APPENDIX D

ADAPTIVE MANAGEMENT PLAN

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SUPPLEMENTAL INDIVIDUAL ENVIRONMENTAL REPORT 36
BAYOU SAUVAGE, TURTLE BAYOU & NEW ZYDECO RIDGE RESTORATION PROJECTS

1.0. Introduction

This Adaptive Management (AM) Plan is for the Bayou Sauvage, Turtle Bayou and New Zydeco Ridge mitigation projects. The projects are designed to mitigate for impacts to refuge brackish and intermediate marsh and BLH-Wet 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. Full descriptions of the mitigation projects are included in the Supplemental Individual Environmental Report (SIER) 36.

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 Bayou Sauvage (BSFBM), Turtle Bayou (TBPIM) and New Zydeco Ridge (NZR) SIER. 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 mitigation projects 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 would be refined as necessary.

2.1. Conceptual Ecological Model

A CEM was developed to identify the major stressors and drivers affecting the proposed mitigation projects in the SIER (see table 1). The CEM does not attempt to explain all possible relationships of potential factors influencing the mitigation sites; rather, the CEM presents only those relationships and factors deemed most relevant to obtaining the required acres/average annual habitat units (AAHU). Furthermore, this CEM represents the current understanding of these factors and would be updated and modified, as necessary, as new information becomes available. Stressors and Drivers identified in the CEM were identified during the PIER Alternative Evaluation Process (AEP) process to evaluate relative risks associated with each alternative mitigation alternative.

Table 1. Conceptual Ecological Model

Alternative Project /Issues/Drivers	Flood Side Brackish Marsh	Protected Side Intermediate Marsh	BLH Wet
Subsidence	-	-	-
Sea Level Rise	-	-	-
Runoff	-	-	-
Storm Induced	+/-	+/-	+/-
Salinity Impacts	+/-	+/-	+/-
Wave Action	-	-	-
Storm Surge	-	-	-
Vegetative Invasive Species	-	-	-
Herbivory	-	-	-
Hydrology	+/-	+/-	+/-
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.

A. Climate change, such as relative sea level rise, drought conditions, and variability of tropical storm frequency, intensity, and timing
B. Subsidence and water level trends at the mitigation sites
C. Uncertainty Relative to Achieving Ecological Success:
    i. Water, sediment, and nutrient requirements for BLH Wet and Marsh
    ii. Magnitude and duration of wet/dry cycles for BLH Wet
    iii. Nutrients required for desired productivity for BLH Wet and Marsh
    iv. Growth curves based on hydroperiod and nutrient application for BLH Wet and Marsh
    v. Tree and marsh litter production based on nutrient and water levels for BLH Wet
    vi. Tree propagation in relation to management/regulation of hydroperiod for BLH Wet
D. Loss rate of vegetative plantings due to herbivory
E. Long-Term Sustainability of Project Benefits

2.3. Adaptive Management Evaluation

As part of PIER 36, the 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 and brackish marsh and BLH
- 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 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 AAHU are met:

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

Uncertainties addressed: A, B, C, D, E

Potential Action #2. Potential need to adjust the gapping in the permanent dikes in the future to maintain sufficient marsh hydrology and connectivity.

Uncertainties addressed: A, B, C, E

Actions 1 and 2 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.

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. Due to the impact the addition of fill to the mitigation projects once they have been planted would incur, lifts to the projects are not currently considered as a viable remedial action. Instead, increasing the size of the existing mitigation project or mitigating the outstanding balance of the mitigation requirement elsewhere or through the purchase of mitigation bank/ILF credits would be options that could be considered through additional coordination with the NFS and the IET. However, such options would have to undergo further analysis in a supplemental NEPA document.

3.0. Monitoring for Project Success

A monitoring plan consistent with WRDA 2007 Section 2036(a) specific to the 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.