

**FEDERAL EMERGENCY MANAGEMENT AGENCY  
FINDING OF NO SIGNIFICANT IMPACT  
CHANGE OF LOCATION AND RECONSTRUCTION OF  
ALEXIS BAY MARSH TERRACES  
PLAQUEMINES PARISH, LOUISIANA  
FEMA-1603-DR-LA (HURRICANE KATRINA)**

**Introduction**

Hurricane Katrina, a strong hurricane with high wind and a destructive storm surge, made landfall and caused catastrophic damage within the parishes of Louisiana. As a result of damages from Hurricane Katrina, the Federal Emergency Management Agency (FEMA) was authorized under Presidential disaster declaration FEMA-1603-DR-LA to provide federal assistance to designated disaster areas in Louisiana. The Robert T. Stafford Disaster Relief and Emergency Assistance Act (PL 93288) Section 406 authorizes FEMA's Public Assistance (PA) Program to provide financial and other forms of assistance to State and local governments to support response, recovery, and mitigation efforts following Presidentially declared disasters.

Plaquemines Parish has submitted an application for Federal Emergency Management Agency (FEMA) grant funding under FEMA's Public Assistance Program being administered in response to FEMA-1603-DR-LA. The Alexis Bay Marsh Terraces were substantially damaged by Hurricane Katrina's winds and coastal flooding and were deemed eligible for grant funding to replace the terraces to predisaster condition. The applicant proposes to construct a new complex of terraces incorporating the functions and capacity of the previous facility at a new location in Alexis Bay in Plaquemines Parish, Louisiana. The facility is proposed to be reconstructed at the northeast edge of the damaged facility at latitude 29.31900 and longitude -89.32900.

In accordance with 44 CFR Part 10, FEMA regulations to implement the National Environmental Policy Act (NEPA), an Environmental Assessment (EA) was prepared. The purpose of this EA is to analyze the potential environmental impacts associated with the relocation and construction of the Alexis Bay Marsh Terraces and to determine whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI).

**Findings**

The above described action would not result in any significant adverse impacts related to geology, soils, hydrology, floodplains, wetlands, water quality, air quality, vegetation, wildlife, state and federally listed threatened and endangered species, cultural resources, socioeconomics (including minority and low income populations), safety, security, noise, hazardous materials, toxic wastes, traffic, or transportation. Based on the information analyzed, FEMA has determined that the implementation of the proposed action would not result in significant adverse impacts to the quality of the natural and human environment. The proposed alternative is not anticipated to have the potential for significant cumulative effects when combined with past, present, and reasonably foreseeable future actions in accordance with 44 CFR Part 10.8 (d)(3)(x).

## FINDING OF NO SIGNIFICANT IMPACT

As a result of this FONSI, an EIS will not be prepared (44 CFR Part 10) and the proposed action as described in the EA may proceed.

### **Conditions And Mitigation Measures**

Based upon the studies and consultations undertaken in this EA, several conditions must be met and mitigation measures must be taken by the applicant prior to and during project implementation.

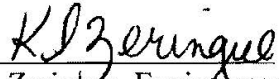
- In accordance with applicable local, state, and federal regulations, the applicant is responsible for acquiring any necessary permits and/or clearances prior to the commencement of any construction related activities.
- FEMA Public Assistance grant funded projects carried out in the floodplain or affecting the floodplain must be coordinated with the local floodplain administrator for a floodplain development permit and the action must be undertaken in compliance with relevant, applicable and required local codes and standards and thereby, will reduce the risk of future flood loss, minimize the impacts of floods on safety, health, and welfare, and preserve and possibly restore beneficial floodplain values as required by Executive Order 11988.
- If during the course of work, archaeological artifacts (prehistoric or historic) or human remains are discovered, the applicant shall stop work in the vicinity of the discovery and take all reasonable measures to avoid or minimize harm to the finds. The applicant shall inform their Public Assistance (PA) contacts at FEMA, who will in turn contact FEMA Historic Preservation (HP) staff. The applicant will not proceed with work until FEMA HP completes consultation with the SHPO. In addition, if unmarked graves are present, compliance with the Louisiana Unmarked Human Burial Sites Preservation Act (R.S. 8:671 et seq.) is required. The applicant shall notify the law enforcement agency of the jurisdiction where the remains are located within twenty-four hours of the discovery. The applicant shall also notify FEMA and the Louisiana Division of Archaeology at (225) 342-8170 within seventy-two hours of the discovery. Failure to comply with these stipulations may jeopardize receipt of FEMA funding.
- In accordance with the rules and regulations of the Louisiana Coastal Resources Program and Louisiana R.S. 49, Sections 214.21 to 214.41, the State and Local Coastal Resources Act of 1978, as amended, the grant applicant must agree to the terms and conditions of the Coastal Use Permit and remain in compliance.
- The Louisiana Division of Administration requires obtaining a Class B Permit in order to conduct the proposed project (Louisiana Division of Administration, 2011). This project must be coordinated with the Division of Administration, the required permit must be obtained, and all conditions within that permit must be complied with and the project must remain in compliance (See Appendix B, Agency Correspondence, for a copy of these Rules and Regulations).

- Department of the Army Permit No. MVN 2004-3345 EBB authorizes the performance of the work in accordance with its specified terms and conditions. This work must be conducted in compliance with all terms and conditions and must remain in compliance. Additionally, the work must be completed within the time limit established within the issued permit and the applicant must submit a request for a time extension, if needed.
- Fill or borrow material used must be sourced from sites that do not contain any buried cultural materials (*i.e.*, wells, cisterns, foundations, basements, prehistoric Indian artifacts, human burials, and the like). If during the course of work, archaeological artifacts (prehistoric or historic) or human remains are discovered, Plaquemines Parish and/or its contractors must immediately stop work in the vicinity of the discovery and take all reasonable measures to avoid or minimize harm to the finds. The Applicant and GOHSEP must inform the FEMA Public Assistance program, who would in turn contact the FEMA Historic Preservation staff. The Applicant must not proceed with work until FEMA completes consultation with the SHPO. In addition, if unmarked graves are present, compliance with the Louisiana Unmarked Human Burial Sites Preservation Act is required. In that situation, the Applicant must notify the local law enforcement agency within 24 hours of the discovery, and notify FEMA and the Louisiana Division of Archaeology at (225) 342-8170 within 72 hours of the discovery. Failure to comply with these stipulations may jeopardize FEMA funding of the project.
- To minimize air quality impacts, Plaquemines Parish and its contractors must implement BMPs to limit air emissions, fugitive dust and exhaust. BMPs would include maintaining and covering spoil piles, covering the loads of haul vehicles and keeping construction equipment properly tuned.
- Plaquemines Parish and its contractors must ensure all project activities are conducted in a safe manner and in compliance with all state and federal occupational safety regulations, including OSHA, to protect workers and the general public.
- Project construction would involve the use of potentially hazardous materials (*e.g.*, petroleum products, cement, caustics, acids, solvents, paint, electronic components, pesticides, herbicides, fertilizers, treated timber) and may result in the generation of small volumes of hazardous wastes. Appropriate measures to prevent, minimize, and control spills of hazardous materials must be taken and generated hazardous and non-hazardous wastes are required to be disposed in accordance with applicable federal, state and local regulations.
- If any solid or hazardous wastes, or soils and/or groundwater contaminated with hazardous constituents are encountered during the project, notification to LDEQ's Single-Point-of-Contact at (225) 219-3640 is required. Additionally, precautions should be taken to protect workers from these hazardous conditions.

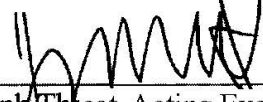
FINDING OF NO SIGNIFICANT IMPACT

- In accordance with applicable local, state, and federal regulations, the applicant is responsible for acquiring any necessary permits and/or clearances prior to the commencement of any construction related activities.

**Approvals**

  
\_\_\_\_\_  
Katherine Zeringue, Environmental Liaison Officer  
1 Seine Court, New Orleans, Louisiana, 70114  
FEMA-1603/1607-DR-LA

3-14-12  
Date

  
\_\_\_\_\_  
Joseph Threat, Acting Executive Director  
1 Seine Court, New Orleans, Louisiana, 70114  
FEMA-1603/1607-DR-LA

3-15-12  
Date

Environmental Assessment

# **Alexis Bay Marsh Terracing Change of Location**

FEMA-1603-DR-LA

Plaquemines Parish, Louisiana

Hazard Mitigation Grant Program

*March 2012*



# **FEMA**

**U.S. Department of Homeland Security**  
**Federal Emergency Management Agency, Region VI**  
Louisiana Recovery Office  
1 Seine Court  
New Orleans, Louisiana 70114

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## LIST OF ACRONYMS

APE	Area of Potential Effects
BFE	Base Flood Elevation
CAA	Clean Air Act
CBRA	Coastal Barrier Resources Act
CBRS	Coastal Barrier Resources System
CFR	Code of Federal Regulations
cm	Centimeter
CWA	Clean Water Act
CWPPRA	Coastal Wetlands Planning, Protection, and Restoration Act
CZMA	Coastal Zone Management Act
DFIRM	Digital Flood Insurance Rate Map
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
GOHSEP	Governor's Office of Homeland Security and Emergency Preparedness
HP	Historic Preservation
LDEQ	Louisiana Department of Environmental Quality
LDNR	Louisiana Department of Natural Resources
LDWF	Louisiana Department of Wildlife and Fisheries
LGS	Louisiana Geological Survey
LSU	Louisiana State University
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NRHP	National Register of Historic Places
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
NWS	National Weather Service
PA	Programmatic Agreement
RCRA	Resource Conservation and Recovery Act
SF	Square Foot
SFHA	Special Flood Hazard Area
SHPO	State Historic Preservation Office/Officer
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

## 1.0 INTRODUCTION

### 1.1 Project Authority

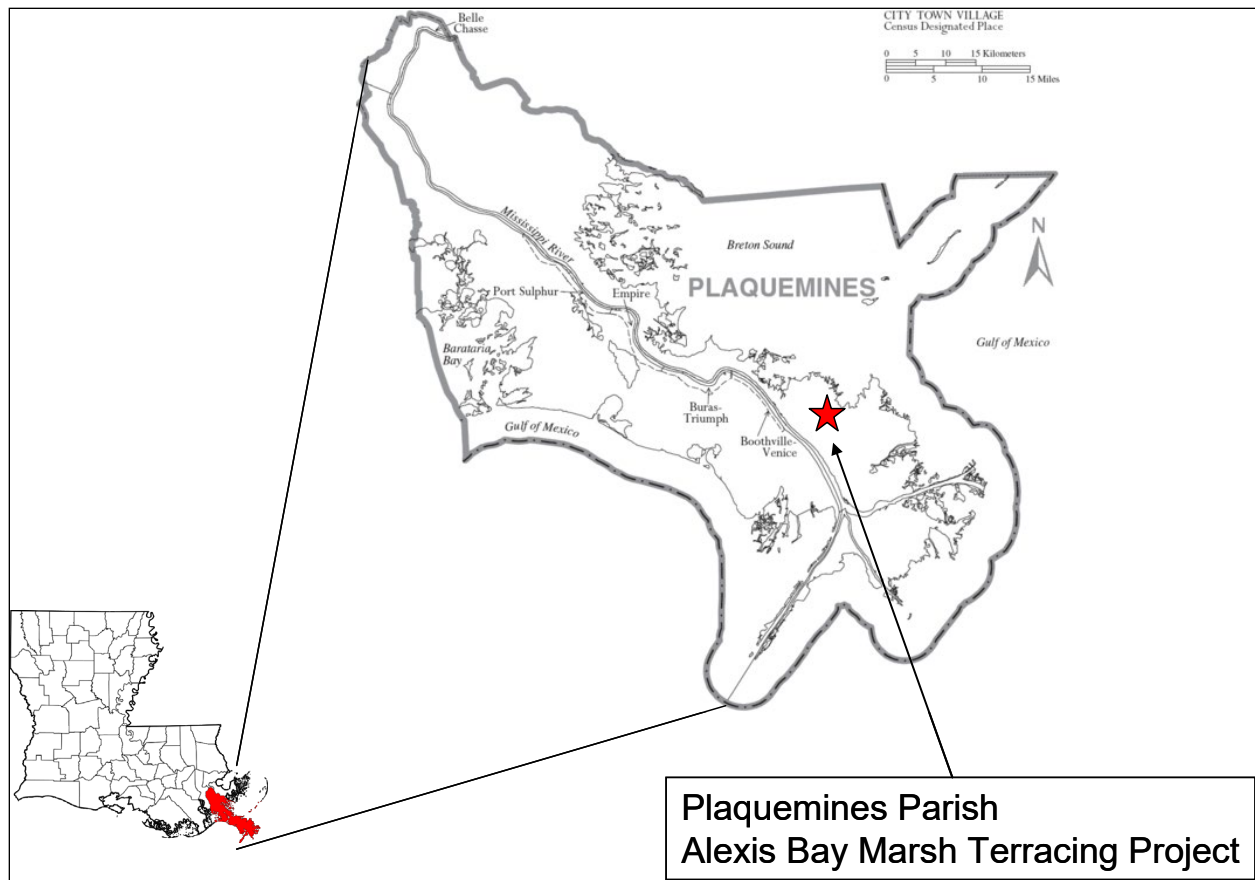
Hurricane Katrina made landfall on August 29, 2005, in southeast Louisiana near Port Sulphur, Plaquemines Parish as a Category 3 storm. Maximum sustained winds at landfall were estimated at 120 miles per hour and were accompanied by strong and damaging storm surge well above normal high tide. President George W. Bush declared a major disaster for the State of Louisiana and signed a disaster declaration (FEMA-1603-DR-LA) on August 29, 2005, authorizing the Department of Homeland Security's Federal Emergency Management Agency (FEMA) to provide federal assistance in designated areas of Louisiana.

Plaquemines Parish requested through the State of Louisiana Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) that FEMA provide disaster assistance through the provision of federal grant funding pursuant to the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), PL 93-288, as amended. Section 406 of the Stafford Act authorizes FEMA's Public Assistance Program to fund projects to repair, restore, and replace facilities damaged as a result of the declared event.

Plaquemines Parish was deemed eligible by FEMA for federal disaster public assistance as an eligible applicant serving the needs of the general public. Before Hurricane Katrina, the Alexis Bay Marsh Terraces, a water control facility, consisted of 157 engineered earthen terraces covered with smooth cordgrass designed and constructed to gather sediment, thereby re-establishing wetlands. As a result of Hurricane Katrina, 141 of the earthen terraces were deemed to be destroyed.

The damaged marsh terraces are located in Alexis Bay in southeast Plaquemines Parish Louisiana. Plaquemines Parish determined that reconstruction of the marsh terraces in substantially the same location to predisaster configuration would not best meet the needs of the community. Therefore, Plaquemines Parish requested approval and federal grant funds for a change of location project to replace the eligible facilities with new facilities providing the same functions at a new location adjacent to the damaged facility (Figure 1).

In accordance with 44 Code of Federal Regulation (CFR) for FEMA, Subpart B – Agency Implementing Procedures, Section 10.9, an Environmental Assessment (EA) is being prepared pursuant to Section 102 of the National Environmental Policy Act (NEPA) of 1969, as implemented by the regulations promulgated by the President's Council on Environmental Quality (40 CFR Parts 1500-1508). This EA will determine if the proposed relocation of the Alexis Bay Marsh Terracing facility will have the potential for significant adverse effects on the quality of the human and natural environment at or near the proposed project. The results of this EA are being used to make a decision whether to initiate preparation of an Environmental Impact Statement (EIS) or to prepare a Finding of No Significant Impact (FONSI).



**Figure 1: Project Location in Southeast Plaquemines Parish, Louisiana**

## 1.2 Area Description

Plaquemines Parish is located in southeastern Louisiana, southeast of the City of New Orleans (Figure 1). The largest and southernmost parish in Louisiana, Plaquemines Parish is a peninsula that covers some 90 miles south of New Orleans, which is bisected by the Mississippi River. Despite the size, very little of the parish is dry land (5 percent); with most of it being water or low-lying marsh wetland (Plaquemines Parish Master Plan, 2011). Although not developable by conventional standards, the wetlands and water areas of the parish are arguably the most used and productive areas of the parish.

The parish lies along both banks of the Mississippi River from Orleans Parish in the north to the Gulf of Mexico, the southern boundary. Plaquemines Parish is also bordered by Jefferson Parish to the west, St. Bernard Parish to the east, and Orleans Parish to the north. The total land area of the parish is approximately 1,986 square miles. The population was 26,757 in 2000 and had decreased to 22,512 (estimated) or approximately 15.9 percent less in 2006, after Hurricane Katrina (FEMA, 2008).

The economy of the area is predominantly agricultural and industrial. The principal crops consist of oranges and tomatoes. Plaquemines Parish has a significant seafood industry exporting millions of pounds of shrimp, oysters, and crabs. Industries are related to offshore oil exploration and

production as well as port facilities afforded by the Mississippi River. The Port of Plaquemines is one of the largest seaports in the United States. State Routes 23 and 39 are the major arteries paralleling the Mississippi River on the west and east banks, respectively. Many other state and parish roads supplement land transportation within the parish. Railroad service is provided on the west bank by the New Orleans and Lower Coast Railroad. Many streams and bays (both natural and man-made) traverse Plaquemines Parish; many of these are navigable. The Mississippi River is the major waterway in the parish and much of the economy and culture of the area is derived from it.

The climate of the area is subtropical and is strongly influenced by the Gulf of Mexico. Extreme temperatures are seldom experienced and the average temperatures range from 83 degrees Fahrenheit (° F) in the summer to 56° F in winter. The average annual precipitation is approximately 60 inches. The heaviest rainfall occurs between June and September and the least during the December-January period.

### 1.3 Project Location

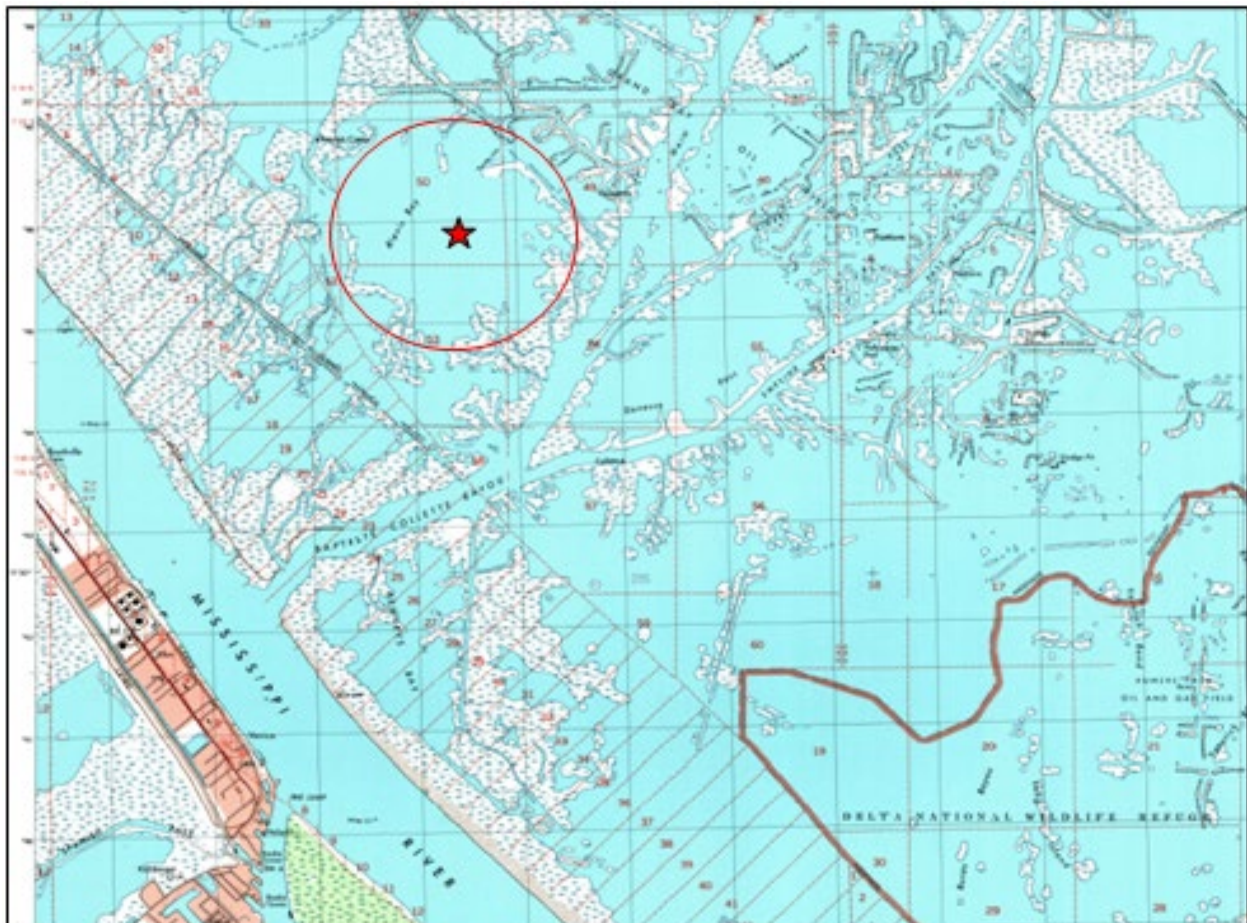


Figure 2: Alexis Bay Marsh Terrace Facility Location (USGS Venice Topographic Quadrangle 1998)

The reconstruction project is proposed to be built adjacent to the existing marsh terraces in Alexis Bay (Figure 2), which is located in the coastal marshes of southeast Plaquemines Parish



approximately four miles northwest of Venice Louisiana and five miles east-southeast of Boothville, Louisiana (Latitude 29.32296, Longitude -89.33719). Alexis Bay is mostly open water in an area of marshes bounded by Baptiste Collette Bayou on the south, the Mississippi River two miles to the west, Grand Bay one mile to the north, and the open waters of the Gulf of Mexico three-to-four miles to the east (Figure 3).



**Figure 3: Alexis Bay Facility Location Venice Aerial Topographic Quadrangle, Remnant of Damaged Terraces Visible (USGS 2009)**

#### **1.4 Purpose and Need for the Proposed Action**

In order to restore the lost functions and resources that were destroyed as a result of Hurricane Katrina, Plaquemines Parish seeks federal grant funds to replace the eligible water control facility in a new location adjacent to the damaged facility.

A total of 157 earthen terraces were constructed in 2005 in order to induce stagnation and sedimentation by reducing tidal flush (Plaquemines Parish, 2009). A total of 141 earthen terraces were destroyed by the storm surge and high winds accompanying Hurricane Katrina. Each terrace is/was 185 feet long by 45 feet wide and 2.5 feet high. A total of 1,000 container plants containing *Spartina alterniflora* were blown away and lost from the high winds and water surge. The parish intends to reconstruct 141 earthen terraces to predisaster condition and replace 1,000 container plants of *Spartina alterniflora* (Plaquemines Parish, 2009).

A change of location project has been requested to reconstruct marsh terraces on an area adjacent to the northeast edge of the existing damaged terraces. The proposed action seeks to restore lost functions of the earthen marsh terraces, which were designed as engineered/improved natural features to collect and build sediment. These terraces were constructed for coastal erosion protection and land reclamation. Relocation of the existing terraces has been chosen by Plaquemines Parish as the desired practicable alternative because “there is no longer sufficient sedimentation material to reconstruct the damaged terraces in the existing location” (Plaquemines Parish, 2009).

Wetland loss in Louisiana has historically contributed to detrimental impacts to commercial, recreational, and environmental interests vital to the state and parish. This project is needed to support implementation of the long-term community recovery plan by providing additional coastal flood defense, increasing floodplain values, and eliminating gaps in the resources available.

## **2.0 ALTERNATIVES CONSIDERED**

### **2.1 Alternative 1 - No Action**

Implementation of the no action alternative would entail no construction or replacement of the marsh terraces damaged by Hurricane Katrina. Consequently, the benefits of the existing coastal restoration project would be diminished by the degraded state of the terraces. The community would be deprived of the economic recompense granted in the original project funding. No action would forego opportunities to restore the benefits of the floodplain, expand marshes, create essential fish habitat, and reduce storm surge risk.

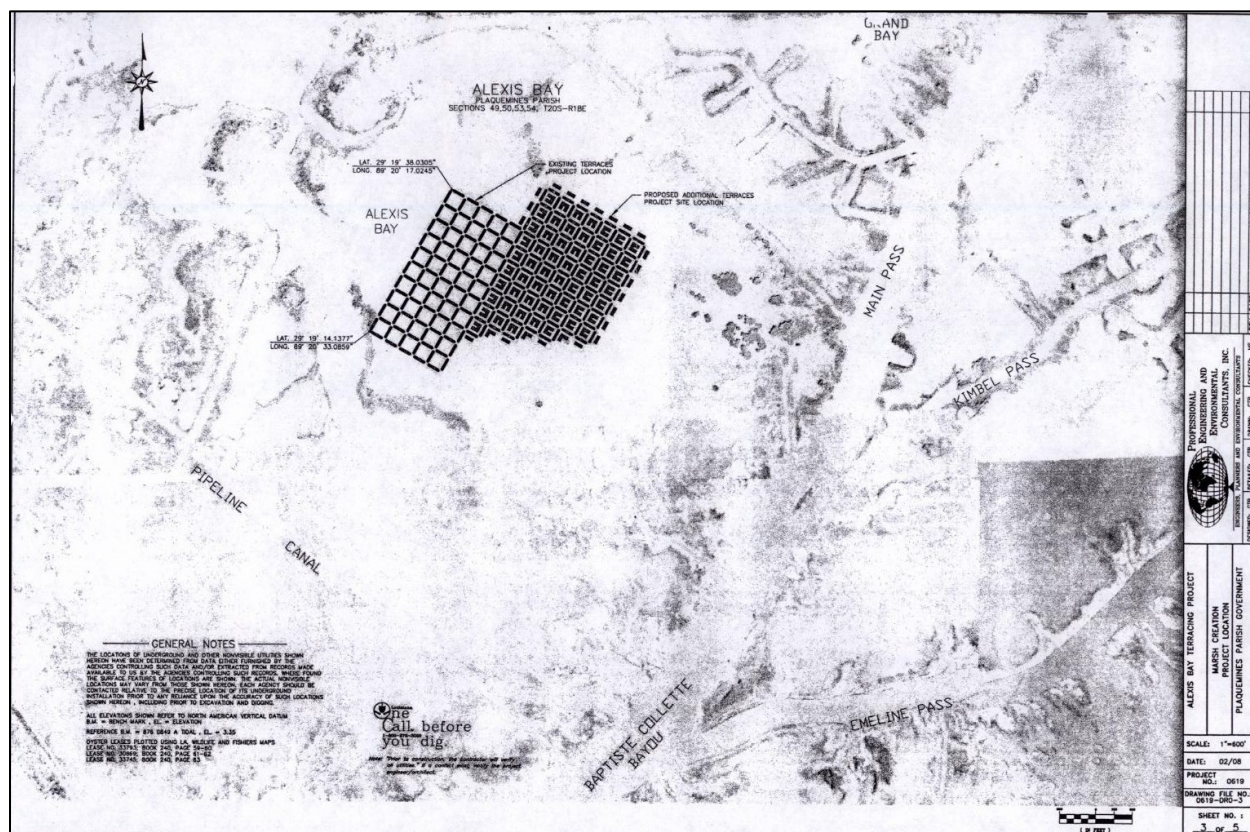
### **2.2 Alternative 2 – Reconstruct at an Alternate Location – Proposed Action**

Plaquemines Parish seeks FEMA Public Assistance federal grant funds for a proposed project to reconstruct the Alexis Bay Marsh Terraces to predisaster condition. The parish determined that reconstruction of the marsh terraces in their current location is technically infeasible due to a lack of suitable sediment to be used for terrace reconstruction. A change of location is proposed to reconstruct equivalent marsh terraces adjacent to the damaged terraces as shown below in Figures 4 through 6.

Terracing is a relatively new wetland restoration technique used to convert shallow subtidal water bottom to marsh. This method uses existing bottom sediments to form terraces or ridges at marsh elevation. Marsh terraces have been shown to increase nursery habitat and support higher densities of most fishery species (NMFS, 2001). This earthen terrace facility is determined by FEMA Public Assistance to be an engineered facility constructed for land reclamation and coastal erosion



A terrace field composed of these ridges arranged in a pattern that maximizes intertidal edge and minimizes fetch between ridges is constructed and the intertidal area is planted with marsh vegetation. The proposed terraces have been designed to be planted with native smooth cordgrass, *Spartina alterniflora*, a perennial deciduous grass which is found in intertidal wetlands, especially estuarine salt marshes. It grows 1-1.5 meters tall, and has smooth, hollow stems which bear leaves up to 20-60 cm long and 1.5 cm wide at their base. They are sharply tapered and bend down at their tips. This plant is noted for its capacity to act as an environmental engineer. It grows out into the water at the seaward edge of a salt marsh and accumulates sediment enabling other habitat-engineering species, such as mussels, to settle. This accumulation of sediment and other substrate-building species gradually builds up the level of the land at the seaward edge and other higher-marsh species move onto the new land.



**Figure 4: Change of Location Plan View, (PEC, 2011)**

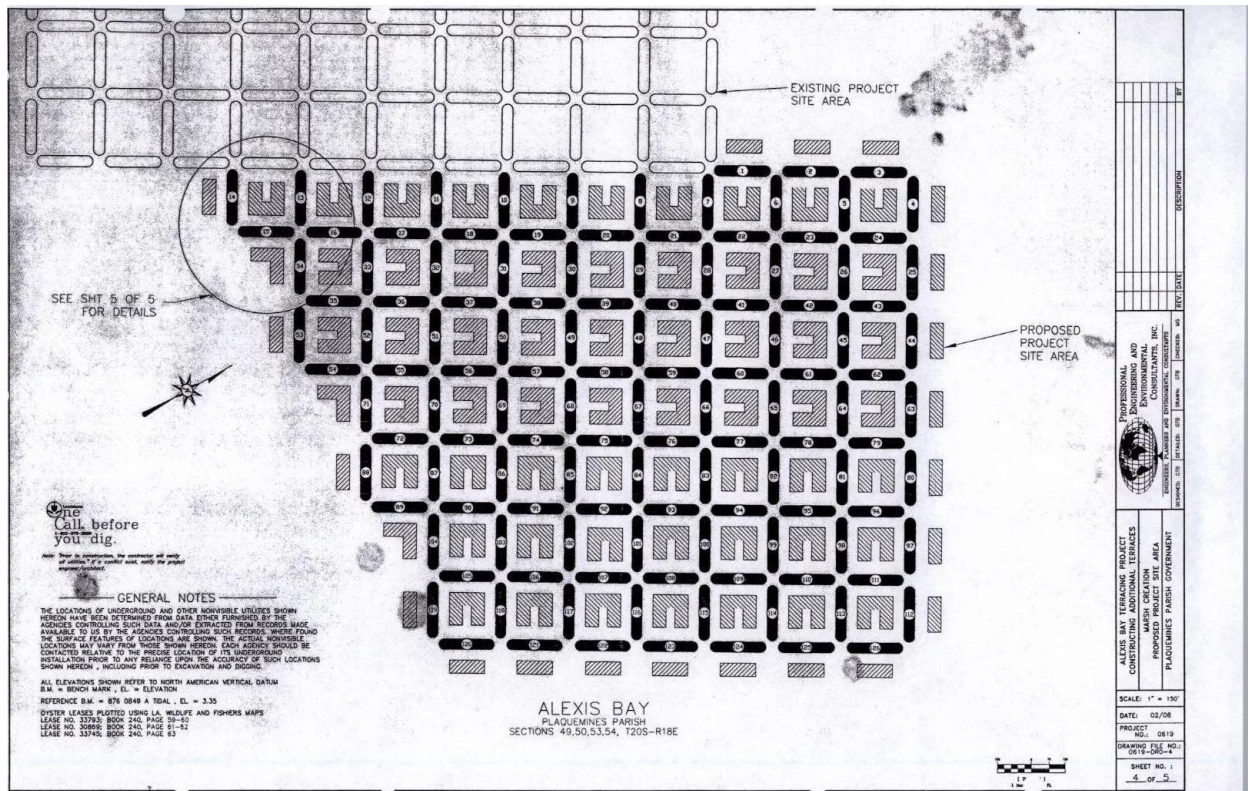
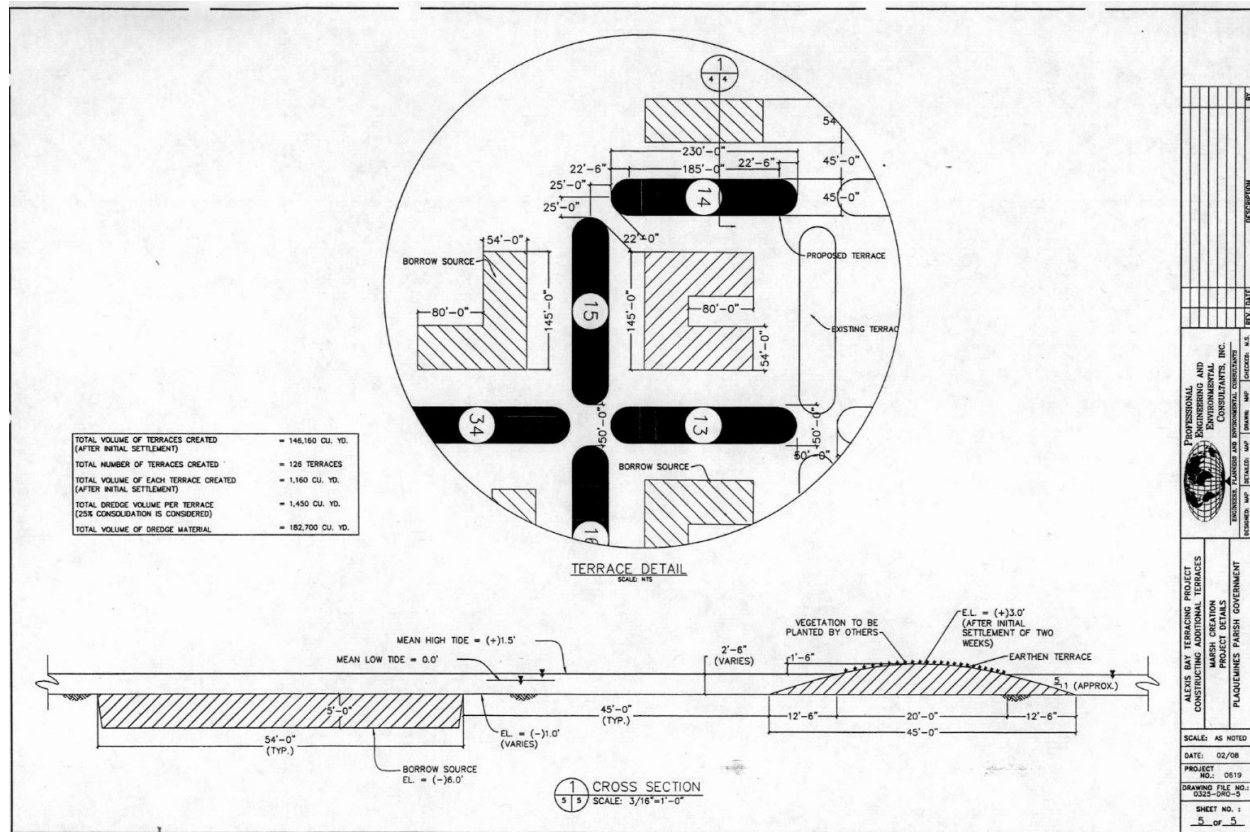


Figure 5: Change of Location Plan View Detail, (PEC, 2011)





### 3.0 AFFECTED ENVIRONMENT AND IMPACTS

#### 3.1 Land Use and Zoning

Due to its location on the Mississippi River delta and its unique geography, the majority of the nearby land area suitable for development lies in two thin strips of levee protected land along the river. Parish land use includes agriculture (55%), industrial (14%), residential (13%), forest (11%), civic or institutional uses (4%), and miscellaneous other uses (Plaquemines Parish, 2010, Figures 7 and 8). The proposed project location lies in an area of open water in intermediate coastal marshes of southeast Louisiana in Plaquemines Parish in an area to the east of Boothville-Venice. Development in marshes of the project vicinity includes infrastructure, canals and dredged areas for oil and gas exploration and extraction. Additionally, extensive fishery activities are supported including shrimping, oystering, and crabbing. Across the Mississippi River to the west, lie the urban and light industrial areas of south Plaquemines Parish in and around Boothville-Venice along Highway 23. Activities include agriculture, single family residential, and light industrial activities supporting the fishing community, the port, and the oil and gas industries.

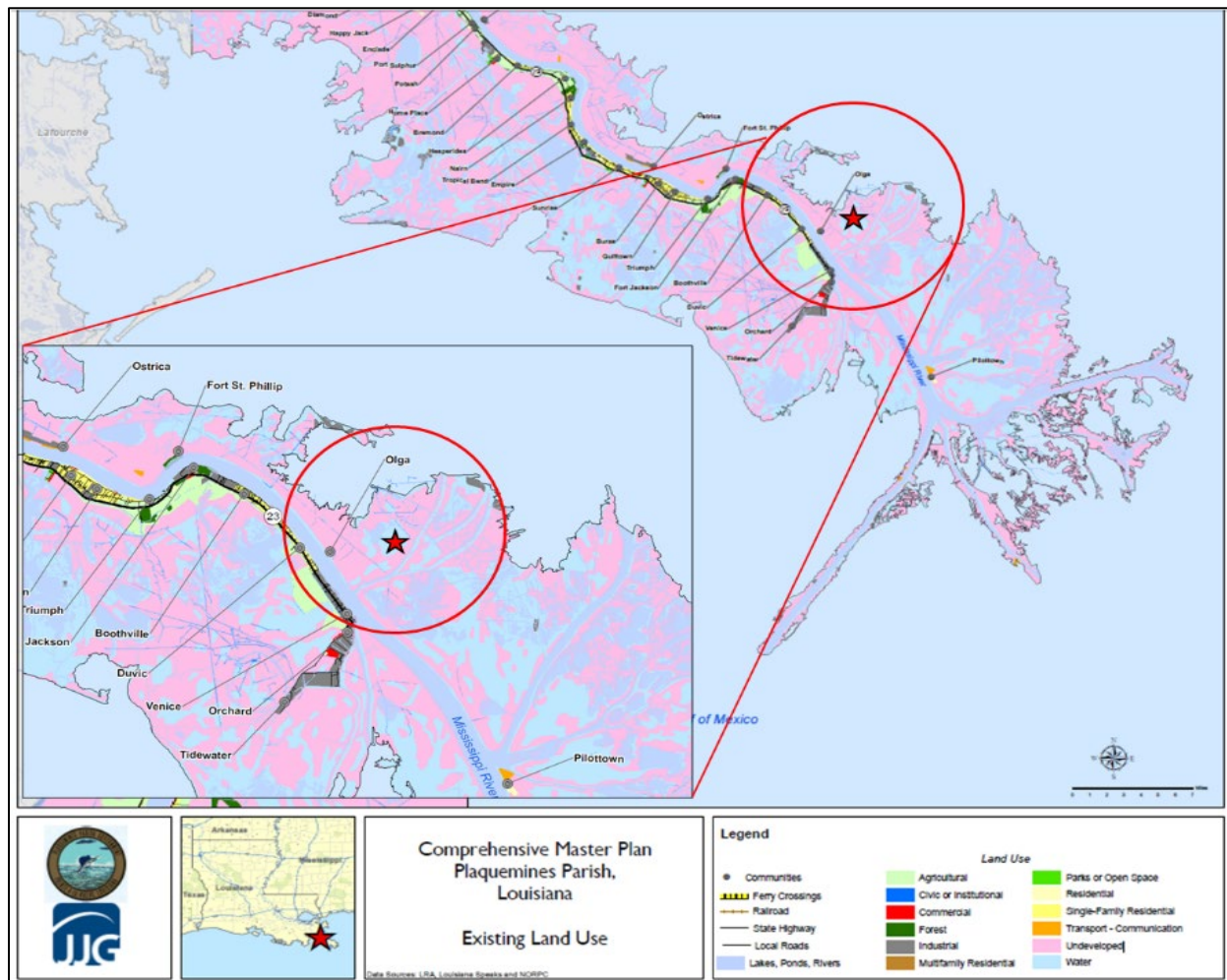


Figure 7: Existing Land Use

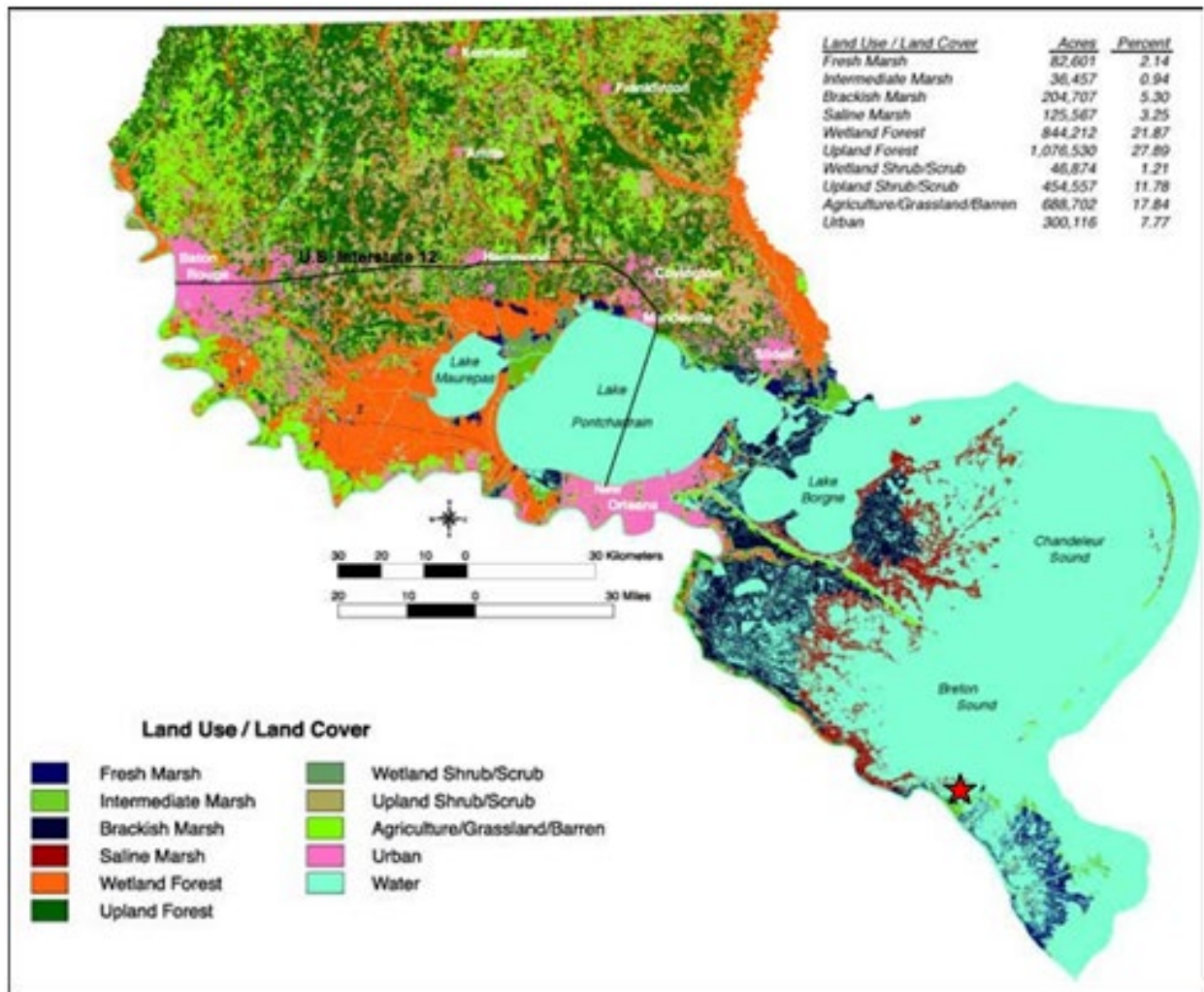


Figure 8: Vicinity Land Use / Land Cover

## Zoning

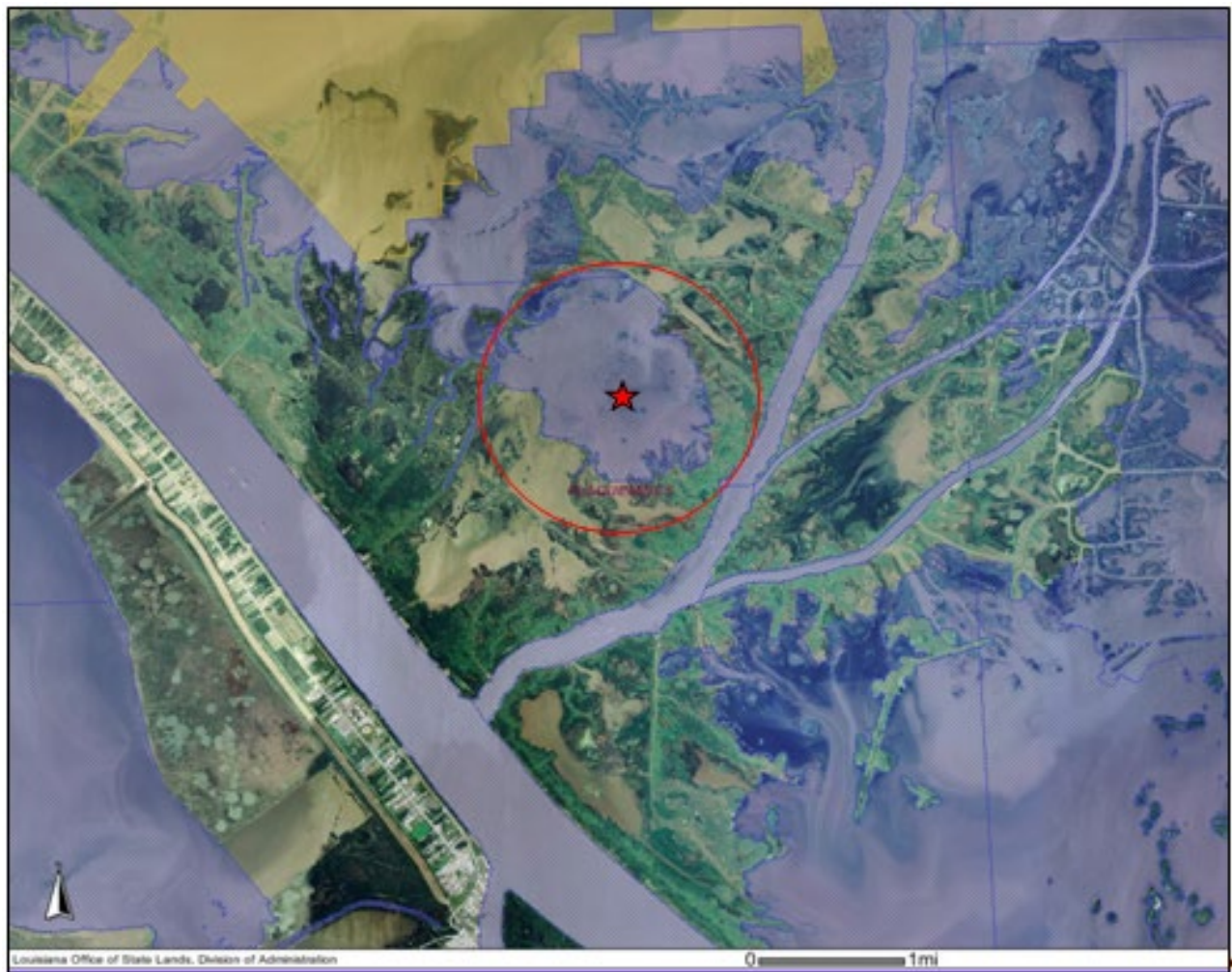
The Commission Council of Plaquemines Parish, for the purposes of promoting the health, safety, morals, convenience, order, prosperity and welfare of Plaquemines Parish has adopted and established the Zoning Ordinance of Plaquemines Parish in the state of Louisiana. This ordinance is known as the Comprehensive Zoning Ordinance of Plaquemines Parish, Louisiana. This zoning ordinance divides the parish into various types of districts, which represent a zoning plan with revisions and amendments. This plan contains regulations with respect to the location, height, size of yards, courts and other spaces; the density of population; and the use of buildings, structures, and land for trade, industry, business, resident or other purposes. The applicant must obtain and comply with a permit from the office of Permits, Planning and Zoning and will thereby ensure compatibility and compliance with parish zoning requirements.

## State Water Bottom Management

The State of Louisiana Waterbottom Permits and Leases Sub-Program: (Louisiana Revised Statutes 41:1701-1714) provides for the permitting and leasing of structures and facilities on non-



eroded waterways and for reclamation and fill of non-eroded areas. It also provides for permits and leases for the construction and maintenance of wharves, piers, docks, and other commercial structures on navigable waterbottoms.



**Figure 9: Louisiana State Claimed Water Bodies, Blue Diagonal Highlights (Louisiana Division of Administration, 2011)**

The beds and bottoms of all navigable waters and the banks or shores of bays, arms of the sea, the Gulf of Mexico, and navigable lakes belong to the state of Louisiana, and the policy of the state is declared to be that these lands and water bottoms, referred to as "public lands", shall be protected, administered, and conserved to best ensure full public navigation, fishery, recreation, and other interests (Figure 9). Unregulated encroachments upon these properties may result in injury and interference with the public use and enjoyment and may create hazards to the health, safety, and welfare of the citizens of the state.

To provide for the orderly protection and management of these state-owned properties and serve the best interests of all citizens, the lands and water bottoms, except those excluded and exempted and as otherwise provided by law, shall be under the management of the LDNR. The State Land

Office is responsible for the control, permitting, and leasing of encroachments upon public lands, in accordance with the laws of Louisiana and the United States.

### **Division of State Lands Permit**

The state of Louisiana owns the beds and bottoms of many waterways. This ownership generally extends to the average low water shoreline in rivers and other streams. The ownership in most lakes, bays, sounds, and similar water bodies and in the Gulf of Mexico extends to the mean high water line. Work planned in state owned water bottoms requires contact with the State Lands Office. Removed material from state owned water bottoms for fill or sale has a fee payable to the Louisiana Department of Wildlife and Fisheries (LDWF) based on the amount of material removed. Based upon the information provided in the plans submitted, the Louisiana Division of Administration requires obtaining a Class B Permit in order to conduct the proposed project (Louisiana Division of Administration, 2011).

### **Alternative 1 – No Action**

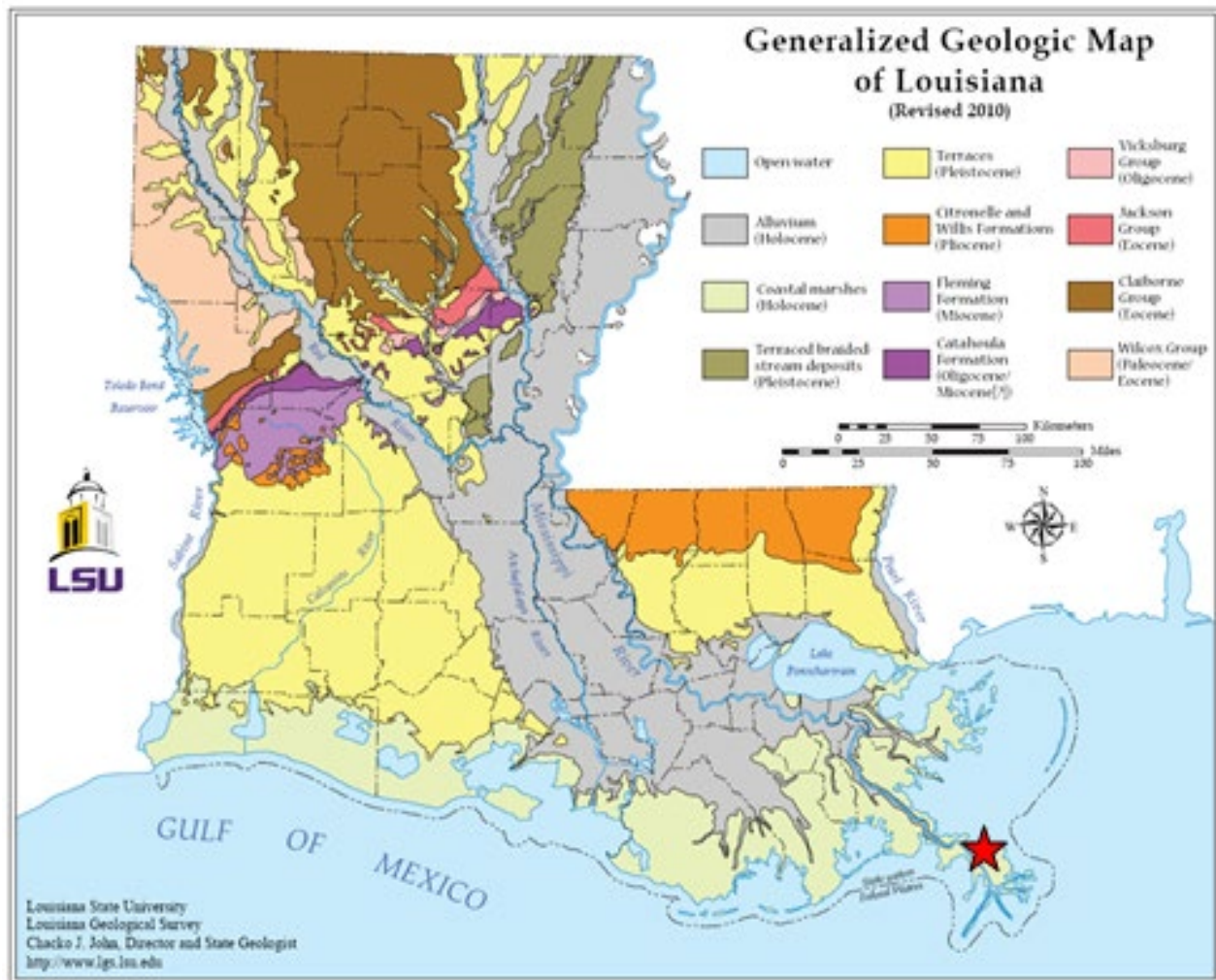
The no action alternative would conform to local land uses and would not adversely impact nearby and adjacent land uses or zoning.

### **Alternative 2 – Proposed Action: Reconstruct at Alternate Location**

The proposed alternative must be properly permitted by the state of Louisiana and Plaquemines Parish and, thereby, would comply with land use regulatory codes, would not adversely impact nearby or adjacent land uses and zoning, or represent an incompatible land use with near and adjacent uses.

## **3.2 Geology and Soil**

Plaquemines Parish lies entirely within the Mississippi River Delta and consists of at least two thick, partially overlapping delta complexes, the St. Bernard and the Plaquemines-Modern complexes. They are underlain by Pleistocene strata at a depth of 100 to 700 feet. Depth to Pleistocene surfaces increases toward the modern delta. Delta lobes of the St. Bernard Delta complex were initially deposited in shallow water about 4,500 years ago. Several lobes were deposited, and periods of progradation (growth of a river delta) and abandonment recurred until about 650 years ago. Deposition of the Plaquemines lobe, which was the early distribution system of the Plaquemines-Modern Delta complex, began about 950 years ago. The Balize Delta lobe, which was the second and present distributary system of the Plaquemines-Modern Delta complex, consists of several sub-deltas that have a much better defined chronology than the earlier complexes. The Balize Delta lobe is the only deepwater delta lobe of the Mississippi River, and thus has unusual bird's-foot morphology.

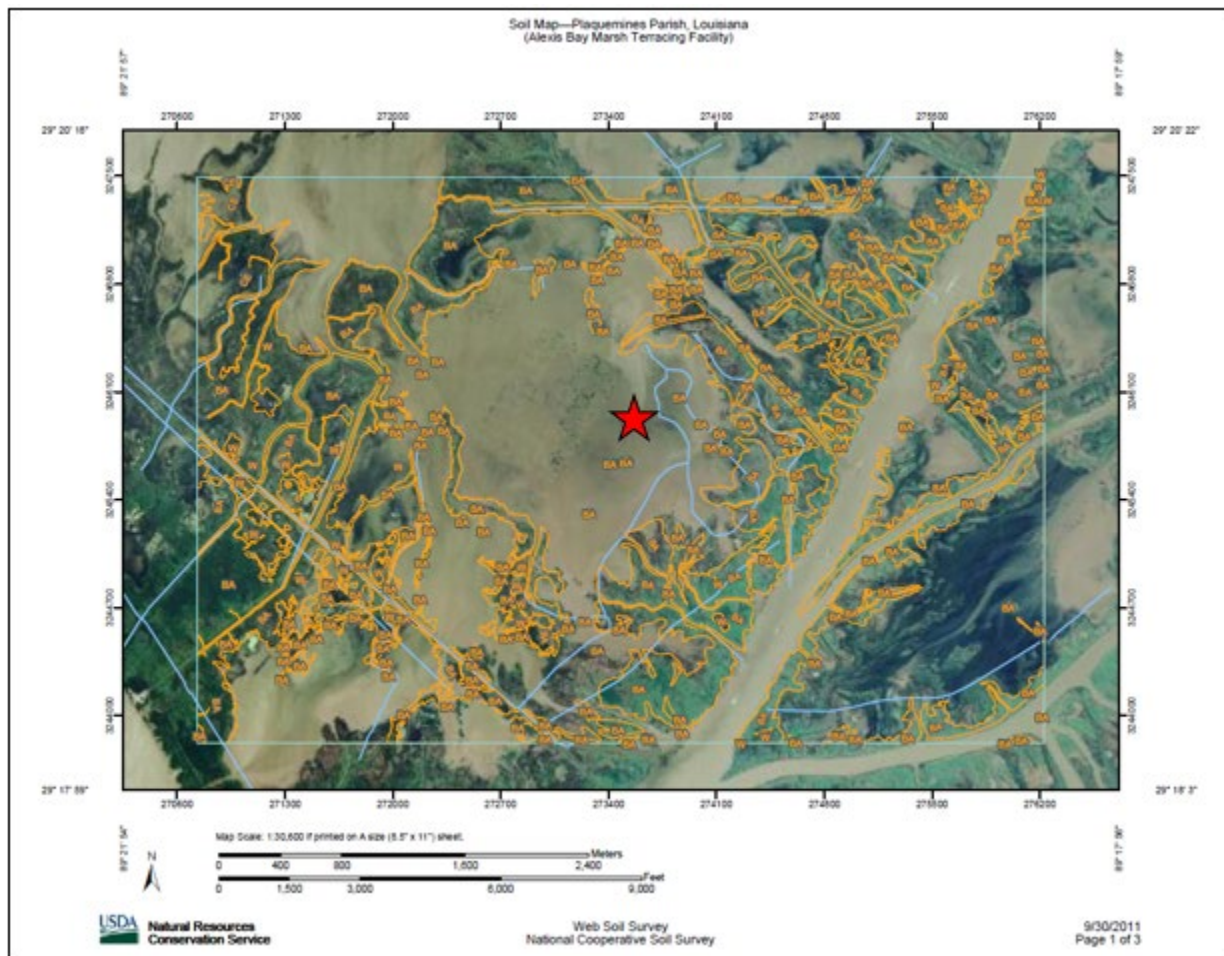


**Figure 10: Generalized Geology Map of Louisiana (LSU, 2010)**

Natural ground in the area varies in elevation from 10 feet along the alluvial banks of the Mississippi River in the northern portion of the parish, to several feet below sea level in the lower portions of some pumped areas. Vegetation varies from urban and agricultural varieties along the alluvial banks and levee protected areas to heavily wooded swamp and open marsh classes covering the largest portions of the area within the parish. Soil conditions are sedimentary types ranging from consolidated clays on the higher alluvial banks to clays and silts in various degrees of liquefaction in open coastal marsh areas (Figure 10). Specific soil map units shown in Figure 11 at or near the proposed site include the Balize Larose and Clovely Muck series (USDA Web Soil Survey, 2011).

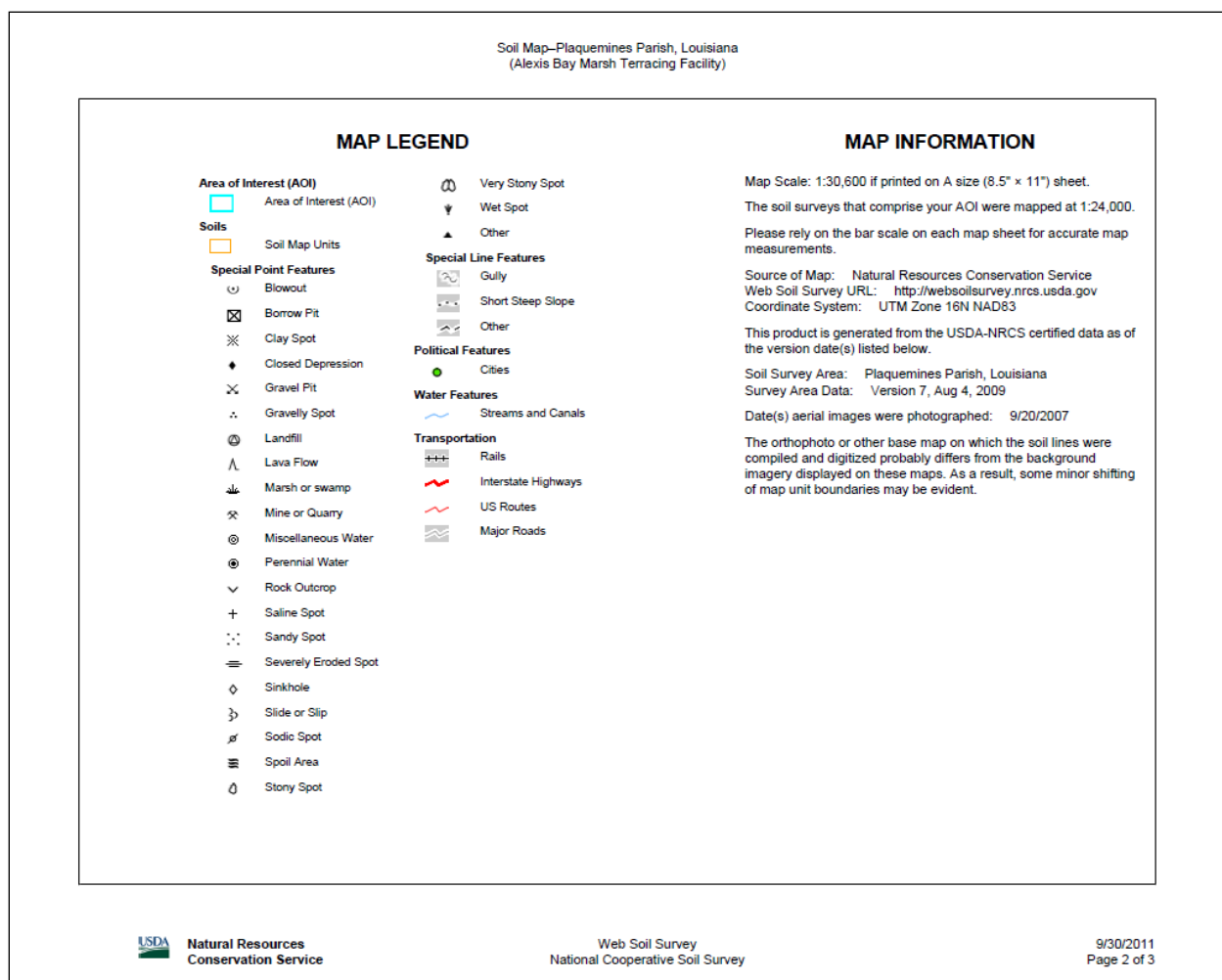
The Balize Larose series consists of very poorly drained, mineral soils that are slowly permeable and very fluid. The soils are forming in loamy alluvium in areas of active filling by the Mississippi River and its distributaries. They are in freshwater marshes and are ponded or flooded most of the time. Slope is less than 1 percent. The Larose series consists of very poorly drained, mineral soils that are very slowly permeable and very fluid. These soils formed in clayey alluvium in freshwater marshes. They are ponded and flooded most of the time. Slope is also less than 1 percent.





**Figure 11: Web Soil Survey National Cooperative Soil Survey (NRCS, 2011)**

The Clovelly series consists of very deep, very poorly drained, very slowly permeable soils. These soils formed in moderately thick accumulations of herbaceous organic material overlying very fluid clayey alluvial sediments. These soils are on broad coastal marshes that are nearly continuously flooded with brackish water and are wet throughout the year. Slope ranges from 0 to 0.2 percent. This organic soil is level, very poorly drained, and slightly saline. It is in brackish marshes, and is flooded and ponded most of the time. Typically, the organic surface layer is a very dark gray, very fluid muck about 42 inches thick. The underlying material to a depth of about 70 inches is gray, very fluid clay. During tidal storms it is covered by as much as 5 feet of water and more during flooding. Water is above the surface most of the year, but during periods of sustained north wind and low tides, the water table drops to about 0.5 foot below the surface (USDA, 2000).



**Figure 12:Web Soil Survey Legend (NRCS, 2011)**

The Farmland Protection Policy Act (FPPA: P.L. 97-98, Sec. 1539-1549; 7 U.S.C. 4201, *et. seq.*) was enacted in 1981 to minimize the unnecessary conversion of farmland to non-agricultural uses as a result of federal actions. Programs administered by federal agencies must be compatible with state and local farmland protection policies and programs. The Natural Resources Conservation Service (NRCS) is responsible for protecting significant agricultural lands from irreversible conversions that result in the loss of essential foods or environmental resources. Prime farmland is characterized as land with the best physical and chemical characteristics for the production of food, feed, forage, fiber and oilseed crops (USDA, 1989). For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can be forest land, pastureland, cropland, or other land, but not water or urban built-up land.

### Alternative 1 - No Action

Implementation of the no action alternative would not impact the soils or geologic processes known for the area. The no action alternative would not result in conversion of farmland to non-agricultural uses.



## Alternative 2 – Proposed Action: Reconstruct at Alternate Location

Construction of the new Alexis Bay Marsh Terracing facility within the identified coastal marsh area would not adversely impact or cause significant adverse disturbance of geology or soil as part of the terrace reconstruction. The project will also not result in conversion to non-agricultural uses of any prime, or state-wide and locally important farmlands. Project activities will be required by the Louisiana Department of Environmental Quality (LDEQ) to observe precautions to control nonpoint source pollution from construction activities and further will be required to obtain permits and implement the required conditions.

### 3.3 Water Resources and Water Quality

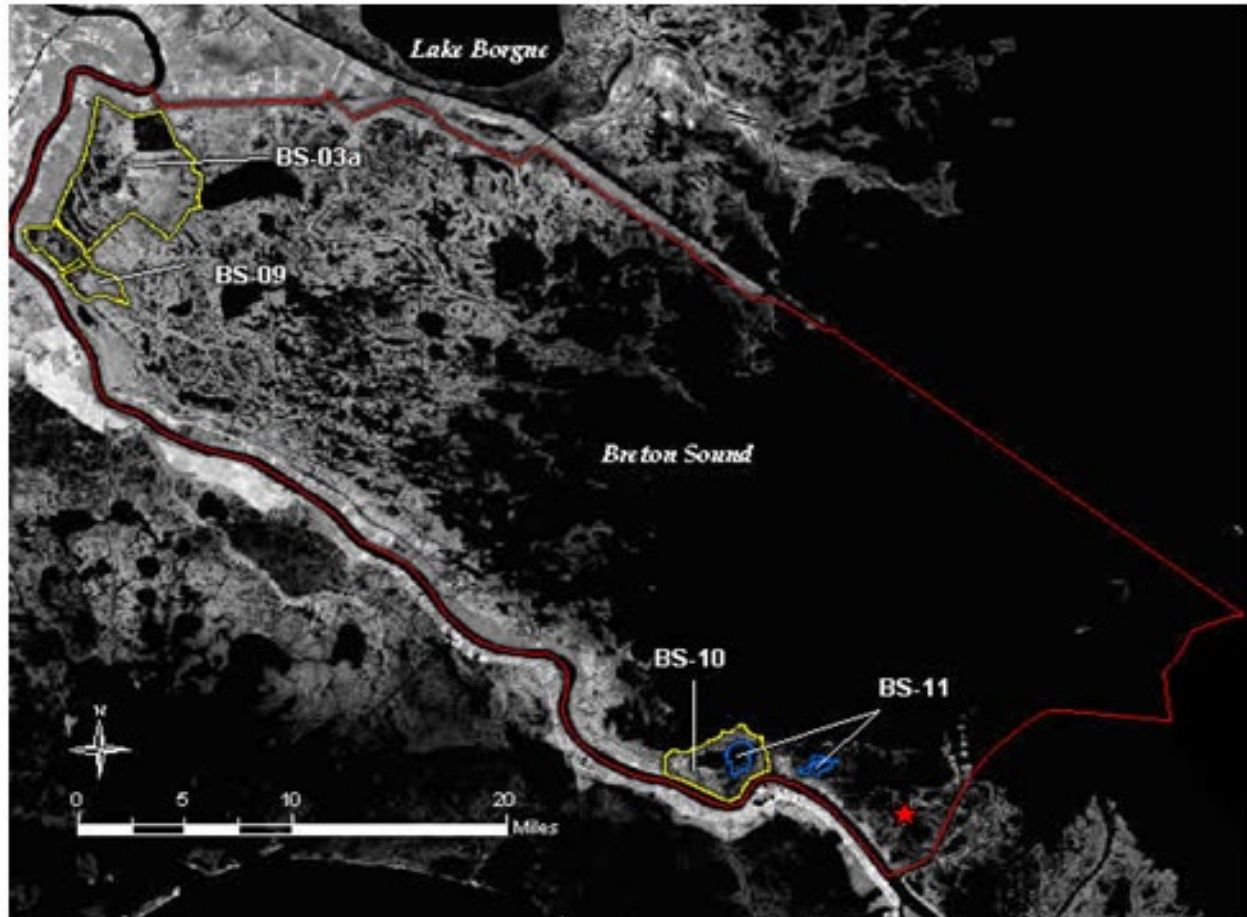
#### 3.3.1 Surface and Ground Water

##### Surface Water



The Breton Sound Basin is the remnant of a Mississippi River delta lobe, the abandoned St. Bernard Delta. The principal hydrologic features of the Breton Sound Basin include the Mississippi River and its natural levee ridges; the flood protection levee; the Mississippi River Gulf Outlet south disposal bank; Bayou Terre aux Boeufs and River aux Chenes (abandoned delta distributaries); and the freshwater diversions at Caernarvon, White's Ditch, Bohemia, and Bayou Lamoque (Coastal Wetlands Planning, Protection, and Restoration Act [CWPPRA], LaCoast.gov, Breton Sound Basin Factsheet, 2011).

The Breton Sound Basin encompasses approximately 676,400 acres, of which 184,100 acres are wetlands. It is bounded on the west by the Mississippi River, on the north by Bayou La Loutre, on the east by the south bank of the Mississippi River Gulf Outlet, and on the south by Baptiste Collette Bayou (the vicinity of the proposed action) and Breton Island (Figure 13). The basin includes portions of Plaquemines and St. Bernard parishes. It consists of approximately 51,300 acres of public land, equaling 28 percent of the total lands within the basin. The natural processes of subsidence, saltwater intrusion, and erosion of wetlands, in addition to the human effects of river levee construction and the oil and gas industry, have caused major impacts to the Breton Sound Basin in recent decades. The two major wetland problems resulting from the natural processes and human intervention in this basin are sediment deprivation and saltwater intrusion.



**Figure 13: Hydrologic Features of Southeast Plaquemines Parish, Red Line Indicates Boundaries of the Breton Sound Basin, Red Star Indicates Project Site (CWPPRA, 2011)**

Historically, the basin was flushed with large quantities of fresh water and sediments annually during the spring. Marine waters would then rise and enter the basin during the late summer and early fall months and would be flushed out the following spring. In the early 1930's, flood protection levees were raised along the Mississippi River as far south as Bohemia in the Breton Sound Basin. This prevented the annual input of fresh water, nutrients, and sediment that nourished the wetlands and combated saltwater intrusion. Between 1940 and 1970, 12.9 square miles (8,256 acres) of canals were dredged across and between the abandoned distributary ridges that run from the river to the outer fringes of the marsh (Gagliano et al., 1970). This has allowed channelized outflow of fresh water and increased tidal flux.

The combination of natural processes and human intervention has allowed salt water to enter close to the head of the basin. Much of the fresh and intermediate marsh that occurred in the upper basin earlier in this century has either converted to more saline habitats or has become open water as a result of sediment and nutrient deprivation.

Subsidence combined with sediment and nutrient deprivation has contributed greatly to the marsh loss in the upper and middle basin and even more greatly in the Bohemia Sub-basin.

The subsidence rate ranges from 0.6 feet per century in the upper portion of the basin to 4 feet per century in the lower portion. The effect of subsidence is very apparent in the area south of Bohemia, which was created by alluvial deposits of the Mississippi River less than 1,000 years ago. Large areas of wetlands flanking the Mississippi River in this area have subsided and are continuing to subside and convert to open water (including the area of the proposed project). Periodic overbank flows from the Mississippi River occur in this area, and some wetlands immediately adjacent to the river are being maintained by this input of sediments and fresh water (CWPPRA, Breton Sound Basin Factsheet, 2011).

A significant cause of wetland loss in the Breton Sound Basin is erosion of shorelines by wind-wave action. Along the shoreline of the outer marshes and around the perimeter of the larger bays, erosion rates of 5 to 10 feet per year are common. These high rates occur in the fringe marshes because the Breton barrier islands are so far offshore that they offer little protection to the estuary behind them.

## Ground Water

The coastal lowlands aquifer system in Louisiana consists of a gulf-ward-thickening, heterogeneous, unconsolidated to poorly consolidated wedge of discontinuous beds of sand, silt, and clay that range in age from Oligocene to Holocene. The aquifer system underlies parts of the East and West Gulf Coastal Plain and the Mississippi Alluvial Plain Sections of the Coastal Plain Physiographic Province. The coastal lowlands aquifer system extends eastward from Texas across southern and central Louisiana into southern Mississippi (Figure 14). The coastal lowlands aquifer system yields large quantities of water for agricultural, public supply, domestic and commercial, and industrial uses (U.S. Geological Survey [USGS] Groundwater Atlas of the U. S., 1998).

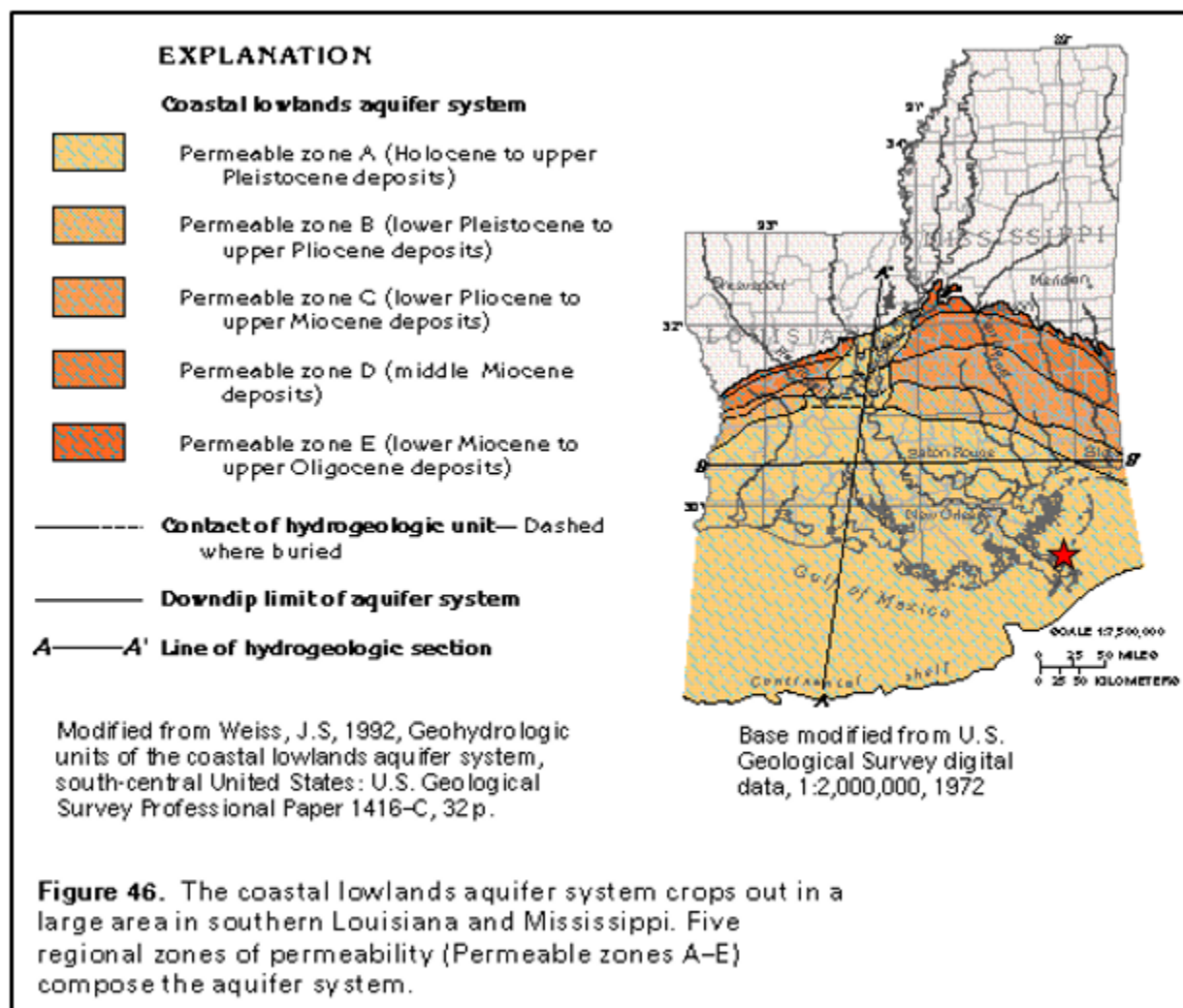


Figure 14: Coastal Lowlands Aquifer System, Ground Water Atlas of the U.S. (USGS, 1998)

In the southeastern part of Louisiana many of the aquifers have been named according to the depth at which they are usually encountered in the industrial districts of Baton Rouge and New Orleans, where groundwater pumpage is substantial (for example, the "1,200-foot" sand). Because of the regional southward dip of the aquifers and because they are cut and displaced by faults, the "1,200-foot" sand in New Orleans is not the same permeable unit as the "1,200-foot" sand in Baton Rouge.

In this case, as in other cases, the same name has been applied locally to water-yielding strata that are neither stratigraphically equivalent nor hydraulically interconnected (USGS, 1998).

Moderate to large quantities of fresh water is available to depths of 200 to 450 feet in most of Plaquemines Parish. Water levels in wells range from artesian to approximately 20 feet below the land surface in most of the parish. Pumping in the parish has had no significant effect on water levels. Several wells in the parish yield 2,000 to 3,000 gallons per minute, and higher yields are possible. The chloride content of water from wells near the Mississippi River ranges from 2 to 5 parts per million. Chloride content generally increases with distance from the Mississippi River. Iron content is a problem with some wells near the Mississippi River. Water from very deep wells is generally soft and with low iron content (USGS, 1998).

### **Potable Water Supply**

The Plaquemines Parish water system provides potable water to the entire parish by treatment of raw water from the Mississippi River. For periods of salt water intrusion, raw water reservoirs are maintained at three locations in the parish, Boothville, Pointe a la Hache, and Davant.

### **Alternative 1 – No Action**

Implementation of the no action alternative would not adversely impact the surface or ground water resources of the region.

### **Alternative 2 – Proposed Action: Reconstruct at Alternate Location**

Construction of marsh terraces in Alexis Bay as planned in accordance with project conditions and mitigation measures will not adversely impact surface water, ground water, or potable water supplies. To minimize spills and leaks of hazardous materials from the maintenance of construction equipment, safe handling procedures per local, state, and federal regulations must be used to reduce impacts to surface and ground water resources. Sound building techniques and the use of best management practices would mitigate minor potential effects that might otherwise result from runoff infiltration to ground water during construction.

### **3.3.2 Wetlands and Waters of the United States**

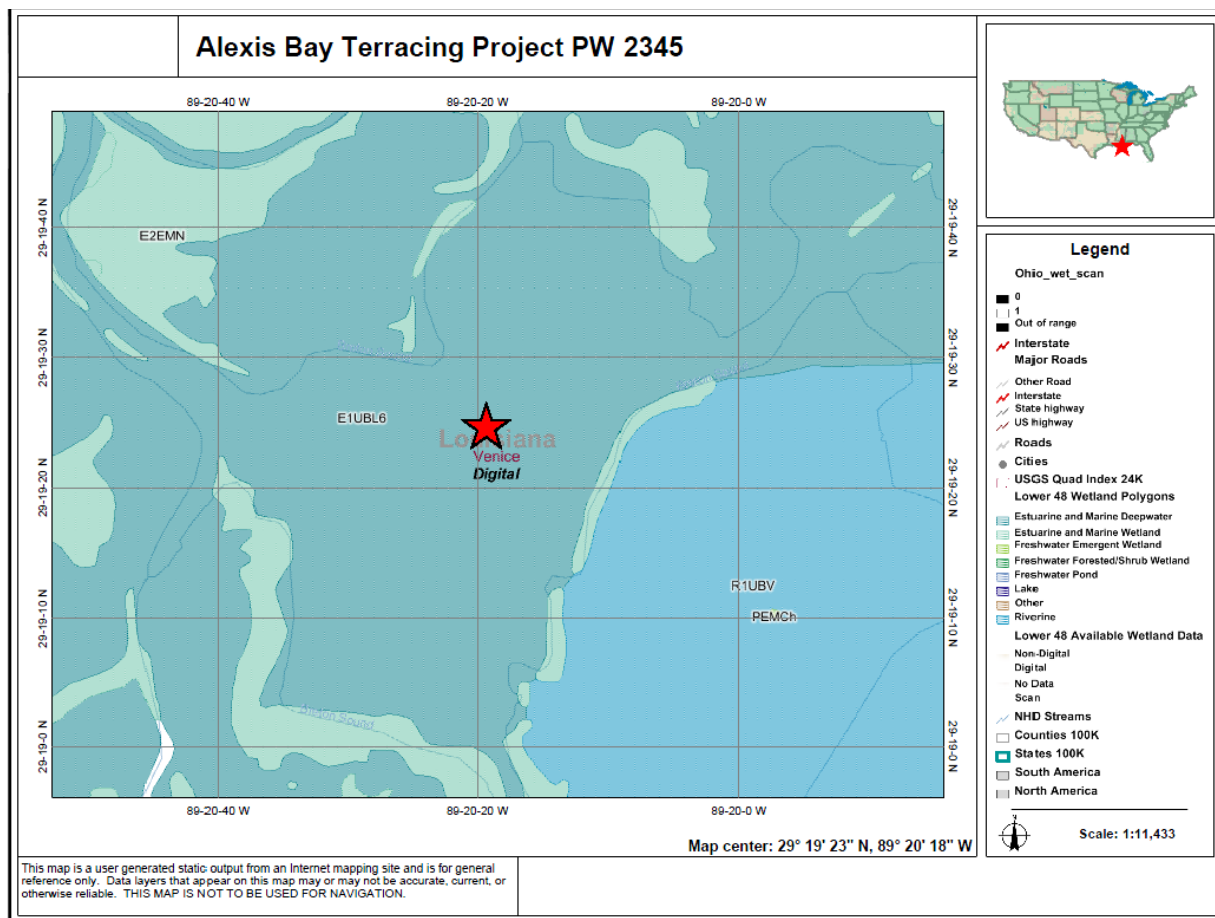
The United States Army Corps of Engineers (USACE) regulates the discharge of dredged or fill materials into waters of the U.S. including wetlands, pursuant to Section 404 of the CWA. Jurisdictional wetlands are defined as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Jurisdictional wetland determinations are regulated by the USACE pursuant to the CWA. Executive Order 11990, Protection of Wetlands, also directs federal agencies to take actions to minimize the destruction, loss, or degradation of wetlands.

The heavily developed areas of Plaquemines Parish are surrounded by levees on all sides, which are surrounded by fresh, intermediate and salt marsh wetlands. These wetlands are the natural spawning grounds and nurseries for much of the nation's desirable seafood. These wetlands also provide natural flood control, hurricane defense, and water filtration (Plaquemines Parish Master

Plan, 2011). This area contains a variety of habitats including forested wetlands, fresh, intermediate, brackish and saline marshes that follow the salinity gradient from the Mississippi River to the fragmented salt marshes close to Breton Sound. Throughout history, these wetlands have received Mississippi River flood water and there has existed a dynamic relationship between the fresh river water and the saline water from Breton Sound.

Review of United States Fish & Wildlife Service (USFWS) National Wetlands Inventory (NWI, Figure 15) identified that the area of the proposed site is classified as Estuarine Subtidal Unconsolidated Bottoms Wetlands (E1SBL6). This wetlands type consists of deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The salinity may be periodically increased above that of the open ocean by evaporation and is classified as oligohaline (0.5 to 5.0 parts per thousand salts). Along some of this low-energy coastline area there is appreciable dilution of sea water (Cowardin, 1979).

Two basic marsh zones occur within the habitat: fresh marsh nearest the main tributaries, and brackish marsh near the Gulf of Mexico. The fertile soils, vegetative composition, and shallow water wetland environment offers outstanding recreational opportunities such as fishing, wildlife observation, photography, hunting, and primitive camping. It provides protection and habitat to numerous plant and wildlife species including the following endangered and threatened species; the American Alligator, Brown Pelican, Arctic peregrine falcon and the Piping Plover. Untold numbers of passerine birds "song birds" and shorebirds use the area for staging during migration periods. The marsh is tidally influenced and water levels fluctuate from less than a few inches to several feet or more. The fertile soils, vegetative composition, and shallow water environment create a highly productive habitat for fish and wildlife.



**Figure 15: Wetland Classification Code E1UBL6, U.S. Fish and Wildlife Wetlands Inventory (FWS, 2011)**



## **Alternative 1 – No Action**

Implementation of the no action alternative would not impact wetlands or other waters of the U.S. and would not require a CWA Section 404 permit.

## **Alternative 2 – Proposed Action: Reconstruct at Alternate Location**

Construction of the Alexis Bay Marsh Terrace facility as proposed including stipulated mitigating conditions would not adversely impact waters of the U.S. or adversely modify wetlands per review of USFWS NWI (USFWS NWI Mapper, 2011) and USACE jurisdictional determination letter dated January 18, 2011 (Appendix B). A Clean Water Act Section 404 Permit (Permit No. MVN 2004-3345 EBB) was issued as part of Joint Coastal Use Permit (Permit No. P20091041, Extended). Successful project implementation may have beneficial impacts including land reclamation, wetlands restoration, and habitat enhancement.

### **3.3.3 Floodplains**

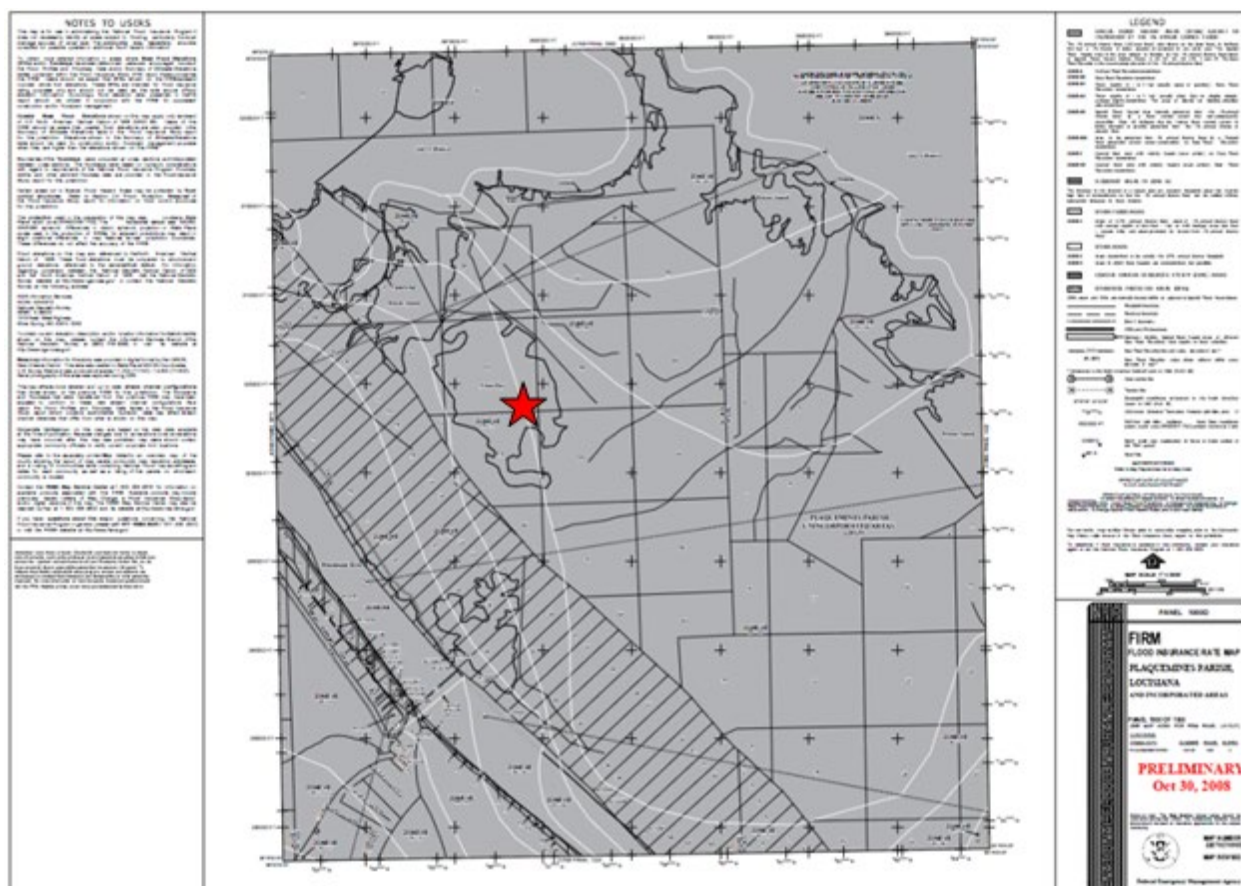
Executive Order (EO) 11988, Floodplain Management, requires federal agencies to avoid direct or indirect support or development within or affecting the 1% annual chance special flood hazard area (SFHA) (i.e., 100-year floodplain) whenever there is a practicable alternative (for “*Critical Actions*”, within or affecting the 0.2% annual chance SFHA, i.e., the 500-year floodplain). FEMA’s regulations for complying with EO 11988 are found in 44 CFR Part 9, Floodplain Management and Protection of Wetlands. In compliance with FEMA policy implementing EO 11988, the proposed project was reviewed for possible impacts associated with occupancy or modification to a floodplain. The Executive Order guidelines address an eight-step process that is carried out as part of the decision-making for projects that have potential impacts to or within the floodplain. The eight steps reflect the assessment process required in Section 2(a) of the Order. The *8-Step Decision Making Process Document* completed for this project is attached herein as Appendix E (FEMA, 2008a).

Plaquemines Parish enrolled in the National Flood Insurance Program (NFIP) on May 1, 1985. FEMA used the NFIP Digital Flood Insurance Rate Map panel (DFIRM) (Figure 16) to determine the flood hazard zone for the proposed project location (FEMA, 2008b). According to the NFIP preliminary DFIRM panel number 22 075C 1000 D (Figure 15), dated October 30, 2008, the proposed project site lies within special flood hazard area zones “VE” Elevation 17 and Elevation 18 (1% annual chance flood area, 100-year floodplain, base flood elevation [BFE] determined, elevation 17 feet and 18 feet above mean sea level North American Vertical Datum 1988, a coastal high hazard velocity zone).

The low-lying areas of Plaquemines Parish are subject to periodic flooding from a variety of sources. Flooding results from intense rainfall in the general area, abnormally high tides in the Gulf of Mexico, hurricanes or lesser tropical disturbances and/or combinations of the various events. In the northern portion of Plaquemines Parish, the predominant flooding source is rainfall runoff. Pumping facilities within protected areas are unable to discharge runoff from severe storms expeditiously. The problem is further aggravated by subsidence that usually occurs in pumped areas that were formerly wetlands (FEMA, 2008b).



Areas in the southern portion of the parish also experience flooding from runoff ponding described above; however, the greatest threat to southern Plaquemines Parish, due to its precarious location on the Mississippi River Delta, is that of hurricane surge inundation. As hurricanes approach coastal Louisiana from any direction, large volumes of water are propelled inland over the low marshlands and into many bayous and canals. Hurricane protection levees, in combination with the Mississippi River levees, provide defense for the pumped areas from hurricanes having recurrence intervals of 10 years or less. During severe hurricanes, overtopping of the hurricane protection levees and the Mississippi River levees in its most exposed reaches can occur, producing severe flooding. The Mississippi River itself is often forced out of its banks in these southern areas during hurricane conditions.



**Figure 16: Effective Flood Insurance Rate Map Panel 22 075C 1000 D, (See Full Figure attached to the Floodplain 8-Step Document in Appendix E, FEMA, 2008c)**

### **Alternative 1 – No Action**

The no action alternative would not result in impacts to the 100-year floodplain.

### **Alternative 2 Proposed Action: Reconstruct at Alternate Location**

The proposed action alternative would involve the relocation and reconstruction of the functions of the damaged marsh terraces to the proposed site within a special flood hazard area. This facility is functionally dependent upon its location in water to fulfill its intended purpose. The ground

surface at the proposed project site is at an approximate elevation between 0.776 and 2.0 feet above mean sea level (North American Vertical Datum 1988).

This EA forms part of the Eight Step Planning Process outlined in 44 CFR Part 9. No acceptable practicable alternatives outside of the special flood hazard area were identified by Plaquemines Parish or GOHSEP that meet the project objectives. Mitigation of potential adverse impacts, if any, must be accomplished by incorporation of mitigation and minimization measures including compliance with relevant codes and standards. These projects must be conducted in accordance with conditions for federal actions in the floodplain as set forth in EO 11988, Floodplain Management, and EO 11990, Protection of Wetlands, and the implementing regulation found at 44 CFR Part 9, Floodplain Management and Protection of Wetlands. These regulations apply to Agency actions which have the potential to affect floodplains or wetlands or their occupants, or which are subject to potential harm by location in floodplains or wetlands.

Additionally, FEMA Public Assistance grant funded projects carried out in the floodplain or affecting the floodplain must be coordinated with the relevant floodplain administrator for a floodplain development permit and the action must be undertaken in compliance with relevant, applicable, and required local codes and standards. This will reduce the risk of future flood loss, minimize the impacts of floods on safety, health, and welfare, and preserve and possibly restore beneficial floodplain values as required by Executive Order 11988.

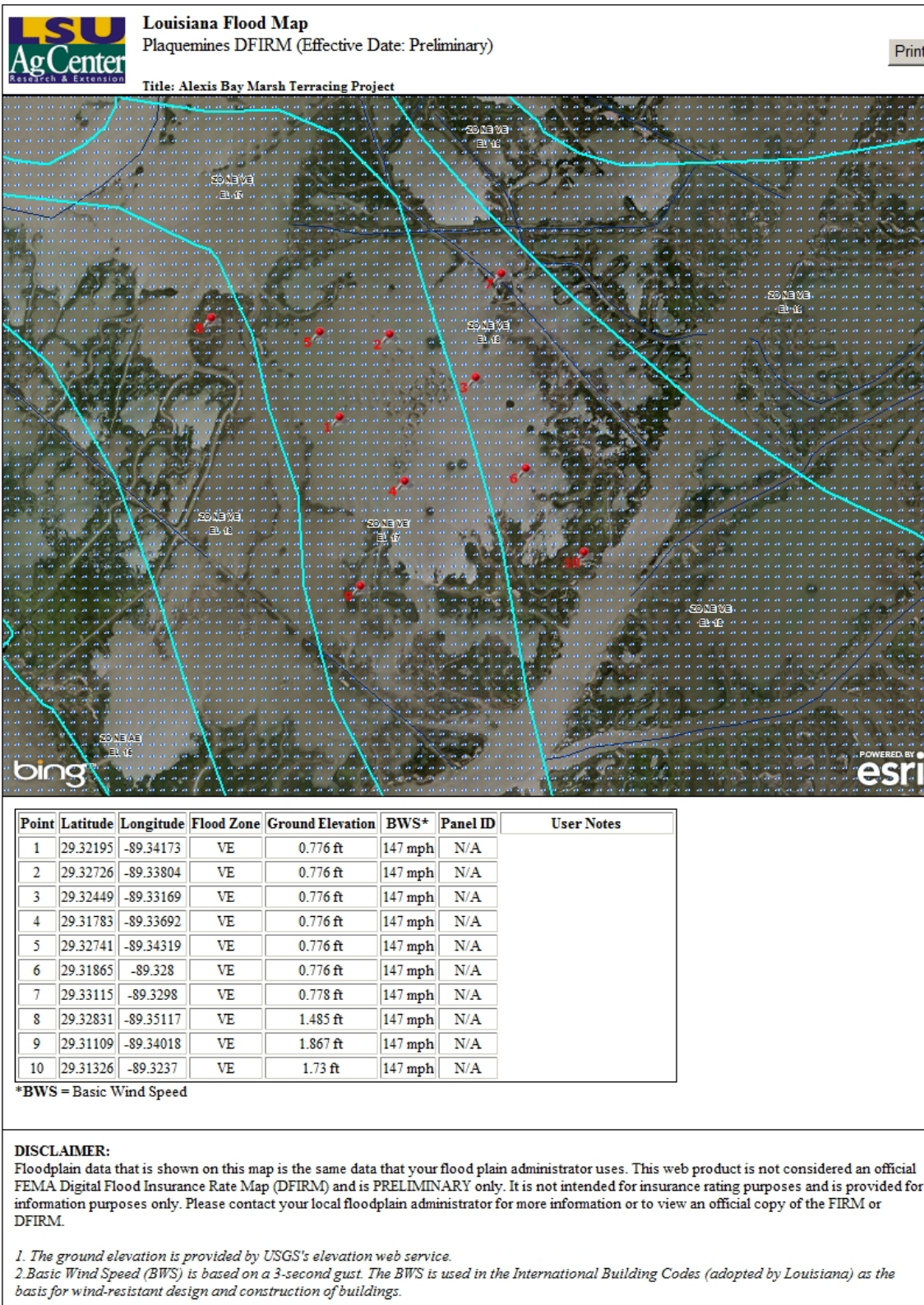


Figure 17: Ground Elevations near the Site, Flood Zones Indicated, (LSU AgCenter, 2011)



### 3.4 Coastal Resources

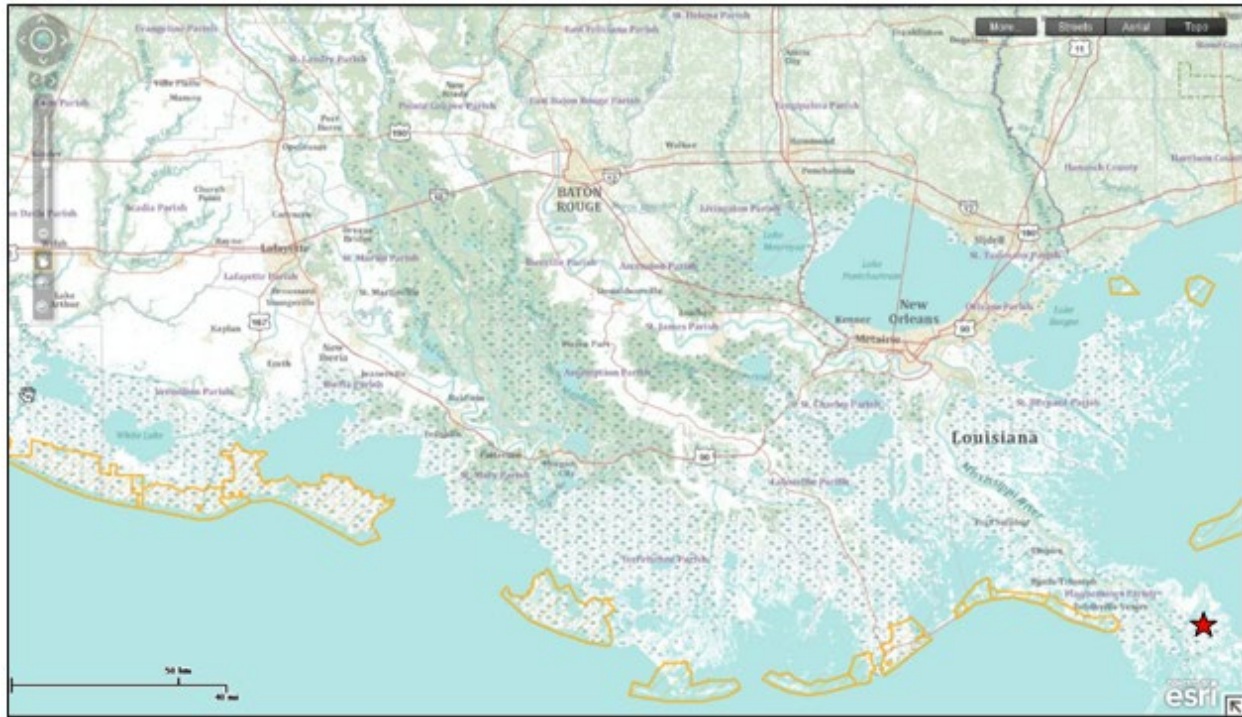
The Coastal Zone Management Act of 1972 (CZMA) requires federal agency actions to be consistent with the policies of the state Coastal Zone Management Program when conducting or supporting activities that affect a designated coastal zone. The Louisiana Department of Natural Resources (LDNR) regulates development in Louisiana's coastal zone through the Coastal Use Permit Program. The Alexis Bay Marsh Terrace facility in southeast Plaquemines Parish is within the regulated Louisiana Coastal Zone and, therefore, is required to obtain a Coastal Use Permit or undergo a federal-state consistency review (Figure 18). In accordance with rules and regulations of the Louisiana Coastal Resources Program, Plaquemines Parish applied for and received Coastal Use Permit number P20091041 (extended September 6, 2011) including USACE Clean Water Act Section 404 permit number MVN 2004-3345 EMM.

Plaquemines Parish and its contractors must carry out, perform, and/or operate the use in accordance with the permit conditions, plans, and specifications approved by the LDNR (See the Conditions Section 5.0 of this EA and in the attached permit copy in Appendix B). This permit authorizes the initiation of the coastal use described in the permit for four years from the date of the signature of the Secretary or his designee on the original permit, which was December 29, 2009.



**Figure 18: Alexis Bay Marsh Terracing Facility within the Highlighted Coastal Zone**

The USFWS regulates federal funding in Coastal Barrier Resource System (CBRS) units under the Coastal Barrier Resources Act (CBRA). This Act protects undeveloped coastal barriers and related areas (i.e., Otherwise Protected Areas) by prohibiting direct or indirect federal funding of projects that support development in these areas. This promotes the appropriate use and conservation of coastal barriers along the Gulf of Mexico. The proposed project site is not located within a regulated CBRS unit (nearest units shown in Figure 19, see yellow bordered areas in photo inset below).



**Figure 19: Alexis Bay Marsh Terracing Facility nearest Coastal Barrier Resource System Units as Shown Highlighted in Yellow**

### **Alternative 1 – No Action**

Implementation of the no action alternative would not impact Coastal Barrier Resources or the Louisiana Coastal Zones.

### **Alternative 2 – Proposed Action: Reconstruct at Alternate Location**

Review of Louisiana's Coastal Zone Boundary Map identified that the construction of the proposed action is within the coastal zone jurisdiction therefore, the project requires a Coastal Use Permit (applied for and issued, permit no. indicated above) to ensure enforcement of applicable construction standards in implementing the proposed action. In addition, the proposed action is not located in a regulated CBRS unit and will have no adverse effects on any CBRS unit.

## **3.5 Air Quality**

The Clean Air Act (CAA) requires the state of Louisiana to adopt ambient air quality standards to protect the public from potentially harmful amounts of pollutants. Six common air pollutants (also known as "criteria pollutants") are regulated by EPA and the states under the CAA. They are particle pollution (often referred to as particulate matter), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. The Louisiana Department of Environmental Quality has designated areas meeting the state's ambient air quality standards by their monitoring and modeling program efforts, (i.e., attainment areas). Louisiana has no carbon monoxide, nitrogen oxides, sulfur oxides, particulate or lead nonattainment areas. According to results from the state's



air quality monitoring, Plaquemines Parish has been identified as an attainment area for criteria pollutants (LDEQ, 2011).

### **Alternative 1 – No Action**

Implementation of the no action alternative would not adversely impact ambient air quality for the area.

### **Alternative 2 – Proposed Action: Reconstruct at Alternate Location**

Negligible impacts would be anticipated from vehicle and equipment exhaust emissions and possibly increased dust during construction of the marsh terraces. Best management practices are required to lessen the impact of the dust, if needed. The proposed action would not significantly affect the ambient air quality by following these best management practices for reducing the amount of particulate matter (dust & vehicle emissions) from construction work occurring on the site.

## **3.6 Biological Resources**

### **3.6.1 Plant Communities**

Wetlands plants are specifically adapted to reducing conditions in the soil. These species are essential to healthy ecosystems, and each species provides specific functions beneficial to the system. By absorbing the force of strong winds, fluctuating water levels, abating flood peaks, and preventing shoreline erosion, wetlands and the plants growing in them protect terrestrial areas from storm and flood damage. Typical wetlands can be divided into four hydrologic regimes: the area of short-term saturation, the area of long term saturation, the draw down zone, and the permanently flooded region (Natural Resources Conservation Service [NRCS], Wetlands Factsheet, 2011).

While wetland conditions are highly temporal, areas around the proposed marsh terraces currently include both permanently flooded areas of open water including water bottoms and areas of draw down zone, areas above the ordinary mean high water line but with ample water from capillary action. The proposed project will be planted with smooth cordgrass, *Spartina alterniflora*, which is compatible with the proposed project location.

### **3.6.2 Essential Fish Habitat**

The National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) has reviewed the project information and determined the project is located in an area that has been identified as essential fish habitat for various life stages of federally managed species, including post-larval and juvenile life stages of red drum, brown shrimp, and white shrimp (NMFS, 2011). The primary categories of EFH that would be affected by project implementation include mud substrates and estuarine water column. Detailed information on federally managed fisheries and the EFH is provided in the 2005 generic amendment of the Fisheries Management Plans for the Gulf of Mexico prepared by the Gulf of Mexico Fishery Management Council. The generic amendment was prepared as required by the Magnuson-Stephens Fishery Management Conservation and Management Act (Magnuson-Stevens Act; P.L. 104-297).

### **3.6.3 Fishery Resources**

In addition to being designated as EFH for red drum, brown shrimp, and white shrimp, wetlands and water bottoms in the project area provide nursery and foraging habitats that support a variety of economically important marine fishery species such as the Atlantic croaker, black drum, Gulf menhaden, blue crab, and striped mullet. Some of these species serve as prey for other fish species managed under the Magnuson-Stevens Act by the Gulf of Mexico Fishery Management Council (e.g., mackerels, snappers, and groupers) and highly migratory species managed by NMFS (e.g., billfishes and sharks). Wetlands in the project area also produce nutrients and detritus, important components of the aquatic food web, which contribute to the overall productivity of the Mississippi River Delta (NMFS, 2011).

### **3.6.4 Threatened and Endangered Species and Critical Habitat**

Under provisions of the Endangered Species Act, federal agencies shall use their authorities to carry out programs for the conservation of listed species, and shall ensure any action authorized, funded or implemented by the agency is not likely to: (1) adversely affect listed species or designated critical habitats; (2) jeopardize the continued existence of proposed species; or (3) adversely modify proposed critical habitat (16 USC 1536).

The Louisiana Natural Heritage Program has compiled data on rare, endangered, or otherwise significant plant and animal species, plant communities, and other natural features throughout the state of Louisiana. Heritage reports summarize the existing information known at the time of a request regarding a location in question. Personnel of the Habitat Section of the Coastal & Nongame Resources Division have reviewed the preliminary data for the proposed project. After careful review of the database, no impacts to rare, threatened, or endangered species or critical habitats are anticipated for the proposed project. No state or federal parks, wildlife refuges, scenic streams, or wildlife management areas are known at or in the vicinity of the specified site within Louisiana's boundaries (LDWF, 2011).

Additionally, the USFWS has indicated that the project has been reviewed for effects to federal trust resources under their jurisdiction and currently protected by the Endangered Species Act of 1973 (Act). The project, as proposed on the current plans, is not likely to adversely affect those resources. This finding fulfills the requirements under Section 7(a)(2) of the Act.

#### **Alternative 1 – No Action**

Implementation of the no action alternative would not adversely affect endangered, threatened, or proposed listed species as well as listed critical habitats.

#### **Alternative 2 – Proposed Action: Reconstruct at Alternate Location**

Careful review of the proposed project by the LDNR and USFWS indicates the proposed plan has little potential for adverse effects and that the project is unlikely to adversely impact protected resources. Based upon the NMFS review of the proposed project and their knowledge of the effects of marsh terracing projects, NMFS believes that project implementation likely would have temporary impacts on water bottoms and water column. However, the project has potential to restore some categories of EFH that are more supportive of marine fishery resources (i.e., estuarine

emergent wetlands). Permit requirements and project conditions have been incorporated into this project to avoid potential adverse impacts and minimize and mitigate temporary adverse effects to plant communities, essential fish habitat, and threatened and endangered species. The implementation of best management practices ensures that the temporary adverse effects of facility construction will be minimized.

### **3.7 Cultural Resources**

#### **Regulatory Setting**

The consideration of impacts to cultural resources is mandated under Section 106 of the National Historic Preservation Act (NHPA) as implemented by 36 CFR Part 800. Requirements include the identification of significant historic properties that may be impacted by the proposed action or alternatives within the project's area of potential effect. Historic properties are defined as archaeological sites, standing structures or other historic resources listed in or determined eligible for listing in the National Register of Historic Places. If adverse effects on historic, archaeological or cultural properties are identified, agencies must consider effects of their activities and attempt to avoid, minimize, or mitigate the impacts to these resources.

FEMA has reviewed this project in accordance with the Statewide Programmatic Agreement dated August 17, 2009 between the Louisiana State Historic Preservation Officer (SHPO), the Louisiana Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP), the Alabama-Coushatta Tribe of Texas, the Caddo Nation, the Chitimacha Tribe of Louisiana, the Choctaw Nation of Oklahoma, the Coushatta Tribe of Louisiana, the Jena Band of Choctaw Indians, the Mississippi Band of Choctaw Indians, the Quapaw Tribe of Oklahoma, the Seminole Nation of Oklahoma, the Seminole Tribe of Florida, the Tunica-Biloxi Tribe of Louisiana, and the Advisory Council on Historic Preservation. The PA was created to streamline the Section 106 review process.

#### **Existing Conditions**

The project area is located in Alexis Bay northwest of Baptiste Collette Bayou and east of the Mississippi River opposite Boothville in the lower part of Plaquemines Parish. The project area encompasses a shallow portion of submerged marshland occupied by marsh grasses and open water. The Area of Potential Effect (APE) for standing structures includes all areas within view shed of the proposed construction. The archaeological APE is approximately 148 acres.

#### **Alternative 1: No Action**

The no action alternative does not include any FEMA undertaking; therefore FEMA has no further responsibilities under Section 106 of the National Historic Preservation Act.

#### **Alternative 2: Proposed Action: Reconstruct at Alternate Location**

The APE is located well away from natural levees along the Mississippi River and other smaller drainages where prehistoric and historic archaeological sites are typically located. In addition, this portion of the Mississippi Delta dates to the Late Holocene which would preclude it from being used by early human populations. Conversely, the depth of the water (less than 2 feet) and the

distance from canals and drainages indicates that ship wrecks are also highly unlikely. There are no previously recorded archaeological sites within ½ mile of the project area. Archaeological surveys have been conducted along the Mississippi River, along the major tributaries of Baptiste Collette Bayou, and along a pipeline to the south of Baptiste Collette Bayou but not within the current project boundaries. FEMA has determined that there is No Historic Properties Affected as a result of the proposed undertaking.

SHPO concurrence with this determination was received December 2, 2009. Consultation with affected tribes including Coushatta Tribe of Louisiana, Chitimacha Tribe of Louisiana, Choctaw Nation of Oklahoma, Jena Band of Choctaw Indians, Jena Band of Choctaw Indians, Mississippi Band of Choctaw Indians, Seminole Tribe of Florida, Seminole Nation of Oklahoma, and the Tunica-Biloxi Tribe of Louisiana was conducted per 36 CFR §800.2(c)(2)(i)(B). The Mississippi Band of Choctaw Indians concurred with this determination on November 16, 2009. Therefore, no impacts to cultural resources are anticipated by the proposed action. The applicant must comply with the Louisiana Unmarked Human Burial Sites Preservation Act (R.S. 8:671 et seq.) and the Inadvertent Discovery Clause, which can be found under conditions section of this EA.

### **3.8 Environmental Justice**

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, mandates that federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of programs on minority and low-income populations.

The population of Plaquemines Parish is estimated to have reached an all-time high in July 2005, a few months before Hurricane Katrina (Plaquemines Parish Master Plan, 2011). Review of U.S. Environmental Protection Agency's (USEPA) Environmental Justice Assessment Mapper identifies that the population of Plaquemines Parish is diverse in its ethnic composition (USEPA Environmental Justice Geographic Mapper, 2009). Hence, there were no identified areas showing a high concentration of a specific ethnic background or affluence within and surrounding the affected community.

#### **Alternative 1 – No Action**

Implementation of the no action alternative would eliminate the function, benefit, and remuneration of the lost facilities. This alternative would not adversely impact minority or low-income populations.

#### **Alternative 2 – Proposed Action: Reconstruct at Alternate Location**

The proposed action will not pose disproportionately high and adverse public health or environmental effects on minority and low-income populations. The reconstruction project would equally restore and enhance lost functions to all citizens.

### **3.9 Hazardous Materials and Waste**

Hazardous wastes, as defined by the Resource Conservation and Recovery Act (RCRA), are defined as “a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

- 1) Cause, or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness, or
- 2) Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed.

A review of data sources (e.g., USEPA EnviroMapper and Electronic Document Management System™) revealed that the proposed project site is not on federal and/or state agency’s lists concerning Volunteer Remedial Program, Brownfield Program, underground storage tank decommission, waste/debris disposal facilities, and oil/gas wells sites. According to historical aerial photographs from 1989 to 2008 and the topographic map dated July 1, 1983, there were no obvious structures on the proposed site and no obvious sites of concern detected in the vicinity of proposed project area.

The Alexis Bay Marsh Terrace facility has no record or indication of past or present hazardous waste activities including notification as a generator or other regulated activity. The Environmental Protection Agency reviewed the site and proposed action and performed a database search for records associated with the site and provided comment on the proposed action (Appendix B). No adverse records were identified and comments were incorporated into the EA analysis and documentation (EPA, 2011).

#### **Alternative 1 – No Action**

Implementation of the no action alternative would not disturb any hazardous materials or create potential hazards to human health.

#### **Alternative 2 – Proposed Action: Reconstruct at Alternate Location**

Construction of the marsh terraces would not disturb any hazardous materials or create increased potential hazards to human health. The proposed site is not adjacent to hazardous or solid waste facilities. If hazardous materials are unexpectedly encountered in the project area during the construction activities, appropriate measures for the proper assessment, remediation, management and disposal of the contamination must be initiated in accordance with applicable federal, state, and local regulations. The contractor is required to take appropriate actions to prevent, minimize, and control the spill of hazardous materials at the proposed site.

### **4.0 CUMULATIVE IMPACTS**

Cumulative impacts are those effects on the environment that result from the incremental effect of the action when added to past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative effects



can result from individually minor but collectively significant actions taking place over a period of time.

The impact of Hurricane Katrina's storm surge devastated the southeastern coastal region of Louisiana. There are numerous other projects to repair buildings, roads, recreational facilities, and public utilities to pre-disaster conditions that include upgrades to codes and standards surrounding the contributing projects site. The area is also undergoing restorations and/or repairs using non-FEMA funding.

Nonetheless, the cumulative impact to the natural resources and socio-economics from the proposed action would be minimal and would not have significant cumulative affects to the environment. The proposed reconstruction may reduce environmental risk since the goal of the facility is to trap sediment and re-establish wetlands that could provide increased coastal flood defense.

## **5.0 CONDITIONS AND MITIGATION MEASURES**

Based upon the studies, reviews and consultations undertaken in this environmental assessment, several conditions and mitigation measures must be taken by the applicant prior to and during project implementation.

- In accordance with applicable local, state, and federal regulations, the applicant is responsible for acquiring any necessary permits and/or clearances prior to the commencement of any construction related activities.
- FEMA Public Assistance grant funded projects carried out in the floodplain or affecting the floodplain must be coordinated with the local floodplain administrator for a floodplain development permit and the action must be undertaken in compliance with relevant, applicable and required local codes and standards and thereby, will reduce the risk of future flood loss, minimize the impacts of floods on safety, health, and welfare, and preserve and possibly restore beneficial floodplain values as required by Executive Order 11988.
- If during the course of work, archaeological artifacts (prehistoric or historic) or human remains are discovered, the applicant shall stop work in the vicinity of the discovery and take all reasonable measures to avoid or minimize harm to the finds. The applicant shall inform their Public Assistance (PA) contacts at FEMA, who will in turn contact FEMA Historic Preservation (HP) staff. The applicant will not proceed with work until FEMA HP completes consultation with the SHPO. In addition, if unmarked graves are present, compliance with the Louisiana Unmarked Human Burial Sites Preservation Act (R.S. 8:671 et seq.) is required. The applicant shall notify the law enforcement agency of the jurisdiction where the remains are located within twenty-four hours of the discovery. The applicant shall also notify FEMA and the Louisiana Division of Archaeology at (225) 342-8170 within seventy-two hours of the discovery. Failure to comply with these stipulations may jeopardize receipt of FEMA funding.
- In accordance with the rules and regulations of the Louisiana Coastal Resources Program and Louisiana R.S. 49, Sections 214.21 to 214.41, the State and Local Coastal Resources

Act of 1978, as amended, the grant applicant must agree to the terms and conditions of the Coastal Use Permit and remain in compliance.

- The Louisiana Division of Administration requires obtaining a Class B Permit in order to conduct the proposed project (Louisiana Division of Administration, 2011). This project must be coordinated with the Division of Administration, the required permit must be obtained, and all conditions within that permit must be complied with and the project must remain in compliance (See Appendix B, Agency Correspondence, for a copy of these Rules and Regulations).
- Department of the Army Permit No. MVN 2004-3345 EBB authorizes the performance of the work in accordance with its specified terms and conditions. This work must be conducted in compliance with all terms and conditions and must remain in compliance. Additionally, the work must be completed within the time limit established within the issued permit and the applicant must submit a request for a time extension, if needed.
- The applicant must follow all applicable local, state, and federal laws, regulations and requirements and obtain and comply with all required permits and approvals prior to initiating work.
- Fill or borrow material used must be sourced from sites that do not contain any buried cultural materials (*i.e.*, wells, cisterns, foundations, basements, prehistoric Indian artifacts, human burials, and the like). If during the course of work, archaeological artifacts (prehistoric or historic) or human remains are discovered, Plaquemines Parish and/or its contractors must immediately stop work in the vicinity of the discovery and take all reasonable measures to avoid or minimize harm to the finds. The Applicant and GOHSEP must inform the FEMA Public Assistance program, who would in turn contact the FEMA Historic Preservation staff. The Applicant must not proceed with work until FEMA completes consultation with the SHPO. In addition, if unmarked graves are present, compliance with the Louisiana Unmarked Human Burial Sites Preservation Act is required. In that situation, the Applicant must notify the local law enforcement agency within 24 hours of the discovery, and notify FEMA and the Louisiana Division of Archaeology at (225) 342-8170 within 72 hours of the discovery. Failure to comply with these stipulations may jeopardize FEMA funding of the project.
- To minimize air quality impacts, Plaquemines Parish and its contractors must implement BMPs to limit air emissions, fugitive dust and exhaust. BMPs would include maintaining and covering spoil piles, covering the loads of haul vehicles and keeping construction equipment properly tuned.
- Plaquemines Parish and its contractors must ensure all project activities are conducted in a safe manner and in compliance with all state and federal occupational safety regulations, including OSHA, to protect workers and the general public.
- Project construction would involve the use of potentially hazardous materials (*e.g.*, petroleum products, cement, caustics, acids, solvents, paint, electronic components, pesticides, herbicides, fertilizers, treated timber) and may result in the generation of small

volumes of hazardous wastes. Appropriate measures to prevent, minimize, and control spills of hazardous materials must be taken and generated hazardous and non-hazardous wastes are required to be disposed in accordance with applicable federal, state and local regulations.

- If any solid or hazardous wastes, or soils and/or groundwater contaminated with hazardous constituents are encountered during the project, notification to LDEQ's Single-Point-of-Contact at (225) 219-3640 is required. Additionally, precautions should be taken to protect workers from these hazardous conditions.

## **6.0 PUBLIC INVOLVEMENT AND AGENCY CONSULTATIONS**

FEMA is the lead federal agency for conducting the NEPA compliance process for this Environmental Assessment and FEMA Public Assistance grant funded project. It is the responsibility of the lead agency to conduct the preparation and review of NEPA documents in a way that is responsive to the needs of the parish communities while meeting the spirit and intent of NEPA and complying with mandated provisions. As part of the development of early interagency coordination related to the proposed action, state and federal resource protection agencies were contacted and FEMA distributed an informal scoping notification through a Solicitation of Views.

These agencies include the State Historical Preservation Officer, U. S. Fish and Wildlife Service, the U.S. Department of Agriculture Natural Resources Conservation Service, the Governor's Office of Homeland Security and Emergency Preparedness, Louisiana Department of Environmental Quality, U. S. Environmental Protection Agency, Louisiana Department of Natural Resources, U. S. Army Corps of Engineers, and National Oceanic & Atmospheric Administration National Marine Fisheries Service. FEMA has received no objections to the project as proposed subsequent to these notifications and comments and conditions received have been incorporated into this NEPA document and the project requirements.

In accordance with applicable local, state, and federal regulations, the applicant would be responsible for acquiring any necessary permits prior to commencing construction at the proposed project site. FEMA is inviting the public to comment on the proposed action during a fifteen (15) day comment period. A public notice will be published for 5 days in the state newspaper, The Advocate, announcing the availability of this EA for review at the Main Library, Plaquemines Parish, Louisiana and at the FEMA Louisiana Recovery Office in New Orleans, LA. A copy of the Public Notice is attached in Appendix C.

## **7.0 LIST OF PREPARERS**

Tiffany Spann-Winfield, Deputy Environmental Liaison Officer, Federal Emergency Management Agency, Louisiana Recovery Office

John Darren Renne, Environmental and Floodplain Specialist, Federal Emergency Management Agency, Louisiana Recovery Office (Contractor)

Daphne Owens, Historic Preservation Specialist/Archaeologist, Technical Assistance, Fluor Contractor Support to FEMA

Catherine Dluzak, Lead Historic Preservation Specialist, Federal Emergency Management Agency, Louisiana Recovery Office

## 8.0 REFERENCES

- Coastal Wetlands Planning, Protection, and Restoration Act [CWPPRA]. [http://lacoast.gov/new/About/Basin\\_data/bs/Default.aspx](http://lacoast.gov/new/About/Basin_data/bs/Default.aspx), Breton Sound Basin Factsheet, 2011.
- Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U. S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. <http://www.npwrc.usgs.gov/resource/1998/classwet/classwet.htm> (Version 04DEC98).
- Federal Register. 1980. Council on Environmental Quality: National Environmental Policy Act. 40 C.F.R. 57488-57514: pp1500-1508. 28 August 1980.
- Federal Emergency Management Agency. 2008a. Flood Insurance Rate Map: Panel Number 22 075C 1000 D. October 30, 2008.
- Federal Emergency Management Agency. 2008b. Flood Insurance Study Number 22075CV000A. Plaquemines Parish, Louisiana and Incorporated Areas. October 30, 2008.
- Federal Emergency Management Agency. 2008c. Floodplain 8-Step Decision Making Process Document (Appendix E). John Renne, CFM, Floodplain Specialist.
- Hoag, Chris J. 2007. Wetland Plants: Their Function, Adaptation, and Relationship to Water Levels. May 2007.
- International Code Council. 2006. Uniform Building Code. Published by International Conference of Building Officials, 500 New Jersey Ave NW, 6<sup>th</sup> Floor, Washington D.C. 20001.
- Louisiana Department of Natural Resources Coastal Management Division. 2007. Louisiana Coastal Zone Map.
- Louisiana Department of Natural Resources Office of Coastal Management. 2011. Coastal Use Permit/Consistency Determination, P20091041.
- Louisiana Department of Environmental Quality. 2008. Air Quality Assessment: Air Monitoring Program of National Ambient Air Quality Standards. Accessed October 21, 2011. <http://www.deq.louisiana.gov/portal/tabid/112/Default.aspx>.
- Louisiana Department of Environmental Quality. 2011. Memo from Beth Altazan-Dixon to Tiffany Spann, DEQ SOV 11907/2610 Alexis Bay Marsh Terracing Project.
- Louisiana Division of Administration. 2011. Memo from Synthia Marcelin, FEMA Environmental Assessment for Public Assistance Grant to Plaquemines Parish, October 11, 2011.



- Louisiana Department of Wildlife and Fisheries. Natural Heritage Program: Endangered & Threatened Plant Species List. Access October 21, 2011. <http://www.wlf.louisiana.gov/experience/naturalheritage/ESA>.
- Louisiana State University. 2010. Generalized Geology Map of Louisiana.
- Plaquemines Parish. 2009. William “Bill” Serpas, Executive Director, Plaquemines Parish, Letter to Colonel Tom Kirkpatrick, Request for a Change of Location Project, Alexis Bay Marsh Terracing Project. October 02, 2009.
- Plaquemines Parish. 2009. Letter from Parish Executive Director William Serpas, Dated July 22, 2009, to Colonel Tom Kirkpatrick, Louisiana Office of Homeland Security and Emergency Preparedness. Alternate Project Application Package for Project Worksheet Number 2345, AI Database Number 885.
- Plaquemines Parish. 2010. Plaquemines Parish Master Plan, Land Use, Demographics, Coastal Restoration, Drainage & Levees, Public Facilities & Services, and Water System.
- Rozas, Lawrence P. et. Al. 2001. Marsh Terracing as a Method for Restoring Estuarine Habitat in Galveston Bay, Texas.
- Shed, Linda R. et. al. 2002. Modified Terracing Strategies for Marsh Creation.
- State of Louisiana Department of Wildlife and Fisheries Office of Wildlife. 2011. Letter from Amity Bass, Natural Heritage Program, Alexis Bay Marsh Terracing Project, ID 5072011.
- U.S. Census Bureau. 2011. QuickFacts Publication for Plaquemines Parish, Louisiana.
- U.S. Department of Agriculture Natural Resources Conservation Service. September 2011. Soil Map – Plaquemines Parish Louisiana.
- U.S. Department of Agriculture. 2011. Natural Resources Conservation Service. Web Soil Survey - Soil Survey of Plaquemines Parish. Accessed September 30, 2011. <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>.
- U.S. Department of Agriculture. 2011. Plant Database-Louisiana. Accessed April 12, 2011. <http://plants.usda.gov/java/links>.
- U.S. Department of Agriculture, Natural Resources Conservation Service. 2011. Wetlands Factsheet. [www.nrcs.gov](http://www.nrcs.gov).
- U.S. Department of Agriculture Soil. 2000. Soil Conservation Service, Soil Survey of Plaquemines Parish Louisiana.
- U.S. Department of the Army. 2011. Permit No. MVN 2004-3345 EBB.
- U.S. Department of Commerce National Marine Fisheries Service. 2011. Letter from Virginia M. Fay, Acting Assistant Regional Administrator, Response to Solicitation of Views.

- U.S. Department of the Interior Minerals Management Service. Coastal Impact Assistance Program. 2007. Final Programmatic Environmental Assessment. May 2007.
- U.S. Environmental Protection Agency. Environmental Justice Geographic Assessment. Access April 19, 2011. <http://www.epa.gov/enviro/ej/>.
- U.S. Environmental Protection Agency. September 30, 2011, Email Memo Received from Mick Tamara, NEPA Environmental Assessment Solicitation of Views for Alexis Bay Marsh Terracing Project – FEMA Federal Assistance Grant Project.
- U.S. Fish and Wildlife Service. 2011. Coastal Barrier Resources System Map Units.
- U.S. Fish and Wildlife Service. 2011. Memo response to SOV, Deborah Fuller, Acting Supervisor.
- U.S. Fish and Wildlife Service. National Wetlands Inventory Mapper. Access September 30, 2011. <http://www.fws.gov/wetlands/Data/Mapper.html>.
- U.S. Geological Survey. 1998. Renken, Robert A. Ground Water Atlas of the United States. Arkansas, Louisiana, Mississippi. HA 730-F.