar	Generic Large Hopper	1,027.57	667.92	359.65	1,027.57	353.44	205.51	70.74	1,438.50	494.91				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL		1,386.03	900.92	485.11	1,386.03	476.75	277.21	95.56	1,940.44	667.44				
YEAR 2012															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper	1,439.34	935.57	503.77	1,439.34	495.13	287.87	98.63	2,015.07	692.80				
	Part of Outer Bar	Generic Large Hopper	4,126.10	2,681.97	1,444.14	4,126.10	1,419.19	825.22	284.03	5,776.54	1,987.25				
2	Outer Bar	Generic Large Hopper	1,771.27	1,151.33	619.95	1,771.27	608.24	354.25	121.93	2,479.78	853.09				
	Jetty Channel	Generic Large Hopper	1,647.70	1,071.00	576.69	1,647.70	566.51	329.54	113.38	2,306.78	793.37				
3	Lower TB	30" Dredge	500.00				225.00						1,200.00	100.00	100.00
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1,128.06				507.63						2,707.34	225.61	225.61
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		10,612.47	5,839.87	3,144.54	8,984.41	3,822.89	1,796.88	618.07	12,578.18	4,326.51		3,907.34	325.61	325.61
YEAR 2013															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper	1,202.21	781.43	420.77	1,202.21	413.56	240.44	82.55	1,683.09	578.68				
	Part of Outer Bar	Generic Large Hopper	3,446.32	2,240.11	1,206.21	3,446.32	1,185.38	689.26	237.24	4,824.85	1,659.85				
2	Outer Bar	Generic Large Hopper	3,041.46	1,976.65	1,064.81	3,041.46	1,045.12	608.29	209.37	4,258.05	1,464.65				
	Jetty Channel	Generic Large Hopper	2,829.27	1,839.02	990.24	2,829.27	973.27	565.85	194.51	3,960.98	1,362.29				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1,502.16				675.97						3,605.18	300.43	300.43
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	366.67				165.00						880.00	73.33	73.33
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		12,388.09	6,837.62	3,681.74	10,519.26	4,459.30	2,103.85	723.66	14,726.97	5,065.55		4,485.18	373.76	373.76

Table C-1. Marine Equipment Operating Hours
Freeport Harbor Channel Improvement Project
LPP Alternative

Operating Hours			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge / Crew Boat	
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper	3,041.46	1,976.95	1,064.51	3,041.46	1,048.12	608.29	209.37	4,258.05	1,464.85				
	Jetty Channel	Generic Large Hopper	2,829.27	1,839.02	990.24	2,829.27	973.27	565.85	194.51	3,960.98	1,362.29				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	1,359.78				619.40						3,287.48	273.96	273.96
6	Channel to Upper Turning Basin through Upper Turning Basin and PA 9	30" Dredge	1,797.24				808.76						4,313.38	359.45	359.45
7	Stauffer Channel	30" Dredge	1,100.00				495.00						2,640.00	220.00	220.00
8	Mitigation														
	YEAR 2014 TOTAL		10,137.76	3,815.98	2,054.76	5,870.73	3,939.56	1,174.15	403.88	8,219.02	2,827.15		10,240.85	853.40	853.40
YEAR 2015															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper	745.80	494.77	261.03	745.80	256.52	149.16	51.34	1,044.12	358.20				
	Jetty Channel	Generic Large Hopper	693.77	460.95	242.82	693.77	238.66	138.75	47.70	971.27	334.05				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basin and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge	1,697.37				763.82						4,073.68	339.47	339.47
8	Mitigation														
	YEAR 2015 TOTAL		3,136.93	955.72	503.85	1,439.57	1,258.99	287.91	99.04	2,015.39	693.25		4,073.68	339.47	339.47

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Table C-2. Marine Engine Emission Factors and Fuel Consumption Algorithms
(in g/kW-hr, for all marine engines)
Freeport Harbor Channel Improvement Project

Statistical Parameter	Exponent (x)	Intercept (b)	Coefficient (a)
CO	1	0	0.8378
NO_X	1.5	10.4496	0.1255
PM	1.5	0.2551	0.0059
PM2.5	1.5	0.2551	0.0059
PM10	1.5	0.2551	0.0059
SO_X	n/a	0	2.3735
VOC (HC)	1.5	0	0.0667
CO2	1	648.6	44.1

Notes:

1.) All regressions but SO_2 are in the form of:

Emissions Rate (g/hp-hr) = (a*(Fractional Load)$^{-x}$ + b) * 0.7457
where the conversion factor of 0.7457 kW/hp is used to calculate the emission factor in g/hp-hr

2.) Fractional Load is equal to actual engine output divided by rated engine output.

3.) The SO_2 regression is the form of:

Emissions Rate (g/hp-hr) = a*(Fuel Sulfur Flow in g/hp-hr) + b
where Fuel Sulfur Flow is the Fuel Consumption times the sulfur content of the fuel;
The sulfur content for the fuel consumption regression was set to 3300 parts per million (0.33 wt%)

4.) **Fuel Consumption (g/hp-hr) = (14.12 / (Fractional Load) + 205.717) * 0.7457**

5.) n/a is not applicable, n/s is not statistically significant.

6.) All information shown above is detailed in Table 5-1 of the EPA technical report "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data", EPA 420-R-00-002, February 2000.

Table C-3. Marine Equipment Load Factors and Emission Factors
Freeport Harbor Channel Improvement Project

	Dredge					Crew Boat		Trawler		Floating Booster	Tug	Spill Barge	Crew Boat
Operating Mode	Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
Load Factor	0.8	0.8	0.8	0.8	0.2	0.4	0.2	0.4	0.2	0.8	0.4	0.4	0.4
EF (Gram/hp-hr)													
CO_2	525	525	525	525	648	566	648	566	648	525	566	566	566
CH_4	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067
N_2O	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015

Notes:

1.) The dredge type, engine type, horsepower, and fuel type were based on information provided by project sponsors.

2.) The engine load factors for the dredges and support equipment were determined from Table 5-2 of the EPA Report "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data", February 2000.

A survey of dredge engine sizes along with input from project sponsors was used to determine which operating mode and hence which load factor applied to each engine. The following assumptions applied to the load factor determination:

A.) The main engines on the dredges were assumed to operate at full power (e.g. 0.8 "cruise" load factor from Table 5-2 of EPA report) for all hours of operation.

B.) The generators on the dredges were assumed to operate at 0.2 load factor during idling.

C.) The main engines or propulsion engines on the support equipment were assumed to operate at intermittent times during the dredging operations and were also determined to operate at the 0.4 "slow cruise" load factor.

D.) The auxiliary engines, if any, on the support equipment were assumed to operate sparingly during idling and were determined to operate at the 0.2 "maneuvering" load factor.

3.) The emission factors were calculated according to the algorithm table and formulas detailed on page 5-3 of the EPA report. The emissions Rate formula and algorithm table are also shown on Table A-4, "Marine Engine Emission Factor and Fuel Consumption Data", February 2000.

4.) The Emission Rate in tons/hr is based on the following formula: Emission Rate = hp*LF*EF*(0.0022046 lbs/gram)*(1 ton/2000 lbs).

5.) CH_4 and N_2O emission factors were obtained from "Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories (ICF International 2009).

Table C-4. Marine Equipment CO_2 Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

CO_2 (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper		970.39	174.17	331.76	35.24	35.77	7.83	75.13	14.78				
	Part of Outer Bar	Generic Large Hopper		2,781.80	499.30	951.04	101.00	102.55	20.21	215.36	42.43				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			3,752.19	673.47	1,282.80	136.23	138.33	27.26	290.49	57.22				
YEAR 2012															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper		3,896.51	699.37	1,332.14	141.49	143.65	28.24	301.66	59.39				
	Part of Outer Bar	Generic Large Hopper		11,169.99	2,004.67	3,818.80	405.34	411.78	81.15	864.77	170.36				
2	Outer Bar	Generic Large Hopper		4,786.11	860.56	1,639.35	174.09	178.78	34.54	371.23	73.13				
	Jetty Channel	Generic Large Hopper		4,460.57	800.61	1,524.98	161.97	164.44	32.37	345.33	68.01				
3	Lower TB	30" Dredge	3,239.33				64.29								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	4,698.19				217.58						337.75	9.29	22.52
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		7,937.52	24,322.18	4,365.52	8,315.27	1,164.97	898.66	176.62	1,882.99	370.90		337.75	9.29	22.52
YEAR 2013															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper		3,254.56	584.15	1,112.67	118.16	119.98	23.59	251.96	49.61				
	Part of Outer Bar	Generic Large Hopper		9,329.72	1,674.57	3,189.65	338.73	343.93	67.79	722.30	142.29				
2	Outer Bar	Generic Large Hopper		8,233.71	1,477.64	2,814.94	298.93	303.54	59.83	637.44	125.58				
	Jetty Channel	Generic Large Hopper		7,699.28	1,374.74	2,618.55	278.12	282.37	55.58	592.97	116.78				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	6,256.29				289.74						449.76	12.37	25.96
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	1,527.11				70.72						109.78	3.02	7.32
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		7,783.38	28,477.26	5,111.30	9,735.81	1,394.42	1,049.84	206.79	2,204.67	434.26		559.54	15.39	37.30

Table C-4. Marine Equipment CO_2 Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

CO_2 (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		9,233.71	1,477.84	2,614.94	298.93	303.64	99.83	637.44	125.58				
	Jetty Channel	Generic Large Hopper		7,659.26	1,374.74	2,618.55	278.12	282.37	55.58	592.97	116.79				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	5,704.95				284.21						410.12	11.28	27.34
6	Channel to Upper Turning Basin through Upper Turning Basin and PA 9	30" Dredge	7,485.22				345.66						536.10	14.80	35.87
7	Stauffer Channel	30" Dredge	4,581.34				212.17						329.35	9.06	21.96
8	Mitigation														
	YEAR 2014 TOTAL		17,771.50	16,892.97	2,852.58	5,433.49	1,400.09	585.91	118.41	1,230.41	242.36		1,277.57	35.13	85.17
YEAR 2015															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		2,018.99	362.38	690.25	73.30	74.43	14.67	156.31	30.79				
	Jetty Channel	Generic Large Hopper		1,878.13	337.19	642.10	68.20	68.24	13.63	145.40	26.64				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basin and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge	7,069.29				327.40						508.20	13.98	33.68
8	Mitigation														
	YEAR 2015 TOTAL		7,069.29	3,897.13	699.48	1,332.35	468.50	143.67	28.30	301.71	59.43		508.20	13.98	33.68

Table C-5. Marine Equipment CH_4 Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

CH_4(tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper		0.1242	0.0223	0.0424	0.0037	0.0042	0.0007	0.0089	0.0015				
	Part of Outer Bar	Generic Large Hopper		0.3559	0.0639	0.1217	0.0105	0.0122	0.0021	0.0256	0.0044				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			0.4801	0.0862	0.1641	0.0141	0.0164	0.0028	0.0345	0.0059				
YEAR 2012															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper		0.4985	0.0895	0.1704	0.0147	0.0170	0.0029	0.0358	0.0062				
	Part of Outer Bar	Generic Large Hopper		1.4291	0.2565	0.4886	0.0420	0.0489	0.0084	0.1026	0.0176				
2	Outer Bar	Generic Large Hopper		0.8135	0.1101	0.2097	0.0180	0.0210	0.0036	0.0440	0.0075				
	Jetty Channel	Generic Large Hopper		0.5707	0.1024	0.1951	0.0168	0.0195	0.0034	0.0410	0.0070				
3	Lower TB	30" Dredge	0.4144				0.0067								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	0.5011				0.0225						0.0401	0.0011	0.0027
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		1.0155	3.1116	0.5585	1.0639	0.1207	0.1064	0.0183	0.2234	0.0384		0.0401	0.0011	0.0027
YEAR 2013															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper		0.4164	0.0747	0.1424	0.0122	0.0142	0.0024	0.0299	0.0051				
	Part of Outer Bar	Generic Large Hopper		1.1937	0.2142	0.4081	0.0351	0.0408	0.0070	0.0857	0.0147				
2	Outer Bar	Generic Large Hopper		1.0534	0.1891	0.3602	0.0310	0.0355	0.0062	0.0746	0.0130				
	Jetty Channel	Generic Large Hopper		0.9799	0.1759	0.3350	0.0288	0.0335	0.0058	0.0704	0.0121				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	0.8004				0.0359						0.0534	0.0015	0.0036
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	0.1954				0.0073						0.0130	0.0004	0.0009
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		0.9958	3.6434	0.6540	1.2456	0.1445	0.1246	0.0214	0.2616	0.0450		0.0664	0.0018	0.0044

Table C-5. Marine Equipment CH_4 Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

CH_4(tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		1.0534	0.1891	0.3602	0.0310	0.0360	0.0062	0.0756	0.0130				
	Jetty Channel	Generic Large Hopper		0.9799	0.1759	0.3350	0.0288	0.0335	0.0058	0.0704	0.0121				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	0.7299				0.0274						0.0487	0.0013	0.0032
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	0.9577				0.0359						0.0638	0.0018	0.0042
7	Stauffer Channel	30" Dredge	0.5851				0.0220						0.0391	0.0011	0.0026
8	Mitigation														
	YEAR 2014 TOTAL		2.2737	2.0334	0.3650	0.6952	0.1450	0.0695	0.0120	0.1460	0.0251		0.1516	0.0042	0.0101
YEAR 2015															
Contract No.	**Location/Disposal Site**	**Dredge**													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		0.2583	0.0464	0.0883	0.0076	0.0088	0.0015	0.0185	0.0032				
	Jetty Channel	Generic Large Hopper		0.2403	0.0431	0.0822	0.0071	0.0082	0.0014	0.0173	0.0030				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge	0.9045				0.0339						0.0603	0.0017	0.0048
8	Mitigation														
	YEAR 2015 TOTAL		0.9046	0.4986	0.0895	0.1705	0.0486	0.0170	0.0029	0.0358	0.0062		0.0603	0.0017	0.0040

Table C-6. Marine Equipment N_2O Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

N_2O (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2011															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper		0.0276	0.0050	0.0094	0.0008	0.0039	0.0002	0.0020	0.0003				
	Part of Outer Bar	Generic Large Hopper		0.0791	0.0142	0.0270	0.0023	0.0027	0.0005	0.0057	0.0010				
2	Outer Bar	Generic Large Hopper													
	Jetty Channel	Generic Large Hopper													
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basin and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2011 TOTAL			0.1067	0.0191	0.0365	0.0031	0.0036	0.0006	0.0077	0.0013				
YEAR 2012															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper		0.1108	0.0199	0.0379	0.0033	0.0038	0.0007	0.0080	0.0014				
	Part of Outer Bar	Generic Large Hopper		0.3176	0.0570	0.1086	0.0093	0.0109	0.0019	0.0229	0.0039				
2	Outer Bar	Generic Large Hopper		0.1353	0.0245	0.0466	0.0040	0.0047	0.0008	0.0098	0.0017				
	Jetty Channel	Generic Large Hopper		0.1268	0.0228	0.0434	0.0037	0.0043	0.0007	0.0091	0.0016				
3	Lower TB	30" Dredge	0.0921				0.0015								
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	0.1336				0.0050						0.0089	0.0002	0.0006
6	Channel to Upper Turning Basin through Upper Turning Basin and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2012 TOTAL		0.2257	0.6916	0.1241	0.2364	0.0268	0.0236	0.0041	0.0496	0.0086		0.0089	0.0002	0.0006
YEAR 2013															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper		0.0925	0.0166	0.0316	0.0027	0.0032	0.0005	0.0066	0.0011				
	Part of Outer Bar	Generic Large Hopper		0.2653	0.0476	0.0907	0.0078	0.0091	0.0016	0.0190	0.0033				
2	Outer Bar	Generic Large Hopper		0.2341	0.0420	0.0800	0.0069	0.0080	0.0014	0.0168	0.0029				
	Jetty Channel	Generic Large Hopper		0.2176	0.0391	0.0744	0.0064	0.0074	0.0013	0.0155	0.0027				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	0.1779				0.0067						0.0119	0.0003	0.0008
6	Channel to Upper Turning Basin through Upper Turning Basin and PA 9	30" Dredge	0.0434				0.0016						0.0029	0.0001	0.0002
7	Stauffer Channel	30" Dredge													
8	Mitigation														
	YEAR 2013 TOTAL		0.2213	0.8097	0.1453	0.2768	0.0321	0.0277	0.0048	0.0581	0.0100		0.0148	0.0004	0.0010

Table C-8. Marine Equipment N_2O Emissions
Freeport Harbor Channel Improvement Project
LPP Alternative

N_2O (tpy)			Dredge					Survey Boat		Trawler		Floating	Tug	Spill Barge	Crew Boat
			Dredging	Propelling	Pumping	Generating	Idling	Propelling	Idling	Propelling	Idling	Pumping	Propelling	Main Engine	Propelling
YEAR 2014															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		0.2341	0.0420	0.0800	0.0069	0.0080	0.0014	0.0168	0.0029				
	Jetty Channel	Generic Large Hopper		0.2178	0.0391	0.0744	0.0064	0.0074	0.0013	0.0156	0.0027				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	0.1522				0.0051						0.0108	0.0003	0.0007
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	0.2128				0.0090						0.0142	0.0004	0.0009
7	Stauffer Channel	30" Dredge	0.1303				0.0049						0.0087	0.0002	0.0006
8	Mitigation														
	YEAR 2014 TOTAL		0.6063	0.4519	0.0811	0.1545	0.0322	0.0154	0.0027	0.0324	0.0056		0.0337	0.0009	0.0022
YEAR 2015															
Contract No.	Location/Disposal Site	Dredge													
1	New Extension	Generic Large Hopper													
	Part of Outer Bar	Generic Large Hopper													
2	Outer Bar	Generic Large Hopper		0.0574	0.0103	0.0196	0.0017	0.0020	0.0003	0.0041	0.0007				
	Jetty Channel	Generic Large Hopper		0.0534	0.0096	0.0183	0.0016	0.0019	0.0003	0.0038	0.0007				
3	Lower TB	30" Dredge													
4	Real Estate														
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge													
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge													
7	Stauffer Channel	30" Dredge	0.2010				0.0075						0.0134	0.0004	0.0009
8	Mitigation														
	YEAR 2015 TOTAL		0.2010	0.1106	0.0199	0.0379	0.0108	0.0038	0.0007	0.0080	0.0014		0.0134	0.0004	0.0009

Table C-7. Summary of Marine Equipment Emissions (tpy)
Freeport Harbor Channel Improvement Project
LPP Alternative

YEAR 2011

Contract No.	Location/Disposal Site	Dredge	CO2	CH4	N2O
1	New Extension	Generic Large Hopper	1,644.3	0.2	0.0
	Part of Outer Bar	Generic Large Hopper	4,713.7	0.6	0.1
2	Outer Bar	Generic Large Hopper			
	Jetty Channel	Generic Large Hopper			
3	Lower TB	30" Dredge			
4	Real Estate				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge			
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge			
7	Stauffer Channel	30" Dredge			
8	Mitigation				
		YEAR 2011 TOTAL	6,358.0	0.8	0.2

YEAR 2012

Contract No.	Location/Disposal Site	Dredge	CO2	CH4	N2O
1	New Extension	Generic Large Hopper	6,602.5	0.8	0.2
	Part of Outer Bar	Generic Large Hopper	18,927.3	2.4	0.5
2	Outer Bar	Generic Large Hopper	8,125.2	1.0	0.2
	Jetty Channel	Generic Large Hopper	7,558.3	1.0	0.2
3	Lower TB	30" Dredge	3,303.6	0.4	0.1
4	Real Estate				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	5,285.3	0.7	0.1
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge			
7	Stauffer Channel	30" Dredge			
8	Mitigation				
		YEAR 2012 TOTAL	49,802.2	6.3	1.4

YEAR 2013

Contract No.	Location/Disposal Site	Dredge	CO2	CH4	N2O
1	New Extension	Generic Large Hopper	5,514.7	0.7	0.2
	Part of Outer Bar	Generic Large Hopper	15,809.0	2.0	0.4
2	Outer Bar	Generic Large Hopper	13,951.8	1.8	0.4
	Jetty Channel	Generic Large Hopper	12,978.4	1.6	0.4
3	Lower TB	30" Dredge			
4	Real Estate				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	7,038.1	0.9	0.2
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	1,718.0	0.2	0.0
7	Stauffer Channel	30" Dredge			
8	Mitigation				
		YEAR 2013 TOTAL	57,010.0	7.2	1.6

Table C-7. Summary of Marine Equipment Emissions (tpy)
Freeport Harbor Channel Improvement Project
LPP Alternative

YEAR 2014

Contract No.	Location/Disposal Site	Dredge	CO2	CH4	N2O
1	New Extension	Generic Large Hopper			
	Part of Outer Bar	Generic Large Hopper			
2	Outer Bar	Generic Large Hopper	13,951.8	1.8	0.4
	Jetty Channel	Generic Large Hopper	12,978.4	1.6	0.4
3	Lower TB	30" Dredge			
4	Real Estate				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	6,417.9	0.8	0.2
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	8,420.6	1.1	0.2
7	Stauffer Channel	30" Dredge	5,153.9	0.7	0.1
8	Mitigation				
		YEAR 2014 TOTAL	**46,922.6**	**5.9**	**1.3**

YEAR 2015

Contract No.	Location/Disposal Site	Dredge	CO2	CH4	N2O
1	New Extension	Generic Large Hopper			
	Part of Outer Bar	Generic Large Hopper			
2	Outer Bar	Generic Large Hopper	3,421.1	0.4	0.1
	Jetty Channel	Generic Large Hopper	3,182.4	0.4	0.1
3	Lower TB	30" Dredge			
4	Real Estate				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge			
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge			
7	Stauffer Channel	30" Dredge	7,952.7	1.0	0.2
8	Mitigation				
		YEAR 2015 TOTAL	**14,556.3**	**1.8**	**0.4**

TOTAL

Contract No.	Location/Disposal Site	Dredge	CO2	CH4	N2O
1	New Extension	Generic Large Hopper	13,761.4	1.7	0.4
	Part of Outer Bar	Generic Large Hopper	39,450.0	5.0	1.1
2	Outer Bar	Generic Large Hopper	39,450.0	5.0	1.1
	Jetty Channel	Generic Large Hopper	36,697.5	4.6	1.0
3	Lower TB	30" Dredge	3,303.6	0.4	0.1
4	Real Estate				
5	Channel to Brazosport through Brazosport Turning Basin and PA 8	30" Dredge	18,741.3	2.4	0.5
6	Channel to Upper Turning Basin through Upper Turning Basis and PA 9	30" Dredge	10,138.6	1.3	0.3
7	Stauffer Channel	30" Dredge	13,106.6	1.7	0.4
8	Mitigation				
		PROJECT TOTAL	**174,649.0**	**22.1**	**4.9**

Table C-8. Annual Marine Equipment Emissions (tpy)
Freeport Harbor Channel Improvement Project
LPP Alternative

	CO_2	CH_4	N_2O
Year 2011	6,358	0.80	0.18
Year 2012	49,802	6.30	1.40
Year 2013	57,010	7.21	1.60
Year 2014	46,923	5.93	1.32
Year 2015	14,556	1.84	0.41

Table D-1. Total Estimated Project Emissions by Year of Construction Activity

Construction Equipment Emission Factors
Freeport Harbor Channel Improvement Project
LPP Alternative

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)		
					CO_2	CH_4[2]	N_2O[2]
Contract 5: Ch to Brz thr Brzpt TB & PA 8							
EP H25HU005 HYD EXCAV, CRWLR, 97,870 LBS, 3.14 CY BKT	Crawler Tractor/Dozers	Diesel	300	59%	536.005004	0.0390782	0.01373018
EP T45XX021 TRUCK TRAILER, LOWBOY, 90 TON, 4 AXLE	Truck Trailer	--	0	0%	0	0	0
EP T50FD019 TRK,HWY, 43,000 GVW, 6X4, 3 AXLE	Highway Truck	Diesel	230	59%	536.137913	0.03908789	0.01373358
EP T50XX011 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP, 4X4	Highway Truck	Diesel	230	59%	536.137913	0.03908789	0.01373358
GEN B20Z1000 BRUSH CHIPPER, 22" (558 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	Chippers/Stump Grinders	Diesel	650	43%	535.797263	0.03906305	0.01372486
GEN B35Z1140 BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Dragline	Diesel	350	59%	535.745354	0.03905927	0.01372353
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	76%	685.997007	0.04983406	0.01713046
GEN C75Z2200 CRANE, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 40 TON (36 MT), 84' (25.6 M) BOOM, 4X4	Cranes	Diesel	173	43%	787.85182	0.05743944	0.02016143
GEN H25Z3185 HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23.3' (7.1 M) MAX DIGGING DEPTH	Excavators	Diesel	239	59%	536.039678	0.03908073	0.01373107
GEN L40Z4395 LOADER, FRONT END, WHEEL, ARTICULATED, 2.75 CY (2.1 M3) BUCKET, 4X4,	Tractor/Loader/Backhoe	Diesel	130	21%	623.402943	0.04545007	0.01596894
GEN L60Z4700 LOG SKIDDER, CABLE, 26,760 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	Log Skidder	Diesel	119	59%	535.743439	0.03905913	0.01372346
GEN L80Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	Log Skidder	Diesel	200	59%	535.855141	0.03906727	0.01372634
GEN T15Z6440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	100	59%	535.903786	0.03907082	0.01372758
GEN T15Z6480 TRACTOR, CRAWLER (DOZER), 101-135 HP (75-101 KW), POWERSHIFT, W/ UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	135	59%	535.903786	0.03907082	0.01372758
GEN T15Z6520 TRACTOR, CRAWLER (DOZER), 181-250 HP (135-186 KW), POWERSHIFT, LGP, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	250	59%	536.005004	0.0390782	0.01373018
GEN T40Z7090 TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Highway Truck	Diesel	230	59%	536.137913	0.03908789	0.01373358
GEN T45Z7280 TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	Highway Truck	Diesel	210	59%	536.137913	0.03908789	0.01373358
GEN T50Z7420 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	Diesel	230	59%	536.137913	0.03908789	0.01373358
GEN T50Z7520 TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	Diesel	310	59%	536.266791	0.03909728	0.01373688
MAP C85MA001 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	Cranes	Diesel	350	43%	530.17646	0.03865326	0.01358067
MAP L15FG001 LANDSCAPING EQUIPMENT, 3,000 GAL, HYDROSEEDER, TRUCK MTD (INCLUDES 50,000 GVW TRUCK)	Highway Truck	Diesel	310	59%	536.266791	0.03909728	0.01373688
Contract 6: Ch to UTB thr UTB & PA 9							
EP H25HU005 HYD EXCAV, CRWLR, 97,870 LBS, 3.14 CY BKT	Crawler Tractor/Dozers	Diesel	300	59%	536.005004	0.0390782	0.01373018
EP T45XX021 TRUCK TRAILER, LOWBOY, 90 TON, 4 AXLE (ADD TOWING TRUCK)	Truck Trailer	--	0	0%		0	0
EP T50FD019 TRK,HWY, 43,000 GVW, 6X4, 3 AXLE	Highway Truck	Diesel	230	59%	536.137913	0.03908789	0.01373358
EP T50XX011 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP, 4X4	Highway Truck	Diesel	230	59%	536.137913	0.03908789	0.01373358

Table D-1. Total Estimated Project Emissions by Year of Construction Activity

Construction Equipment Emission Factors
Freeport Harbor Channel Improvement Project
LPP Alternative

Equipment Type	Description	Fuel Type[1]	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)		
					CO_2	CH_4[2]	N_2O[2]
GEN B20Z1000 BRUSH CHIPPER, 22" (559 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	Chippers/Stump Grinders	Diesel	650	43%	535.797263	0.03906305	0.01372486
GEN B35Z1140 BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Dragline	Diesel	350	56%	535.745354	0.03905927	0.01372353
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	8	78%		0	0
GEN C75Z2200 CRANE, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 40 TON (36 MT), 84' (25.6 M) BOOM, 4X4	Cranes	Diesel	250	43%	530.173	0.03865301	0.01358079
GEN H25Z3165 HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23.3' (7.1 M) MAX DIGGING DEPTH	Excavators	Diesel	238	59%	536.039676	0.03908073	0.01373107
GEN L40Z4365 LOADER, FRONT END, WHEEL, ARTICULATED, 2.75 CY (2.1 M3) BUCKET, 4X4,	Tractor/Loader/Backhoe	Diesel	130	21%	623.402943	0.04545007	0.01596894
GEN L60Z4760 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	Log Skidder	Diesel	119	59%	535.743439	0.03905913	0.01372348
GEN L60Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	Log Skidder	Diesel	200	59%	535.855141	0.03906727	0.01372634
GEN T15Z6440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	100	59%	535.903786	0.03907082	0.01372758
GEN L60Z4760 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	Log Skidder	Diesel	119	59%	535.743439	0.03905913	0.01372348
GEN L60Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	Log Skidder	Diesel	200	59%	535.855141	0.03906727	0.01372634
GEN T15Z6440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	Diesel	100	59%	535.903786	0.03907082	0.01372758
GEN T45Z7280 TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	Highway Truck	Diesel	210	59%	536.137913	0.03908789	0.01373358
GEN T50Z7520 TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	Diesel	310	59%	536.256791	0.03909726	0.01373688
GEN T50Z7700 DUMP TRUCK, HIGHWAY, 10 - 13 CY (7.6 - 9.9 M3) DUMP BODY, 35,000 LBS (15,900 KG) GVW, 2 AXLE, 4X2	Highway Truck	Diesel	205	59%	536.137913	0.03908789	0.01373358
MAP C85MA001 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	Cranes	Diesel	350	43%	530.17646	0.03865326	0.01358087
UPB T15CA004 DOZER,CWLR, D-4H,PS (ADD BLADE)	Crawler Dozers/Tractor	Diesel	80	59%	594.912657	0.04337294	0.01523914
UPB T40KX008 REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)		–	0	0%		0	0
UPB T50KE003 TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	Highway Truck	Diesel	230	59%	536.137913	0.03908789	0.01373358

Table D-2. Total Estimated Project Emissions by Year of Construction Activity

SCC Code	Equipment	Load Factor[1] Diesel	Load Factor[1] Gasoline
22xx003010	Aerial Lifts	21%	46%
22xx005015	Agricultural Tractor	59%	62%
22xx006015	Air Compressors	43%	56%
22xx001030	All Terrain Vehicles	42%	100%
22xx002033	Bore/Drill Rigs	43%	79%
22xx002042	Cement & Motar Mixers	43%	59%
22xx004066	Chippers/Stump Grinders	43%	78%
22xx002039	Concrete/Industrial Saws	59%	78%
22xx002045	Cranes	43%	47%
22xx002066	Crawler Dozers/Tractor	59%	80%
22xx002054	Crushing/Procesing Equipment	43%	85%
22xx002078	Dumpers/Tenders	21%	41%
22xx002036	Excavators	59%	53%
22xx007015	Fellers/Bunchers/Skidders	59%	70%
22xx003020	Forklifts	59%	30%
22xx006020	Gas Compressors	43%	85%
22xx006005	Generator Sets	43%	68%
22xx002048	Graders	59%	64%
22xx005050	Hydro Power Units	43%	56%
22xx004056	Lawn and Garden Tractor	43%	44%
22xx002051	Off-Highway Truck	59%	80%
22xx002075	Off-Highway Tractor	59%	70%
22xx004056	Other Agricultural Equipment	59%	55%
22xx002081	Other Construction Equipment	59%	48%
22xx003040	Other General Industrial	43%	54%
22xx003050	Other Material Handling	21%	53%
22xx002003	Pavers	59%	66%
22xx002021	Paving Equipment	59%	59%
22xx002009	Plate Compactors	43%	55%
22xx006030	Pressure Washer	43%	85%
22xx006010	Pumps	43%	69%
22xx003060	Refrigeration/AC	43%	46%
22xx002015	Rollers	59%	62%
22xx002057	Rough Terrain Forklifts	59%	63%
22xx002063	Rubber Tire Dozer	59%	75%
22xx002060	Rubber Tire Loader	59%	71%
22xx002018	Scrapers	59%	70%
22xx002072	Skid Steer Loader	21%	58%
22xx001060	Specialty Vehicle/Carts	21%	58%
22xx002024	Surfacing Equipment	59%	49%
22xx003030	Sweepers/Scrubbers	43%	71%
22xx002006	Tampers/Rammers	43%	55%
22xx003070	Terminal Tractors	59%	78%
22xx005040	Tillers > 6 hp	59%	71%
22xx004026	Timmer/Edger/Brush Cutter	43%	91%
22xx002066	Tractor/Loader/Backhoe	21%	48%
22xx002030	Trenchers	59%	66%
22xx006025	Welders	21%	68%

1. Load Factors from Appendix A of *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, EPA Office of Air and Radiation Report Number NR-005b, December 2002

Table D-3. Total Estimated Project Emissions by Year of Construction Activity

Freeport Harbor Channel Improvement Project
LPP Alternative

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	CO_2 Emissions (tons per year)			CH_4 Emissions (tons per year)			N_2O Emissions (tons per year)		
				2012	2013	2014	2012	2013	2014	2012	2013	2014
Contract 5: Ch to Brz thr Brzpt TB & PA 8			8									
EP H25HU005 HYD EXCAV, CRWLR, 97,870 LBS, 3.14 CY BKT	1	24	8	2.8237	3.7649	0.6275	0.0002	0.0003	0.0000	0.0001	0.0001	0.0000
EP T45XX021 TRUCK TRAILER, LOWBOY, 90 TON, 4 AXLE	1	24	8	-	-	-	-	-	-	-	-	-
EP T50FC019 TRK,HWY, 43,000 GVW, 6X4, 3 AXLE	1	24	8	2.1653	2.8871	0.4812	0.0002	0.0002	0.0000	0.0001	0.0001	0.0000
EP T50XX011 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP, 4X4	1	1,136	8	102.4929	136.6572	22.7762	0.0075	0.0100	0.0017	0.0026	0.0035	0.0006
GEN B20Z1000 BRUSH CHIPPER, 22" (559 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	1	183	8	33.9854	45.3139	7.5523	0.0025	0.0033	0.0006	0.0009	0.0012	0.0002
GEN B35Z1140 BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1	6,651	8	912.4823	1,216.6431	202.7739	0.0665	0.0887	0.0148	0.0234	0.0312	0.0052
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	183	8	0.7286	0.9714	0.1619	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000
GEN C7522200 CRANE, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 40 TON (36 MT), 84' (25.6 M) BOOM,	1	24	8	1.7443	2.3258	0.3876	0.0001	0.0002	0.0000	0.0000	0.0001	0.0000
GEN H25Z3185 HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23.3' (7.1 M) MAX DIGGING DEPTH	1	24	8	2.2402	2.9870	0.4978	0.0002	0.0002	0.0000	0.0001	0.0001	0.0000
GEN L40Z4395 LOADER, FRONT END, WHEEL, ARTICULATED, 2.75 CY (2.1 M3) BUCKET, 4X4,	1	314	8	6.6270	8.8361	1.4727	0.0005	0.0006	0.0001	0.0002	0.0002	0.0000
GEN L60Z4760 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	1	366	8	17.0725	22.7633	3.7939	0.0012	0.0017	0.0003	0.0004	0.0006	0.0001
GEN L60Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	1	366	8	28.6992	38.2656	6.3776	0.0021	0.0028	0.0005	0.0007	0.0010	0.0002
GEN T15Z6440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	183	8	7.1754	9.5673	1.5945	0.0005	0.0007	0.0001	0.0002	0.0002	0.0000
GEN T15Z6480 TRACTOR, CRAWLER (DOZER), 101-135 HP (75-101 KW), POWERSHIFT, W/ UNIVERSAL BLADE	1	64	8	3.3876	4.5170	0.7528	0.0002	0.0003	0.0001	0.0001	0.0001	0.0000
GEN T15Z6520 TRACTOR, CRAWLER (DOZER), 181-250 HP (135-186 KW), POWERSHIFT, LGP, W/UNIVERSAL	1	4,014	8	393.5476	524.7302	87.4550	0.0287	0.0383	0.0064	0.0101	0.0134	0.0022
GEN T40Z7090 TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1	24	8	2.1653	2.8871	0.4812	0.0002	0.0002	0.0000	0.0001	0.0001	0.0000
GEN T45Z7260 TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	1	10	8	0.8238	1.0984	0.1831	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000
GEN T50Z7420 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	85	8	7.6689	10.2252	1.7042	0.0006	0.0007	0.0001	0.0002	0.0003	0.0000
GEN T50Z7520 TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	10	8	1.2163	1.6218	0.2703	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000
MAP C85MA001 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80'	1	6,651	8	658.1167	877.4890	146.2482	0.0480	0.0640	0.0107	0.0169	0.0225	0.0037
MAP L15FG001 LANDSCAPING EQUIPMENT, 3,000 GAL, HYDROSEEDER, TRUCK MTD (INCLUDES 56,000 GVW	1	61	8	7.4197	9.8929	1.6488	0.0005	0.0007	0.0001	0.0002	0.0003	0.0000
Contract 6: Ch to UTB thr UTB & PA 9			4									

Table D-3. Total Estimated Project Emissions by Year of Construction Activity

Freeport Harbor Channel Improvement Project
LPP Alternative

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	CO_2 Emissions (tons per year)			CH_4 Emissions (tons per year)			N_2O Emissions (tons per year)		
				2012	2013	2014	2012	2013	2014	2012	2013	2014
EP H25HU005 HYD EXCAV, CRWLR, 97,870 LBS, 3.14 CY BKT	1	24	4			2.5099			0.0002			0.0001
EP T45XX021 TRUCK TRAILER, LOWBOY, 90 TON, 4 AXLE (ADD TOWING TRUCK)	1	24	4			-			-			-
EP T50FO019 TRK,HWY, 43,000 GVW, 6X4, 3 AXLE	1	24	4			1.9247			0.0001			0.0000
EP T50XX011 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP, 4X4	1	1,173	4			94.0721			0.0069			0.0024
GEN B20Z1000 BRUSH CHIPPER, 22" (559 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	1	191	4			31.5299			0.0023			0.0008
GEN B35Z1140 BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1	6,863	4			837.5588			0.0611			0.0215
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	191	4			-			-			-
GEN C75Z2200 CRANE, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 40 TON (36 MT), 84' (25.6 M) BOOM,	1	24	4			1.5078			0.0001			0.0000
GEN H25Z3185 HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23.3' (7.1	1	24	4			1.9913			0.0001			0.0001
GEN L40Z4395 LOADER, FRONT END, WHEEL, ARTICULATED, 2.75 CY (2.1 M3) BUCKET, 4X4,	1	381	4			7.1476			0.0005			0.0002
GEN L60Z4760 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	1	383	4			15.8604			0.0012			0.0004
GEN L60Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	1	383	4			26.6953			0.0019			0.0007
GEN T15Z6440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	191	4			6.6570			0.0005			0.0002
GEN L60Z4760 LOG SKIDDER, CABLE, 26,700 LB (12,111 KG) LINE-PULL, WINCH AND BLADE, WHEEL, 4X4	1	45	4			1.8658			0.0001			0.0000
GEN L60Z4800 LOG SKIDDER, LOG FELLER/BUNCHER, 20" (508 MM) DIA TREE SAW CUTTER, WHEEL, 4X4	1	45	4			3.1365			0.0002			0.0001
GEN T15Z6440 TRACTOR, CRAWLER (DOZER), 76-100 HP (57-75 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	25	4			0.8713			0.0001			0.0000
GEN T45Z7280 TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	1	73	4			5.3454			0.0004			0.0001
GEN T50Z7520 TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	73	4			7.8927			0.0006			0.0002
GEN T50Z7700 DUMP TRUCK, HIGHWAY, 10 - 13 CY (7.6 - 9.9 M3) DUMP BODY, 35,000 LBS (15,900 KG) GVW, 2	1	120	4			8.5777			0.0006			0.0002
MAP C85MA001 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80'	1	45	4			3.9580			0.0003			0.0001
UPB T15CA004 DOZER,CWLR, D-4H,PS (ADD BLADE)	1	80	4			2.4762			0.0002			0.0001
UPB T40XX008 REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	1	40	4			-			-			-
UPB T50KE003 TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	1	40	4			3.2079			0.0002			0.0001
TOTALS				**2,192.58**	**2,923.44**	**1,552.05**	**0.16**	**0.21**	**0.11**	**0.06**	**0.07**	**0.04**

Table D-4. Total Estimated Project Emissions by Year of Construction Activity
Freeport Harbor Channel Improvement Project
LPP Alternative

	2012	2013	2014
CO2	2192.58	2923.44	1552.05
CH4	0.16	0.21	0.11
N2O	0.06	0.07	0.04

Table E-1. Crew Size per Equipment
Freeport Harbor Channel Improvement Project
LPP Alternative

	Hopper Dredge		Cutterhead Dredge		
	Hopper Dredge Crew	Shore Crew	Cutterhead Dredge Crew	Shore Crew	Other Construction Equipment
Employees	22	8	46	6	6

Table E-2. Emission Factors for Employee Vehicles
Freeport Harbor Channel Improvement Project

County	Type of Vehicle	EPA Category[1]	Emisson Factor (g/mile)[2]		
			CO2	CH4	N2O
Brazoria	Cars	LDGV	202.3547	0.0147	0.0079
	Pickups	LDGT1	216.1203	0.0157	0.0101

Notes:
1. LDGV=light duty gasoline-fueled vehicles designated for transport of up to 12 people
LDGT1=light duty gasoline-fueled trucks with a gross vehicle weight (GVW) rating of 6000 pounds or less

2. Emission factors estimated from emissions data provided in Climate Action Registry (California Climate Action Registry, 2009).

Table E-3. Summary of Employee Vehicles Emissions (tpy)
Freeport Harbor Channel Improvement Project
LPP Alternative

Project Year	Type of Vehicle	EPA Category	Daily Vehicles (/day)	Total (VMT)	Travel Days (days/yr)	Annual Travel (VMT/yr)	Annual Emissions (tpy)		
							CO2	CH4	N2O
2011	Cars	LDGV	15	50.0	130	97,500	21.75	0.0016	0.0008
	Pickups	LDGT1	15	50.0	130	97,500	23.23	0.0017	0.0011
						2011 Total Mobile Emission	**44.97**	**0.0033**	**0.0019**
2012	Cars	LDGV	138	50.0	718	4,954,200	1,105.05	0.0803	0.0431
	Pickups	LDGT1	138	50.0	718	4,954,200	1,180.23	0.0857	0.0552
						2012 Total Mobile Emission	**2,285.28**	**0.1660**	**0.0983**
2013	Cars	LDGV	56	50.0	762	2,133,600	475.91	0.0346	0.0186
	Pickups	LDGT1	56	50.0	762	2,133,600	508.28	0.0369	0.0238
						2013 Total Mobile Emission	**984.19**	**0.0715**	**0.0423**
2014	Cars	LDGV	67	50.0	760	2,546,000	567.90	0.0413	0.0222
	Pickups	LDGT1	67	50.0	760	2,546,000	606.53	0.0441	0.0283
						2014 Total Mobile Emission	**1,174.42**	**0.0853**	**0.0505**
2015	Cars	LDGV	56	50.0	281	786,800	175.50	0.0127	0.0069
	Pickups	LDGT1	56	50.0	281	786,800	187.44	0.0136	0.0088
						2015 Total Mobile Emission	**362.94**	**0.0264**	**0.0156**

Notes:
1. Total VMT is assumed to be 50 miles/day round trip.
2. Annual travel = Daily vehicles * Total VMT * Travel days/yr.
3. Annual emissions = Emission factor * Annual travel * 1lb/453.6 grams * 1ton/2000lb

Table E-4. Annual Employee Vehicle Emissions
Freeport Harbor Channel Improvement Project
NED Alternative
(tons per year)

Year	CO2	CH4	N2O
Year 2011	44.975	0.003	0.002
Year 2012	2285.28	0.17	0.10
Year 2013	984.19	0.07	0.04
Year 2014	1174.42	0.09	0.05
Year 2015	362.94	0.03	0.02

Table F-1. LPP Alternative - Additional Maintenance Dredging - Assumptions for Marine Equipment Engines
Freeport Harbor Channel Improvement Project
Additional 1,280,000 cy/yr Maintenance Dredging

Activity	Equipment Type	Quantity	Total Installed Power (hp)	Engine Type	Engine Fuel Type	Engine Load Factor	Engine Horsepower (hp)	Hours of Operation per Day (hrs/day)	Daily Engine Usage (%)	Total Days of Operation (days)	Total Engine Hours of Operation (hrs)
Additional 1,280,000 cy/yr Maintenance Dredging	Hopper Dredge	1	14,000	Propulsion - Oceangoing	Diesel	0.8	9,000	20	65%	32	416
				Propulsion - Dredging	Diesel	0.8	9,000	20	35%	32	224
				Dredge Pump(s)	Diesel	0.8	3,000	20	35%	32	224
				Auxiliary - Oceangoing	Diesel	0.8	2,000	20	65%	32	416
				Auxiliary - Idling	Diesel	0.8	2,000	20	35%	32	224
	Survey Boat	1	2,000	Propulsion	Diesel	0.4	2,000	20	100%	6	128
				Auxiliary	Diesel	0.2	2,000	20	100%	6	128
	Shrimp Boat (Turtle Trawl)	2	600	Propulsion	Diesel	0.4	600	24	100%	22	1,075
				Auxiliary	Diesel	0.2	600	24	100%	22	1,075
Total Engine Hours											3,910

Notes:
1. Days of operation are determined assuming 40,000 CY/day production rate for a hopper dredge removing unconsolidated, predominantly silty dredged material.

Table F-2. LPP Alternative - Additional Maintenance Dredging - Marine Equipment Hours of Operation
Freeport Harbor Channel Improvement Project
Additional 1,280,000 cy/yr Maintenance Dredging

			Dredge								
			Generic Large Hopper Dredge					Crew/Survey Boat (Runabout)		Shrimp Boats (Total of Two)	
Contract No.	**Additional Volume/Disposal Site**	**Dredge**	Propulsion Ocean Going	Propulsion Dredging	Dredge Pump(s)	Auxilary Oceangoing	Auxiliary Idling	Propulsion	Secondary	Propulsion	Secondary
Additional Maintenance Dredging	1,280,000 CY of Additional Maintenance Material to ODMS	Hopper	416	224	224	416	224	128	128	1,075	1,075

Table F-3. LPP Alternative - Additional Maintenance Dredging - Marine Equipment Estimated Emissions
Freeport Harbor Channel Improvement Project
Additional 1,280,000 cy/yr Maintenance Dredging
(Tons per Year)

Phase No.	Pollutant	Dredge	Dredge									Total Emissions Per Year
			Generic Large Hopper Dredge					Crew/Survey Boat		Shrimp Boat		
			Propulsion Oceangoing	Propulsion - Dredging	Dredge Pump(s)	Auxiliary - Oceangoing	Auxillary - Dredging	Propulsion	Auxiliary	Propulsion	Auxiliary	
Additional 1,280,000 cy/yr Maintenance Dredging	CO_2	Hopper	1,732.60	932.94	310.98	385.02	64.01	63.87	36.58	160.96	92.17	**3,779.15**
	CH_4	Hopper	0.2217	0.1194	0.0398	0.0493	0.0066	0.0076	0.0038	0.0191	0.0095	**0.48**
	N_2O	Hopper	0.0493	0.0265	0.0088	0.0109	0.0015	0.0017	0.0008	0.0042	0.0021	**0.11**