

**DRAFT TIERED INDIVIDUAL
ENVIRONMENTAL REPORT**

**PREPARED TO COMPLEMENT:
PROGRAMMATIC INDIVIDUAL ENVIRONMENTAL REPORT 36**

**MILTON ISLAND MARSH RESTORATION PROJECT
SAINT TAMMANY PARISH, LOUISIANA**

PIER 36, TIER 1, MILTON ISLAND



**US Army Corps
of Engineers®**

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TABLE OF CONTENTS

TITLE	PAGE
1. INTRODUCTION	1
1.1 PURPOSE AND NEED FOR THE PROPOSED ACTION	2
1.2 AUTHORITY FOR THE PROPOSED ACTION	6
1.3 PRIOR REPORTS.....	6
1.4 INTEGRATION WITH OTHER INDIVIDUAL ENVIRONMENTAL REPORTS	7
1.5 PUBLIC CONCERNS	7
1.6 DATA GAPS AND UNCERTAINTIES.....	7
2. ALTERNATIVES	7
2.1 ALTERNATIVES DEVELOPMENT AND PRELIMINARY SCREENING CRITERIA.....	7
2.2 DESCRIPTION OF THE ALTERNATIVES	8
2.3 PROPOSED ACTION.....	8
2.4 ALTERNATIVES TO THE PROPOSED ACTION	10
2.5 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION	11
3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES	11
3.1 ENVIRONMENTAL SETTING	11
3.2 SIGNIFICANT RESOURCES	12
3.2.1 Wildlife	13
3.2.3 Threatened and Endangered Species	15
3.2.4 Fisheries, Aquatic Resources, and Water Quality.....	19
3.2.5 Essential Fish Habitat	21
3.2.6 Cultural Resources	24
3.2.7 Recreational Resources	25
3.3 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW)	26
3.4 CUMULATIVE IMPACTS	26
4. COORDINATION AND CONSULTATION	27
4.1 PUBLIC INVOLVEMENT.....	27
4.2 AGENCY COORDINATION.....	27
4.3 COMPLIANCE WITH ENVIRONMENTAL LAWS, REGULATIONS, AND GUIDANCE	29
5. CONCLUSION	30
6. PREPARERS	30
7. LITERATURE CITED	31

LIST OF TABLES

TITLE	PAGE
Table 1 - Significant Resources In and Near the Project Area.....	13
Table 2 - Threatened and Endangered Species in St. Tammany Parish	15
Table 3 - EFH for the Managed Species Expected in Project Area	22

LIST OF FIGURES

TITLE	PAGE
Figure 1 - Milton Island Project - All Features	3
Figure 2 – Milton Island Project – Marsh Mitigation Area.....	4
Figure 3 – Aerial Photograph of Project Area March 5, 2013.....	5

LIST OF APPENDICES

- Appendix A: Public Comment and Responses (Reserved for Final TIER)**
- Appendix B: Interagency Correspondence**
- Appendix C: General Mitigation Guidelines**
- Appendix D: Adaptive Management Plan**
- Appendix E: Wetland Value Assessment**

1. INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Mississippi Valley Division, New Orleans District (CEMVN), has prepared this Tiered Individual Environmental Report (TIER) to evaluate the potential impacts associated with the proposed restoration of intermediate marsh at Milton Island as compensatory mitigation for impacts to non-refuge intermediate marsh caused by construction of flood risk reduction features on the east bank of the Mississippi River in the New Orleans Metropolitan Area as described in the Programmatic Individual Environmental Report (PIER) 36 titled “Lake Pontchartrain and Vicinity (LPV) Hurricane and Storm Damage Risk Reduction System (HSDRRS) Mitigation, Orleans, Plaquemines, St. Bernard, St. Charles, St. John the Baptist and St. Tammany Parishes, Louisiana” and the Decision Record approved by the CEMVN Commander on November 22, 2013. Both documents are hereby incorporated by reference. Since this document is the first TIER being prepared after completion of the PIER, it is designated as PIER 36, TIER 1, Milton Island.

This document has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and the Council on Environmental Quality’s Regulations (40 CFR §1500-1508), as reflected in the USACE Engineering Regulation (ER) 200-2-2, Procedures for Implementing NEPA. These regulations allow Federal agencies, in consultation with the Council on Environmental Quality (CEQ), to implement alternative arrangements for complying with NEPA in lieu of a traditional Environmental Assessment (EA) or Environmental Impact Statement (EIS) in certain emergency circumstances (40 CFR 1506.11). The CEMVN published the CEQ-approved Emergency Alternative Arrangements on March 13, 2007 in the Federal Register. This process was implemented in order to expeditiously complete the environmental analyses for the HSDRRS. The Alternative Arrangements can be found at www.nolaenvironmental.gov, and are herein incorporated by reference.

The approved LPV HSDRRS mitigation plan set forth in the PIER was comprised of both constructible and programmatic features. The programmatic features are being addressed through further NEPA documents called TIERS to provide specific project design details and environmental analysis. The LPV HSDRRS mitigation plan provides compensatory mitigation for the following habitat types:

Habitat Type	Average Annual Habitat Units (AAHUs) Impacted
Non-Refuge Bottomland Hardwood (BLH) -Wet/Dry	93.85 AAHUs
Non-Refuge Swamp	108.01 AAHUs
Non-Refuge Fresh/Intermediate Marsh	45.70 AAHUs
Non-Refuge Brackish Marsh	118.06 AAHUs
Refuge Brackish Marsh	8.79 AAHUs
Refuge Protected Side BLH-Wet	83.92 AAHUs
Refuge Intermediate Marsh	41.29 AAHUs
Refuge Flood Side BLH-Wet	8.91 AAHUs

The LPV HSDRRS mitigation plan is summarized as follows:

Constructible Features	Mitigation Bank (BLH-Wet/Dry)
	Mitigation Bank (Swamp)
Programmatic Features	Milton Island Marsh Restoration (Non-Refuge Intermediate Marsh)
	Bayou Sauvage Marsh Restoration (Non-Refuge/Refuge Brackish Marsh)
	Bayou Sauvage Protected Side Refuge BLH-Wet/ Intermediate Marsh Restoration
	Fritchie Flood Side Refuge BLH-Wet Enhancement

The proposed Milton Island Marsh Restoration project is located near Madisonville, Louisiana on the north shore of Lake Pontchartrain, west of the Causeway Bridge in St. Tammany Parish. Figure 1 shows the location of the mitigation project including the designated borrow source in Lake Pontchartrain. Figure 2 shows a closer view of the marsh mitigation area. Figure 3 is an aerial photograph of the project area clearly showing the breach that has developed along the lake’s shoreline and sediment from the eroded shoreline and the lake bottom deposited in the marsh restoration area during storms.

The Milton Island Marsh Restoration project is designed to compensate for unavoidable impacts resulting from construction of the LPV HSDRRS on fresh and intermediate marsh located on the flood side of the levees and floodwalls, and not on National Wildlife Refuge lands. Freshwater marsh is found in low-lying frequently flooded areas, with the water level remaining on or near the surface for extended periods of time during growing season. It contains emergent herbaceous (non-woody) vegetation adapted to predominantly non-tidal freshwater conditions (salinity less than 5 parts per thousand (ppt) during the growing season: March-November). Intermediate marsh is found between brackish marsh and freshwater marsh. This marsh is characterized by a diversity of species, many of which are found in freshwater marsh and some of which are found in brackish marsh (e.g. Cyperus species, wire grass). Intermediate marsh has an irregular tidal regime and experiences a mean salinity equal to or less than 7 ppt during the growing season.

1.1 PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed action is to compensate for habitat losses to non-refuge, fresh and intermediate marsh incurred during construction of the Lake Pontchartrain and Vicinity component (on the east bank of the Mississippi River) of the HSDRRS. The proposed mitigation would replace the lost functions and services of the impacted habitat through restoration activities designed to create, increase, and improve the habitat functions or services at the specific mitigation site.

Figure 1 – Milton Island Project – All Features

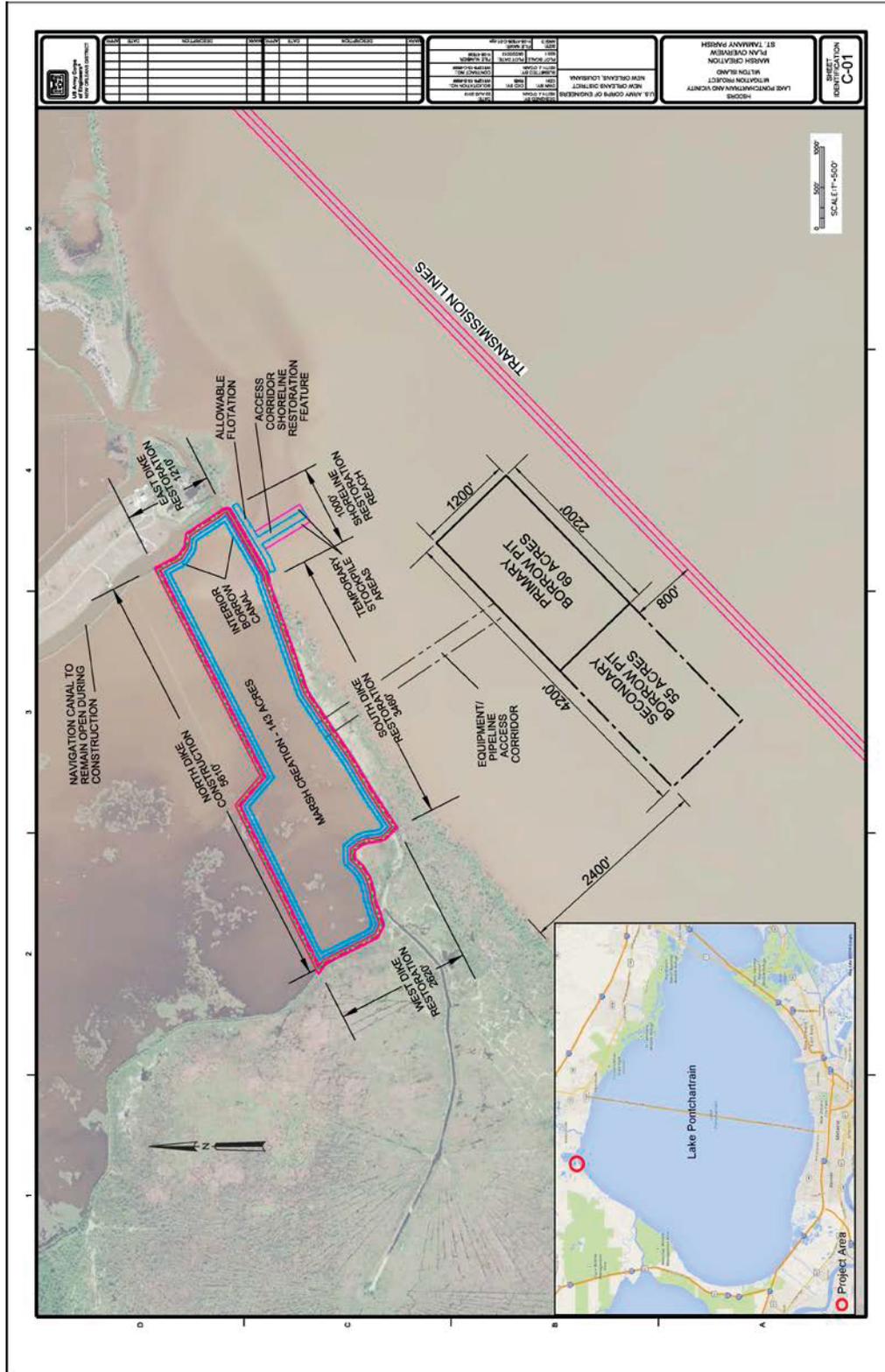


Figure 2 – Milton Island Project – Marsh Mitigation Area

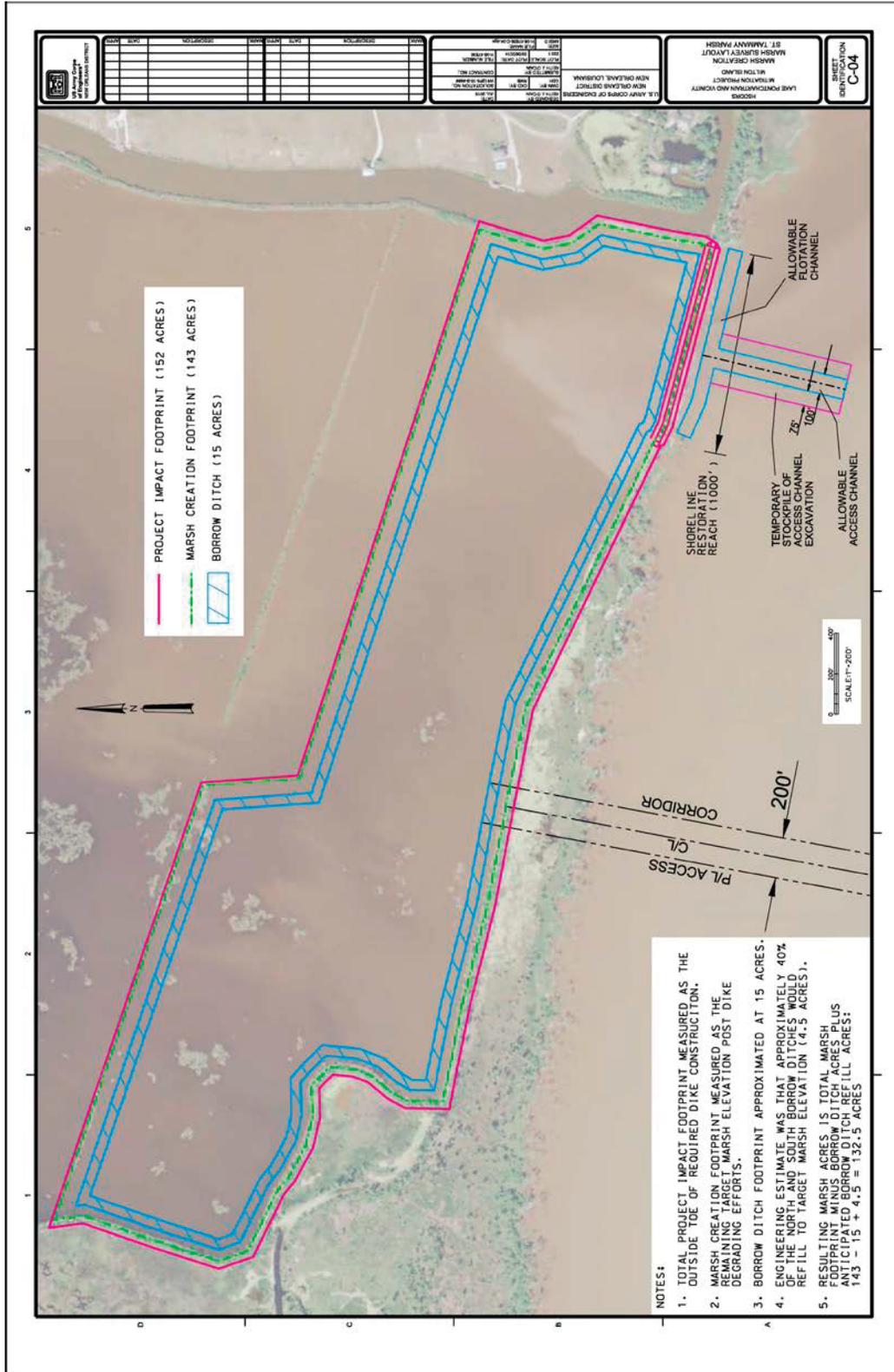
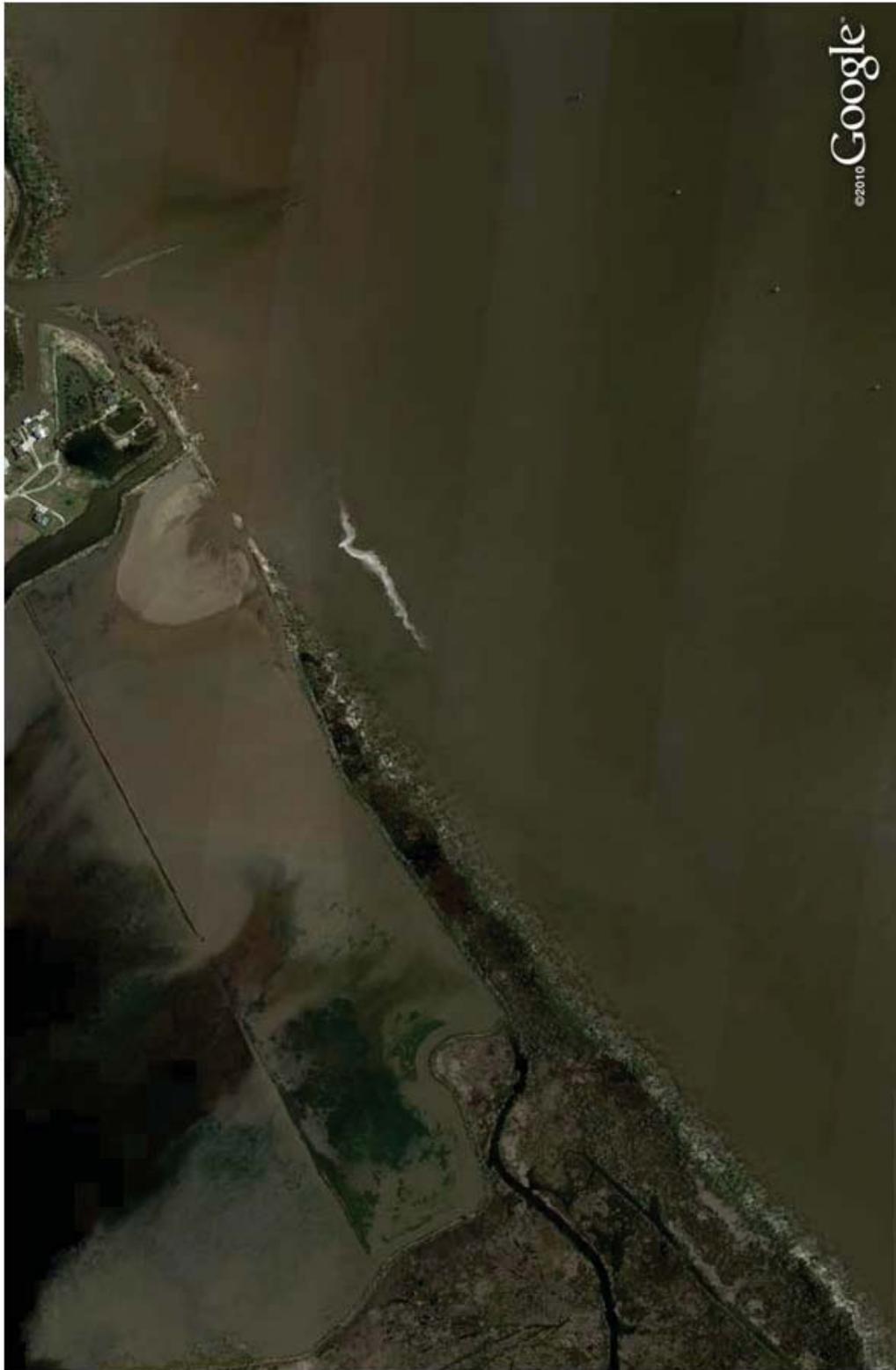


Figure 3 – Aerial Photograph of Project Area - March 5, 2013



1.2 AUTHORITY FOR THE PROPOSED ACTION

The LPV project was authorized under the Flood Control Act of 1965 (P.L. [Public Law] 89-298, Title II, Sec. 204) which authorized a “project for hurricane protection on Lake Pontchartrain, Louisiana ... substantially in accordance with the recommendations of the Chief of Engineers in House Document 231, Eighty-ninth Congress.” The original statutory authorization for the LPV Project was amended by the Water Resources Development Acts (WRDA) of 1974 (P.L. 93-251, Title I, Sec. 92), 1986 (P.L. 99-662, Title VIII, Sec. 805), 1990 (P.L. 101-640, Sec. 116); 1992 (P.L. 102-580, Sec. 102), 1996 (P.L. 104-303, Sec. 325), 1999 (P.L. 106-53, Sec. 324), and 2000 (P.L. 106-541, Sec. 432); and Energy and Water Development Appropriations Acts of 1992 (PL 102-104, Title I, Construction, General), 1993 (PL 102-377, Title I, Construction, General), and 1994 (PL 103-126, Title I, Construction, General).

The authority for the HSDRRS and its associated compensatory mitigation was provided as part of a number of hurricane and storm damage risk reduction supplemental appropriations. These authorizations and appropriations included funding for modifications and improvements to several existing USACE projects in southeastern Louisiana, including the Lake Pontchartrain and Vicinity project, which is located on the east bank of the Mississippi River in Saint Charles, Jefferson, Orleans, and Saint Bernard Parishes.

The Department of Defense, Emergency Supplemental Appropriations to Address Hurricanes in the Gulf of Mexico, and Pandemic Influenza Act of 2006 (3rd Supplemental - P.L. 109-148, Chapter 3, Construction, and Flood Control and Coastal Emergencies) authorized accelerated completion of the Lake Pontchartrain and Vicinity project and restoration of project features to design elevations at 100 percent Federal cost. The Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery of 2006 (4th Supplemental - P.L. 109-234, Title II, Chapter 3, Construction, and Flood Control and Coastal Emergencies) authorizes construction of authorized a 100-year level of protection; the replacement or reinforcement of floodwalls; and the construction of levee armoring at critical locations.

The 6th Supplement, P.L. 110-252, Title III, Chapter 3, authorized additional amounts for “Construction,” for necessary expenses related to the consequences of Hurricane Katrina and other hurricanes of the 2005 season, to modify authorized projects in southeast Louisiana to provide hurricane, storm and flood damage reduction in the greater New Orleans and surrounding areas to the levels of protection necessary for participation in the National Flood Insurance Program under the base flood elevations current at the time of enactment of this Act, including funding for the Lake Pontchartrain and Vicinity project.

1.3 PRIOR REPORTS

A number of studies and reports on water resources development in the proposed project area have been prepared by the USACE, other Federal, state, and local agencies, universities, research institutes, and individuals. The most relevant report to the proposed

action is PIER 36. PIER 36 references all pertinent previous reports and studies and is hereby incorporated by reference.

This TIER addresses project-specific design information and environmental analysis not discussed in detail in the PIER. Additional TIER(s) will be developed to address the specific details of the programmatic features contained in the mitigation plan set forth in the PIER 36 Decision Record.

1.4 INTEGRATION WITH OTHER INDIVIDUAL ENVIRONMENTAL REPORTS

The CEMVN has prepared a Final Comprehensive Environmental Document (CED), Phase I, dated May 22, 2013. The CED, Phase I described the cumulative impacts of the HSDRRS construction completed by July 2011 and incorporated information from IERs and supplemental IERs completed by November 15, 2010. The IERs completed after November 15, 2010, and HSDRRS features constructed after July 2011 will be described in a future phase of the CED. Once sufficient information is available concerning the cumulative impacts of the HSDRRS, including the HSDRRS features and the IERs not addressed in CED, Phase I, a future final phase of the CED would be published for public comment, after which, in accordance with the Emergency Alternative Arrangements, the District Commander will issue a CED Decision Record.

1.5 PUBLIC CONCERNS

The foremost public concern is reducing risk of hurricane, storm, and flood damage for businesses and residences, and enhancing public safety during major storm events in the New Orleans metropolitan area. Throughout the Lake Pontchartrain basin, the public has expressed concern that sufficient funding be allocated for the HSDRRS mitigation efforts and that the HSDRRS mitigation is completed in a timely manner.

1.6 DATA GAPS AND UNCERTAINTIES

At the time of submission of this report coordination is still ongoing with Federally-recognized Indian tribes and local, state and Federal agencies regarding the proposed action. Prior to a decision on the proposed action evaluated in this document, all relevant coordination will be completed. At that point no known data gaps should exist. All marsh restoration projects contain certain inherent uncertainties. Those uncertainties and accompanying contingencies are further discussed in the project specific monitoring and adaptive management plans which will be completed prior to finalization of this document. The drafts of these plans are included as appendices to this report.

2. ALTERNATIVES

2.1 ALTERNATIVES DEVELOPMENT AND PRELIMINARY SCREENING CRITERIA

NEPA requires that in analyzing alternatives to a proposed action a Federal agency consider an alternative of “No Action.” That alternative will be evaluated in this document. Multiple alternative projects to meet the requirements of mitigation for fresh

and intermediate marsh impacts were evaluated in the PIER 36. The Milton Island project performed better than all other projects for this habitat type under the Risk and Reliability, Cost Effectiveness and Other Cost Considerations criteria, and performed as well as most under the Time criterion. Therefore the Milton Island project is the proposed action.

2.2 DESCRIPTION OF THE ALTERNATIVES

Descriptions of the alternatives considered to meet the fresh and intermediate marsh mitigation requirements can be found in detail in PIER 36. Fresh and intermediate marsh is combined together for mitigation purposes because the ecological functions of the two marsh types are very similar and the Wetland Value Assessment model for both marsh types is nearly identical. Briefly, six alternatives for mitigating impacts to fresh and intermediate marsh were considered in the PIER. All six alternatives were similar in nature; all would dredge material from the bottoms of nearby lakes and pump the material via hydraulic cutterhead dredge to shallow open water areas to restore marshes. Five of the projects (Bayou Des Mats, Fritchie, Big Branch, LaBranche, and Milton) would have borrowed fill material from the bottom of Lake Pontchartrain, whereas the Caernarvon project would have borrowed material from the bottom of Lake Lery on the border between St. Bernard and Plaquemines Parishes. The Milton Island project was determined to be the most cost-effective of these projects and performed better in comparisons of other selection criteria and therefore was selected for implementation.

2.3 PROPOSED ACTION

This intermediate marsh restoration project is located near Madisonville, Louisiana on the north shore of Lake Pontchartrain, west of the Causeway Bridge. The proposed marsh creation site is located in a shallow lake immediately adjacent to Lake Pontchartrain that was previously separated from Lake Pontchartrain. Approximately 1,000 feet of the eastern lakeshore-marsh boundary has been breached into the lake, and a shoreline restoration feature is proposed to provide future protection of the proposed marsh feature

In order to ensure that HSDRSS impacts were adequately mitigated, a functional assessment model titled the Wetland Value Assessment Model (WVA) was utilized to predict the Average Annual Habitat Units (AAHUs) lost from the project impact against the AAHUs generated by the proposed mitigation. The proposed intermediate marsh restoration project would encompass 152 acres, not including the 115-acre borrow source for fill material in Lake Pontchartrain. Within the 152-acre project area, 7 acres are existing dikes partially surrounding the perimeter and 2 acres are where a shoreline protection feature is proposed. The remaining 143 acres are currently shallow open water that would be filled with dredged material to develop into marsh. Up to approximately 15 acres of interior borrow ditches would be excavated to provide material to build and improve dikes to contain the dredged material. Only about 4.5 acres of the 15 acres of borrow ditches are expected to become marsh, leaving about 10.5 acres un-vegetated. Therefore, the calculated amount of marsh that would be developed is 132.5 acres.

The proposed intermediate marsh restoration project would provide the required 45.7 AAHUs of mitigation credit through restoration of approximately 129 acres of

intermediate marsh within a 152-acre project area. As designed, the project has been calculated to provide 48.2 AAHUs, or approximately 5% more AAHUs than required, which is considered to be within the margin of error for the analysis.

The project consists of dredging material from the bottom of Lake Pontchartrain beginning about 2,000 feet from the shoreline. A hydraulic cutterhead dredge would be used to remove the material and pump the material via a pipeline to the proposed marsh creation site. Initial elevation for dredge fill would be to approximate elevation +2.25 feet NAVD88, to ultimately result in a target marsh elevation of between +1.5 and +1.0 feet NAVD88. Total perimeter retention would be required to retain dredged material and to allow for vertical accretion. Existing retention features exist along the east, west, and south perimeters of the project footprint, except for a 1,000 foot reach of lake shoreline which would require restoration efforts as described at the end of this section. Rehabilitation of these existing dikes would be accomplished as necessary to retain the dredge material slurry. Approximately 5,600 linear feet of new retention dike would be required along the northern limit of the project footprint. The dike would be built with borrow material obtained within the marsh creation footprint to an elevation +4.5 feet NAVD88 and with a 5-foot crown width, to provide two feet of freeboard during the dredged material pumping operation. Plugs would be left in the borrow ditch at 1,000-foot intervals to minimize water flow and material loss during pumping operations. Spill boxes and/or weirs would be constructed at locations along the northern and western retention dikes as necessary to allow for effluent water release from within the marsh creation area for approximately one year after construction, when the perimeter dikes are breached and degraded. If deemed necessary by the construction contractor, a low-level interior weir or baffle dikes would be constructed to assist in vertical stacking of dredged material. The dike along the north side of the marsh creation area would be degraded approximately one year after project construction, upon settlement and dewatering of the created marsh platform. The existing western dike would be gapped approximately one year after project construction to allow interaction with the existing marsh and scrub/shrub wetlands to the west of the project area. The gaps would be spaced with care being taken to locate gaps at existing natural bayous, canals, or other openings. The gaps would require a 25-foot bottom at approximately elevation +0.0 NAVD88 (lower limit of existing nearby marsh platform) to assure water interchange with the existing marsh. Two to three gaps would be placed in the eastern dike to allow water exchange with the existing canal located to the east of the project area. The southern dike would remain to provide protection from Lake Pontchartrain waves and water intrusion.

The proposed marsh restoration layout would result in an open water area immediately north and adjacent to the marsh footprint. The entire northern retention dike would be degraded to marsh elevation, allowing unimpeded access for fish and wildlife between the open water and created marsh platform. The degraded material may be disposed in the original borrow ditch if settlement allows, or cast into open water immediately outside of the project footprint. Construction of trenasses (small ditches) is not proposed within the created marsh footprint. It is anticipated that natural sloughs and/or access corridors would develop over the project life.

The marsh footprint would be planted upon satisfactory settlement and dewatering of the dredged material, approximately 1 year after initial construction. Plugs of appropriate marsh vegetation would be planted over the marsh restoration acreage on 7-foot centers. The planting contractor would use the lake side access corridor to the site or potentially use the existing canal along the eastern border. No additional staging areas are envisioned. As project access is restricted to Lake Pontchartrain, all required storage and staging would likely be accomplished on floating vessels.

The southern limit of the proposed marsh creation footprint is bounded by the Lake Pontchartrain shoreline. Aerial photography confirmed by a site visit shows that this shoreline has breached, and lake waters are free to enter and exit the interior shallow water and remnant marsh. Approximately 1,000 feet of shoreline restoration is proposed to reestablish the shoreline. The shoreline restoration feature may need to be longer than 1,000 feet if the shoreline erodes appreciably before the construction contract is awarded. The shoreline repair would be an earthen dike feature, with an approximate crown width of 25 feet to match existing shoreline elevations to the east and west. Material to rebuild the shoreline would be obtained by dredging on both the lake-side and marsh side of the alignment. An earthen-filled bag system, which would accommodate planting of shoreline vegetation, would be constructed on the lake-side of the shoreline dike to minimize erosion.

The borrow plan is to obtain material from Lake Pontchartrain, requiring a buffer of 2,000 feet between the existing shoreline and the borrow area limit. Marsh restoration would require borrow of approximately 1,000,000 cubic yards of material. A primary borrow site of 60 acres would accommodate this requirement. To assure adequate borrow material is available, a 55-acre secondary borrow pit adjacent to the primary area is proposed to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or undocumented cultural resources. Borrow excavation would not be allowed greater than 10 feet below the existing lake bottom, which ranges from 9 to 10 feet in depth, except that a tolerance of 1-foot below this target elevation would be allowed to account for inaccuracies in the dredging process. Existing electrical transmission lines are located in Lake Pontchartrain, south of the proposed borrow site. A minimum buffer of 800 feet would be required between the borrow site footprint and the transmission line alignment. A pipeline corridor has been designated from the borrow source to the shoreline, with no allowances for excavation. The dredge pipeline will be floated and or submerged within this corridor, and then the dredge pipe would be laid across the shoreline and into the marsh creation area. The area of shoreline disturbed by this pipeline access effort will be repaired upon completion of the dredging operation. The pipeline would cross the existing lakeshore approximately at the east/west midpoint of the marsh polygon. A second access corridor with allowable flotation excavation would be used to offload and on-load equipment as necessary, and transport personnel to and from the worksite. This corridor is located at the approximate mid-point of the shoreline restoration reach of work. The contractor would be instructed to minimize usage and damage within the access corridor(s), by using existing waterways for daily transportation of supplies and personnel where possible.

2.4 ALTERNATIVES TO THE PROPOSED ACTION

Alternatives to the proposed action were considered in detail in PIER 36. This TIER will address only the No Action alternative and the Proposed Action. All other alternatives were addressed and eliminated from consideration in PIER 36. Under the no action alternative, environmental impacts to fresh and intermediate marsh caused by construction of the HSDRRS would go unmitigated. Failure by the USACE to adequately mitigate for those impacts would violate Federal laws, USACE regulations and policy, and lead to a net loss of environmental functions and values.

2.5 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

NEPA requires that in analyzing alternatives to a proposed action, a Federal agency consider an alternative of “No Action”. Typically the No Action alternative evaluates not implementing any of the alternatives and represents the future without-project condition against which alternatives considered in detail are compared. However, because compensatory mitigation for unavoidable impacts is required by law (e.g. Clean Water Act and the Water Resources Development Acts of 1986 and 2007), the No Action alternative is not considered a reasonable or legally viable alternative. Under the no action alternative, the Pontchartrain Basin would continue a trend of land loss caused by both natural factors such as subsidence, erosion, tropical storms and sea level rise, and human factors such as flood risk reduction projects, canal dredging, development, interruption of accretion processes, and oil and gas exploration. The No Action alternative would not provide for the compensatory mitigation of unavoidable impacts from the construction of the HSDRRS.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1. ENVIRONMENTAL SETTING

The Lake Pontchartrain and Vicinity HSDRRS mitigation planning basin is bounded to the north by Interstate 12 from the Louisiana/Mississippi state line to the Mississippi River at Baton Rouge. From Baton Rouge, the boundary then proceeds south utilizing the centerline of the Mississippi River. The southern boundary is situated to exclude the barrier islands since the HSDRRS work did not impact the barrier islands.

The Milton Island project area is located near the middle of the HSDRRS mitigation planning basin along the northern shoreline of Lake Pontchartrain. The lake is slightly brackish, with a silty to sandy bottom, and up to about 15 feet deep. Specifically, the project area consisting of the borrow site and the marsh restoration site are located along the northern shoreline of Lake Pontchartrain with existing water depths of approximately nine feet and two feet, respectively. Historically, the shorelines of the lake were bordered by cypress/tupelo gum swamps, fresh to intermediate marshes, and bands of bottomland hardwood forests bordering natural drainages and the lake rim in some areas. Currently much of the lake’s southern and northeastern shoreline is composed of urban and suburban development. The lake shoreline near the project area is a mixture of low-

density residential development and undeveloped wetlands, including second-growth swamp and bottomland hardwood forest, scrub/shrub wetlands and fresh to intermediate marshes. The general project area supports a wide variety of fish and wildlife resources, many of which are important to recreational and commercial fishermen and hunters.

3.2. SIGNIFICANT RESOURCES

This section contains a list of the significant resources located in and near the proposed action, and describes in detail those resources that would be impacted, directly or indirectly. Direct impacts are those that are caused by the action taken and occur at the same time and place (40 CFR §1508.8(a)). Indirect impacts are those that are caused by the action and are later in time or further removed in distance, but are still reasonably foreseeable (40 CFR §1508.8(b)). A cumulative impact is defined as the “the impact on the environment which results 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 person undertakes such other actions” (40 CFR §1508.7).

The resources described in this section are those recognized as significant by laws, executive orders, regulations, and other standards of National, state, or regional agencies and organizations; technical or scientific agencies, groups, or individuals; and the general public. Table 1 shows those significant resources found in and near the project area, and notes whether they would be impacted by the proposed alternative.

All resources that would not be impacted, or only negligibly impacted are not discussed in this document. Aesthetics is not addressed since the project site is only visible from a small number of residences located east of the project area, and because the undeveloped nature of the project area would be preserved. Air quality is not addressed since the only emissions would be from temporary construction equipment, and St. Tammany Parish is in attainment for all monitored air quality parameters. No construction emissions assessment to demonstrate conformity with any air quality program is required. Noise is not addressed due to the undeveloped nature of the project area and the distance between the project area and the closest receptors, which are the residences to the east of the project area.

The potential for impacts to socioeconomic resources including environmental justice were also considered. There are no anticipated impacts to population, housing, or minority or low-income populated areas since the project area and surrounding lands are uninhabited, remote, and privately owned. Environmental justice was determined to not be relevant to this project due to the undeveloped nature of the area. Additionally, the only residences in the vicinity are indicative of high value and are not primarily occupied by minorities. There are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries or in adjacent areas, and therefore no impacts to employment, businesses, industry, public facilities and services, community and regional growth, community cohesion, or property values are anticipated to occur with construction of this project. The proposed project does not require any agricultural or forestry land to be impacted or converted, therefore the requirements of the Farmland Protection Policy Act, Section 1541(b), do not apply. Since most, if not all,

of the construction equipment and personnel would access the project from Lake Pontchartrain, no impacts to land-based transportation would be anticipated.

Table 1
Significant Resources In and Near the Project Area

Significant Resource	Impacted	Not Impacted
Wildlife	X	
Threatened & Endangered Species	X	
Aquatic Resources	X	
Water Quality	X	
Essential Fish Habitat	X	
Recreation	X	
Cultural Resources ¹		X
Air Quality		X
Noise		X
Aesthetics		X
Environmental Justice		X
Socioeconomic Resources		X
HTRW ²		X

¹Although not impacted, cultural resources are addressed in this document to comply with the National Historic Preservation Act.

²Hazardous, Toxic, and Radioactive Waste. Although the area has been determined to have a low probability of containing HTRW, it is assessed in this document to comply with USACE policy.

3.2.1 Wildlife

Existing Conditions. The coastal wetlands in the Lake Pontchartrain Basin provide important and essential fish and wildlife habitats, especially transitional habitat between estuarine and marine environments, used for shelter, nesting, feeding, roosting, cover, nursery, and other life requirements. Emergent fresh and intermediate wetlands are typically used by many different wildlife species, including: Seabirds; wading birds; shorebirds; dabbling and diving ducks; raptors; rails; coots and gallinules; nutria; muskrat; mink; river otter; and raccoon; rabbit; white-tailed deer; and American alligator (LCWCRTF & WCRA, 1999). All of these species are likely to be found in or near the projects area.

Open water habitats such as Lake Pontchartrain provide wintering and multiple use functions for brown pelicans, various seabirds, and other open water residents such as laughing gulls and least terns, and migrants such as lesser scaup and double crested cormorants. (LCWCRTF & WCRA, 1999). Open water areas within the project area provide suitable habitat for many of these species, especially dabbling ducks, coots, and gallinules, which feed primarily on submerged aquatic vegetation.

Bottlenose dolphins are protected under the Marine Mammal Protection Act of 1972, and are found in temperate and tropical waters around the world including Lake

Pontchartrain. The lake appears to have a semi-resident population of dolphins that generally are found in the eastern side of the lake which has the higher salinity level. They likely feed on various estuarine fish and shellfish. It is highly unlikely that dolphins venture into the area proposed for wetland mitigation due to existing very shallow water and submerged aquatic vegetation.

No Action: Without implementation of the proposed action it is likely that the land berm partially separating the interior shallow open water area (proposed mitigation site) from Lake Pontchartrain would continue to erode exposing the interior area to increased wave energies and salinity. Changes to adjacent plant communities and submerged aquatic vegetation would likely take place due to these factors, thus negatively impacting wildlife diversity and utilization of the existing area. Land based animals would be the most directly affected, due to loss of the herbaceous and wooded wetlands around the project area.

Proposed Action: Direct impacts to wildlife would result from the conversion of 143 acres of open water habitat within the project area to herbaceous intertidal wetland (marsh). This conversion would reduce use and function for brown pelicans, seabirds, dabbling and diving ducks, coots, and gallinules and other species that feed in the shallow open water in this location, but it is anticipated they would utilize an adjacent large area of open water habitat to the north of the project site, as well as the improved overall wetland habitat functions provided by the proposed intermediate marsh creation. The establishment of intermediate marsh in the area would provide 132.5 acres of new habitat for terrestrial and semi-aquatic species such as nutria, muskrat, mink, river otter, and raccoon, all of which are commercially important furbearers. Reptiles including the American alligator, western cottonmouth, water snakes, speckled kingsnake, rat snake, and eastern mud turtle are likely to utilize and populate the proposed marsh area. Amphibians expected to colonize the area include the bullfrog, southern leopard frog, and Gulf coast toad. The edges and small areas of open water that would form over time would also provide feeding habitat for common wading bird species including great blue heron, green heron, tricolored heron, great egret, snowy egret, yellow-crowned night-heron, black-crowned night-heron, and white ibis.

Incidentally created mudflats and shallow-water areas would provide habitat for numerous species of shorebirds and seabirds. Shorebirds expected to utilize such areas include American avocet, willet, black-necked stilt, dowitchers, and various species of sandpipers. White pelican, black skimmer, herring gull, laughing gull, and several species of terns would also be expected to forage in and near the project area. Migratory and resident non-game birds, such as the boat-tailed grackle, red-winged blackbird, seaside sparrow, northern harrier, belted kingfisher, and marsh wrens, would also utilize the project area. Gamebirds utilizing the area would include the clapper rail, sora rail, Virginia rail, American coot, common moorhen, and common snipe in addition to resident and migratory waterfowl. The project area is not anticipated to be of sufficient depth to be utilized by bottlenose dolphins nor is sufficient access available to anticipate the use of it by this species. As such, construction of the project should not result in entrapment of this species within the marsh creation site.

Indirectly, species that utilize shallow open water habitats would be displaced by the habitat conversion. However, these species would utilize adjacent shallow open water areas. Many species utilizing the current habitat type would thrive with the additional foraging, cover and resting habitat the project would create. A rise in turbidity at the borrow site could immediately reduce water quality in the area; however those effects would be temporary and would be reduced by movement of the tides. Any bottlenose dolphins or their prey in the borrow area would be free to relocate during construction since the borrow area encompasses only a small section of a 403,200 acre estuarine/brackish lake. This project would prevent an overall loss in the basin of intermediate marsh habitat necessary for many wildlife species. This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin, would prevent the net loss of fresh and intermediate wetland function and overall decline of wildlife species within the basin and would be beneficial in both preserving the species bio-diversity and combating the current trend of conversion of coastal marsh to open water which would be accelerated due to sea level rise.

3.2.3 Threatened and Endangered Species

Existing Conditions: Within St. Tammany Parish there are ten documented animal and one plant species under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS), presently classified as endangered or threatened (Table 2). Designated critical habitat for one of the animal species (Gulf sturgeon) is located within St. Tammany Parish. The USFWS and the NMFS share jurisdictional responsibility for sea turtles and Gulf sturgeon. Other species that were listed on the Endangered Species List but have since then been de-listed because population levels have improved are bald eagle and brown pelican. Currently, American alligators and shovelnose sturgeon are listed as threatened under the Similarity of Appearance clause in the Endangered Species Act (ESA) of 1973, as amended, but are not subject to ESA Section 7 consultation requirements.

Table 2: Threatened and Endangered Species in St. Tammany Parish

Species	Potentially in Project Area	Status	Jurisdiction	
			USFWS	NMFS
West Indian Manatee (<i>Trichechus manatus</i>)	X	E	X	
Red Cockaded Woodpecker (<i>Picoides borealis</i>)		E	X	
Gopher Tortoise (<i>Gopherus polyphemus</i>)		T	X	
Ringed Map Turtle (<i>Graptemys oculifera</i>)		T	X	
Kemp's Ridley Sea Turtle (<i>Lepidochelys kempii</i>)	X	E	X	X

Species	Potentially in Project Area	Status	Jurisdiction	
			USFWS	NFMS
Green Sea Turtle (<i>Chelonia mydas</i>)	X	T	X	X
Loggerhead Sea Turtle (<i>Caretta caretta</i>)	X	T	X	X
Pallid Sturgeon (<i>Scaphirhynchus albus</i>)		E	X	
Gulf Sturgeon (<i>Acipenser oxyrinchus desotoi</i>)	X	T	X	X
Alabama Heelsplitter Mussel (<i>Potamilus inflatus</i>)		T	X	
Louisiana Quillwort (<i>Isoetes louisianensis</i>)		E	X	

Of the listed animal and plant species occurring in St. Tammany Parish, only the West Indian manatee; Gulf sturgeon; and Kemp’s ridley, loggerhead, and green sea turtles are expected to potentially be found in the proposed borrow area in Lake Pontchartrain. It would be highly unlikely that any of the listed species would be found in the proposed marsh mitigation area due to very shallow water. All of these species are typically found in deeper water where they are able to maneuver and forage effectively.

West Indian Manatee

The West Indian manatee is Federally and state-listed as endangered and also is protected under the Marine Mammal Protection Act of 1972, under which it is considered depleted (USFWS 2001). Critical habitat for the manatee has been designated in Florida, but not in Louisiana (USFWS 1977). The manatee is a large gray or brown aquatic mammal that may reach a length of 13 ft and a weight of over 2,200 pounds. It occurs in both freshwater and saltwater habitats within tropical and subtropical regions. The manatee is not a year-round resident in Louisiana, but it may migrate there during warmer months. The primary human-related threats to the manatee include watercraft-related strikes (impacts and/or propeller strikes), crushing and/or entrapment in water control structures (flood gates, navigation locks), and entanglement in fishing gear, such as discarded fishing line or crab traps (USFWS 2007).

There have been 110 reported sightings of manatees in Louisiana since 1975 (LDWF 2005). Sightings in Louisiana, which have been uncommon and sporadic, have included occurrences in Lake Pontchartrain as well as the Amite, Blind, Tchefuncte, and Tickfaw Rivers. Between 1997 and 2000, there were approximately 16 sightings in the Lake Pontchartrain area and a general increase in the number of manatees per sighting (Abadie et al. 2000). Sightings of the manatee in the Lake Pontchartrain basin have increased in recent years, and in late July 2005, 20 to 30 manatees were observed in the lake from the air (Powell and Taylor 2005).

In order to minimize the potential for construction activities to cause adverse impacts to manatees, the following standard manatee protection measures, developed by the USFWS, Lafayette, Louisiana Field Office, would be implemented when activities are proposed that would impact habitat where manatees could occur: All contract personnel associated with the project would be informed of the potential presence of manatees and the need to avoid collisions with manatees. All construction personnel would be responsible for observing water-related activities for the presence of manatees. Temporary signs would be posted prior to and during all construction/dredging activities to remind personnel to be observant for manatees during active construction/dredging operations or within vessel movement zones (i.e., the work area), and at least one sign would be placed where it is visible to the vessel operator. If a manatee is sighted within 100 yards of the active work zone, special operating conditions would be implemented, including: moving equipment would not operate within 50 ft of a manatee; all vessels would operate at no wake/idle speeds within 100 yards of the work area; and siltation barriers, if used, would be re-secured and monitored. Once the manatee has left the 100-yard buffer zone around the work area of its own accord, special operating conditions would no longer be necessary, but careful observations would be resumed. Any manatee sighting would be immediately reported to the U.S. Fish and Wildlife Service (337/291-3100) and the Louisiana Department of Wildlife and Fisheries (LDWF), Natural Heritage Program (225/765-2821).

Gulf Sturgeon

The Gulf sturgeon was listed as threatened throughout its range on September 30, 1991. The Gulf sturgeon is an anadromous fish that migrates from salt water into coastal rivers to spawn and spend the warm summer months. Subadults and adults typically spend the three to four coolest months of the year in estuaries or Gulf waters foraging before migrating into the rivers. This migration typically occurs from mid-February through April. Most adults arrive in the rivers when temperatures reach 70 degrees Fahrenheit and spend eight to nine months each year in the rivers before returning to estuaries or the Gulf of Mexico by the beginning of October.

Critical habitat identifies specific areas that have been designated as essential to the conservation of a listed species. Critical habitat units (areas) designated for the Gulf sturgeon in Louisiana include the eastern half of Lake Pontchartrain east of the Causeway, Lake Catherine, Lake Borgne, out into the Mississippi Sound (USACE 2006a). Studies conducted by the LDWF have shown the presence of Gulf sturgeon in Lake Pontchartrain during the winter and during periods of migration between marine and riverine environments. Most records of Gulf sturgeon from Lake Pontchartrain have been located east of the Causeway, particularly on the eastern north shore. Gulf sturgeon have also been documented west of the causeway, typically near the mouths of small rivers (USFWS and NMFS 2003).

Kemp's Ridley, Loggerhead, and Green Sea Turtles

Sea turtles inhabit tropical and subtropical marine and estuarine waters around the world. Of the seven species in the world, six occur in waters of the U.S., and all are listed as threatened or endangered. The three species potentially occurring in Lake Pontchartrain and Lake Borgne in the vicinity of the mitigation projects have a similar appearance, though they differ in maximum size and coloration. The Kemp's ridley sea turtle is the smallest sea turtle – adults average about 100 pounds with a carapace length of 24 to 28 inches and a shell color that varies from gray in young individuals to olive green in adults. The loggerhead sea turtle is the next largest of these three species – adults average about 250 pounds with a carapace length of 36 inches and a reddish brown shell color. The green sea turtle is the largest of these three species – adults average 300 to 350 pounds with a length of more than 3 feet and a brown coloration (its name comes from its greenish colored fat). The Kemp's Ridley has a carnivorous diet that includes fish, jellyfish, and mollusks. The loggerhead has an omnivorous diet that includes fish, jellyfish, mollusks, crustaceans, and aquatic plants. The green sea turtle has an herbivorous diet of aquatic plants, mainly sea grasses and algae, which is unique among sea turtles. All three species nest on sandy beaches, which are not present near Lake Pontchartrain. The life stages that may occur in Lake Pontchartrain range from older juveniles to adults.

No Action: Without implementation of the proposed action it is likely that the land berm partially separating the interior lake (proposed project area) from Lake Pontchartrain would continue to erode exposing the interior area to increased wave energies and salinity changes. Even with this erosion, no listed species would be expected to utilize the area due to the shallow water depths. The area proposed for borrowing fill material (Lake Pontchartrain), would continue to be available to any of the listed species in the area. The borrow site would not provide feeding habitat for manatees and green sea turtles due to the lack of submerged aquatic vegetation, but they may pass through the area. This area of the lake could provide feeding habitat for Gulf sturgeon although the mud/silt substrate is not to their preference, which is sandy bottom. Kemp's ridley and loggerhead sea turtles may forage in the lake at the borrow site, although available evidence is they very rarely are found in the lake.

Proposed Action: No listed species are expected to be directly impacted within the proposed marsh mitigation area since they would not be expected there due to shallow water depths (typically less than two feet). Still, precautions will be taken during construction to ensure no impacts to listed species. The construction contractor would be required to induce listed species to leave the immediate work area prior to any work regardless of water depth. A bucket (or similar equipment) will be dropped into the water and retrieved empty one time. After the bucket has been dropped and retrieved, a one-minute no work period must be observed. During this no work period, personnel should carefully observe the work area in an effort to visually detect listed species. If species are sighted, no bucket dredging should be initiated until the listed species have left the work area. If the water turbidity makes such visual sighting impossible, work may proceed after the one-minute no work period has elapsed. If more than fifteen minutes elapses with no work, then the empty bucket drop/retrieval process shall be performed again prior to work commencing.

The borrow area could potentially be utilized by manatees, sturgeon and sea turtles. Direct impacts to listed species in the proposed borrow area are unlikely as the site is located outside of designated critical habitat and the construction activities would be of a nature that are not known to directly injure the species. The indirect impacts resulting from the temporary loss of the area as foraging habitat would be insignificant given the small size of the borrow area compared to the overall area of Lake Pontchartrain. The presence of construction-related activity, machinery, and noise would be expected to cause these species to avoid the project area during the construction period. Dredging for borrow material would occur via hydraulic cutterhead dredge. Entrainment of sea turtles is not expected since hydraulic dredges are slow moving and use of them is not known to impact these species. Manatee could potentially be affected by dredging operations, but the impacts would be mitigated by implementation of standard manatee protection measures developed by the USFWS as a method to minimize the likelihood that USACE dredging contracts in coastal Louisiana would adversely affect manatees. These conditions are included in the construction contract specifications for nearly all USACE dredging contracts in coastal Louisiana.

Potential indirect impacts from the proposed action would primarily consist of effects from dredging operations, notably turbidity. However, although the rise in turbidity could immediately reduce water quality in the project area, those effects would be temporary and would be reduced by movement of the tides. Any sea turtles in the area would be free to relocate during construction since the project area encompasses only a small section of Lake Pontchartrain. As such, no impacts to sea turtles are anticipated from temporary minor impacts to water quality. Potential cumulative impacts to the threatened or endangered species that could occur in the vicinity of the project area from construction of the other HSDRRS mitigation projects are minimal.

The USACE has assessed the potential of the proposed action to affect listed species. It has been determined that the proposed action may affect, but is not likely to adversely affect Federally-listed species. This determination, along with supporting documentation, has been transmitted to the USFWS and NMFS under informal consultation procedures for implementing Section 7 of the Endangered Species Act. The USACE will not complete the NEPA process for the proposed action until Section 7 consultation is completed.

3.2.4 Aquatic Resources and Water Quality

Existing Conditions: The NMFS oversees and manages our Nation's domestic fisheries through development and implementation of fishery management plans and actions. The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), first enacted in 1976, amended in 1996, and reauthorized in 2006, is the primary law governing marine fisheries management in United States Federal waters to end overfishing, promote market-based management approaches, improve science, serve a larger role in decision-making, and enhance international cooperation.

The NMFS has determined that Lake Pontchartrain and adjacent wetlands provide nursery and foraging habitats which support varieties of economically important marine fishery species, including striped mullet, Atlantic croaker, Gulf menhaden, spotted and sand sea trout, southern flounder, black drum, and blue crab. Some of these species also serve as prey for other fish species managed under the MSFCMA by the Gulf of Mexico Fishery Management Council (e.g., mackerel, snapper, and grouper) and highly migratory species managed by NMFS (e.g., billfish and shark).

The existing submerged aquatic vegetation and shallow open water within the project area, and adjacent wetlands, provide important estuarine fisheries habitat, including transitional habitat between estuarine and marine environments used by migratory and resident fish, as well as other aquatic organisms for nursery, foraging, spawning, and other life requirements. Historically and currently, the area provides valuable recreational and commercial fishing opportunities a wide variety of finfish and shellfish (Rounsefell, 1964; Penland et al., 2002).

The assemblage of species in the proposed project area is largely dictated by salinity levels and season. During low-salinity periods, species such as Gulf menhaden, blue crab, white shrimp, blue catfish, largemouth bass and striped mullet are present in the project area. During high-salinity periods, more salt-tolerant species such as sand seatrout, spotted seatrout, black drum, red drum, Atlantic croaker, sheepshead, southern flounder, Spanish mackerel, and brown shrimp may move into the project area, especially the borrow area in Lake Pontchartrain. Wetlands throughout the project area also support small resident fishes and shellfish such as least killifish, sheepshead minnow, sailfin molly, grass shrimp and others. Those species are typically found along marsh edges or among submerged aquatic vegetation, and provide forage for a variety of fish and wildlife.

The water quality of the hydrologic unit which this project is in does not fully support one of its designated uses: Fish and Wildlife Propagation. The suspected sources of these impairments include loss of wetlands, littoral/shore area modifications, atmospheric deposition of toxins, and habitat modification. Lake Pontchartrain, the project's borrow source, is considered to fully support its designated uses.

No Action: Without implementation of the proposed action it is likely that the land berm partially separating the interior lake (proposed project area) from Lake Pontchartrain would continue to erode exposing the interior area to increased wave energies, turbidity, loss of aquatic vegetation, and increased salinity levels. Continued loss of submerged aquatic vegetation would lower habitat value for some species of resident species such as grass shrimp and killifishes that provide food for many species of birds. Increased salinity would allow more estuarine species to utilize the proposed marsh mitigation area. The proposed borrow source would likely remain unchanged.

Proposed Action: Approximately 143 acres of open water and mud substrate would be replaced with intermediate marsh, increasing spawning, nursery, forage and cover habitat for fisheries resources over the long term. For approximately 5 years after project

construction the area would be above daily tidal inundation and only partially vegetated, so maximum fisheries benefits would not be realized until after this 5-year period. Turbidity during borrow excavation and fill placement would temporarily impair visual predators and impact filter feeders, but this impact is expected to cease and benthic species rebound once construction is complete. Temporary water quality impacts from turbidity are not anticipated to be substantial enough to cause impairment of the water body's designated uses as defined under the standards of Louisiana Administrative Code, Title 33, Part IX, Chapter 11. Water quality impacts in the fill area would temporarily add to the water quality impairment of this sub-segment, but these impacts would be minimized through best management practices and would diminish to background levels after construction.

Fish access to this area would be extremely limited until the material consolidated and settled to an elevation conducive to that of a natural intermediate marsh. It is expected this "lag" time would be approximately 5 years. Once the success criteria have been achieved, this area would once again serve its traditional functional role in the local ecosystem.

It is probable that crab fishermen sometimes place crab traps within the proposed borrow area just like they do throughout Lake Pontchartrain. Shrimp fishermen may venture into the area either pulling trawls or pushing "skimmer" nets. The fishermen and their gear would be temporarily displaced during project construction, and the borrow area may be less productive for a few months after project construction due to loss of benthic animals from the dredging operation. The depth restriction on the borrow pit, preventing it from being more than 10 feet deeper than adjacent lake bottom, would minimize the chance that the area would suffer from low oxygen conditions. The borrow pit should revert to productive habitat within a few months of project construction. Overall, commercial fisheries in Lake Pontchartrain would not be disrupted by the proposed action.

Although there would be a loss of 143 acres of open water from construction of this project, open water is found in abundance throughout the Lake Pontchartrain Basin. The resulting marsh would provide a cumulative benefit in the form of additional spawning, nursery, forage and cover habitat for important fish species in the basin. Combined with other HSDRRS mitigation efforts, the proposed action would provide a great overall environmental lift with an incidental improvement to water quality within the basin. Implementation of this project would prevent an overall loss in the basin of intermediate marsh habitat. This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the loss of wetlands and combat the current trend of conversion of marsh to open water. There would be an overall loss of open water habitat containing submerged aquatic vegetation in the basin, but no permanent adverse impacts are anticipated because this habitat is prevalent throughout the basin. Direct impacts from the aquatic vegetation loss were factored into the mitigation planning analysis and would be mitigated by the restoration of intermediate marsh in the proposed project area.

3.2.5 Essential Fish Habitat

Existing Conditions: The MSFCMA (50 CFR 600) states that EFH is “those waters and substrate necessary for fish for spawning, breeding or growth to maturity” (16 United States Code [USC] 1802(10); 50 CFR 600.10). The 2005 amendments to the MSFCMA set forth a mandate for the NMFS, regional Fishery Management Councils (FMC), and other Federal agencies to identify and protect EFH of economically important marine and estuarine fish. A provision of the MSFCMA requires that FMCs identify and protect EFH for every species managed by a Fishery Management Plan (FMP) 16 USC 1853. The public places a high value on seafood and recreational and commercial opportunities provided by EFH. Specific categories of EFH include all estuarine waters and substrates (mud, sand, shell, rock, and associated biological communities), subtidal vegetation (seagrasses and algae), and adjacent intertidal vegetation (marshes and mangroves). Table 3 shows the categories of EFH and the managed species that occur in the project area.

Table 3- EFH for the Managed Species Expected in Project Area

Life Stage	Brown Shrimp	White Shrimp	Red Drum
Adults		R	R
Eggs			
Juveniles	C to HA	C to A	C
Larvae			
Spawners			
Relative Abundance: Blank - Not Present A – Abundant R – Rare HA - Highly Abundant C – Common (Variation in abundance due to seasonality) (NMFS, 1998)			
Life Stage	Essential Fish Habitat		
Brown Shrimp - Adults	Silt, sand, muddy sand		
Brown Shrimp - Juveniles	Marsh edge, submerged aquatic vegetation, tidal creeks, inner marsh		
White Shrimp - Adults	Silt, soft mud		
White Shrimp - Juveniles	Marsh edge, submerged aquatic vegetation, marsh ponds, inner marsh, oyster reefs		
Red Drum - Adults	Estuarine mud substrate		
Red Drum - Juveniles	Submerged aquatic vegetation, estuarine mud substrate, marsh/water interface		

The project is located within an area identified as essential fish habitat for postlarval/juvenile brown shrimp; postlarval/juvenile white shrimp; and postlarval/juvenile and adult red drum. The 2005 generic amendment of the FMP for the Gulf of Mexico, prepared by the Gulf of Mexico FMC, identifies EFH in the project area to be estuarine intertidal wetlands, submerged aquatic vegetation, estuarine water column, and mud substrates.

No Action: Without implementation of the proposed action it is likely that the land berm partially separating the proposed marsh mitigation area from Lake Pontchartrain would continue to erode exposing the interior area to increased wave energies and salinity changes. Loss of adjacent intertidal wetlands and submerged aquatic vegetation would likely take place thus adversely impacting these essential fish habitats. These habitats would likely convert to shallow, mud bottom estuarine, which is another category of essential fish habitat. Mud bottom estuarine habitat is more common in the Lake Pontchartrain Basin and generally considered to be less valuable habitat for critical early life stages of these managed species.

Proposed Action: The existing essential fish habitat at the marsh restoration site includes estuarine water bottom, estuarine water column, and submerged aquatic vegetation. These habitats would be largely converted to another type of essential fish habitat – estuarine intertidal herbaceous wetlands (marsh). Benthic resources within the borrow site would be lost until they can re-colonize the borrow area which should take no more than a year or so following project construction. The borrow area would not be excavated more than 10 feet below the adjacent lake bottom thereby minimizing the possibility of anoxic conditions forming. Fisheries access to the marsh mitigation area would be extremely limited during the initial 3-5 years of the project life while the pumped-in sediments are dewatering and subsiding. This area was once a functional marsh system that provided nursery and feeding habitat to local fisheries. Over time, the proposed action would result in a net gain of functional marsh and associated shallow water habitat thereby accomplishing the required level of mitigation and offsetting adverse impacts to certain categories of EFH. The adverse impacts to essential fish habitat that would result from the proposed action may affect, but should not adversely affect, managed species considering the small acreage involved relative to Lake Pontchartrain, plus the project would provide long-term benefit to the managed species by providing intertidal wetlands, a valuable type of essential fish habitat.

Indirect impacts to managed species include increased turbidity and disturbance of Lake Pontchartrain in the vicinity of the borrow area. These species may be temporarily displaced. Cumulative impacts to fresh and intermediate marsh EFH resulting from construction of the LPV HSDRRS were considered and found to be adequately offset by the resulting increase in habitat quality from the proposed action. Implementation of the proposed action would result in sufficient EFH habitat improvement to offset adverse impacts to fresh and intermediate marsh EFH and open water designated as essential fish habitat from the LPV HSDRRS construction projects as well as the construction of this proposed mitigation project. The other LPV HSDRRS mitigation projects recommended in PIER 36 were evaluated and found to have inconsequential cumulative impacts to EFH

as the overall objective of the LPV HSDRRS mitigation is to improve EFH within the Lake Pontchartrain Basin. No additional Corps activities that would impact similar open water EFH were identified in the project vicinity.

3.2.6. Cultural Resources

Existing Conditions: Few surveys for cultural resources have been carried out in close proximity to the proposed project area. In 1982, a Level I cultural resources survey of the proposed 300-acre Port Louis Tract was conducted for a proposed residential development (Gagliano et al. 1982, with addendum by Thigpen and Pearson 1983). In the summer of 2000, a Phase I terrestrial survey of the proposed Entergy Little Gypsy to Madisonville project area was conducted (Lee et al. 2000). Portions of this survey were carried out along the Lake Pontchartrain shoreline and southern boundary of the proposed marsh creation area. In 2012, cultural resources surveys for a similar project were carried out in the vicinity of the currently proposed project, but further consideration was not given to the project in 2012 and the results of the surveys were never published. Previous surveys have identified four cultural resources within one mile of the proposed project area.

The CEMVN elected to partially fulfill its obligations under Section 106 of the National Historic Preservation Act of 1966, as amended, through the execution and implementation of a Programmatic Agreement for the HSDRRS, Lake Pontchartrain and Vicinity and West Bank and Vicinity mitigation projects. The Programmatic Agreement was developed in consultation with the Advisory Council on Historic Preservation, the Louisiana State Historic Preservation Officer (SHPO), Federally recognized Indian Tribes, and other identified interested parties. The Programmatic Agreement was executed on June 18, 2013. The Programmatic Agreement is available at the nolaenvironmental.gov website (click on Projects, Mitigation, PIER 36). Pursuant to that agreement, CEMVN is assessing the Milton Island mitigation project for its effect on historic properties and will coordinate its effect determination with the Louisiana SHPO and signatory Indian Tribes.

No Action: Without implementation of the proposed action it is likely that the shoreline partially separating the proposed marsh mitigation area from Lake Pontchartrain would continue to erode exposing the interior area to increased wave energies and erosion. Cultural resources that are present would continue to be impacted and eventually lost to erosion and conversion of existing land areas to open water.

Proposed Action: Existing and as yet undiscovered cultural resources could be adversely impacted by activities associated with the proposed project such as retention dike construction, gapping along natural bayous, degrading of dikes, staging area location, access corridor use, shoreline restoration, and other activities. Existing and as yet undiscovered cultural resources could be adversely impacted by activities associated with the proposed project such as retention dike construction, gapping along natural bayous, degrading of dikes, staging area location, access corridor use, shoreline restoration, and other activities. Implementation of the proposed action to restore vegetated marsh could

help to prevent or slow future erosion, and over time would contribute to the protection and preservation of cultural resources that may exist in the project area.

Consultation with the SHPO and Federally recognized Indian Tribes pursuant to Section 106 of the National Historic Preservation Act and in accordance with the Programmatic Agreement as executed on June 18, 2013 is ongoing. A draft report documenting the findings of the cultural resources surveys will be provided to the CEMVN in April 2014. Once it is received and reviewed by the CEMVN, this report and CEMVN's findings regarding the need for any additional investigations and the project's potential effect on historic properties will be provided to the SHPO and participating Indian Tribes for their review and comment. Consultation would be completed prior to the signing and issuance of the Decision Document. Any cultural resources surveys determined to be required would be completed prior to the start of construction activities for the proposed action, and the results of surveys would be coordinated with the State Historic Preservation Officer and Federally-recognized Indian Tribes for review in accordance with the stipulations of the Programmatic Agreement.

3.2.6 Recreational Resources

Existing Conditions: A variety of recreation areas occur in the Lake Pontchartrain Basin, including two National Wildlife Refuges, four Louisiana Wildlife Management Areas, four Louisiana State Parks, and one State Historic Site. Other recreational features are provided by parishes and communities that attract visitors to a variety of heritage and cultural festivals, historical sites, parks offering opportunities for passive and active recreation that include tennis courts, soccer and softball fields, swimming pools, and golf courses. There are no public recreation areas in the immediate vicinity of the proposed project. The 27,500- acre, state-managed Joyce Wildlife Management Area extends to within about two miles of the western edge of the proposed project area. This management area is used primarily by fishermen and hunters to pursue freshwater fish (bass, catfish, and bream), alligator, waterfowl, whitetail deer, and small game. The proposed project area is privately owned. Although not documented, the proposed project area and areas nearby are probably hunted for waterfowl, deer and possibly small game (rabbits and squirrel). The secluded nature of the area and the shallow open water with submerged aquatic vegetation could make waterfowl hunting a successful venture. There is probably a limited amount of recreational fishing in the area as well with freshwater species pursued in and near the proposed marsh mitigation area and estuarine species pursued along the lake shoreline. The proposed borrow area in Lake Pontchartrain and nearby areas of the lake are not likely fished due to the lack of any structure on the lake bottom in this area.

No Action: The land berm partially separating the proposed marsh mitigation area from Lake Pontchartrain would continue to erode exposing the interior area to increased wave energies and salinity changes. Changes to adjacent plant communities and submerged aquatic vegetation would likely take place reducing its utilization by waterfowl, and the likelihood that hunters would try to hunt them. Fisheries usage would likely decrease as

well with a related decrease in recreational fishing success due to continued encroachment of the lake into the project area due to erosion.

Proposed Action: The project area would be acquired in fee to preserve the benefits of the proposed mitigation in perpetuity. A non-Federal entity would be responsible for managing the area. A plan for managing the area has not been developed. If the non-Federal managing entity chooses, and the USACE and the NFS are in agreement, public use would be allowed as long as it does not reduce the mitigation aspects of the area. The likelihood of public access to the mitigation area is impossible to determine at this time. Potential recreational opportunities in the marsh mitigation area would include hunting for deer, wild hogs, rabbit, and possibly waterfowl. Fishing opportunities would be limited by the small amount of open water expected to form within the area. The proposed action would indirectly benefit recreational fishing opportunities through habitat improvement for the small juveniles of sought-after species that would eventually mature into harvestable size fish. The HSDRRS restoration projects within the Lake Pontchartrain Basin would have a positive cumulative effect on recreation by improving habitat for species sought after by recreational fishermen.

3.3. HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW)

In accordance with Engineering Regulation 1165-2-132, the potential to encounter HTRW in the project area was investigated. Generally, HTRW investigations are focused on land areas. Any contamination occurring under water is addressed through application of regulations promulgated under the Clean Water Act, primarily Section 401 and 404. Since the proposed borrow area is all open water and the marsh mitigation area is nearly all open water, except for the perimeter, Clean Water Act regulations are applicable, whereas the USACE HTRW regulations are only marginally applicable. However, the proposed borrow and marsh mitigation areas were nevertheless subjected to investigations for the potential presence of HTRW.

The proposed mitigation site was surveyed via aerial photographs, topographic maps, field investigation, and database searches. The proposed site has not been developed in recent historic times based on a time-series of aerial photography. No recognized environmental concerns were found or identified within or near the proposed mitigation area. The database searches failed to identify any pipelines crossing the proposed mitigation area or borrow area. Likewise, no oil or gas well or waste pits have been identified. In conclusion, there would be a low probability of encountering HTRW in the proposed mitigation area and borrow area.

3.4. CUMULATIVE IMPACTS

NEPA requires Federal agencies to consider not only the direct and indirect impacts of a proposed action, but also the cumulative impacts of the action. A cumulative impact is defined as the “the impact on the environment which results 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 person undertakes such other actions (40 CFR §1508.7).” Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Cumulative impacts of the proposed action relative to specific resources were discussed in the evaluation of effects to individual resources in Section 3. Those impacts were determined to be individually and cumulatively insignificant. The proposed action is one part of a larger mitigation plan addressed in PIER 36. PIER 36 and the Final Comprehensive Environmental Document, Phase I, Greater New Orleans Hurricane and Storm Damage Risk Reduction System (USACE 2013) both included detailed cumulative impact analysis and are incorporated herein by reference.

4. COORDINATION AND CONSULTATION

4.1. PUBLIC INVOLVEMENT

Extensive public involvement has been sought in planning the mitigation for HSDRRS impacts beginning with a public notice of the NEPA Alternative Arrangements published in the Federal Register on March 13, 2007 (Federal Register Volume 72, No. 48) which included a commitment to analyze alternatives to determine appropriate mitigation. The notice is also available on the website www.nolaenvironmental.gov.

Mitigation-specific public involvement was sought in preparing PIER 36 from which this document is tiered. The details of that specific coordination are specified in PIER 36 and incorporated herein by reference.

This draft TIER will be distributed for a 30-day public review and comment period. A public meeting specific to the proposed action will be held if requested during the review period. Any comments received during this public meeting will be considered part of official record. After the 30-day comment period, and public meeting if requested, the CEMVN District Commander will review all comments received during the review period and make a determination if they rise to the level of being substantive in nature. If comments are not considered to be substantive, the District Commander will make a decision on the proposed action. This decision will be documented in a TIER Decision Record. If a comment(s) is determined to be substantive in nature, an addendum to the TIER will be prepared and published for an additional 30-day public review and comment period. After the expiration of the public comment period the District Commander will make a decision on the proposed action. The decision will be documented in a TIER Decision Record.

4.2. AGENCY COORDINATION

Preparation of this TIER will be coordinated with appropriate Congressional, Federal, state, and local interests, as well as environmental groups and other interested parties. An interagency environmental team was established in which Federal and state agency staff played an integral part in the project planning and alternative analysis phases of the HSDRRS mitigation planning (members of this team are listed in appendix C). This interagency environmental team was integrated with the CEMVN project delivery team. A subset of the interagency environmental team participated in the more detailed development and analysis of the Milton Island Mitigation project that continued after preparation of PIER 36 and during preparation of this document.

The following agencies, as well as other interested parties, are receiving copies of this draft TIER:

U.S. Department of the Interior, Fish and Wildlife Service
U.S. Department of the Interior, National Park Service
U.S. Environmental Protection Agency, Region VI
U.S. Department of Commerce, NOAA National Marine Fisheries Service
U.S. Natural Resources Conservation Service
Louisiana Coastal Protection and Restoration Authority Board
Louisiana Governor's Executive Assistant for Coastal Activities
Louisiana Department of Wildlife and Fisheries
Louisiana Department of Natural Resources, Coastal Management Division
Louisiana Department of Natural Resources, Coastal Restoration Division
Louisiana Department of Environmental Quality
Louisiana State Historic Preservation Officer

The USFWS is reviewing the proposed action to see if it would affect any threatened and endangered species, or critical habitat, under its jurisdiction. A determination of may effect, but not likely to adversely affect listed species has been submitted to the USFWS for their consideration.

The NMFS is reviewing the proposed action to see if it would affect any threatened or endangered species, or critical habitat, under its jurisdiction. A determination of may effect, but not likely to adversely affect listed species has been submitted to the NMFS for their consideration.

The Louisiana Department of Natural Resources (LDNR) is reviewing the proposed action for consistency with the Louisiana Coastal Resource Program. The proposed action was found to be consistent with the LCRP by the CEMVN, with a determination forwarded to LDNR for their consideration.

The Louisiana Department of Environmental Quality (LDEQ) is reviewing the proposed action. An application for Water Quality Certification has been prepared and submitted to LDEQ for their consideration.

Section 106 of the National Historic Preservation Act, as amended, requires consultation with the SHPO and Federally recognized Indian tribes. The CEMVN elected to partially fulfill its obligations under Section 106 through the execution and implementation of a Programmatic Agreement with the SHPO and signatory Indian Tribes. CEMVN will comply with the provisions of that agreement. The SHPO is reviewing the proposed action along with the CEMVN determination that it would not adversely affect any cultural resources. Eleven Federally- recognized Indian tribes that have an interest in the region are being given the opportunity to review the proposed action.

A final Fish and Wildlife Coordination Act Report (CAR) for PIER 36 was provided by the USFWS on October 28, 2013. The final CAR concluded that the USFWS supports the current constructible features and recognizes that additional Tiered IERs will further address individual mitigation features that were still in early design phases. The USFWS has provided a draft CAR for the proposed Milton Island Restoration project which is included in Appendix B. The CAR states that the USFWS supports the USACE's plan to mitigate impacts to fish and wildlife resources associated with the HSDRRS and believes that the recommendations provided in their October 28, 2013, CAR addressing PIER 36 continue to remain valid and should be incorporated into future project planning and implementation. No project-specific position or recommendation is included. The NMFS provided comments on PIER 36 by letter dated September 24, 2013. The NMFS provided a variety of comments related to potential impacts to essential fish habitats and the need to scale the final mitigation projects based on advanced engineering and design to ensure no net loss of wetlands and corresponding functions. The NMFS expressed concern that the WVA analysis may not be addressing all of the potential impacts to aquatic resources. The USFWS, NMFS, and the CEMVN environmental staffs worked together to assess the potential mitigation benefits of the Milton Island mitigation project to assure that the proposed action is capable of fully and adequately compensating for the adverse impacts to fresh and intermediate marsh as a result of constructing the Lake Pontchartrain and Vicinity component of the HSDRRS.

4.3. COMPLIANCE WITH ENVIRONMENTAL LAWS, REGULATIONS, AND GUIDANCE

Construction of the proposed action would not commence until the proposed action achieves environmental compliance with all applicable laws and regulations, as described below.

Environmental compliance for the proposed action will be achieved upon coordination of this TIER with appropriate agencies, organizations, and individuals for their review and comments; USFWS and NMFS confirmation that the proposed action would not be likely to adversely affect any threatened or endangered species or their critical habitats; LDNR concurrence with the determination that the proposed action is consistent, to the maximum extent practicable, with the Louisiana Coastal Resources Program; SHPO concurrence with the determination that the proposed action would not adversely affect cultural resources; receipt and acceptance or resolution of all Fish and Wildlife Coordination Act recommendations; and receipt and acceptance or resolution of all LDEQ comments on the water quality (including Section 401 Certification). The correspondence documenting compliance will be included in the final TIER, Appendix B. Other specific environmental requirements were addressed in PIER 36 and require no further consideration in this TIER. A Section 404 (b)(1) evaluation is currently being developed. A public notice will be distributed to solicit public and agency input into development of that evaluation. A decision document would not be finalized until completion of all required coordination and the Section 404 (b)(1) evaluation.

An effective monitoring program is required by the Water Resources Development Act of 2007, Section 2036, to determine if the project outcomes are consistent with the

identified success criteria. A monitoring plan including general success criteria, monitoring requirements, and planting guidelines for the proposed mitigation project has been developed and is included as Appendix E.

The purpose of adaptive management activities in the life-cycle of the project is to address ecological and other uncertainties that could prevent successful implementation of a project. Adaptive management also establishes a framework for decision making that utilizes monitoring results and other information, as it becomes available, to update project knowledge and adjust management/mitigation actions. Hence, early implementation of adaptive management and monitoring allows for a project that can succeed under a wide range of conditions and can be adjusted as necessary. Furthermore, careful monitoring of project outcomes both advances scientific understanding and helps adjust operations changes as part of an iterative learning process. An adaptive management plan has been developed and is included as Appendix F.

A "habitat-based methodology" in the form of the wetland value assessment (WVA) model was used to assess impacts from construction of the HSDRRS work and future benefits to be obtained through the compensatory mitigation projects. The WVA model computes the difference in the habitat value over the period of analysis between the future with project and future without project (no-action) conditions. The difference is expressed as net average annual habitat units (AAHUs). The same version of the model was used to calculate both the impacts from construction the HSDRRS work and future benefits to be obtained through the implementation of the proposed mitigation. The WVA model analysis indicated a need for 45.7 AAHUs to compensate for impacts to fresh and intermediate marsh resulting from the construction of the Lake Pontchartrain and Vicinity portion component of the HSDRRS. The proposed action would result in the creation of the same number of AAHUs. The detailed assumptions and project specific data utilized in application of the WVA model to the Milton Island mitigation project can be found in Appendix E.

5. CONCLUSION

The proposed action has been assessed for its potential impacts to wildlife, threatened and endangered species, fisheries, aquatic resources, water quality, essential fish habitat, cultural resources, and recreation, and for the potential of the project to encounter HTRW. This assessment has not identified any potential significant environmental effects or impacts from the proposed action. The proposed action would provide the 45.7 AAHUs of mitigation required for fresh and intermediate marsh impacts of the Lake Pontchartrain and Vicinity HSDRRS through restoration of fresh and intermediate marsh within a 152-acre project area. The CEMVN has determined that the proposed action would adequately mitigate for specific impacts of the HSDRRS.

6. PREPARERS

This TIER was prepared by Howard Ladner, Biologist and Richard Boe, Supervisory Environmental Resources Specialist. Eric Williams, Archeologist, prepared the Cultural Resources sections. Patrick Erwin, Project Manager, provided support. The address of

the preparers is: U.S. Army Corps of Engineers, Regional Planning and Environment Division, CEMVN-RPEDS; P.O. Box 60267; New Orleans, Louisiana 70160-0267.

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APPENDIX A

Public Comment and Response

(Reserved for Final TIER)

APPENDIX B

INTERAGENCY CORRESPONDENCE



United States Department of the Interior



FISH AND WILDLIFE SERVICE

646 Cajundome Blvd.

Suite 400

Lafayette, Louisiana 70506

March 25, 2014

Colonel Richard L. Hansen
District Commander
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Colonel Hansen:

Please reference Programmatic Individual Environmental Report (PIER #36) and forthcoming Tiered Individual Environmental Reports (TIER) addressing the final array of mitigation alternatives. Those reports are prepared under the approval of the Council on Environmental Quality (CEQ) and will partially fulfill the U.S. Army Corps of Engineers' (Corps) compliance with the National Environmental Policy Act of 1969 (NEPA) (83 Stat. 852, as amended; 42 U.S.C. 4321- 4347). Individual Environmental Reports are CEQ-approved alternative arrangements for compliance with NEPA that would allow expedited implementation of improved hurricane protection measures in Louisiana. Work proposed under this TIER would mitigate impacts to fresh and intermediate marsh habitats resulting from the improved hurricane protection measures to the Lake Pontchartrain and Vicinity (LPV) project and would be conducted under the authority of Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4). That law authorized the Corps to upgrade two existing hurricane protection projects (i.e., Westbank and Vicinity of New Orleans and Lake Pontchartrain and Vicinity) in the Greater New Orleans area in southeast Louisiana.

The Fish and Wildlife Service (Service) provides this report to assist your staff in fulfilling mitigation needs associated with those efforts in accordance with the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). This report does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the FWCA. Copies of this draft report will be provided to the National Marine Fisheries Service (NMFS) and the Louisiana Department of Wildlife and Fisheries and their comments will be incorporated into this final report. Furthermore, additional comments are provided in accordance with provisions of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.), the Bald and Golden Eagle Protection Act (BGEPA) (54 Stat. 250, as amended, 16 U.S.C. 668a-d), and the Migratory Bird Treaty Act (MBTA) (40 Stat. 755, as amended; 16 U.S.C. 703 et seq.).

Through the Corps' alternative evaluation process (AEP) the Milton Island Intermediate Marsh Restoration (non-refuge impacts) project was selected as a Tentatively Selected Plan (TSP) to mitigate impacts to fresh and intermediate marsh. This report is provided to assist in fulfilling

those mitigation needs. This draft report incorporates and supplements our October 28, 2013, FWCA Report provided during the development of the PIER#36, as well as our November 26, 2007, Draft FWCA Report that provided twenty-six programmatic recommendations for the Hurricane and Storm Damage Risk Reduction System (HSDRRS) authorized work to help avoid and minimize impacts to fisheries, wetlands, forested habitats, migratory birds, and public lands. This report also incorporates, and supplements the numerous FWCA Reports provided for the work authorized under 4th and 5th Supplemental for the LPV Hurricane Protection Project only (i.e., IERS 1-11, including supplemental documents). Those reports contain a thorough discussion of the significant fish and wildlife resources (including those habitats) that occur within the study area. For brevity, that discussion is incorporated by reference herein but the following information is provided to update the previously mentioned reports and provide specific information and recommendations.

Project Impacts & Mitigation

As a result of HSDRRS impacts to approximately 100 acres and 45.7 average annual habitat units (AAHUs, based on 95-100% design of levee impacts) of intermediate and fresh marsh, mitigation plans are jointly being developed by the Corps, the Service and the NMFS. The current plan consists of acquisition and management of a 152-acre area near Madisonville in St. Tammany Parish, Louisiana. The site is located within an area that was converted from a marsh and swamp complex into a mechanically-dependent agricultural area surrounded by dikes. The area is no longer used for agriculture but is managed to attract wintering waterfowl. Recent shoreline loss has resulting in breaching of the Lake Pontchartrain shoreline allowing tidal influence into the immediate project area. The project area is bounded on the north by similar open water habitat, on the west by a cypress-tupelo swamp and on the east by a borrow canal (i.e., Frederick's Canal) that supports a residential development along the Milton's Island ridge.

HSDRRS project activities are located in the Mississippi River Deltaic Plain. Habitats (bottomland hardwoods, swamp, and estuarine marshes) within this area have decreased because of urbanization, especially adjacent to the New Orleans metropolitan area, and conversion to agriculture along the adjacent natural river levees. Other factors contributing to the loss of those habitats include hydrologic alterations associated with navigation channels, isolation from historic riverine overbank flows by flood-control levees, oil and gas exploration, extraction and transportation activities, sea-level rise, and subsidence. Due to their value and scarcity, in-kind compensation for project-induced losses to estuarine marsh habitats would be implemented. Avoidance and minimization of impacts to wetlands and incorporation of environmental features, when feasible, into levee designs were Corps' planning objectives. A more detailed description of the habitats and their value to fish and wildlife resources was presented in our October 28, 2013, FWCA Report and herein incorporated by reference.

The Service quantified unavoidable project impacts on wildlife resources and calculated mitigation needs and benefits through the use of Wetland Value Assessment (WVA). Habitat units fluctuate in response to changes in habitat quality, represented by the Habitat Suitability Index (HSI), and/or quantity (acres); those changes are predicted for various target years over the period-of-analysis (i.e., 50 years), for future without-project and future with-project scenarios. Target years (TY) were selected for this analysis to capture the effects of important biological events. Values for model variables were obtained from site visits to the area, previous wetland assessments in similar habitats, communication with personnel knowledgeable about the study

area and similar habitats, and review of aerial photographs and reports documenting fish and wildlife habitat conditions in the study area and similar habitats. For all the habitat assessments, the products of the resulting HSI values and acreage estimates were then summed and annualized for each habitat type to determine the AAHUs available. The net change (increase or decrease) in AAHUs under future with-project conditions, compared to future without-project conditions, provides a quantitative comparison of anticipated project impact/benefits in AAHUs. By dividing the AAHU by the proposed mitigation project acreage a mitigation potential per acre was determined. That mitigation potential was used to refine the project size to meet the mitigation needs. Further explanation of how impacts/benefits are assessed with the WVA and an explanation of the assumptions affecting HSI values are available for review at the Service's Louisiana Ecological Services Office. Impact assessments and mitigation benefit assessments considered sea-level rise, subsidence, accretion, and historic marsh loss trends and were coordinated with other State and Federal agencies.

Milton Island Intermediate Marsh Mitigation Site and Plan

The proposed mitigation area is within the Pontchartrain Basin and is considered to be located in the "middle" Pontchartrain Basin along with the areas of impact. Intermediate marsh is generally found between brackish and freshwater marsh, usually characterized by an irregular tidal regime, whereas brackish marsh is generally found near estuaries of coastal rivers where an influx of freshwater dilutes seawater to a brackish level of salinity. Chabreck (1972) classified fresh and intermediate marshes as having an average salinity range of 0.1 parts per thousand (ppt) to 9.9 ppt with a mean of < 3.0 ppt for fresh and 3.3 ppt for intermediate marshes, whereas brackish marsh average salinities can range from 0.4 ppt to 28.1 ppt (average 8.0 ppt). Implementation of the mitigation plans would maintain and/or increase fish and wildlife resource values via the improvement and re-establishment of estuarine marsh. The proposed mitigation plan is being developed to offset losses to fresh/intermediate marshes and includes the purchase of protective easements (or fee-title) and the construction of a marsh restoration project (containment dike construction, dedicated dredging, and filling of open water areas) on 152 acres along the Lake Pontchartrain shoreline (Figure 1). Mitigation lands are to be purchased by the Corps and managed by the Non-Federal Sponsor, the Coastal Protection and Restoration Authority Board.

The Milton Island Flood Side Intermediate Marsh Restoration project will consist of 143 acres of flood side intermediate marsh and associated open water (i.e., The "flood side" description indicates that this proposed project footprint falls on the unprotected side of the hurricane protection levee). The project consists of dredging material from Lake Pontchartrain about 2,000 feet from the shoreline using a hydraulic cutterhead dredge. Initial elevation for dredge fill would be to an approximate elevation of +2.25 feet North American Vertical Datum 1988 (NAVD88), to ultimately result in a target marsh elevation of between +1.5 and +1.0 feet NAVD88 within the project life. Total perimeter retention would be required to retain dredged material and to allow for vertical accretion. Existing retention features exist along the east, west, and south perimeters of the project footprint, except for a 1,000-foot reach of shoreline along the lake which would require shoreline restoration efforts. Rehabilitation of these existing dikes would be accomplished as necessary to retain the dredge material slurry. Over 5,500 linear feet of new retention dike would be required along the northern limit of the project footprint. The dike would be built to an elevation +4.5 feet NAVD88 with borrow material obtained within the marsh creation footprint and would have a 5-foot crown width to provide two feet of freeboard

different species: California Bulrush, Black Needle Rush, Giant Cutgrass, Marshhay Cordgrass, Maidencane, and/or Seashore Paspalum.

Land Use

The proposed mitigation project was part of a larger parcel that has been reviewed by the Interagency Review Team as a Section 404 of the Clean Water Act mitigation bank proposal. That mitigation bank proposal was never approved. According to information presented during the project evaluation process, the site underwent a massive land conversion from swamp and marsh to a pumped agricultural area during the 1950's. Construction was completed in the 1960's, and has since been used for agriculture and hunting. The impounded area historically underwent spring and summer drawdowns and winter filling to attract waterfowl. A recent breach in the Lake Pontchartrain shoreline connects the project area to the lake. Except for the remnant dikes most of the site is currently open water, and until recently was cut off from tidal fluctuations. A portion of the Milton Island ridge, just east of the project area, has been developed into a residential area.

Soils

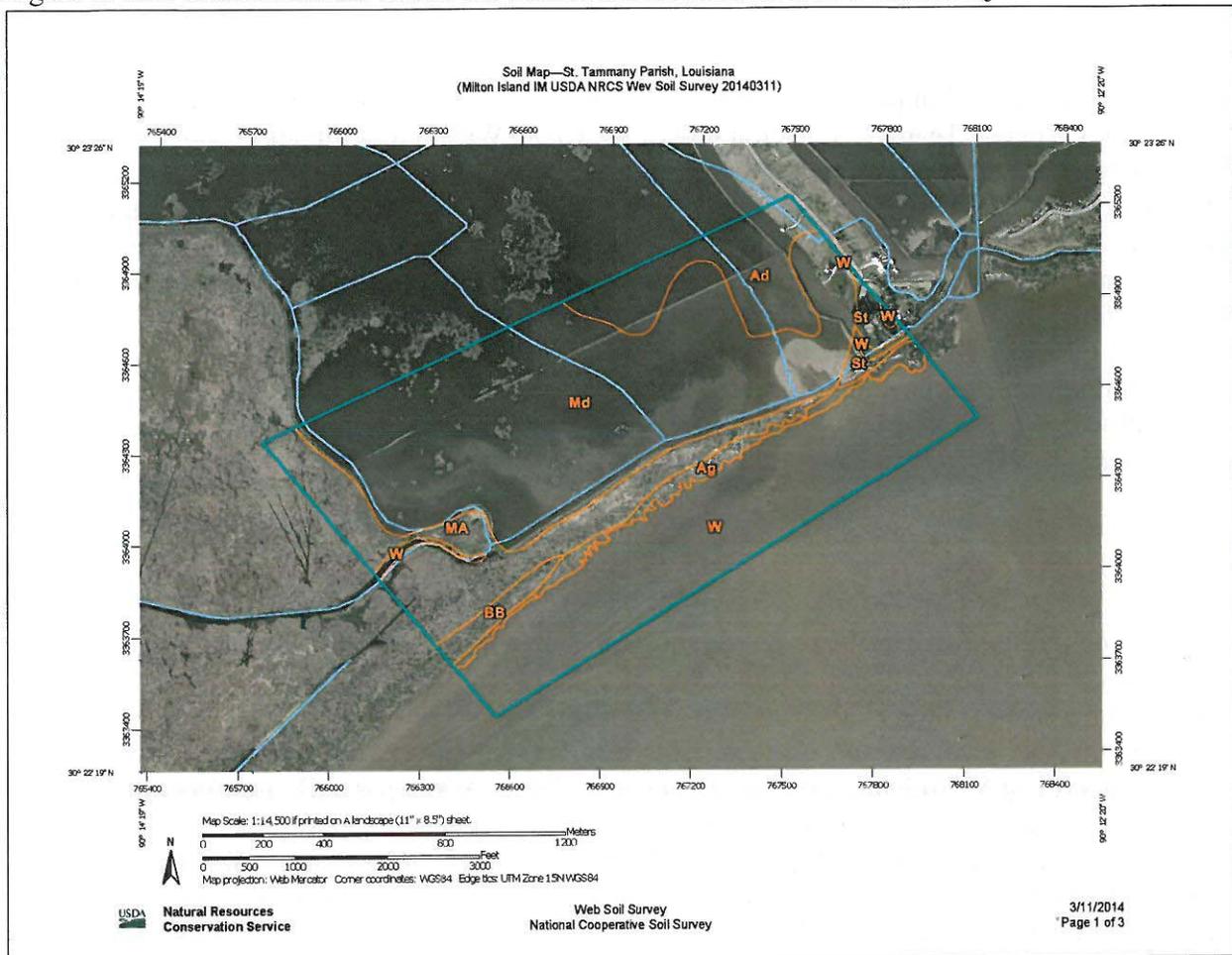
Soils found within and near the proposed mitigation area include Maurepas muck, drained (Md); Maurepas muck (MA); Allemands muck (drained) (Ad); and Aquents, dredged (Ag) (Figure 2). The site is predominantly Maurepas muck which consists of very poorly drained organic soils formed in woody plant remains characteristic of soils found in very large swamps. According to the *Soil Survey of St. Tammany Parish, Louisiana*, (1990), Maurepas soils are flooded and ponded most of the time by freshwater, and have a low capacity to support loads. Allemands muck soils make up a significant portion of the project area and are organic soils that are in former freshwater marshes that have been drained. They are similar to the Maurepas soils with an organic layer on top of a clay layer; however the organic layer in the Allemands soils is shallower (18 inches thick). Both series are best used as habitat for wetland fish and wildlife. The natural vegetation for the Allemands series includes bulltongue, maidencane, alligator weed, cattail, common rush, pickerel weed, and giant cutgrass. Bald cypress has been known to occur occasionally throughout the area.

The shoreline of Lake Pontchartrain is characterized as Aquents (dredged) soils. Aquents soils are created by the placement of dredged material either through the creation of dikes for the agricultural impoundments or dredged material disposal from Lake Pontchartrain. These soils are variable in texture and, according to the *Soil Survey of St. Tammany Parish, Louisiana* (1990) range from muck and clay to sand. The material was stacked and allowed to dry, then leveled and spread throughout the diked area. Also occurring along the Lake Pontchartrain shoreline near the project area is the Barbary muck clay soils. Typical vegetation supported by this soil includes water tupelo, bald cypress, water oak, white oak, red ample, elm, and water hickory for the overstory, and lizard's tail, spiderlily and buttonbush as the understory.

A small portion of the project area near the shoreline breach and along Frederick's Canal is classified as Stough find sandy loam. This is a somewhat poorly drained soil that formed in loamy marine and fluvial sediments, and is found on terraces of the late Pleistocene age. This

soil is well suited for woodland and openland habitat, and moderately suited for crop production and recreational use.

Figure 2. Soil Classifications within the Milton Island Intermediate Marsh Project



Hydrology

Until recently the project area was part of a larger non-operational agricultural impoundment that was cut off from tidal influences. The area was diked and pumped to support the agricultural activities and dependent on rain water for freshwater input. The 1,000-foot breach that has recently developed allows some tidal flow into the area.

The mitigation plan includes gapping and degrading dikes after initial settlement to restore the tidal regime to the project area. This will also offer hydrologic benefits to adjacent areas that have reduced hydrologic connections near existing dikes.

The Corps' Draft 100% Design Document Report for the Milton Island Intermediate Marsh project used data from the Mandeville tide gage. Using 14,253 usable records taken between January 1, 1959 and May 14, 2011, the minimum stage is estimated at -1.64 feet, the average stage is +1.33 feet, and the maximum stage is +5.00 feet. Tidal data to be used for Milton Island was calculated from the Corps #85575 Mandeville hourly adjusted gage readings, located in the

Mandeville Harbor just east of the Causeway Bridge. Since this is about the same distance from the mouth of the Tchefuncte River as the project is, but on opposite sides of this river outlet, this gage is a suitable gage for this project. Using tidal data terminology from National Oceanic and Atmospheric Administration, the results of the Mandeville gage are as follows:

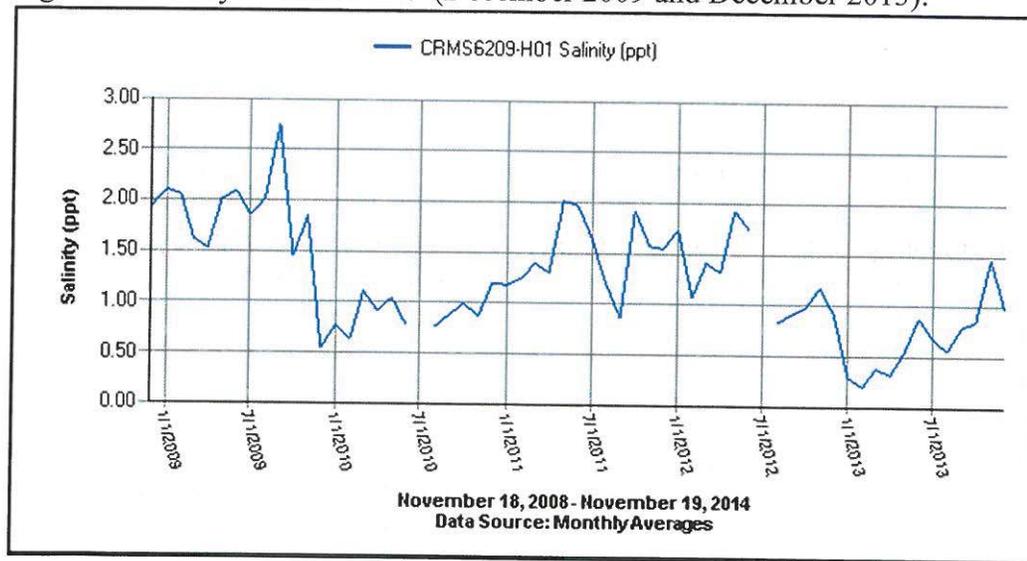
- MHW & MHHW = 1.00 feet NAVD88 (which occurs at 71% above all other lower elevations)
 - MSL & MTL = 0.70 feet NAVD88 (which occurs at 53% above all other lower elevations)
 - MLW & MLLW = 0.40 feet NAVD88 (which occurs at 32% above all other lower elevations)
- **MHW = Mean High Water, MHHW = Mean High High Water, MLW = Mean Low Water, MLLW = Mean Low Low Water

Since Lake Pontchartrain is not subject to diurnal tides, MLLW is the same as MLW and MHHW is the same as MHW. Due to Relative Sea Level Rise (RSLR), water surface elevations in the project area could increase by up to the following amounts by the end of the project's 50 year period of analysis: 1.23 feet for the Low estimate, 1.66 feet for the Intermediate estimate, and 3.06 feet for the High estimate.

Salinities

Two Coastwide Reference Monitoring System (CRMS) stations are located near the project area but further inland likely resulting in fresher conditions observed at those stations compared to the project area. CRMS4094 is located in a fresh marsh area east of the Tchefuncte River. Average salinity between November 2011 and December 2013 was measured at 1.26 ppt. CRMS6209 is located in a swamp also inland from the lake shoreline and has a recorded average salinity of 1.07 ppt between December 2009 and December 2013. The WVA references the proposed Guste Island Mitigation Bank habitat assessment which indicates that the area salinity averages 3.0 ppt during the growing season.

Figure 3. Salinity at CRMS6209 (December 2009 and December 2013).



Future-without Mitigation

Under future without-management conditions, the proposed wetland mitigation area is predicted to remain in private ownership. Without management it is likely that the remnant dikes will further deteriorate and the project area will become an extension of Lake Pontchartrain. Areas further inland will experience increased turbidity and salinities as the site will be exposed to greater wind fetch and tidal conditions. Submerged aquatic vegetation will likely respond negatively to this increase in turbidity and salinity. Aquatic organism ingress and egress will likely increase as the shoreline breaches into the project area.

Future-with Mitigation

General

The goal of the mitigation plan is to provide for equal replacement of the habitat units lost due to re-construction of the hurricane/flood protection projects. The equal replacement compensation goal specifies that the gain of one habitat unit can be used to offset the loss of one habitat unit. Achieving this goal would re-establish, maintain and protect emergent wetland habitats as a species diverse, sustainable habitat by restoring/maintaining unique functions, values, and services. The objectives of the mitigation measures would be to establish and maintain an intermediate marsh habitat at an elevation that would support emergent vegetation for the longest period of time within the project life.

The mitigation plan consists of acquisition (easement or fee-title) and management of approximately 152 acres of intermediate marsh; approximately 9 acres of the 152 acres consist primarily of levees surrounding the proposed mitigation site which will be incorporated into proposed containment dike design. The mitigation plan addresses marsh loss due to induced subsidence as a result of the area being leveed and placed under a pump system. Marsh elevations and natural tidal regimes will need to be restored to support a diversity of native marsh vegetation and intertidal marsh functions for a time period no less than that of a natural marsh.

Success Criteria, Monitoring, and Adaptive Management

“General Mitigation Guidelines” for monitoring, success criteria, and reporting requirements were developed by the Corps in coordination with the Interagency Team, including the Non-Federal Sponsor. General mitigation guidelines for Milton Island have also been drafted (Appendix A); however those draft detailed mitigation plans will need to be reviewed and agreed upon by the Interagency Team including the Non-Federal Sponsor. It is anticipated that final mitigation plans would not deviate substantially in regards to the general guidelines provided in the PIER.

According to the “General Mitigation Guidelines”, the proposed mitigation actions will include construction with the Non-Federal Sponsor responsible for operation and maintenance of functional portions of work as they are completed. The Corps will monitor completed mitigation to determine whether additional actions are required to achieve mitigation success and will implement those actions in accordance with cost sharing responsibilities applicable to

the project and subject to the availability of funds. Once the Corps determines that the mitigation has achieved initial success criteria, monitoring will be performed by the Non-Federal Sponsor. If the mitigation fails to meet the intermediate and/or long term ecological success criteria the Non-Federal Sponsor is responsible for performing the corrective actions and additional monitoring, at their expense, to ensure success criteria are met.

Development of the detailed mitigation plan should continue to be conducted in coordination with the Interagency team. Future changes to that plan should be evaluated against the accrued and anticipated benefits and the effect of implementing the proposal on achievement of the mitigation plan goal. Any changes that would prevent the mitigation goal from being achieved would not be recommended for implementation. Furthermore, the following activities are not permitted within the mitigation area:

1. Placing, filling, storing, or dumping of refuse, trash, vehicle bodies or parts, rubbish, debris, junk, waste, or other such items on the property.
2. Mechanized land clearing or deposition of soil, shell, rock or other fill on the property without prior request for approval, excluding the existing right-of-ways.
3. Cutting, removal or destruction of vegetation on the property except in accordance with the restoration plan.
4. Grazing of cattle or other livestock on the property that has been restored or enhanced.
5. Commercial, industrial, agricultural, or residential uses of the property.
6. No other human activities that result in the material degradation of habitat within the area shall occur.

However, it is understood that the mitigation plan shall not prohibit hunting, fishing, trapping, non-consumptive recreational pursuits and exploration and production of minerals. Exploration and production of minerals shall be conducted in accordance with all applicable laws and regulations. The Service acknowledges that such activities have the potential to reduce the ability of the area to achieve the mitigation goal, depending on the extent of the impacts to the mitigation wetlands.

ANTICIPATED BENEFITS FROM THE MITIGATION SITE

Implementation of the proposed restoration plan is predicted to restore 143 acres of intermediate marsh and increase the habitat value of the estuarine habitat for fish and wildlife. Mitigation-area habitat values would increase due to the increased quantity and quality of estuarine emergent wetlands. Very little emergent vegetation would be present immediately after construction as most of the project area would be un-vegetated dredged material. Planting of the marsh platform is proposed and will reduce the time to achieve a functional marsh community. Under the future-with project conditions, marsh loss would continue in the project area. The WVA assumes that land loss would continue in the project area at a reduced rate of -0.14% percent per year, compared to -0.28% percent per year under the No Action Alternative. Within the project area, 110 acres of marsh would remain at the end of the 50-year project life compared to 0 acres under the No Action Alternative, and a significant amount of acreage of marsh would remain within the project area after the project life. According to Corps' RSLR analysis, assuming an initial elevation of 2.5 feet NAVD88, a majority of the project area will experience intertidal marsh elevations for a period of 18 years under the intermediate relative sea level rise scenario (Figure 4 and Table 1). While this considers local sediment rates, post construction accretion rates associated with organic production was not considered.

The project area would continue to support a diverse assemblage of fishes and shellfishes. The creation and nourishment of intertidal marsh would ensure that the project area continues to provide important nursery functions throughout the project life offsetting those impacts that occurred as a result of the levee improvements. Improved habitat conditions would support several species of wildlife including migratory and resident waterfowl, shorebirds, wading birds, and furbearers. Migratory waterfowl utilizing the project area would benefit from a greater food supply resulting from the increased abundance and diversity of emergent and submerged species. Habitat for the resident mottled duck would also improve considerably as the marsh platform would provide more desirable nesting habitat.

Predicted habitat conditions under future-with and without-restoration scenarios are provided in the WVA (Appendix B). Net Change in Habitat Units is provided in Table 2. The difference between future with-project and future without-project Average Annual Habitat Unit (AAHU) values expected to result from the above-described mitigation scenario reflect the expected net benefit of the restoration action, and does not factor in the AAHU values lost as a result of the HSDRRS levee impacts.

Figure 4. Settlement curves for constructed marsh beginning at 1.0, 1.5, 2.0, and 2.5 feet NAVD88, and tidal ranges for the three future sea level scenarios outlined in the Corps' EC 1165-2-212 (Corps 2014).

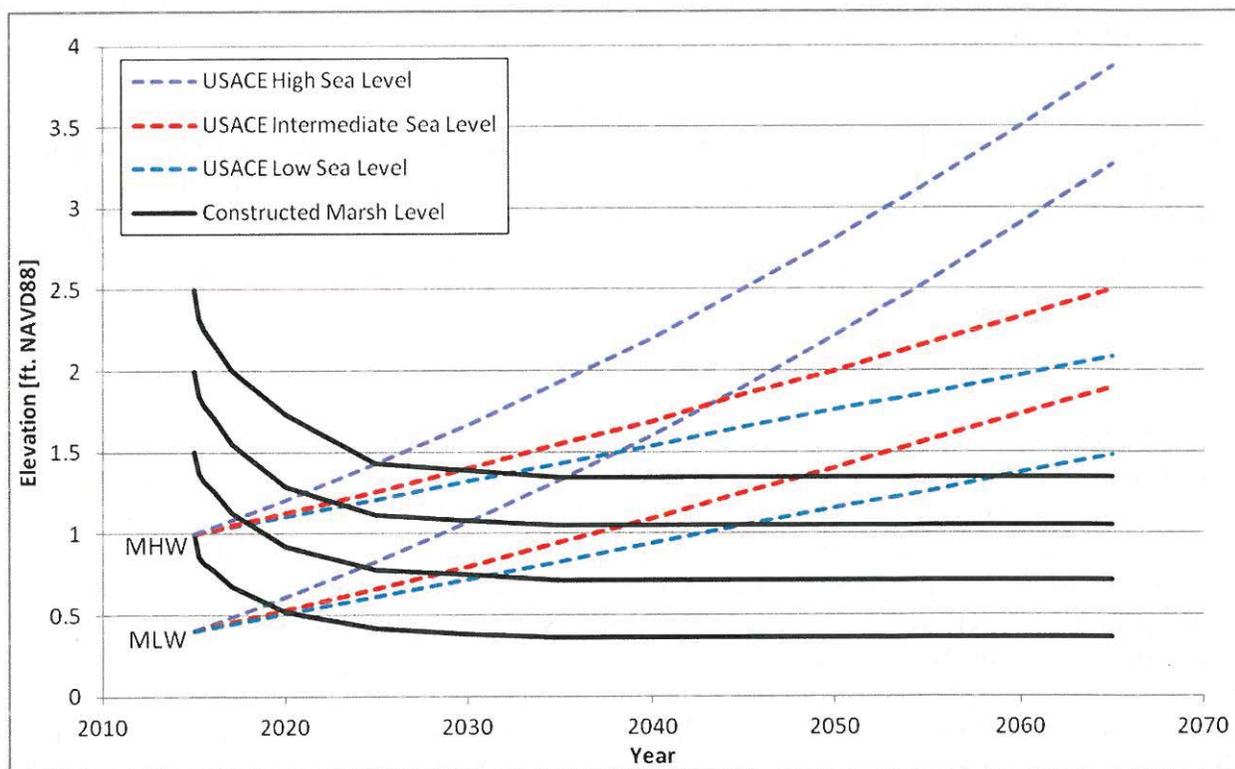


Table 1. Time periods of intertidal marsh elevation under various relative sea level rise scenarios, assuming initial elevation of 2.5 feet NAVD88, as provided by the Corps (2014).

2.5 Ft. Initial Elevation			
RSLR Scenario	USACE Low	USACE Intermediate	USACE High
Intertidal Start Year	2033	2031	2027
Intertidal End Year	2059	2049	2036
Intertidal Duration (Yrs)	26	18	9

Predicted habitat conditions under future-with and without-restoration scenarios are provided in the WVA (Appendix B). Net Change in Habitat Units is provided in Table 2. The difference between future with-project and future without-project Average Annual Habitat Unit (AAHU) values expected to result from the above-described mitigation scenario reflect the expected net benefit of the restoration action, and does not factor in the AAHU values lost as a result of the HSDRRS levee impacts.

Conditions under the future-with mitigation scenario (i.e., restoration of emergent marsh) proposed were input into the habitat model to calculate the AAHU value of the area over the life of the project. The AAHU value was then used to determine the per acre AAHU value (0.33). This project produces 47.91 AAHUs over the period of analysis accounting for the estimated 45.7 AAHUs of intermediate/fresh marsh habitat needed based on 95-100% design of levee impacts.

Table 2. Net Change in Habitat Units for the Proposed Milton Island Restoration Project

	Emergent Marsh	Open Water
Future With Out Project (AAHUs)	0.00	73.38
Future With Project (AAHUs)	98.04	16.01
Total	98.04	-57.37
Net Benefit	47.91	

SERVICE POSITION AND RECOMMENDATIONS

The Service supports the Corps' plan to mitigate impacts to fish and wildlife resources associated with HSDRRS and believes that the recommendations provided in our October 28, 2013, FWCA Report addressing PIER 36 continue to remain valid and should be incorporated into future project planning and implementation. Those recommendations have been provided in Appendix C for reference.

Should you or your staff have any questions regarding this letter and our attached report, please contact David Walther (337/291-3122) of this office.

Sincerely,



Jeffrey D. Weller
Field Supervisor
Louisiana Ecological Services Office

cc: National Marine Fisheries Service, Baton Rouge, LA
EPA, Dallas, TX
LA Dept. of Wildlife and Fisheries, Baton Rouge, LA
LA Dept. of Natural Resources, CMD, Baton Rouge, LA
LA Dept. of Natural Resources, CRD, Baton Rouge, LA

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APPENDIX C

GENERAL MITIGATION GUIDELINES: PLANTINGS, SUCCESS CRITERIA, MONITORING, AND OTHER GENERAL GUIDANCE

TIERED INDIVIDUAL ENVIRONMENTAL REPORT 36 MILTON ISLAND

INTRODUCTION

This document follows the general mitigation guidelines developed for both the Lake Pontchartrain and Vicinity and the West Bank and Vicinity Hurricane Storm Damage and Risk Reduction System (HSDRRS) Mitigation Program. They were developed by the U.S. Army Corps of Engineers (USACE) in coordination with an Interagency Team and the non-Federal project sponsor (NFS). The original guidelines were included as Appendix J in PIER 36. This Appendix makes project specific adjustments and outlines the project specific guidelines and success criteria.

The proposed mitigation actions include construction, with the NFS responsible for operation and maintenance of functional portions of work as they are completed. On a cost shared basis, USACE will monitor completed mitigation to determine whether additional construction, invasive species control and/or planting are necessary to achieve mitigation success. USACE will undertake additional actions necessary to achieve mitigation success in accordance with cost sharing applicable to the project and subject to the availability of funds. Once USACE determines that the mitigation has achieved initial success criteria, monitoring will be performed by the NFS as part of its OMRR&R obligations. If, after meeting initial success criteria, the mitigation fails to meet its intermediate and/or long-term ecological success criteria, USACE will consult with other agencies and the NFS to determine whether operational changes would be sufficient to achieve ecological success criteria. If, instead, structural changes are deemed necessary to achieve ecological success, USACE will implement appropriate adaptive management measures in accordance with the contingency plan and subject to cost sharing requirements, availability of funding, and current budgetary and other guidance.

The respective responsibilities for the construction, monitoring and maintenance of this project are as follows:

1. Construction and planting (the “construction phase”) - performed by USACE per applicable cost-sharing;
2. After construction and planting, USACE issues Notice of Construction Complete (NCC) and provides the Operation, Maintenance, Repair, Replacement, and Rehabilitation manual to the NFS (the “O&M phase”);
3. Notwithstanding NCC, USACE will monitor the project on a cost-shared basis until it reaches its Initial Success Criteria;

4. If, after NCC but before Initial Success Criteria are achieved, the project needs additional construction, invasive species control or planting, USACE will perform these items subject to applicable cost-sharing and availability of funds;
5. After Initial Success Criteria are achieved, NFS will monitor project;
6. If, after Initial Success Criteria are achieved, there is a problem that can be corrected through a change in operation, NFS will be responsible to change its operation of the project; and
7. If, after Initial Success Criteria are achieved, there is a problem that requires structural changes, USACE will implement adaptive management according to applicable cost-sharing and subject to availability of funds.

For the Milton Island project, “construction” is defined as:

1. Mobilization and de-mobilization of required construction equipment to the site.
2. Construction of temporary retention/perimeter dikes and associated spill boxes to contain dredged material.
3. Construction of the shoreline restoration feature along the eroded shoreline of Lake Pontchartrain, including planting of the feature with specified vegetation, dredging the access channel to the site, and filling the access channel once the feature has been constructed.
4. Dredging material from the bottom of Lake Pontchartrain and pumping the material via hydraulic pipeline along a defined access corridor to the designated fill site to establish a marsh platform at design elevation.
5. Surveying to determine fill height during and at the end of the dredging operation.
6. Degrading the northern perimeter dike and gapping the eastern and western dikes to allow water exchange.
7. Initial (during first year after establishment of marsh platform) invasive and nuisance plant species control.
8. Surveying 1 year after fill event and before planting to determine fill elevation.
9. One year after establishment of marsh platform, planting native, herbaceous, wetland vegetation throughout the fill area.

MITIGATION PLANTING GUIDELINES

Herbaceous species would be planted on 7-foot centers (average) to achieve a density of approximately 890 plants per acre. Stock would typically be either 4-inch container size or bare-root or liner stock, depending on the species involved. Plants would be obtained from a registered licensed regional nursery/grower and of a regional eco-type species properly stored and handled to ensure viability. Planting should be conducted during the period from March 15 through June 15. Planting should not be undertaken later than approximately July 15, although planting during the early fall may be deemed acceptable on a case-by-case basis.

Species installed in the proposed intermediate marsh habitat would be selected from the species list provided in Table 1. Plantings would consist of at least 2 different species. The species used and the proportion of the total plantings represented by each species would be dependent on various factors including site conditions and planting stock availability and would be documented for the project.

Table 1: Preliminary Planting List for Intermediate Marsh Habitats

Common Name	Scientific Name
California bulrush	<i>Schoenoplectus californicus</i>
Black needle rush	<i>Juncus roemerianus</i>
Giant cutgrass	<i>Zizaniopsis miliacea</i>
Marsh-hay cordgrass	<i>Spartina patens</i>
Maidencane	<i>Panicum hemitomon</i>
Common threesquare	<i>Schoenoplectus americanus</i>
Big cordgrass	<i>Spartina cynosuroides</i>
Seashore paspalum	<i>Paspalum vaginatum</i>

MITIGATION SUCCESS CRITERIA AND MITIGATION MONITORING

1. General Construction

- A. Within approximately 4 months following the start of construction all initial mitigation construction activities (e.g. construction of temporary retention/perimeter dikes, shoreline restoration feature, placement of fill/borrow material into mitigation site, etc.) would be completed as outlined in the project description found in the TIER and in accordance with the final contract plans and specifications. This would be accomplished by the USACE and would be cost-shared with the NFS in accordance with all relevant agreements. This requirement is part of the construction phase of the project and classifies as an initial success criterion.
- B. Approximately 1 year following completion of all initial mitigation construction activities (Target Year 2) all final mitigation construction activities would be completed as specified in the TIER project description and in accordance with the final contract plans and specifications. Such activities could include, but are not limited to degrading and gapping temporary retention dikes, and planting appropriate vegetation as specified above. Finishing the construction components

would be considered as the “completion of final mitigation construction activities”. This would be accomplished by the USACE and would be cost-shared with the NFS in accordance with all relevant agreements. This requirement is part of the construction phase of the project and classifies as an initial success criterion.

2. Topography

- A. At the end of the initial mitigation construction activities (Target Year 1) the USACE would demonstrate that at least 80% of the mitigation area has a surface elevation that is within 0.5 feet of the designed initial target surface elevation, which is +2.25 feet NAVD88. The mitigation area is the total area filled with dredged material (143 acres). The shoreline restoration feature of the south dike would be maintained to design specifications. This requirement is part of the construction phase of the project and classifies as an initial success criterion.
- B. At or near the time that final mitigation construction activities are being implemented (Target Year 2), USACE would demonstrate that at least 80% of the mitigation area has a surface elevation that is within 0.5 feet of the expected surface elevation at this time. At Target Year 2, when vegetation plantings and dike gapping are conducted, the elevation of the dredged fill is expected to be +1.9 feet NAVD88, plus or minus 0.5 feet. Note that this elevation was derived from settlement data provided by the USACE, New Orleans District, Geotechnical Branch. The mitigation area is the total area filled with dredged material (143 acres). The shoreline restoration feature of the south dike would be maintained to design specifications. This requirement is part of the construction phase of the project and classifies as an initial success criterion.
- C. Three years following completion of final mitigation construction activities (Target Year 5) at least 80% of the mitigation area should have a surface elevation of 1.6 feet NAVD88, plus or minus 0.5 feet. The mitigation area is the total area filled with dredged material (143 acres). The shoreline restoration feature of the south dike would be maintained to design specifications. This requirement classifies as an intermediate success criterion.

3. Native Vegetation

- A. Complete initial marsh planting (Target Year 2) in accordance with initial marsh planting guidelines within the 143 acre mitigation area. This requirement is part of the construction phase of the project and classifies as an initial success criterion.
- B. Monitor vegetation one year following completion of initial plantings (Target Year 3). The monitoring should demonstrate at least 80% survival of planted species, or achieve a minimum average cover of 25%, within the area filled with dredged material (143 acres), comprised of native herbaceous species (includes planted species and volunteer species). The vegetation should meet USACE hydrophytic vegetation criteria (see definition of terms at end of this Appendix). This requirement classifies as an initial success criteria, with the exception that the requirement to demonstrate vegetation satisfies USACE hydrophytic vegetation criteria throughout the duration of the overall monitoring period classifies as a long-term success criterion.

- C. Three years following completion of initial plantings (Target Year 5) the project should achieve a minimum average cover of 80% within the area filled with dredged material (143 acres), comprised of native herbaceous species (includes planted species and volunteer species). This requirement classifies as an intermediate success criterion.
- D. For the period beginning 4 years following completion of final mitigation construction activities (Target Year 6) and continuing through 20 years following completion of final mitigation construction activities, maintain a minimum average cover of 80%, comprised of native herbaceous species. This requirement classifies as a long-term success criterion.

4. Invasive and Nuisance Vegetation

- A. Complete the initial eradication of invasive and nuisance plant species within 1 year of completion of initial mitigation construction activities (Target Year 2). The eradication would occur during or around the same time as the initial vegetation plantings occur. This requirement is part of the construction phase of the project and classifies as an initial success criterion.
- B. Maintain all areas such that they are essentially free from invasive and nuisance plant species immediately following a given maintenance event and such that the total average vegetative cover accounted for by invasive and nuisance species each constitute less than 5% of the total average plant cover during periods between maintenance events. These criteria must be satisfied throughout the duration of the overall monitoring period. Until such time that monitoring responsibilities are transferred from the USACE to the NFS, this requirement classifies as an initial success criterion. Following the transfer of monitoring responsibilities, this requirement classifies as a long-term success criterion.

MITIGATION MONITORING GUIDELINES

Reference Document for Monitoring

All project monitoring would generally follow the procedures detailed in the following document: A Standard Operating Procedures Manual for the Coast-wide Reference Monitoring System – Wetlands: Methods for Site Establishment, Data Collection, and Quality Assurance/Quality Control, prepared by the Louisiana Coastal Protection and Restoration Authority, January 27, 2012. This referenced document is specific to coastal Louisiana wetlands and provides very detailed instructions for conducting field monitoring that is applicable to the proposed project. Those detailed methods are not repeated in this document.

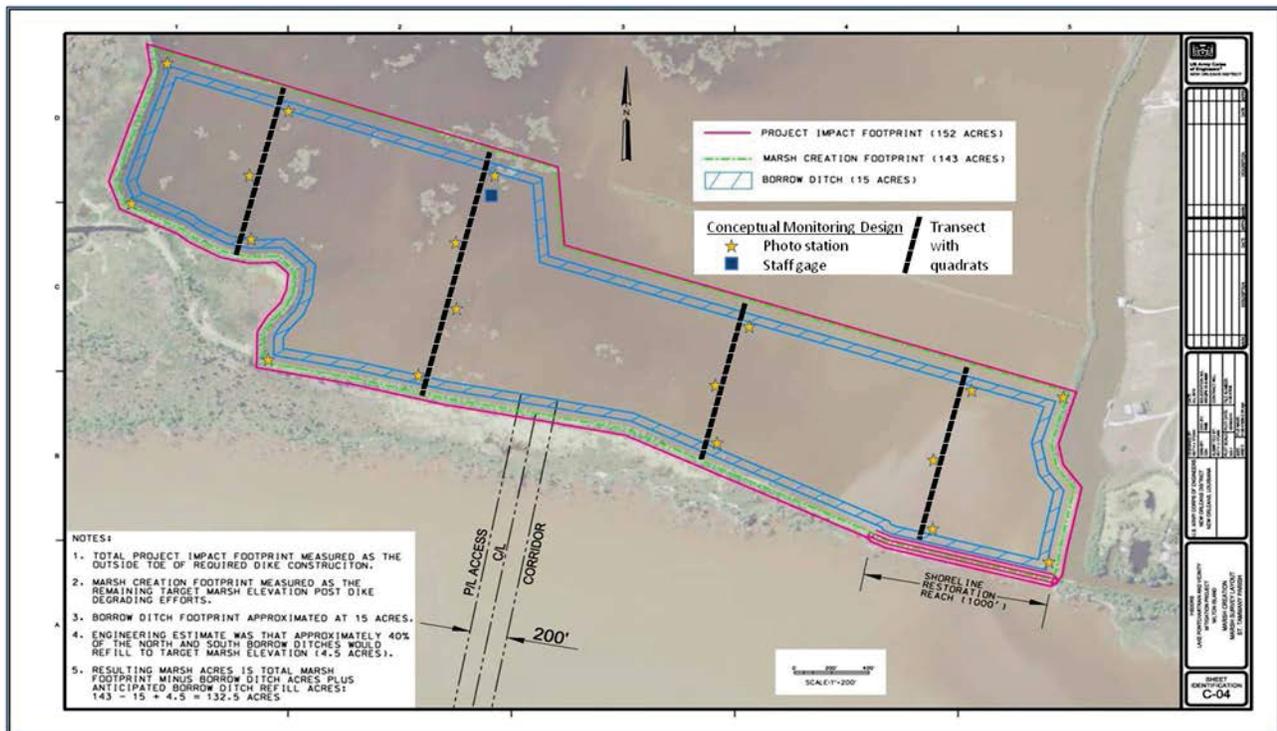
Baseline Monitoring Report (First Monitoring Report)

The mitigation site would be monitored and a baseline monitoring report prepared after final construction is complete (Target Year 2). Information provided would typically include the following items:

- A. A detailed discussion of all mitigation activities completed.

B. A plan view drawing of the mitigation site showing the approximate boundaries of the restored marsh features, significant interspersed features established within the marsh features (as applicable), monitoring transect locations, sampling quadrat locations, photo station locations, and staff gauge locations. The exact locations of the photo stations, transects, quadrats and the staff gauges would be determined during the initial site visit and the baseline monitoring event. The proposed sampling design is further described below and depicted in Figure 1. An as-built survey of surface elevations (topographic survey) within each marsh feature would be required, along with an as-built survey of any dikes constructed as part of the marsh restoration features. If a particular marsh feature is immediately adjacent to existing marsh habitat, the topographic survey would include spot elevations collected within the existing marsh habitat near the restored marsh feature. In addition to the survey data, an analysis of the data would be provided addressing attainment of topographic success criteria.

Figure 1. Project Area Showing Monitoring Details



C. Photographs documenting conditions in the restored marsh feature at the time of monitoring would be included. Photos would be taken at approximately 18 permanent photo stations (preliminarily at least three photo stations are planned along each of the four permanent transects) within the marsh feature. At least two photos would be taken at each station with the view of each photo always oriented in the same general direction from one monitoring event to the next.

- D. A detailed inventory of all species planted, including the number of each species planted, the stock size planted, along with the general locations, would be provided. This includes providing an itemization indicating the number of each species planted depicted on the plan view drawing of the mitigation site.
- E. Water level elevation readings would be collected at the time of monitoring from a single staff gauge. The monitoring report would provide the staff gauge data along with mean high and mean low water elevation data as gathered from a tidal elevation recording station in the general vicinity of the mitigation site. The report would further address estimated mean high and mean low water elevations at the mitigation site based on field indicators. It is proposed that the staff gauge be installed along the northern limit of the project area close to the mid-point between the eastern and western limits. The exact location of the proposed staff gauge would be determined during the initial site visit and the baseline monitoring event.
- F. Various qualitative observations would be made in the mitigation site to help assess the status and success of mitigation and maintenance activities. These observations would include: General estimate of the average percent cover by native plant species; general estimates of the average percent cover by invasive and nuisance plant species; general observations concerning colonization of the mitigation site by volunteer native plant species; general condition of native vegetation; trends in the composition of the plant community; wildlife utilization as observed during monitoring (including fish species and other aquatic organisms); the natural formation of interspersion features within restored marshes; observations regarding general surface water flow characteristics within marsh interspersion features; and the general condition of permanent dikes. General observations made during the course of monitoring would also address potential problem zones and other factors deemed pertinent to the success of the mitigation program.
- G. A summary assessment of all data and observations along with recommendations as to actions necessary to help meet mitigation and management/maintenance goals and mitigation success criteria.
- H. A brief description of anticipated maintenance/management work to be conducted during the period from the current monitoring report to the next monitoring report.

Additional Monitoring Reports

All monitoring reports generated after the initial baseline report would provide the following information unless otherwise noted:

- A. All items listed for the baseline monitoring report with the exception of: (a) the topographic/as-built survey, although additional topographic/as-built surveys are required for specific monitoring reports (see below); (b) the inventory of planted species; although such an inventory must be provided in any monitoring report generated for a year in which a restored intermediate marsh feature is re-planted to meet applicable success criteria.

- B. Quantitative data concerning plants in the ground cover stratum. Data would be collected from approximately 60 permanent sampling quadrats established at approximately equal intervals along four permanent monitoring transects established within the marsh mitigation area. It is proposed that at least four permanent transect lines would be established perpendicular to the Lake Pontchartrain shoreline and the north and south dike construction. Each transect would include approximately 15 equally spaced sampling quadrats. The number of quadrats per transect would depend on the length of the transect. The sampling quadrats would be approximately 2 meters by 2 meters in size. Data recorded from the sampling quadrats would include: Average percent cover by native plant species; average percent cover by invasive plant species; average percent cover by nuisance plant species; composition of plant species and the wetland indicator status of each species. The average percent survival of planted species (i.e. number of living planted species as a percentage of total number of plants installed) would also be recorded. However, data for percent survival of planted species would only be recorded until such time as it is demonstrated that success criteria for plant survivorship has been achieved or until planted species are undetectable from volunteered species. The exact placement of the transect lines and quadrats plots would be determined during the initial site visit and the baseline monitoring event.
- C. A brief description of maintenance and/or management work performed since the previous monitoring report along with a discussion of any other significant occurrences would be included.
- D. In addition to the above items, the monitoring report prepared upon completion of the final mitigation construction activities in Target Year 2 and the monitoring report prepared for 3 years following completion of final mitigation construction activities (estimated TY5) would include a topographic survey of each marsh restoration feature. These surveys would cover the same components as described for the topographic survey conducted for the baseline monitoring report. In addition to the surveys themselves, each of the two monitoring reports involving topographic surveys would include an analysis of the data as regards attainment of applicable topographic success criteria. If the second survey indicates topographic success criteria have not been achieved and supplemental topographic alterations are necessary, then another topographic survey may be required following completion of the supplemental alterations. This determination would be made by USACE in coordination with the Interagency Team and NFS.

MITIGATION MONITORING SCHEDULE AND RESPONSIBILITIES

Monitoring would typically take place in mid to late summer of the year of monitoring, but may be delayed until later in the growing season due to site conditions or other unforeseen circumstances. Monitoring reports would be submitted by December 31 of each year of monitoring. Monitoring reports would be prepared by the USACE or provided to the USACE by the NFS, depending on whether or not all of the initial success criteria have been achieved, for coordination with the agencies comprising the Interagency Team and the NFS. The various monitoring and reporting responsibilities addressed in this section are all subject to the provisions set forth in the Introduction section.

The USACE would be responsible for conducting the monitoring events and preparing the associated monitoring reports until such time that the following initial mitigation success criteria are achieved (criteria follow numbering system used in success criteria section):

1. General Construction – Criteria 1.A and 1.B.
2. Topography – Criteria 2.A and 2.B.
3. Native Vegetation – Criteria 3.A and 3.B.
4. Invasive and Nuisance Vegetation – Criterion 4.A, plus criterion 4.B until such time as monitoring responsibilities are transferred to the NFS.

Monitoring events associated with the above would include the baseline monitoring event in Target Year 2 and a second monitoring event 1 year after the baseline monitoring event (Target Year 3). The USACE would be responsible for conducting these monitoring activities and preparing the associated monitoring reports.

The NFS would be responsible for conducting the required monitoring events and preparing the associated monitoring reports after the USACE has demonstrated the initial mitigation success criteria listed above have been achieved. Once monitoring responsibilities have been transferred to the NFS, the next monitoring event should take place in TY5 in order to demonstrate attainment of success criteria 2.C and 3.C. Thereafter, monitoring would be conducted every 5 years throughout the remaining 50-year period of analysis (based on 50-year period of analysis beginning in TY0 and ending in TY50).

If certain success criteria are not achieved, failure to attain these criteria would trigger the need for additional monitoring events not addressed in the preceding paragraphs. The USACE and/or the NFS would be responsible for conducting such additional monitoring and preparing the associated monitoring reports. The following lists instances requiring additional monitoring that would be the responsibility of the USACE:

- A. If the initial survival criterion for planted species or the initial vegetative cover criterion are not achieved (i.e. the criteria specified in success criteria 3.B), a monitoring report would be required for each consecutive year until two sequential annual reports indicate that the applicable survival criterion or vegetative cover criteria have been satisfied (i.e. that corrective actions were successful). The USACE would also be responsible for the purchase and installation of supplemental plants needed to attain the success criteria subject to availability of funds, but the overall cost would be shared with the NFS according to the project cost-sharing agreement.
- B. If topographic success criteria 2.A or 2.B are not achieved, a monitoring report would be required for each consecutive year until two sequential annual reports indicate the applicable criteria have been satisfied. Since failure to meet topographic success criteria would mandate corrective actions such as addition of fill, removal of fill, or other actions to change grades within the subject marsh feature, the USACE would also be responsible for performing the necessary corrective actions subject to availability of funds, but the overall cost would be shared with the NFS according to the project cost-sharing agreement.

There could also be cases where failure to attain intermediate or long-term success criteria (after meeting initial success criteria) would trigger the need for additional monitoring events for which the NFS would be responsible:

- A. If the vegetative cover criterion specified for 3 years after the initial planting of the marsh feature is not achieved (i.e. success criterion 3.C), a monitoring report would be required for each consecutive year until two sequential annual reports indicate that the vegetative cover criterion has been satisfied. The USACE and the NFS would consult and coordinate regarding the purchase and installation of supplemental plants needed to attain the success criterion, which would be cost-shared.
- B. If the topographic success criterion 2.C is not achieved, a monitoring report would be required for each consecutive year until two sequential annual reports indicate success criteria have been satisfied. Since failure to meet this topographic success criteria would mandate corrective actions such as addition of fill, removal of fill, or other actions to change grades within the marsh feature, the USACE and the NFS would consult and coordinate regarding the necessary corrective actions, which would be cost-shared.
- C. Native vegetation success criterion 3.D is applicable to the period extending from 5 years through 20 years following completion of mitigation construction activities. If this criterion is not satisfied at the time of monitoring, the USACE and the NFS would consult and coordinate regarding corrective actions, which would be cost-shared. Such actions could include installing additional plants in the subject marsh (probable course of action), adding sediment to the subject marsh in problem zones (marsh nourishment), or a combination of these activities. Under this scenario, a monitoring report would be required for each consecutive year following completion of the corrective actions until two sequential annual reports indicate that the vegetative cover criterion has been attained. The NFS would be responsible for conducting these additional monitoring events and preparing the associated monitoring reports, at their cost.

The following table indicates the currently anticipated monitoring report schedule and the party responsible for conducting the monitoring and preparing the report.

Table 2. Standard mitigation monitoring report schedule and monitoring responsibility.

Target Year	Monitoring Report Number	Party Responsible for Monitoring and Reporting
1 Complete initial construction activities	N/A	N/A
2 Complete final construction activities	1 (Baseline Report)	USACE
3 Monitor vegetation cover, re-plant as necessary	2	USACE

4 Monitor vegetation cover, re-plant as necessary	3	NFS
5 Monitor vegetation cover, re-plant as necessary	4	NFS
10-50 (every 5 years)	5-13	NFS

Re-planting of certain areas within the restored marsh habitat may be necessary to ensure attainment of applicable native vegetation success criteria. Any monitoring report submitted following completion of a re-planting event must include an inventory of the number of each species planted and the stock size used. It must also include a depiction of the areas re-planted or those planted, as applicable, cross-referenced to a listing of the species and number of each species planted in each area.

Although the USACE would be responsible for conducting the first and second monitoring efforts and would be responsible for preparing the reports, the cost for these activities would be cost-shared with the NFS. Once initial success criteria are achieved, the NFS will be responsible for the costs associated with conducting the monitoring and preparing all monitoring reports.

Once monitoring responsibilities have been transferred to the NFS, the NFS would retain the ability to modify the monitoring plan and the monitoring schedule should this become necessary due to unforeseen events or to improve the information provided through monitoring. Twenty years following completion of mitigation construction activities, the number of monitoring transects and/or quadrats that must be sampled during monitoring events may be reduced substantially if it is clear that mitigation success is proceeding as anticipated. Any significant modifications to the monitoring plan or the monitoring schedule must first be approved by the USACE in coordination with the Interagency Team.

MITIGATION MONITORING COSTS

The total estimated cost of monitoring the proposed project is approximately \$393,000. The estimated costs are provided in Table 3.

MILTON ISLAND MARSH MITIGATION PROJECT - MONITORING COSTS

Target Year	Calendar Year	Work Item	Work Item Description	Cost
1	2016	Initial Construction	Mob and Demob, Dredge, Dike & Weir Construction	0.00
		Topographic Survey	Perform as-built topographic survey of restored marsh areas. Results documented in mitigation monitoring report	40,000.00
		Monitoring	Perform field mitigation monitoring	13,828.00
		Monitoring Report	Prepare and submit report	20,742.00
2	2017	Final Construction	Initial planting of restored marsh features. Install herbaceous species	0.00
		Topographic Survey	Perform as-built topographic survey of restored marsh areas. Results documented in mitigation monitoring report	40,000.00
		Monitoring	Perform field mitigation monitoring	6,562.50
		Monitoring Report	Prepare and submit report	13,125.00
3	2018	Analysis for Notice of Construction Complete	Review monitoring report from prior year and other data to make determination that Non-Federal Sponsor (NFS) is responsible for operation and maintenance	2,800.00
		NFS Responsible	NFS is responsible for operation and maintenance, unless topographic corrections and/or marsh planting required in Target Year 5.	0.00
		Begin OMRR&R		
5	2020	Topographic Survey	Perform topographic survey of restored marsh areas. Results documented in mitigation monitoring report.	50,000.00
		Monitoring	Perform field mitigation monitoring (Aug-Sept).	10,500.00
		Monitoring Report	Submit report Oct-Dec. Includes aerial photography.	15,750.00
7	2022	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
10	2025	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
15	2030	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
20	2035	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
25	2040	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
30	2045	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
35	2050	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
40	2055	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
45	2060	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
50	2065	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
Total Project Monitoring Cost				\$393,307.50

NOTES:

The costs for aerial photography needed for monitoring ARE included in the cost for the "monitoring and report" event that occurs in the same year that the photography is required.

The costs for topographic/as-built surveys needed for monitoring are NOT included in the cost for the "monitoring and report" events.

Assume marsh features will require 1 re-planting event to meet vegetation success criteria. For cost, assume that 20% of the total quantity of plants used in the initial planting will be the quantity needed for re-planting.

Assume invasive/nuisance plant eradication activities will not be required for intermediate and brackish marshes.

During the time mitigation monitoring is the responsibility of CEMVN, additional work required by CEMVN will include coordinating with the Interagency Review Team and NFS concerning the monitoring results and the necessary management/maintenance activities to insure mitigation success.

Once the non-Federal sponsor assumes monitoring responsibility, additional work required by CEMVN will include reviewing the sponsor's mitigation monitoring reports, plus coordinating with the Interagency Review Team and NFS concerning the monitoring results and the necessary management/maintenance activities the NFS must take to help insure mitigation success. CEMVN will further need to enter mitigation data into the USACE mitigation reporting database. These actions will occur in the early part of each year following the year in which the NFS's monitoring report is submitted.

COST ITEMS: \$50,000 included for cost of topographic survey

DEFINITION OF TERMS

Growing Season

As used herein, the growing season is considered to be the period from April through October of any given year, although some deviation from this typical range is allowed.

Interagency Team

The “Interagency Team” consists of representatives from the following resource agencies; US Fish and Wildlife Service, National Marine Fisheries Service, US Environmental Protection Agency, Louisiana Department of Wildlife and Fisheries, State of Louisiana Office of Coastal Protection and Restoration, Louisiana Department of Natural Resources.

Interspersion Features

This term refers to shallow open water features situated within marsh habitats. Examples include tidal channels, creeks, trenasses, and relatively small, isolated ponds. Emergent vegetation is typically absent in such features although they may contain submerged aquatic vegetation. They provide areas of foraging and nursery habitat for fish and shellfish along with associated predators, and provide loafing areas for waterfowl and other waterbirds. The marsh/open water interface forms an ecotone where post-larval and juvenile organisms can find cover and where prey species frequently concentrate.

Invasive Plant Species

All plant species identified as invasive or as non-indigenous (exotic) in the following two sources:

Louisiana Aquatic Invasive Species Task Force. 2005. State Management Plan for Aquatic Invasive Species in Louisiana, Appendix B. Invasive Species in Louisiana (plants). Center for Bioenvironmental Research, Tulane & Xavier Universities, New Orleans, LA. (Website - http://is.cbr.tulane.edu/docs_IS/LAISMP7.pdf)

Barataria-Terrebonne National Estuary Program (BTNEP). 2012. Exotic Invasive Species of the Barataria-Terrebonne, Invasive Species in Louisiana. BTNEP, Thibodaux, LA. (Website – <http://invasive.btnep.org/invasivesvsnatives/invasivesinla2list.aspx>)

In addition, invasive plant species include; Japanese climbing fern (*Lygodium japonicum*), tall fescue (*Festuca arundinacea*), chinaberry (*Miscanthus sinensis*), Brazilian vervain (*Verbena litoralis* var. *brevibracteata*), coral ardisia (*Ardisia crenata*), Japanese ardisia (*Ardisia japonica*), cogon grass (*Imperata cylindrical*), golden bamboo (*Phyllostachys aurea*), and rescuegrass (*Bromus catharticus*).

Native Plant Species

This category includes all plant species that are not classified as invasive plant species and are not considered to be nuisance plant species.

Non-Federal Sponsor (NFS)

This term refers to the Non-Federal Sponsor for the mitigation projects. In this case, the NFS is the Louisiana Coastal Protection & Restoration Authority Board (CPRAB).

Nuisance Plant Species

Nuisance plant species will include native species deemed detrimental due to their potential adverse competition with desirable native species. Nuisance plant species identified for the mitigation project include; dog-fennel (*Eupatorium* spp.), ragweed (*Ambrosia* spp.), cattail (*Typha* spp.), grapevine (*Vitis* spp.), wild balsam apple (*Momordica charantia*), climbing hempvine (*Mikania scandens*, *M. micrantha*), pepper vine (*Ampelopsis arborea*), common reed (*Phragmites australis*), catbrier (*Smilax* spp.), blackberry (*Rubus* spp.), black willow (*Salix nigra*), and box elder (*Acer negundo*). Following completion of the initial mitigation activities (e.g. placement of fill, initial plantings), the preceding list may be expanded to include other nuisance plant species. Any such addition to the list would be based on the results of the standard monitoring reports. The determination of whether a particular new plant species should be considered as a nuisance species and therefore eradicated or controlled would be determined by the USACE in coordination with the NFS and Interagency Team.

Planting Season

This is generally considered to be the period from approximately December 15 through March 15, although some deviation from this typical range is allowed.

Target Year

This document often refers to a “Target Year”. Target Years are the years in which construction or monitoring activities are expected to occur, based on Target Year 1 as the year in which the initial mitigation construction activities are anticipated to be completed, which is presently estimated to occur in calendar year 2016. Target Year 2 (2017) is the year in which the final construction contract is expected to be completed. Target years increase from this time forward in concert with the corresponding calendar year.

USACE Hydrophytic Vegetation Criteria

Reference to satisfaction of USACE hydrophytic vegetation criteria (i.e. plant community is dominated by hydrophytic vegetation) shall mean that sampling of the plant community demonstrates that one or more of the hydrophytic vegetation indicators set forth in the following reference is achieved:

- USACE. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0);
- ERDC/EL TR-10-20. USACE Engineer Research and Development Center, Vicksburg, MS.

Wetland Indicator Status of Plant Species

The wetland indicator status of plants is a means of classifying the estimated probability of a species occurring in wetlands versus non-wetlands. Indicator categories include; obligate wetland (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), and obligate upland (UPL). The wetland indicator status of a particular plant species shall be as it is set forth in the following reference (the “2012 National Wetland Plant List”), using the Region 2 listing contained therein. If the USACE approves and adopts a new list in the future, the new list will apply.

- Lichvar, Robert W. and J.T. Kartesz. 2009. North American Digital Flora: National Wetland Plant List, version 2.4.0 (https://wetland_plants.usace.army.mil). USACE, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH and BONAP, Chapel Hill, NC.

APPENDIX D

ADAPTIVE MANAGEMENT PLAN

TIERED INDIVIDUAL ENVIRONMENTAL REPORT 36 MILTON ISLAND

1.0. Introduction

This Adaptive Management (AM) Plan is for the Milton Island mitigation project. The project is designed to mitigate for impacts to non-refuge fresh and intermediate marsh resulting from construction of the Lake Pontchartrain and Vicinity (LBV) component of the Hurricane and Storm Damage Risk Reduction System (HSDRRS). The Water Resources Development Act (WRDA) of 2007, Section 2036(a) and U.S Army Corps of Engineers (USACE) implementation guidance for Section 2036(a) (CECW-PC Memorandum dated August 31, 2009:

“Implementation Guidance for Section 2036 (a) of the Water Resources Development Act of 2007 (WRDA 2007) – Mitigation for Fish and Wildlife and Wetland Losses”) requires adaptive management and monitoring plans be included in all mitigation plans for fish and wildlife habitat and wetland losses.

2.0. Adaptive Management Planning

Initial adaptive management planning was conducted during the planning process for the Programmatic Individual Environmental Report (PIER) 36 and was reviewed and revised for the Milton Island Tiered Individual Environmental Report (TIER). Adaptive management planning elements included: 1) development of a Conceptual Ecological Model (CEM), 2) identification of key project uncertainties and associated risks, 3) evaluation of the Milton Island mitigation project as a candidate for adaptive management and 4) the identification of potential adaptive management actions (contingency plan) to better ensure the mitigation project meets identified success criteria. The adaptive management Plan is a living document and will be refined as necessary.

The Milton Island mitigation project would consist of intermediate marsh restoration located near Madisonville, Louisiana on the north shore of Lake Pontchartrain, west of the Causeway Bridge. The intermediate marsh would be created in open water areas using borrow from Lake Pontchartrain. Existing permanent retention features (dikes) exist along the east, west, and south perimeters of the project footprint and a new dike on the northern edge would be used to retain fill material. The dike along the north side of the marsh creation area would be degraded approximately 1 year after project construction, upon settlement and dewatering of the created marsh platform. The existing western and eastern dikes would be gapped approximately 1 year after project construction to allow interaction with the existing marsh platform. The gaps would be spaced with care being taken to locate gaps at all existing natural bayous or openings. The southern dike would remain, to provide protection from Lake Pontchartrain’s waves and water intrusion. Aerial photography confirmed by a site visit shows that the southern shoreline has breached at the southeast corner of the project footprint, and lake waters are free to enter and exit the area where marsh mitigation would occur. Shoreline restoration is proposed to close off the approximately 1,000-foot long opening. The shoreline restoration feature and the marsh mitigation area are shown in Figure 1 below. Vegetation planting would be accomplished upon dewatering and consolidation of the fill material, approximately 1 year after project construction.

Alternatives/Issues/Drivers	Flood Side Intermediate Marsh
Salinity Impacts	+/-
Wave Action	-
Storm Surge	-
Vegetative Invasive Species	-
Herbivory	-
Hydrology (water table; wet/dry days; soil inundation)	+/-
Topography (elevation)	+/-

Key to Cell Codes: - = Negative Impact/Decrease
 + = Positive Impact/Increase
 +/- = Duration Dependent

2.2. Sources of Uncertainty and Associated Risks

A fundamental tenet underlying adaptive management is decision making and achieving desired project outcomes in the face of uncertainties. There are many uncertainties associated with restoration of the coastal systems. The project delivery team (PDT) identified the following uncertainties during the planning process.

- Climate change, such as relative sea level rise, drought conditions, and variability of tropical storm frequency, intensity, and timing
- Subsidence and water level trends
- Uncertainty relative to achieving ecological success
- Long-term sustainability of project benefits
- Adaptability

2.3. Adaptive Management Evaluation

As part of PIER 36, the Milton Island project site was evaluated and planned through the AEP to develop a project with minimal risk and uncertainty. The items listed below were incorporated into the mitigation project implementation plan and Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) plans to minimize project risks.

- Detailed planting guidelines for intermediate marsh
- General monitoring guidelines for project success
- Specified success criteria (i.e., mitigation targets)
- Invasive species control
- Supplementary plantings as necessary (contingency)
- Corrective actions to meet topographic success as required (contingency)

Subsequently, as part of the adaptive management planning effort the Milton Island project features were re-evaluated against the CEM and sources of uncertainty and risk were identified to determine if there was any need for additional adaptive management actions.

Based on the uncertainties and risks associated with the project implementation the following contingency/adaptive management actions have been identified to be implemented if needed to ensure the required AAHUs are met:

Potential Action #1. Additional vegetative plantings as needed to meet identified success criteria.

Potential Action #2. Marsh renourishment by adding sediment to obtain elevations necessary for marsh establishment and maintenance.

Potential Action #3. Repair or modification of the shoreline restoration feature as necessary to reduce Lake Pontchartrain wave and salinity influences on the marsh restoration feature.

Potential Action #4. Potential need to adjust the gapping in the western permanent dike in the future to maintain sufficient marsh hydrology and connectivity.

Actions 1-3 are not recommended as separate adaptive management actions since they are already built into the mitigation plan and success criteria identified in Appendix C. In the event that monitoring reveals the project does not meet the identified vegetation or topographic success criteria, additional plantings or construction activities would be conducted under the mitigation project. Specific measures to implement Action 2, if determined necessary to achieve project benefits, would be coordinated with the NFS and other agencies to determine the appropriate course of action. If it is determined that the project benefits are significantly compromised because of improper elevation, additional fill material may need to be pumped into the project area. The USACE would be responsible for performing any necessary corrective actions, but the overall cost would be shared with the NFS according to the project cost-share agreement. Action 4 has not been addressed in the implementation or OMRR&R plan and should be considered as a separate potential adaptive management action in the future. The estimated adaptive management cost for the Milton Island mitigation project is approximately \$200,000.

The USACE would be responsible for the proposed mitigation construction and monitoring until the initial success criteria are met. Initial construction and monitoring would be funded in accordance with all applicable cost-share agreements with the NFS. The USACE would monitor (on a cost-shared basis) the completed mitigation to determine whether additional construction, invasive/nuisance plant species control, and/or plantings are necessary to achieve initial mitigation success criteria. Once the USACE determines that the mitigation has met the initial success criteria, monitoring would be performed by the NFS as part of its OMRR&R obligations. If after meeting initial success criteria, the mitigation fails to meet its intermediate and/or long-term ecological success criteria, the USACE would consult with other agencies and the NFS to determine the appropriate management or remedial actions required to achieve ecological success. The USACE would retain the final decision on whether or not the project's required mitigation benefits are being achieved and whether or not remedial actions are required. If structural changes are deemed necessary to achieve ecological success, the USACE would implement appropriate adaptive management measures in accordance with the contingency plan and subject to cost-sharing requirements, availability of funding, and current budgetary and other guidance.

3.0. Monitoring for Project Success

A monitoring plan consistent with WRDA 2007 Section 2036(a) specific to the Milton Island mitigation project has been developed (see Appendix C). The monitoring plan identifies success criteria and targets, a schedule for the monitoring events and the specific content for the monitoring reports that measure progress towards meeting the success criteria.

Table 2 summarizes the success criteria outlined in Appendix B and may be used to depict project progress towards achieving the identified success criteria. In the event monitoring results reveal that any success criteria have not been met, the USACE, NFS, or its assigns after consultation with CEMVN and other appropriate agencies, would modify management practices in order to achieve these criteria in the future.

Table 2: Intermediate Marsh Report Card - Summary of Mitigation Success Criteria

Performance Categories	
Mitigation Construction	Criteria 1A: Complete initial construction activities. Criteria 1B: Complete final construction activities.
Native Vegetation	Criteria 3A. Complete initial plantings. Criteria 3B: For intermediate marsh , 1 year after initial plantings, achieve: <ul style="list-style-type: none"> • $\geq 80\%$ survival of planted species OR $\geq 25\%$ cover by native herbaceous species. • meet hydrophytic vegetation criteria. Criteria 3C: For intermediate marsh 3 years after initial plantings, achieve: <ul style="list-style-type: none"> • $\geq 75\%$ cover by native herbaceous species. Criteria 3D: For all marshes, 5 through 20 yrs after final construction completion, achieve: <ul style="list-style-type: none"> • $\geq 80\%$ cover by native herbaceous species.
Invasive and Nuisance Vegetation	Criteria 4A. Complete initial eradication of invasive species within 1 year of completion of final mitigation construction activities. Criteria 4B. Maintain $< 5\%$ cover by invasive species for the overall duration of the monitoring period.
Topography	Criteria 2A: Upon completion of construction, $\geq 80\%$ of total area must be within 0.5 ft of target elevation. Criteria 2B: 1 year after completion of construction, $\geq 80\%$ of total area must be within 0.5 ft of target elevation. Criteria 2C: 3 years after completion of construction, $\geq 90\%$ of mitigation site must be within functional marsh elevation range.

APPENDIX E

January 2012

Version 1.1

Wetland Value Assessment Methodology Coastal Marsh Community Model

The Wetland Value Assessment (WVA) methodology is a quantitative habitat-based assessment methodology developed for use in determining wetland benefits of project proposals submitted for funding under the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA). The WVA quantifies changes in fish and wildlife habitat quality and quantity that are expected to result from a proposed wetland restoration project. The WVA operates under the assumption that optimal conditions for fish and wildlife habitat within a given coastal wetland habitat type can be characterized, and that existing or predicted conditions can be compared to that optimum to provide an index of habitat quality. Habitat quality is estimated or expressed through the use of community models developed specifically for each habitat type. The results of the WVA, measured in Average Annual Habitat Units (AAHUs), can be combined with cost data to provide a measure of the effectiveness of a proposed project in terms of annualized cost per AAHU gained. In addition, the WVA methodology provides an estimate of the number of acres benefited or enhanced by the project and the net acres of habitat protected/restored.

The WVA was developed by the CWPPRA Environmental Work Group (EnvWG) after the passage of CWPPRA in 1990. The EnvWG includes members from each agency represented on the CWPPRA Task Force and members of the Academic Advisory Group (AAG). The WVA is a modification of the Habitat Evaluation Procedures (HEP) developed by the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 1980). HEP has been widely used by the Fish and Wildlife Service (FWS) and other Federal and State agencies in evaluating the impacts of development projects on fish and wildlife resources. A notable difference exists between the two methodologies, however, in that HEP generally uses a species-oriented approach, whereas the WVA utilizes a community approach.

The WVA has been developed for application to several habitat types along the Louisiana coast and community models have been developed for fresh marsh, intermediate marsh, brackish marsh, saline marsh, swamp, barrier islands, and barrier headlands. Habitat assessment models for bottomland hardwoods and coastal chenier/ridge habitat were developed outside of CWPPRA and are periodically used by the EnvWG. The WVA models have been developed for determining the suitability of Louisiana coastal wetlands in providing resting, foraging, breeding, and nursery habitat to a diverse assemblage of fish and wildlife species. The models have been designed to function at a community level and therefore attempt to define an optimum combination of habitat conditions for all fish and wildlife species utilizing a given habitat type. Each model consists of 1) a list of variables that are considered important in characterizing fish and wildlife habitat, 2) a Suitability Index (SI) graph for each variable, which defines the assumed relationship between habitat quality (Suitability Index) and different variable values, and 3) a mathematical formula that combines the Suitability Index for each variable into a single value for habitat quality; that single value is referred to as the Habitat Suitability Index, or HSI.

The output of each model (the HSI) is assumed to have a linear relationship with the suitability of a coastal wetland system in providing fish and wildlife habitat.

Note: This document has been primarily developed to guide the application of the coastal marsh community models for CWPPRA. However, the guidance it provides may be used by other restoration programs (e.g., Louisiana Coastal Area, U.S. Army Corps of Engineers Civil Works) recognizing the distinction between projects that result in net habitat gain (i.e., restoration), net loss (i.e., development), or no net loss (i.e., mitigation). Furthermore, for development and mitigation projects, it should be recognized that the role and jurisdiction of specific groups may vary from program to program. In addition, these models may be used to calculate the number of average annual habitat units lost to determine the potential impacts and adequately compensate (i.e., mitigation) for those impacts.

The above information is the introduction to the WVA methodology as detailed in the WVA application document. The Point of Contact is:

Kevin J. Roy
U.S. Fish and Wildlife Service
646 Cajundome Blvd., Suite 400
Lafayette, LA 70506
(337) 291-3120
kevin_roy@fws.gov

Project Goal: Restore a sufficient amount of intermediate marsh habitat within the Milton Island Marsh project area to mitigate for the 45.7 AAHUs of non-refuge, fresh and intermediate marsh habitat impacted by the LPV HSDRRS. The proposed marsh site initial target elevation for dredge fill would be elevation +2.0' to +2.5' NAVD88, to ultimately hit a target marsh elevation of +1.0 within the project life.

The proposed marsh layout results in an open water area immediately north and adjacent to the marsh footprint. The entire northern retention dike will be degraded to marsh elevation in year two (2), allowing immediate access for fish and wildlife between the open water and marsh platforms. The created marsh will provide an additional expanse of shoreline buffer for other interior swamp and marsh habitats. As such, construction of trenasses will not be proposed within the marsh platform. It is anticipated that natural sloughs and/or access corridors will develop over the project life.

A final element of the project construction will be the restoration of a 1,000 foot reach of the lake shoreline which has breached, allowing lake waters to freely enter the project footprint. An earthen berm, with a 25 foot crown width, 1:4 foot (rise to run) side slope, at elevation +5.0' NAVD88 is proposed. An earthen-filled bag system, which will accommodate planting of shoreline vegetation, will be considered as a viable shoreline protection alternative, and included in the construction cost estimate. It is estimated that the footprint of the shoreline restoration would result in 2 acres (rounded up from 1.7 acres) of impacted water bottoms.

The total project area is 152 acres which includes the containment dike footprint and the shoreline berm feature. Of that area 7 acres are existing containment dikes, leaving 145 acres within the area of analysis. Within that 145-acre area, as much as 15 acres would be excavated to construct a new containment dike along the northern perimeter and strengthen and enlarge existing dikes along the other three sides. Corps Engineering Division estimated that approximately 40 percent of the northern and southern borrow ditches, or 4.5 acres, would refill to marsh elevation. This is assuming some of the material from degrading the perimeter dikes would settle to target elevation. Two (2) acres (1.7 acres rounded up) of open water will be converted to a vegetated shoreline berm and tie into the existing lakefront shoreline. These acres were subtracted from the 145-acre area of analysis for the future with project land loss analysis, yielding a 143 acre potential benefit area (132.5 acres of marsh and 10.5 acres of water). The mitigation potential was calculated using the 145-acre area of analysis.

The calculation for the area that would be filled to target elevation is:

143 acres of benefit – 15 acres borrow excavated + 4.5 acres of borrow at target elevation = 132.5 acres of marsh (10.5 acres of water)

Project Construction Schedule:

TY0 – Dec 2015-Mar 2016: Physical Construction: Dredge, Dikework, etc. (120 days)

TY1 – 2016 (Mar 2016-Mar 2017: Settlement (1-yr))

TY2 – 2017 (Mar-Apr 2017: Initial Planting (60 days) & gapping)

May-Aug 2017: NCC Project after Initial Planting complete (per MVD guidance); process takes 4 months per LPV/WBV project teams experience with NFS

Habitat Assessment Method

The WVA operates under the assumption that optimal conditions for general fish and wildlife habitat within a given coastal wetland type can be characterized, and that existing or predicted conditions can be compared to that optimum to provide an index of habitat quality. Habitat quality is estimated or expressed through the use of a mathematical model developed specifically for each wetland type. Each model consists of 1) a list of variables that are considered important in characterizing fish and wildlife habitat, 2) a Suitability Index graph for each variable, which defines the assumed relationship between habitat quality (Suitability Index) and different variable values, and 3) a mathematical formula that combines Suitability Index for each variable into a single value for wetland habitat quality; that single value is referred to as the Habitat Suitability Index, or HSI.

The WVA models assess the suitability of each habitat type for providing resting, foraging, breeding, and nursery habitat to a diverse assemblage of fish and wildlife species. This standardized, multi-species, habitat-based methodology facilitates the assessment of project-induced impacts on fish and wildlife resources. The coastal marsh WVA model consists of six variables: 1) percent of wetland area covered by emergent vegetation; 2) percent of open water area covered by aquatic vegetation; 3) marsh edge and interspersion; 4) percent of open water area \leq 1.5 feet deep in relation to marsh surface; 5) salinity; and 6) aquatic organism access.

Values for those variables are derived for existing conditions and are estimated for conditions projected into the future if no restoration efforts are applied (i.e., future-without-project), and for conditions projected into the future if the proposed restoration project is implemented (i.e., future-with-project), providing an index of quality or habitat suitability of the habitat for the given time period. The habitat suitability index (HSI) is combined with the acres of habitat to get a number that is referred to as “habitat units”. Expected project benefits are estimated as the difference in habitat units between the future-with-project (FWP) and future-without project (FWOP). To allow comparison of WVA benefits to costs for overall project evaluation, total benefits are averaged over a 50-year period, with the result reported as Average Annual Habitat Units (AAHUs).

V1 - Emergent Vegetation

Existing – The project area is classified as open water as determined by FWS analysis of 2012 and 2013 aerial photography. Chabreck and Linscombe (1997) identified fresh marsh as occurring within the project area, while Sasser et al. (2007) classified the area as intermediate marsh.

The two major soil types in the project area are classified by Trahan (1987) as Allemands muck and Maurepas muck. Both soil types are very poorly drained, occurring within former freshwater marshes and swamps.

Land Loss Data

To calculate loss rates USGS evaluated a 9,848 acre extended boundary (Figure 2). USGS determined the 1985-2010 rate from a linear regression that is depicted in Figure 3. The loss rate

(-0.28%/yr) was calculated from percent land values (acres) from that 1984-2010 timeframe. USGS excluded some data points from the regression analysis due to low and high water events.

USGS's percent is percent of the total area (marsh + water). The FWS percent loss rate was determined as a percent of the 1985 land area and also included all data points provided. Typically, in WVAs and other such evaluations, we have used the FWS method as there might in some cases be non-wetlands within the polygon and then use of the total polygon area would result in obvious errors. Therefore, the FWS method has been the standard method used in the past. Based on the data provided by USGS, the FWS determined a loss rate of -0.28% per year. For FWP it is assumed that the loss rate would be reduced by 50% until a point when post-construction accretion exceeds 10 inches above the created marsh platform; and therefore, a loss rate of -0.19 acres per year ($0.28\%/2 * 132.5$) was applied under the FWP scenario.

Figure: 2. USGS Extended Boundary for Milton Island Marsh - polygon 05

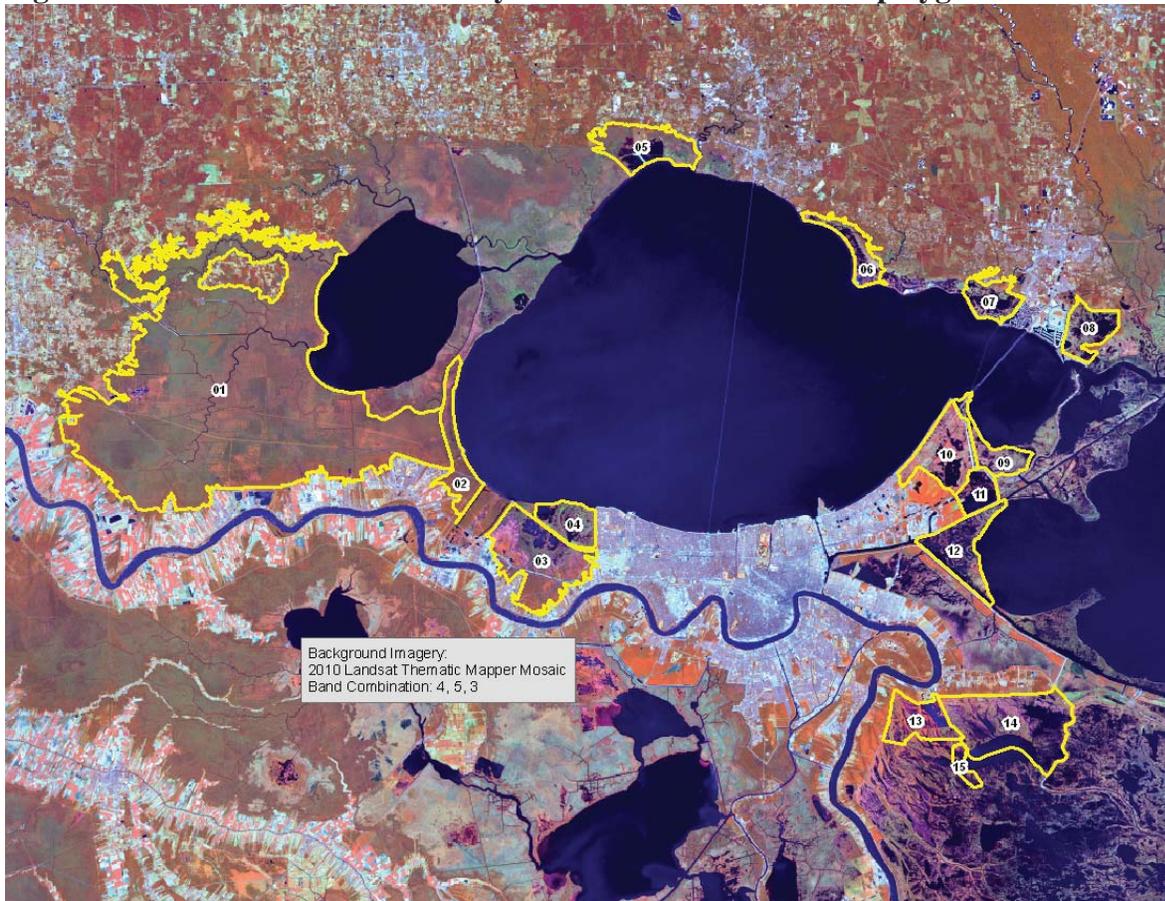
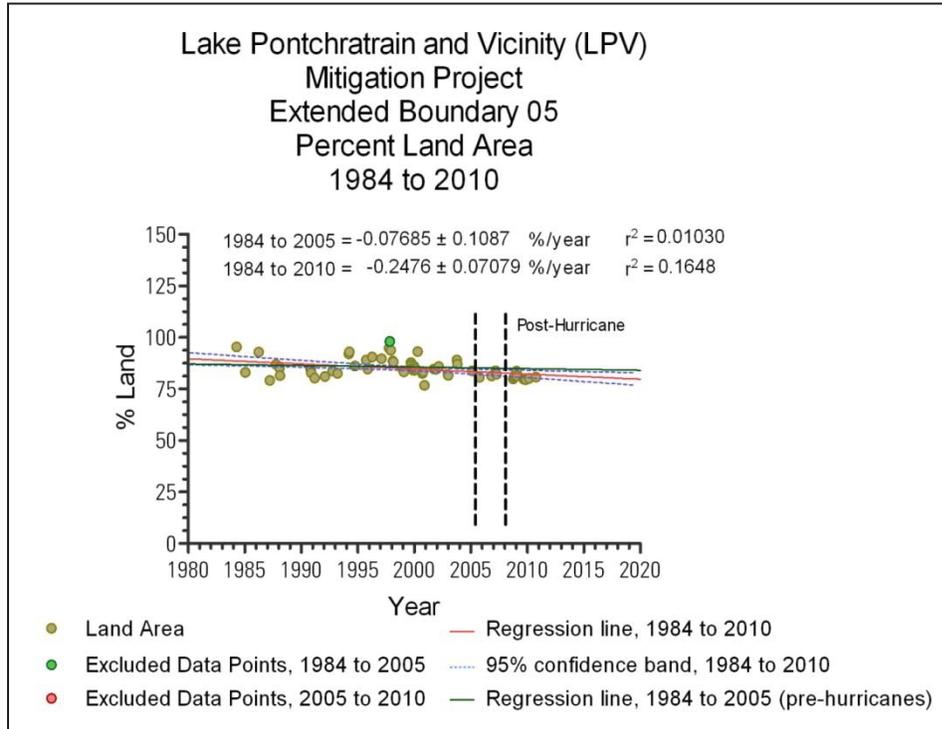


Figure 3. Land loss rate determined by USGS



FWOP

Loss Rate: -0.28% /year (FWS LLR, 0 acres/yr due to no land being in the PA polygon)

TY0-50	Marsh	0 acres (0%)	TY0 = 2015
	Water	145 acres (100%)	

FWP

For use in the WVA models, projected Relative Sea Level Rise (RSLR) estimates were developed according to EC 1165-2-211, using a nearby reference gage (Mandeville gage) in the Lake Pontchartrain and Vicinity mitigation watershed. The reference gage was used to develop low, intermediate and high RSLR estimates. Based on MVD planning guidance, the Intermediate RSLR scenario was used for the purpose of WVA modeling for alternative comparison. Analysis of USGS landloss data indicates that land change is still occurring under the low SLR scenario. Therefore, the FWS applied the intermediate RSLR scenario starting from the last year of USGS landloss data.

Created marsh platform has limited marsh function until settlement, breaching of retention dikes, and vegetation occurs. Land loss is applied at the time of marsh creation. The rate is 50% of the background loss rate until TY40 when at least 10 inches of water is assumed to cover the marsh and, therefore, 10 inches of post-construction accretion is assumed to occur. At that time background loss rate is resumed. A settlement period of 5 years was also applied based on the

Corps settlement analysis that indicates 75% of settlement occurs in the first 5 years. This assumption will delay when the loss rate changes back to 100% (YR, Settlement curves). Percent loss rate is of the entire project area acreage.

Research by Nyman et al. (1993) suggests that coastal marshes may undergo rapid degradation and conversion to open water beyond a critical rate of submergence/inundation. Louisiana Coastal Protection and Restoration Authority (CPRA) personnel working to model marsh loss for the 2012 Louisiana Coastal Master Plan have used statewide Coastal Reference Monitoring System data to develop plant productivity vs inundation (i.e., accretion deficit) relationships. From those relationships, they identified inundation ranges at the primary production low-end points to predicting onset of abrupt marsh collapse (Coastal Protection and Restoration Authority of Louisiana 2012). In this study, the median value for intermediate marsh (34.4 cm) was considered to predict onset of abrupt marsh collapse; however, marsh collapse does not occur under the intermediate RSLR scenario.

Loss Rate: -0.19 acres/year (FWS LLR)

TY0	Marsh	0 acres (0%)
	Water	145 acres (100%)
TY1	Marsh	0 acres (assume 0% credit of the remaining 132.5-ac marsh platform)
	Water	12.7 acres (7.5%)
TY2	Marsh	13.2 acres (9%) (assume 10% credit of the remaining marsh platform for gapping/planting)
	Water	12.9 acres (9%, borrow & marsh loss)
TY3	Marsh	33.0 acres (23%) (assume 25% credit of remaining marsh platform)
	Water	13.1 acres (9%)
TY5	Marsh	131.5 acres (91% - assume full credit of remaining marsh platform)
	Water	13.5 acres (9%)
TY6	Marsh	131.2 acres (92%)
	Water	13.8 acres (9.5%)
TY40	Marsh	117.7 acres (82%)
	Water	27.3 acres (19%)
TY50	Marsh	110.1 acres (76%)
	Water	34.9 acres (24%)

V2 – Submerged Aquatic Vegetation (SAV)

The project area is primarily open water with depths ranging from approximately 0.5 to 3 feet (see Milton Island Marsh Raw WVA Data.xlsx). During a May 17, 2011, HSDRRS WVA field trip it was estimated that approximately 55% of the open water had SAV cover. It is assumed that this value will decrease over the 50 year project life as open water areas continue to deepen over time. Also the shoreline has breached opening the area to the lake. Increased turbidity is expected under the FWOP. The Corps RSLR data was applied to FWOP conditions.

FWOP

TY0	55%	
TY1	55%	
TY3	55%	
TY5	55%	
TY6	55%	
TY40	35%	Assume decrease due to subsidence and continued deepening of open Water. Water level increases 0.34 ft by TY 40.
TY50	15%	Assume 70% decrease due to subsidence and continued deepening of open Water. Water level increases 0.44 ft by TY 50.

FWP

For the HSDRRS Mitigation alternatives analysis the interagency team developed the following assumptions for a 50 year project life:

TY0	55%
TY1	0%
TY3	0%
TY5	55% (baseline)
TY6	63% (increase baseline X 15%)
TY40	50% (assume decrease as open water areas deepen)
TY50	28% (decrease baseline X 50%)

V3 – Interspersion

The marsh creation cell is 100% open water. For the HSDRRS Mitigation alternatives analysis it is assumed that marsh creation would occur within the entire cell and, therefore, no marsh nourishment would be credited. Therefore, the site will be classified as Class 5 for FWOP.

FWOP

TY0-50 100% Class 5

FWP

The created marsh will be considered a “carpet marsh” at TY3 (i.e., 100% Class 3) transitioning to a Class 1 by TY6.

TY0	100% Class 5
TY1	100% Class 5
TY2	100% Class 3
TY3	100% Class 3 (“carpet marsh”)
TY5	90% Class 3/10% Class 1 (accounting for north dike degradation & portions of the borrow canal)
TY6	90% Class 3/10% Class 1
TY40	100% Class 1 TY 40 = 81% marsh/19% water (boarder line class 1*)

TY50 100% Class 2 Assume would drop to a class 2 with 76% marsh/24% water

* USGS Interspersion tool assumes marsh areas >82% marsh = Class 1

V4 – Shallow Open Water Habitat

Water depths were taken throughout the project site during a May 17, 2011 field investigation. Refer to Milton Island Marsh Raw WVA Data.xlsx for existing water depth and adjusted water depth information.

CRMS6209-H01 Average Water Elevation (ft NAVD88) - 1/2010-1/2011 = 0.74

Lake Pontchartrain at Mandeville (85575) 13:00 hours 4/14/2011 0.9 NAVD88

0.16 ft above average, therefore, subtract 0.16 to measured water depths to bring to average water depths

19% of the project area is currently ≤ 1.5 ft depth.

FWOP

Table: FWOP Increases in Water Levels Under Intermediate SLR Scenario.

Med RSLR WL increase (ft)	TY	Year	FWOP Percent OW ≤ 1.5 ft
0.03	0	2015	18.8
0.03	1	2016	18.8
0.04	2	2017	18.8
0.05	3	2018	18.8
0.05	4	2019	18.8
0.06	5	2020	18.8
0.07	6	2021	18.8
0.34	40	2055	14.5
0.44	50	2065	14.0

FWP

TY0 19%

TY1 100% including borrow area

TY2 100%

TY3 100%

TY5 100% assume the 1% marsh lost would become shallow open water

TY6 100%

TY40 90% assume that marsh lost would convert to shallow open water and that shallow open water (i.e., ≤ 1.5 feet) would deepen over time (i.e., to > 1.5 feet)

TY50 83% assume 1/6 of shallow open water (marsh loss) becomes deep based on 0.44 feet of water level rise

V5 – Salinity

Average salinity during the growing season information was obtained from the Guste Island Mitigation Bank (located east of Milton Island Marsh) project. It is not expected that the project will affect salinity because of the tidal exchange with adjacent Lake Pontchartrain.

FWOP & FWP

TY0-50 3.0 ppt

V6 – Fish Access

All of the study area is accessible and the access points are open and unobstructed.

FWOP

TY0-50 1.0 open system

FWP

TY0	1.0	open system
TY1	0.0001	solid plug
TY2	0.8	open system resulting from gapping and degrading dikes, but applied some reduced suitability due to settlement curves projecting fill elevations being +2.0, trenasses are not proposed
TY3	0.8	open system, limited access due to elevations
TY5	0.9	open system, 75 % settlement has occurred at TY 5
TY6	1.0	open system
TY40	1.0	open system
TY50	1.0	open system

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WETLAND VALUE ASSESSMENT COMMUNITY MODEL

Fresh/Intermediate Marsh

Project: **Milton Island IM Med SLR**

Project Area:	145
% Fresh	
% Intermediate	100

Condition: Future Without Project

Variable		TY 0		TY 1		TY 6	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	0	0.10
V2	% Aquatic	55	0.60	55	0.60	55	0.60
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	0.10	0	0.10
	Class 2	0		0		0	
	Class 3	0		0		0	
	Class 4	0		0		0	
	Class 5	100		100		100	
V4	%OW <= 1.5ft	19	0.31	19	0.31	19	0.31
V5	Salinity (ppt)						
	fresh	0	0.90	0	0.90	0	0.90
	intermediate	3		3		3	
V6	Access Value						
	fresh	0.0000	1.00	0.0000	1.00	0.0000	1.00
	intermediate	1.0000		1.0000		1.0000	
Emergent Marsh HSI =		0.23		EM HSI =	0.23	EM HSI =	0.23
Open Water HSI =		0.62		OW HSI =	0.62	OW HSI =	0.62

Project: **Milton Island IM Med SLR**

FWOP

Variable		TY 50		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10				
V2	% Aquatic	15	0.24				
V3	Interspersion	%		%		%	
	Class 1	0	0.10				
	Class 2	0					
	Class 3	0					
	Class 4	0					
	Class 5	100					
V4	%OW <= 1.5ft	14	0.26				
V5	Salinity (ppt)						
	fresh	0	0.90				
	intermediate	3					
V6	Access Value						
	fresh	0.0000	1.00				
	intermediate	1.0000					
EM HSI =		0.23		EM HSI =		EM HSI =	
OW HSI =		0.36		OW HSI =		OW HSI =	

Project: Milton Island IM Med SLR

FWOP

Variable		TY		TY		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent						
V2	% Aquatic						
V3	Interspersion	%		%		%	
	Class 1						
	Class 2						
	Class 3						
	Class 4						
V4	%OW <= 1.5ft						
	Salinity (ppt)						
V5	fresh						
	intermediate						
V6	Access Value						
	fresh						
	intermediate						
		EM HSI =		EM HSI =		EM HSI =	
		OW HSI =		OW HSI =		OW HSI =	

WETLAND VALUE ASSESSMENT COMMUNITY MODEL Fresh/Intermediate Marsh

Project: Milton Island IM Med SLR

Project Area:	145
% Fresh	
% Intermediate	100

Condition: Future With Project

Variable		TY 0		TY 1		TY 2	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	0	0.10	0	0.10	9	0.18
V2	% Aquatic	55	0.60	0	0.10	0	0.10
V3	Interspersion	%		%		%	
	Class 1	0	0.10	0	0.10	0	0.40
	Class 2	0		0		0	
	Class 3	0		0		100	
	Class 4	0		0		0	
V4	%OW <= 1.5ft	19	0.31	100	0.60	100	0.60
	Salinity (ppt)						
V5	fresh	0	0.90	0	0.90	0	0.90
	intermediate	3		3		3	
V6	Access Value						
	fresh	0.0000	1.00	0.0000	0.20	0.0000	0.84
	intermediate	1.0000		0.0001		0.8000	
Emergent Marsh HSI =		0.23		EM HSI =		0.20	
Open Water HSI =		0.62		OW HSI =		0.21	
				EM HSI =		0.33	
				OW HSI =		0.27	

Project: Milton Island IM Med SLR

FWP

Variable		TY 3		TY 5		TY 6	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	23	0.31	91	0.92	91	0.92
V2	% Aquatic	0	0.10	55	0.60	63	0.67
V3	Interspersion	%		%		%	
	Class 1	0	0.40	10	0.46	10	0.46
	Class 2	0		0		0	
	Class 3	100		90		90	
	Class 4	0		0		0	
	Class 5	0		0		0	
V4	%OW <= 1.5ft	100	0.60	100	0.60	100	0.60
V5	Salinity (ppt)						
	fresh	0	0.90	0	0.90	0	0.90
	intermediate	3		3		3	
V6	Access Value						
	fresh	0.0000	0.84	0.0000	0.92	0.0000	1.00
	intermediate	0.8000		0.9000		1.0000	
		EM HSI = 0.43		EM HSI = 0.87		EM HSI = 0.88	
		OW HSI = 0.27		OW HSI = 0.66		OW HSI = 0.72	

Project: Milton Island IM Med SLR

FWP

Variable		TY 40		TY 50		TY	
		Value	SI	Value	SI	Value	SI
V1	% Emergent	81	0.83	76	0.78		
V2	% Aquatic	63	0.67	28	0.35		
V3	Interspersion	%		%		%	
	Class 1	100	1.00	0	0.60		
	Class 2	0		100			
	Class 3	0		0			
	Class 4	0		0			
	Class 5	0		0			
V4	%OW <= 1.5ft	90	1.00	83	1.00		
V5	Salinity (ppt)						
	fresh	0	0.90	0	0.90		
	intermediate	3		3			
V6	Access Value						
	fresh	0.0000	1.00	0.0000	1.00		
	intermediate	1.0000		1.0000			
		EM HSI = 0.88		EM HSI = 0.80		EM HSI =	
		OW HSI = 0.79		OW HSI = 0.54		OW HSI =	

AAHU CALCULATION - EMERGENT MARSH

Project: Milton Island IM Med SLR

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0.0001	0.23	0.00	
1	0.0001	0.23	0.00	0.00
6	0.0001	0.23	0.00	0.00
50	0.0001	0.23	0.00	0.00
Max=	50		AAHUs =	0.00

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	0.0001	0.23	0.00	
1	0.0001	0.20	0.00	0.00
2	13.2	0.33	4.31	1.87
3	33	0.43	14.09	8.86
5	131.5	0.87	113.88	113.55
6	131.2	0.88	114.93	114.41
40	117.7	0.88	103.15	3707.42
50	110.1	0.80	88.27	956.12
Max=	50		AAHUs	98.04

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Emergent Marsh AAHUs =	98.04
B. Future Without Project Emergent Marsh AAHUs =	0.00
Net Change (FWP - FWOP) =	98.04

AAHU CALCULATION - OPEN WATER

Project: Milton Island IM Med SLR

Future Without Project			Total HUs	Cummulative HUs
TY	Water Acres	x HSI		
0	145	0.62	90.51	
1	145	0.62	90.51	90.51
6	145	0.62	90.51	452.57
50	145	0.36	51.57	3125.87
Max= 50			AAHUs = 73.38	

Future With Project			Total HUs	Cummulative HUs
TY	Water Acres	x HSI		
0	145	0.62	90.51	
1	12.7	0.21	2.68	37.49
2	12.9	0.27	3.52	3.10
3	13.1	0.27	3.58	3.55
5	13.5	0.66	8.93	12.45
6	13.8	0.72	9.93	9.42
40	27.3	0.79	21.54	529.52
50	34.9	0.54	18.87	205.16
Max= 50			AAHUs 16.01	

ck

145
145
145
145

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project Open Water AAHUs =	16.01
B. Future Without Project Open Water AAHUs =	73.38
Net Change (FWP - FWOP) =	-57.37

TOTAL BENEFITS IN AAHUs DUE TO PROJECT	
A. Emergent Marsh Habitat Net AAHUs =	98.04
B. Open Water Habitat Net AAHUs =	-57.37
Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1	47.91