2019

Lake Pontchartrain and Vicinity GRR Mitigation Plan – Appendix K

U.S. Army Corps of Engineers, New Orleans District

Non-Federal Sponsor: Coastal Protection and Restoration Authority Board

12/04/2019

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1. INTRODUCTION

1.1 PROPOSED ACTION

The U.S. Army Corps of Engineers (USACE), Mississippi Valley Division, New Orleans District (CEMVN), has prepared a Draft Environmental Impact Statement (EIS) and General Re-Evaluation Report (GRR) to evaluate the impacts associated with the proposed construction of the Lake Pontchartrain and Vicinity (LPV) project. See Section 1.3 and 1.6 of the LPV Draft EIS-GRR for study authority and study description, respectively.

Given the combined effects of consolidation, settlement, subsidence, and sea level rise, the levees along the east bank of the Mississippi River need to be raised to sustain the current 1% level of risk reduction for hurricane and tropical storms (Draft EIS-GRR, ongoing). As part of the LPV project, flood side shifts to the existing Mississippi River Levees (MRL) would extend beyond the existing rights-of-way (ROW) and the 15 foot “vegetation-free” zone from the toe of the levee. The flood side shift is required due to the inability to construct a protected side shift; therefore, the impacts to bottomland hardwood-wet habitat are unavoidable. The flood side shifts would impact approximately 27 acres of bottomland hardwood-wet habitat along the co-located LPV and MRL. On the east bank it is anticipated that LPV levees or floodwalls would need to be placed on top of the MR&T levees (raising elevation 2-2.5 feet) between river miles 81 and 90 (Figure 1). River mile 90.5 has been identified as the design grade crossover point with an intermediate relative sea level rise scenario (1.8 feet). This is the point where the MRL authorized design grade equals the 1% HSDRRS design grade by year 2073 (the end of the period-of-analysis for the Draft EIS-GRR).

The LPV Draft EIS-GRR proposed alternatives for implementation include:

1) Alternative 1: No Action Alternative
2) Alternative 2: Raising floodwalls and system levee lifts to the projected 1% AEP event at year 2073 with intermediate relative sea level rise (1.8 feet)
3) Alternative 3: Raising floodwalls and system levee lifts to the projected 0.5% AEP event at year 2073 with intermediate relative sea level rise (1.8 feet)

The Draft EIS-GRR and this mitigation plan will be distributed for a 55-day public review and comment period. All comments received during that review and public meetings will be considered part of the official record.

1.2 PUBLIC CONCERNS

Throughout the LPV basin, the public has expressed concern that sufficient funding be allocated for the mitigation efforts associated with storm damage risk reduction features and that mitigation requirements be completed in a timely manner. To date, mitigation efforts for the original HSDRRS work is still ongoing. Concern has also been expressed that mitigation banks are given the opportunity to sell credits to satisfy Corps mitigation requirements.

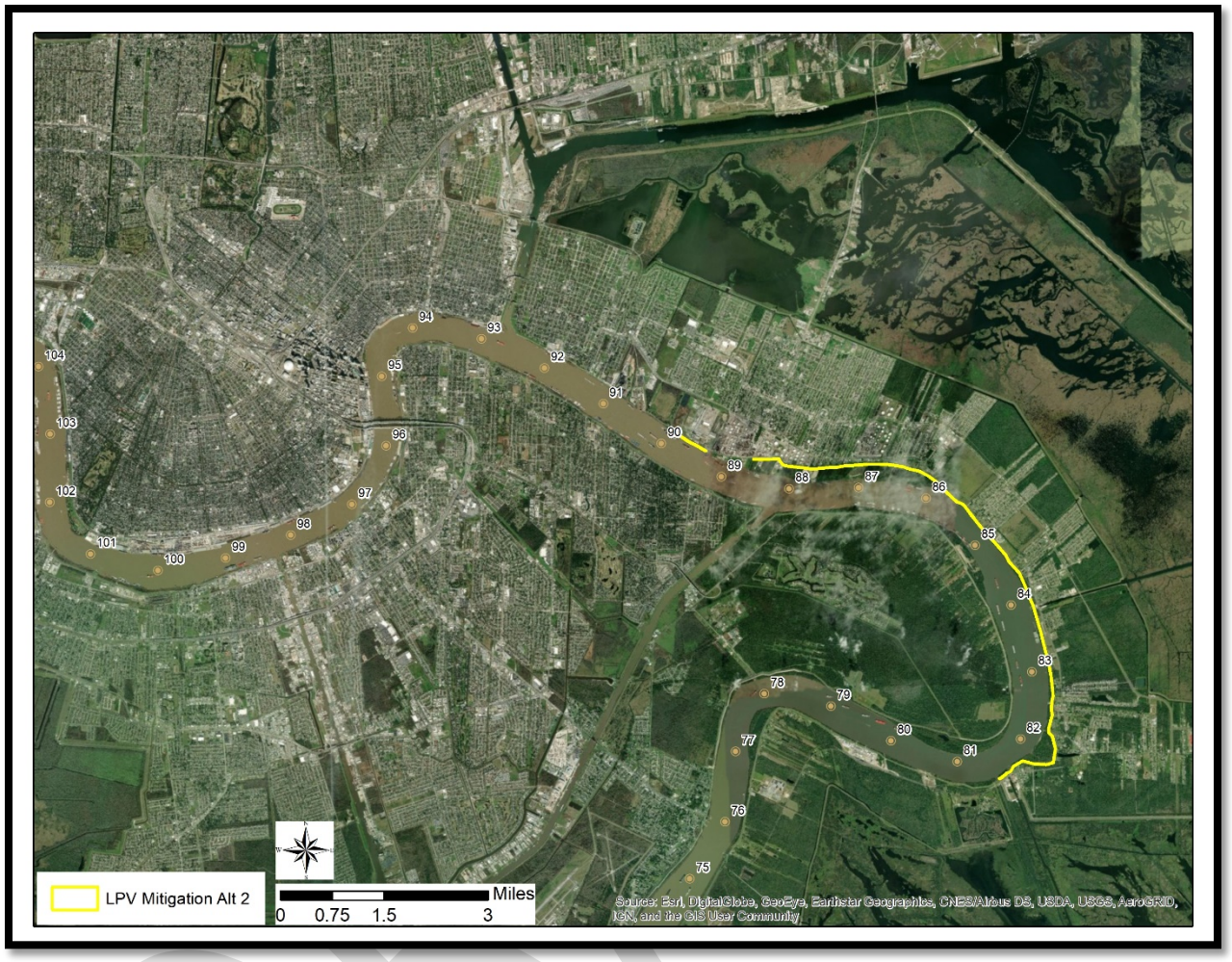

Figure 1. Location of potential impacts.

1.3 PRIOR REPORTS

Numerous studies and reports regarding mitigation for water resources development projects in the study area have been prepared by CEMVN, other federal, state, and local agencies, research institutes, and individuals. The CEMVN HSDRRS website provides additional information on studies and construction: https://www.mvn.usace.army.mil/Missions/HSDRRS/. Previous mitigation plans have identified and modified mitigation projects for various habitat types impacted. The original mitigation projects associated with HSDRRS are discussed in:

Programmatic Individual Environmental Report #36 Lake Pontchartrain and Vicinity (LPV) Hurricane and Storm Damage Risk Reduction System (HSDRRS) Mitigation, PIER #36[1], signed Decision Record 22 November 2013.

[1] Available online at https://www.mvn.usace.army.mil/Portals/56/Users/194/42/2242/PIER%2036%20LPV%20HSDRRS%20Mitigation.pdf; accessed on 21 October 2019

PIER #36 described and evaluated its proposed mitigation plan to compensate for unavoidable habitat losses caused by the construction of the LPV HSDRRS. The mitigation plan set forth in the PIER was comprised of both constructible and programmatic features. In the Decision Record, the constructible feature of the selected plan was recommended for implementation, which included purchase of BLH-Wet and swamp mitigation bank credits with no particular mitigation bank identified, while the programmatic features were recommended for further evaluation and design.

Supplemental to PIER #36, Bayou Sauvage, Turtle Bayou & New Zydeco Ridge Restoration Project, Saint Tammany & Orleans Parishes, Louisiana, SIER 1[2], signed Decision Record 20 October 2015.

SIER 1 described and evaluated proposed changes to the recommended mitigation plan described in PIER #36.

The status of ongoing mitigation work related to the LPV HSDRRS can be found here: https://www.mvn.usace.army.mil/Missions/HSDRRS/Mitigation/Lake-Pontchartrain-Vicinity/

2. MITIGATION PROCEDURES

Per Appendix C of the Planning Guidance Notebook, updated 31 July 2019 by the Office of the Assistant Secretary of the Army of Civil Works in a memo dated 2 August 2019, the following steps were conducted to document the plan formulation for the mitigation requirements for LPV Draft EIS-GRR.

2.1 INVENTORY AND CATEGORIZE ECOLOGICAL RESOURCES

An ecological resources inventory within the study area is documented in Chapter 4 of the Draft EIS-GRR LPV.

2.2 DETERMINE SIGNIFICANT NET LOSSES

This section describes the methods used to evaluate the quality of BLH-Wet habitat and to determine the quantity of like-quality mitigation habitat required. Assumptions are provided in Enclosure 1 of this appendix.

2.2.1 WVA MODEL ANALYSES

The WVA Bottomland Hardwood Community Model used for the LPV Mitigation was certified in accordance with EC 1005-2-412 and was re-approved for regional use on December 6, 2018.

The WVA methodology 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 level to provide an index of habitat quality. Habitat quality is estimated or expressed through the use of a mathematical model

[2] Available online at https://www.mvn.usace.army.mil/Portals/56/Users/194/42/2242/SIER%201%20BS,%20TB,%20NZ%20(PIER%2036,%20S1).pdf; accessed on 21 October 2019

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 the 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 following WVA model was used for the LPV DEIS-GRR mitigation effort:

- U.S. Army Corps of Engineers Planning Models Improvement Program, Wetland Value Assessment Bottomland Hardwoods Community Model for Civil Works (Version 1.2)

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. The standardized, multi-species, habitat-based methodology facilitates the assessment of project-induced impacts on fish and wildlife resources. The Bottomland Hardwood Community Model, which was used for BLH-Wet features, consists of 7 variables: 1) tree species composition; 2) stand maturity; 3) understory/midstory; 4) hydrology; 5) size of contiguous forested area; 6) suitability and traversability of surrounding land uses; and 7) disturbance.

Values for variables used in the model are derived for existing conditions and are estimated for conditions projected into the future if no mitigation efforts are applied (i.e., future without project) and for conditions projected into the future if the proposed mitigation project is implemented (i.e., future with project), providing an index of habitat quality, or habitat suitability, for the period of analysis. The HSI is combined with the acres of habitat to generate a number that is referred to as "habitat units". Expected project impacts/benefits are estimated as the difference in habitat units between the future with project scenario and the future-without-project scenario. 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 Annualized Habitat Units (AAHUs). WVA assumptions used and full calculations for the LPV Draft EIS-GRR Mitigation Plan are provided in Enclosure 1 below. Table 2-1 summarizes the calculation of mitigation requirements for LPV DEIS-GRR.

Table 2-1. Summary of Impacted BLH-Wet Habitat and Mitigation Requirement

Location	Existing Conditions of BLH-Wet Impacted		Mitigation Requirement
	Acres	AAHUs Impacted	AAHUs
River Mile 81-90	26.89	17.2	17.2

In accordance with WRDA 1986, Section 906 as amended (33 U.S.C. 2283(d)), mitigation measures are required to either restore or enhance the same habitat types that would be impacted (e.g. "habitat type for habitat type") by proposed LPV Draft EIS-GRR construction.

2.3 DEFINE MITIGATION PLANNING OBJECTIVES

The mitigation project area consists of the LPV study area in St. Charles, Jefferson, Orleans and St. Bernard Parishes and the Mississippi River Levee on the east bank in St. Bernard Parish and associated right-of-way. The goal is to mitigate for impacts to approximately 27 acres of bottomland hardwood forest Section 404 jurisdictional wetlands (BLH-Wet). The required mitigation would offset the unavoidable loss of this habitat type, which is already limited in the vicinity of the study area.

The objective of the proposed mitigation is to compensate for habitat losses, as measured by AAHUs, are expected to occur during the construction of the proposed actions for to flood side (FS) BLH-Wet which is the only habitat type expected to be impacted by the FS shift of the MRL levees. All other features of the recommended plan for LPV are not expected to require compensatory mitigation since those actions are proposed within the existing, previously-disturbed ROWs. The proposed compensatory mitigation would replace the lost functions and services of the impacted FS BLH-Wet habitat either through restoration or enhancement activities designed to create/increase/improve habitat functions and services at specific mitigation sites or through the purchase of mitigation bank credits or a combination of both a Corps-constructed project and the purchase of credits.

2.4 DETERMINE UNIT OF MEASUREMENT

The output of the mitigation plan increments would be measured by AAHUs.

2.5 IDENTIFY AND ASSESSS THE POTENTIAL MITIGATION STRATEGIES

2.5.1 MITIGATION PROJECT SELECTION

The following factors were considered during the mitigation project selection process:

1) In accordance with the USACE Implementation Guidance of Section 2036 of the WRDA 2007 (which amended WRDA 1986, Section 906), *Mitigation for Fish and Wildlife and Wetlands Losses*, compensatory mitigation was formulated to occur within the same watershed or hydrologic basin as the impacts and to replace the functions and services of each impacted habitat type with functions and services of the same habitat type. The LPV Draft EIS-GRR Mitigation Basin boundaries coincide with the Lake Pontchartrain watershed boundaries except for the southern boundary. The southern boundary for planning purposes was limited to the intermediate/brackish marsh interface at 6 part per thousand (ppt) because the LPV Draft EIS-GRR work only impacts freshwater BLH-Wet habitat and the functions and services of freshwater wetland could not be replaced in areas with salinities greater than those found in intermediate wetland systems.
2) In accordance with WRDA 1986, Section 906, as amended (33 U.S.C. 2283(d)), mitigation measures were required to either restore or enhance the same habitat types that would be impacted (i.e. “habitat type for habitat type”) by proposed LPV Draft EIS-GRR construction.

3) LPV HSDRRS Mitigation plan formulation efforts (e.g., PIER #36, SIER 1) are herein incorporated by reference into this mitigation plan. Lessons learned from these efforts were considered for this mitigation planning effort. Details of the previous screening process are not repeated here.

2.5.2 CONSIDERED MITIGATION PROJECTS

The following mitigation projects are considered alternatives to compensate for the proposed impacts to BLH-Wet habitat due to proposed actions of LPV Draft EIS-GRR:

1) **Mitigation Bank:** Purchase of sufficient mitigation bank credits to satisfy the BLH-Wet mitigation requirement and offset anticipated losses of impacted BLH-Wet habitat.
2) **Alternative to Mitigation Banks:** Construction of a new or an expansion of an existing Corps-constructed mitigation project within LPV watershed to be identified in the event that a credit purchase is not feasible due to lack of sufficient credits or lack of acceptable, cost-effective offers.
3) **Combination** of Corps-constructed mitigation project and mitigation bank credits.

2.6 DEFINE AND ESTIMATE COSTS OF MITIGATION PLAN INCREMENTS

A qualitative cost estimate for BLH-Wet mitigation is based on previous estimates for BLH-Wet mitigation in the area. The cost of mitigation was based on per acre cost estimate of $110,000 and applied in the project cost estimates in the main report.

2.7 DISPLAY INCREMENTAL COSTS

The cost effective incremental cost analysis for the proposed action is provided in the LPV Draft EIS-GRR, which includes cost estimate for mitigation.

2.8 ELEMENTS OF THE RECOMMENDED MITIGATION PLAN (33 U.S.C. §2283)

a. Description of Physical Action – None. Purchase of mitigation credits does not involve any physical action. The mitigation bank that sells the credits will continue to operate in accordance with its mitigation banking instrument.

b. Type, amount, and characteristics of the habitat to be restored – Sufficient bottomland hardwood forest credits will be purchased from a mitigation bank in the Lake Pontchartrain watershed to offset impacts to 17.2 AAHUs of bottomland hardwood forests located on the floodside of the Mississippi River Levee in St. Bernard Parish. The same WVA model that was used to determine impacts will be used to determine the number of bank credits required to offset the bottomland hardwood forest losses.

c. Ecological Success Criteria –The selected mitigation bank must be in compliance with its Mitigation Banking Instrument, which sets forth the bank's ecological success criteria and the timeline for the bank's achievement of its ecological success milestones.

d. Monitoring Plan - The purchase of mitigation bank credits relieves the USACE and the NFS from monitoring to ensure ecological success.

e. Adaptive Management – The selected mitigation bank must be in compliance with its Mitigation Banking Instrument, including relevant success criteria. Purchase of credits relieves USACE and the NFS of the responsibility to ensure ecological success.

f. Real Estate Required – None.

3. EVALUATION OF MITIGATION PROJECTS

3.1 CONSIDERED ALTERNATIVES

No Action Alternative: NEPA requires that in analyzing alternatives to proposed action, a Federal agency consider an alternative of "No Action". The No Action alternative evaluates not implementing the LPV Draft EIS-GRR proposed action and associated mitigation, and represents the future-without-project (FWOP) scenario by which alternatives considered in detail are compared. The FWOP provides a baseline essential for impact assessment and alternative analysis. This section presents the No Action Alternative as not implementing mitigation for LPV Draft EIS-GRR construction impacts. Compensatory mitigation for unavoidable habitat losses due to the construction of the proposed LPV Draft EIS-GRR is required by law (e.g., Clean Water Act, WRDAs of 1986, 2007, and 2016), and the CEMVN does not consider the No Action Alternative to be a reasonable or legally viable alternative that could be chosen.

The analysis for the No Action Alternative considers previous, current, and reasonably foreseeable future projects, which could impact the resources evaluated in the DEIS-GRR. For the purpose of this analysis, a project is considered "reasonably foreseeable" if it meets one of the following criteria:

- USACE authorized ecosystem restoration, hurricane and storm damage risk reduction, flood risk reduction, and/or navigation project with an anticipated Tentatively Selected Plan;
- CWPPRA project authorized at a Phase 2 – construction status;
- Coastal Impact Assistance Program ecosystem restoration or hurricane and storm damage risk reduction or flood risk reduction project which is funded for construction;
- State of Louisiana Surplus-funded ecosystem restoration or hurricane and storm damage risk reduction or flood risk reduction project funded for construction; or
- Louisiana Levee District permitted hurricane and storm damage risk reduction or flood risk reduction project.

Wetland or ecosystem restoration activities considered part of the No Action Alternative could counter, to a degree, the current land loss trends throughout the basin and progressions of wetlands to open water. In addition to these ecosystem restoration projects, a number of hurricane and storm damage risk reduction projects, flood risk reduction, projects, and navigation projects would continue to influence the hydrodynamics within the basin.

1) Purchase of Mitigation Bank Credits. 17.2 Average Annual Habitat Units (AAHUs) of flood side BLH-Wet impacts would be mitigated through the purchase of mitigation bank BLH credits from a bank with perpetual conservation servitude. The purchase would occur prior to or concurrent with construction impacts. Due to the relatively few AAHU's of BLH habitat that

would be lost and the time and resources that would be required to design and implement a Corps-constructed mitigation project, purchase of mitigation bank credits is the most timely, efficient, and cost-effective alternative.

No particular bank is proposed for use at this time. The bank(s) from which credits would be purchased would be selected through a solicitation process, through which any mitigation bank meeting eligibility requirements and having the appropriate resource type of credits could submit a proposal to sell credits. If appropriate and cost-effective, the Corps may choose to purchase mitigation bank credits from more than one bank to fulfill the compensatory mitigation requirements for BLH-Wet habitat type.

The purchase of credits is dependent on receipt of acceptable, cost-effective proposals from eligible banks. Currently, there are insufficient in-kind mitigation bank credits in the watershed to implement this alternative; however, CEMVN anticipates future banks and/or future credit releases may be approved prior to construction of the proposed action for the LPV Draft EIS-GRR. No new cumulative impacts to any resource would be incurred from the purchase of credits from a previously approved mitigation bank for the LPV Draft EIS-GRR mitigation under the proposed mitigation plan. The purchase of mitigation bank credits would occur at an existing approved banks, which perform in accordance with schedules contained in their respective mitigation banking instruments. No physical impacts at a bank would occur with the purchase of credits. Depending on the amount of mitigation bank credits available in the basin at the time of credit purchase for the LPV mitigation, LPV use of mitigation credits may reduce the number of credits available to permittees to compensate for BLH impacts authorized by Department of Army Section 10/404 permits. Following the LPV purchase, in the event sufficient credits are not available to offset impacts associated with a proposed permit, the district engineer would determine appropriate compensatory mitigation based on the factors described in 33 CFR Part 332.3(b) (Provided in Enclosure 2 of this Appendix).

If purchase of mitigation bank credits were approved as the DEIS-GRR Mitigation Plan and if an acceptable, cost-effective bid to sell credits is received, then all BLH-Wet FS impacts would be mitigated through the purchase of BLH-Wet credits equaling 17.2 AAHUs. The same version of the WVA model that was used to assess the impacts of constructing the proposed action would be run on the mitigation banks to ensure that the assessment of the functions and services provided by the mitigation bank match the assessment of the lost functions and services as the impacted site. The use of mitigation banks was carried forward to offset unavoidable impacts of constructing the proposed LPV project to BLH-Wet habitat.

2) Alternative Projects to Mitigation Banks. If, based on credit availability or following evaluation of the mitigation bank proposals, it becomes apparent that purchasing bank credits is not cost effective or feasible (including due to lack of satisfactory bids), CEMVN will complete its evaluation of Mitigation Plan Alternative 2 which would evaluate Corps-constructed mitigation projects within the LPV watershed, possibly in combination with a credit purchase. Construction of a mitigation project involves identification of a site, planning, design, acquisition of real estate, construction, monitoring, adaptive management, and ongoing operation and maintenance by the NFS. In that event, environmental compliance would be achieved through the following evaluation, coordination, and analysis:

1) Endangered Species Act Section 7 Consultation with the USFWS;
2) Coordination under the Louisiana Coastal Resources Program with Louisiana Department of Natural Resources;
3) Receipt of a Water Quality Certification from the State of Louisiana;
4) Public review of the Section 404(b)(1) Public Notice and signature of the Section 404(b)(1) Evaluation; Coordination with Louisiana Department of Environmental Quality (LDEQ) on the air quality impact analysis;
5) Coordination with National Marine Fisheries Services on Essential Fish Habitat recommendations;
6) Completion of the National Historic Preservation Act Section 106 consultation pursuant to the Programmatic Agreement; and
7) Preparation of and issuance of a supplemental NEPA document evaluating the proposed Corps-constructed project for 30-day public review and comment.

3.2 DATA GAPS AND UNCERTAINTIES

Tropical Storms. Tropical storm events can directly and indirectly contribute to coastal land loss through erosion from increased wave energies, removal and/or scouring of vegetation from storm surge, and saltwater intrusion into estuaries and interior wetlands. Wetland loss and degradation of large areas can occur over a short period of time as a result of storms. There is a risk that a single storm event, or multiple storms over a short period of time, could significantly reduce or eliminate anticipated benefits of mitigation plans in areas susceptible to storm surge and shearing. The extent of potential damage is dependent upon several unknown variables, including the track and intensity of the storm, the development stage of the project, changes in future conditions in the study area, and variability of project performance from forecast conditions due to other factors of risk and uncertainty.

Increased Sea Level Rise and Subsidence. Increased sea level rise coupled with subsidence could convert emergent wetlands to shallow open water and shallow open water to deep water habitat, reducing or eliminating the effectiveness of mitigation plans.

Climate Change. Extreme changes in climate (temperature, rain, evaporation, wind) could result in conditions that cannot support the types of habitat restored, reducing the effectiveness of the mitigation plan. Extreme climate change could essentially eliminate the benefits of vegetative plantings, if the change resulted in plant mortality. The monitoring plan for all USACE constructed projects would monitor the success of any vegetative plantings and includes provisions for replanting if mortalities become such that meeting the required success criteria is in jeopardy (Enclosure 3 of this Appendix).

Errors in Analysis. Future conditions are inherently uncertain. The forecast of future conditions is limited by existing science and technology. Future conditions described in the LPV Draft EIS-GRR are based on an analysis of historic trends and the best available information. Some variation between forecast conditions and reality is certain. Mitigation features were developed in a risk-aware framework to minimize the degree to which these variations would affect planning decisions. However, error in analysis or discrepancies between forecast and actual conditions could affect plan effectiveness.

All of the models used in the LPV Draft EIS-GRR are abstract mathematical representations of reality. Models simulate complex systems by simplifying real processes into expressions of their most basic variables. These tools assist with finding optimal solutions to problems, testing hypothetical situations, and forecasting future conditions based on observed data. No model can account for all relevant variables in a system. The interpretation of model outputs must consider the limitations, strengths, weaknesses, and assumptions inherent in model inputs and framework. Inaccurate assumptions or input errors could change benefits predicted by models used in the LPV Draft EIS-GRR. The potential for significant changes due to errors has been reduced through technical review, sensitivity analyses, and quality assurance procedures. However, there is inherent risk in reducing complex natural systems into the results of mathematical expressions driven by the simplified interaction of key variables.

WVA Model Uncertainties. WVA models will be run using site-specific data collected at all project sites or through assumptions made based on aerial photography and field data from similar projects. There is reasonable confidence that these data are representative of actual site conditions and that the WVA has produced results representative of what would be found to the sites within LPV Draft EIS-GRR. At this point in the time, the initial evaluation used previously-collected data. Evaluations will be updated during feasibility level of design. The final mitigation potentials will be located in the Final Fish and Wildlife Coordination Act Report.

Implementation. The timing for implementation is an uncertainty that must be considered. If the plan is not implemented in a timely fashion, the conditions in the study area could change. The impact of the uncertainties associated with the future condition of the study area could increase mitigation costs, decrease mitigation benefits, or both.

If the proposed mitigation project becomes infeasible due to difficulties in implementation or changed conditions, the CEMVN will take appropriate action to ensure satisfaction of its mitigation requirement. If a proposed mitigation projects could not be implemented, the CEMVN would default to another alternative or to a combination of Corps-constructed project and credit purchase to meet the need.

Mitigation Bank Credit Availability. Whether in-basin mitigation banks may be capable of supplying the credits needed to meet any of the mitigation requirements at the time of solicitation is uncertain. Banks currently able to meet the mitigation requirements may not be able to do so at the time of solicitation. In addition, new banks able to meet the mitigation requirement may become approved by the time the solicitation is released. Accordingly, identification of particular banks that could be used to meet the mitigation requirement cannot occur with any degree of certainty and has not been done for the LPV Draft EIS-GRR. Since the bank(s) that may ultimately be selected to provide the necessary mitigation credits is(are) unknown, the existing conditions present at the bank site(s) are similarly unknown. Existing bank habitat quality varies depending on the success criteria met, as specified in the bank's Mitigation Banking Instrument (MBI). Typically, as mitigation success criteria are met and the quality of the habitat increases within the bank, more credits are released for purchase.

Mitigation for Coastal Zone Impacts. Louisiana Department of Natural Resources (LDNR) administers the Federal Coastal Zone Management Act in Louisiana through its Louisiana

Coastal Resources Program (LCRP). Depending on the projects implemented, LDNR may determine that, in its view, such projects do not mitigate for coastal zone impacts. If deemed necessary, additional mitigation for coastal zone impacts may be required and would be assessed and coordinated in subsequent NEPA documents.

3.3 RECOMMENDED MITIGATION ACTION

CEMVN has assessed the impacts of the no action alternative and the proposed mitigation credit purchase on relevant resources in the study area, including air quality, water quality, terrestrial habitat, aquatic habitat, fish and wildlife, wetlands, threatened and endangered species, recreational resources, aesthetic resources, cultural resources, farmland, and socioeconomic resources through the LPV Draft EIS-GRR. Chapter 4 of the LPV Draft EIS-GRR provides the details of the existing conditions within the study area and are not repeated here. Chapter 7 of the LPV Draft EIS-GRR describes the environmental impacts, including direct, indirect, and cumulative effects of the proposed action including mitigation on relevant resources and are not repeated here.

The proposed action in this mitigation plan consists of purchasing mitigation bank credits to mitigate 17.2 AAHUs of FS BLH-Wet impacts.

Since the proposed action recommended for implementation at this time consists of purchasing mitigation credits, CEMVN has concluded that there would be no new direct, indirect, or cumulative impacts to any relevant resources from that action. Any changes to the proposed mitigation plan would be fully evaluated in future NEPA documents. Future NEPA documents would further evaluate the impacts of Alternative 2 (Alternative Projects to Mitigation Bank).

4. MITIGATION SUCCESS CRITERIA, MONITORING, REPORTING & ADPATIVE MANAGEMENT

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 (AM) 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 AM 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.

For Corps-constructed mitigation projects, each would have a contingency plan for taking corrective actions in cases where monitoring demonstrates that the mitigation feature is not achieving ecological success in accordance with its success criteria (Enclosure 4 of this Appendix provides an example cost estimate for monitoring for a Corps-constructed project). If credits are purchased from a mitigation bank, the mitigation bank must be in compliance with the requirements of the USACE Regulatory Program and its MBI, which specifies the management, monitoring, and reporting required to be performed by the bank.

The proposed mitigation action solely includes the purchase of mitigation bank credits. Purchase of credits relieves the CEMVN and non-federal sponsor of the responsibility for monitoring and of demonstrating mitigation success. If appropriate mitigation bank credits are not available or are too costly, then consistent with WRDA 2007, Section 2036(a), a monitoring and adaptive management plan for proposed Corps-constructed mitigation projects would be developed with success criteria targets identified. An example adaptive management plan is provided in Enclosure 5 of this Appendix for future reference if Corps-constructed is needed.

5. COORDINATION AND CONSULTATION

5.1 PUBLIC INVOLVEMENT

A 45-day public comment and review period will occur to solicit additional public input on the proposed LPV Draft EIS-GRR and associated mitigation plan.

5.2 AGENCY COORDINATION

Preparation of the LPV Draft EIS-GRR has been coordinated with appropriate Congressional, federal, state, and local interests, as well as environmental groups and other interested parties. The following agencies, as well as other interested parties, will receive copies of the LPV Draft EIS-GRR:

- 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, National Oceanic and Atmospheric Administration, NMFS
- U.S. Natural Resources Conservation Service
- Louisiana Advisory Council on Historic Preservation
- 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
- Coastal Protection and Restoration Authority Board

If the USACE determines that the proposed mitigation plan of purchasing mitigation bank credits would not be implemented and other mitigation projects would be necessary, additional coordination with the agencies would be required.

6. COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

Section 7.22 of the LPV Draft EIS-GRR summarizes the status of compliance with environmental laws and regulations for the proposed action.

The following coordination is ongoing as part of the LPV Draft EIS-GRR:

- Coastal Zone Management Act
- Clean Water Act
- Clean Air Act
- Endangered Species Act
    - USFWS
    - NMFS
- Fish and Wildlife Coordination Act. A draft project-specific Coordination Act Report for the Draft EIS-GRR was received from USFWS by letter date 9 October 2019 (Provided in LPV Draft EIS-GRR Appendix L, Coordination). A final Coordination Act Report will be received in the future.
- Migratory Bird Treaty Act. The USFWS addressed compliance with this Act in the "Draft Fish and Wildlife Coordination Act Report for the Draft EIS-GRR" in letter dated 9 October 2019.
- Section 305 of the Magnuson-Stevens Fishery Conservation and Management Act
- Section 106 of the National Historic Preservation Act

7. FUTURE MITIGATION NEEDS

Once final designs for all LPV Draft EIS-GRR contracts are complete, the mitigation team, along with resource agencies, would revisit the impacts to all habitat types from the LPV Draft EIS-GRR construction. Completion of this effort would result in a final computation of impacts and may necessitate the expansion of the proposed LPV Draft EIS-GRR mitigation project in order to fully mitigate all impacts. For any habitat type where mitigation has already been constructed, an expansion of that mitigation project would be considered. Other options to that expansion providing adequate compensatory mitigation, such as mitigation banks, would also be analyzed. Any expansion, and alternatives to that expansion, would be presented to the public through a supplemental NEPA document.

8. CONCLUSION

8.1 RECOMMENDED DECISION

Recommend approval of the LPV Draft EIS-GRR Mitigation Plan, which fulfills the general FS BLH-Wet mitigation requirement for LPV Draft EIS-GRR: purchase of mitigation bank credits.

8.2 PREPARED BY

The point of contact for this mitigation plan for the LPV Draft EIS-GG is Mr. Kip Runyon, USACE St. Paul District, CEMVP-PD-P.

9. ENCLOSURE 1: WETLAND VALUE ASSESSMENT MODEL ASSUMPTIONS AND CALCULATIONS

9.1 PROJECT SPECIFIC ASSUMPTIONS

- Aerial imagery used to delineate impacted area along the LPV-MRL
- 25 feet from existing right-of-way was used to calculate the area impacted by flood side levee shifts required.
- Acreage estimated via GIS
- WVA conducted with previously collected data (2010)
- Approximately 27 acres impacted by proposed action

Table 1. Acres impacted by proposed action (Alternative 2, the Tentatively Selected Plan)

Location	Unavoidable Impacts to Bottomland Hardwood-Wet (Acres)
River Mile 81-90	26.89

9.2 INITIAL WETLAND VALUE ASSESSMENT FOR LPV

- No field site visits were performed for the current analysis. Analysis was based on data collected in 2010. The existing BLH-Wet on the flood side of the existing levees is primarily black willow and of generally poor quality.
- Future Without Project: For the FWOP it was assumed that the area would remain in some of form of BLH-Wet for the period-of-analysis (50 years, end year 2073), with gradual increases in tree maturity.
- Future With Project: For the FWP it was assumed all BLH-Wet habitat that is present today would be converted to a turfed levee by year 1 and was determined to not provide any bottomland hardwood habitat values.

Future Without Project			Total	Cumulative
Target Year	Acres	x HSI	HUs	HUs
0	26.89	0.50	13.45	
1	26.89	0.51	13.72	13.59
10	26.89	0.58	15.72	132.52
25	26.89	0.68	18.20	254.45
50	26.89	0.71	19.09	466.21
Max TY=	50			
			Total HUs =	866.76
			AAHUs =	17.34

Future With Project			Total	Cumulative
Target Year	Acres	x HSI	HUs	HUs
0	26.89	0.50	13.45	
1	26.89		0.00	6.72
10	26.89		0.00	0.00
25	26.89		0.00	0.00
50	26.89		0.00	0.00
Max TY=	50			
			Total HUs =	6.72
			AAHUs =	0.13

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future Without Project AAHUs =	17.34
B. Future With Project AAHUs =	0.13
Net Change (FWP - FWOP) =	-17.20

9.3 WVA MODEL GENERAL ASSUMPTIONS AND RELATED GUIDANCE

PREFACE

Several of the assumptions set forth in this document are based on mitigation implementation schedules. Many sections include specified WVA model target years (TYs) and calendar years applicable to assumptions, and a few sections outline anticipated mitigation construction (*i.e.,* mitigation implementation) schedules. It is critical for the WVA analyst to understand that this document has not been revised to account for changes to the mitigation implementation/construction schedule for a particular mitigation project from CEMVN prior to running WVA models. The analyst may then need to modify some of the WVA model assumptions and guidelines presented herein to account for differences between the present mitigation implementation/construction schedule and the schedules(s) that were assumed in generating this document.

This document should be applied when conducting WVA analyses for the Draft EIS-GRR and the Tentatively Selected Plan selected for meeting the LPV mitigation needs.

BOTTOMLAND HARDWOOD MODEL – GENERAL ASSUMPTIONS

V1 – Tree Species Associations/Composition (in canopy stratum – percentage of trees that are hardmast or other edible-seed producing trees and their percentage that are soft mast, non-mast/inedible seed producing trees)

BLH-Wet, Corps Constructed Mitigation Future With Project, if implemented:

Of the total trees initially planted, 60% will be hard-mast producing species and 40% will be soft-mast producing species. Assume this species composition ratio (*i.e.*, 60% of trees are hard mast-producing and 40% are soft mast-producing) will remain static over the entire period of analysis (*i.e.*, remains the same from time of planting throughout all subsequent model target years).

General Notes: Do not classify Chinese Tallow as a “mast or other edible-seed producing tree”. Consider it a non-mast producing tree. Although it is an invasive species, one must still include this species regarding its contribution to percent cover in the canopy, midstory, and ground cover strata when it is present on a site (applicable to FWP scenario and applicable to FWOP scenario)

V2 – Stand Maturity (average age or density breast height (dbh) of dominant and co-dominant canopy trees)

BLH-Wet, Corps Constructed Mitigation FWP, if implemented:

Guidance as to how factors like subsidence and sea level rise might affect this variable (especially if the mitigation sites becomes flooded for long durations, since the growth of the trees may be adversely affected and certain tree species could die): If the mitigation feature (polygon) is designed such that flooding at the end of the period of analysis will not impact tree survival, (*i.e.*, flooding is <12% of the growing season (33 days) and is no more than 20% to 30% of the non-growing season, then trees should not be adversely affected. However, if the

site design does not achieve this goal, then adjust the tree growth spreadsheet such that typical growth is reduced by at least 10% once flooding exceeds 20-30% of the non-growing season or as 12% or more of the growing season.

General Notes: Include the dbh of Chinese tallow when working with this variable. The same guidance would apply to other invasive species in the canopy stratum. For planted trees, you can use the age of the trees in lieu of their dbh when running the model. Assume trees planted will be approximately 1 year old when they are first installed.

V3 – Understory/Midstory (percent cover)

BLH-Wet, Corps Constructed Mitigation FWP, if implemented:

Assumptions applicable to restoration features that do not require the deposition of fill to achieve target grades:

TY	Year (tentative)	Assumption
0	2022	Understory = 0%//Midstory = 0%
1	2023	Undestory = 100%//Midstory = 0%
10	2033	Understory = 50%//Midstory = 50%
25	2048	Understory = 25% //Midstory = 60%
50	2073	Understory = 35% // Midstory = 30%

Values for cover in the understory and midstory strata must be based on site-specific conditions existing prior to the start of construction. The specified values are based on the assumptions that normal flooding conditions are present (*i.e.,* desirable depth and duration of inundation). These values will need to be adjusted if sea-level rise is anticipated to increase flooding of the particular mitigation polygon to a degree whereby growth and/or survival of plant species in the understory and/or midstory strata are adversely impacted.

General Notes: Cover accounted for by Chinese tallow and other invasive and nuisance plant species must be included in the percent cover data. Changes in hydrology could result from factors such as sea level rise and subsidence. An increase in the duration of flooding will typically decrease the understory cover and, to a lesser degree, decrease the midstory cover.

V4 – Hydrology (flooding duration and water flow/exchange)

BLH-Wet, Corps Constructed Mitigation FWP, if implemented:

Assumptions applicable for restoration features that do not require deposition or fill to achieve target grades and to the BLH-Wet enhancement features where hydrologic enhancements is a component of the mitigation design:

TY	Year (tentative)	Assumption
0	2023	Baseline conditions (score based on existing hydrology)
1	2024	Duration = temporary
10	2033	Duration = temporary
25	2048	Duration = temporary
50	2073	Duration = temporary

Scoring of water flow/exchange component of hydrology must be based on site-specific conditions anticipated. The specified value for flooding duration is based on the assumption that normal flooding conditions are present (*i.e.*, desirable depth and duration of inundation). This value will need to be adjusted if sea-level rise is anticipated to significantly increase the duration of flooding in the particular mitigation polygon. In many case, it is probably that the duration may shift from temporary to season. For BLH-Wet enhancement features that do not include measures to enhance existing hydrology as part of the mitigation design, the scoring of variable V4 must be based on site-specific conditions hence no general assumptions are applicable.

V5 – Size of Contiguous Forested Area

BLH-Wet, Corps Constructed Mitigation FWP, if implemented:

Do not consider the mitigation polygon to classify as “forested” until the planted trees are 10 years old. Remember that trees will be 1 year old when they are first installed, hence the mitigation polygon would classify as forested 9 years following the year of initial planting. Prior to this target year, the trees initially planted in the mitigation polygon will be considered as either understory or midstory cover. For the target year when the planted trees reach 10 years old and for all model target years thereafter, the planted trees will be considered large enough for the mitigation polygon to be considered a forest. Hence at the target year planted trees reach 10 years old and all target years thereafter, the mitigation polygon can be included in the calculation of forested acreages (along with contiguous forested areas outside the mitigation polygon).

BLH-Wet, Corps Constructed Mitigation FWOP:

For areas outside the mitigation polygons, assume the conditions present at TY0 will remain unchanged throughout the period of analysis of the mitigation project. As used here, the term “mitigation polygon” refers to all proposed mitigation polygons regardless of the target habitat proposed. Under the FWOP scenario, existing conditions would prevail in the mitigation polygon and areas outside the limits of these polygons throughout the period of analysis.

General Notes: When scoring this variable for the FWP scenario, the area within the mitigation polygon itself as well as the adjacent “non-mitigation” areas are combined to generate the total forested acreage. However, remember the assumption that planted trees in restoration features will not be considered large enough for the feature to classify as forest until the planted trees are 10 years old. When evaluating the size of contiguous forested areas, non-forested corridors <75 feet wide will not constitute a break in the forest area contiguity.

V6 – Suitability and Tranversability of Surrounding Land Uses (within 0.5 miles of site perimeter)

BLH-Wet, Corps Constructed Mitigation FWP, if implemented:

When scoring a given BLH-Wet mitigation polygon, include the nearby or adjacent mitigation polygons in your assessment of land use types by assuming their land use type is the habitat type proposed (*i.e.*, the target habitat type). However, one must consider the TY that the nearby/adjacent mitigation polygon will actually shift from its existing habitat type to the target habitat type.

BLH-Wet, Corps Constructed Mitigation FWOP:

When evaluating this variable, typically assume the land uses in lands outside the mitigation polygons will score the same under the FWP and FWOP scenario. In other words, typically assume that the existing conditions present in TY0 will remain unchanged over the period of analysis of the mitigation project. One would typically not consider potential future land development rates when scoring this variable due to the uncertainty of long-term development trends. Exceptions to this general approach would include: (1) situations where there is a high level of confidence that a particular area is slated for significant change in land use; or (2) situations where it is anticipated that the "land use" (habitat type) will significantly change over time due to the effects of sea level rise and land loss.

V7 – Disturbance (sources of disturbance vs. distance from site perimeter to disturbance source)

BLH-Wet, Corps Constructed Mitigation FWP and FWOP scenarios, if implemented:

For consistency purposes, assume baseline conditions affecting the scoring of this variable will not change over time. In other words, typically assume that the existing conditions present in TY0 will remain unchanged over the period of analysis of the mitigation project.

General Notes: When scoring this variable, all distances are measured from the perimeter of the BLH-Wet mitigation polygon itself.

NOTES REGARDING CONSTRUCTION & PLANTING OF BLH-WET MITIGATION AREAS

If Corps-Constructed Mitigation Projects are needed due to future mitigation banks not being available, then following is a typical estimated project construction timeline:

All projects: begin construction in Year X

For BLH-Wet restoration areas that do not require deposition of fill as part of the construction process:

- June Year X – Begin construction
- Nov. Year X – End construction (but could be as late as March or April of Year X+1 if much earthwork is required)
- Dec. Year X+1 – Install plants (earliest scenario for site requiring minimal earthwork)
- Sept. Year X+2 – Install plants (earliest scenario for site requiring substantial earthwork).

For BLH enhancement area:

- June Year X – Begin construction (includes start of invasive plant eradication)
- Oct. Year X – End construction
- Dec. Year X – Install Plants

All of these above timelines are preliminary and are subject to refinement as plans as refined for a particular mitigation site. Planting of canopy and midstory species in March should be avoided if possible since conditions could be adversely dry, thereby decreasing survival of plantings. Chemical eradication of invasive/nuisance hardwood species such as Chinese tallow should be done during the growing season. Greatest effectiveness may be realized if chemical treatment is applied from August through October when most energy is being used for root development.

Planting of BLH-Wet Restoration Areas:

Initial plantings should be:

- Canopy species: plant on 9-ft centers (538 trees/acre) , of total trees planted, 60% will be hard mast-producing species and 40% will be soft mast-producing species.
- Midstory species (shrubs and small trees): plant on 20-ft centers (109 seedlings/acre)
- Stock size (canopy and midstory species): 1 year old, 1.5 ft tall (minimum)

Planting of BLH-Wet Enhancement Areas:

Initial plantings should follow the same guidelines as for BLH-Wet restoration areas regarding the general density of installed plants and the stock used. Where initial enhancement activities include the eradication of invasive/nuisance plants, a significant number of native canopy and/or midstory species may remain, but in spatial distribution that leaves relatively large “gaps” in the canopy stratum and/or the midstory stratum. In such cases, areas measuring approximately 25 feet by 25 feet that are devoid of native canopy species should be planted and areas measuring approximately 45 feet by 45 feet that are devoid of native midstory species should be planted.

The typical guideline of having 60% of the canopy species planted be hard mast-producing and 40% of the canopy be soft mast-producing species may be altered in situations where several native trees remain after eradicating invasive/nuisance species. The objective would be to have the ultimate canopy composition (planted trees after reaching canopy strata plus existing trees) be close to 60%:40% ratio of hard mast to soft mast species.

BOTTOMLAND HARDWOOD-WET WVA MODEL – TARGET YEARS FOR MODELS FOR PROPOSED CORPS CONSTRUCTED MITIGATION PROJECTS (IF NEEDED)

Use the target years specified below when analyzing BLH-Wet restoration polygons:

TY	Year (tentative)	
0	2023	Baseline conditions, assumes construction starts
1	2024	Initial construction activities begin and are completed. Initial eradication of invasive and nuisance plants is started and completed
2	2025	Restoration feature settles to desired target grade Any associated perimeter containment dikes are degraded or gapped. Plants installed. Temporary flooding duration (target flooding duration/target hydroperiod) acheived
11	2034	Class 5 is achieved for V1. Planted areas Class as Forested for V5
20	2043	For V3, Undestory = 25%//Midstory = 60%
50	2073	End of period of analysis for a GRR-LPV mitigation feature

The user of these general guidelines is cautioned that the construction schedule for proposed mitigation features may not follow the construction schedule assumed in the preceding sections. If this is the case, the model target years and their associated model assumptions may have to be adjusted accordingly.

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
441 G STREET, NW
WASHINGTON, DC 20314-1000

REPLY TO
ATTENTION OF

CECW-P

28 February 2012

MEMORANDUM FOR Director, National Ecosystem Restoration Planning Center of Expertise (ECO-PCX)

SUBJECT: Wetland Value Assessment Models – Coastal Marsh Module Version 1.0 – Approval for Use

1. The Coastal Marsh Community model is one of seven WVA community models that were developed by the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Environmental Work Group. Based on information provided by the ECO-PCX, it is the understanding of the HQUSACE Model Certification Panel that this model will be used on the following projects over the next five years:

a. MRGO Ecosystem Restoration
b. Barataria Basin Barrier Shoreline
c. Lake Pontchatrain and Vicinity Hurricane Storm Damage Risk Reduction System (HSDRRS) Mitigation
d. West Bank and Vicinity HSDRRS Mitigation
e. HSDRRS IERS –total number unknown
f. Louisiana Coastal Area (LCA) 4 Davis Pond Modification
g. LCA4 Modification to Caernarvon
h. LCA4 Point Au Fer Island
i. LCA4 Caillou Lake Land Bridge
j. LCA Myrtle Grove
k. LCA White Ditch PED
l. LCA Mississippi River Hydrodynamic and Delta Management
m. LCA Caernarvon
n. Larose to Golden Meadow (LGM) Post-Authorization Change (PAC) Study
o. Larose to Golden Meadow Intracoastal Floodwall Reach 2b (LGM-022C).
p. Larose to Golden Meadow Intracoastal Floodwall Reach 2a (LGM-022B).
q. Larose to Golden Meadow C-North Highway 24 Relocation (LGM-001C).
r. Baptiste Collette Bayou Deepening study
s. Barataria Bay Waterway (CAP 204)
t. Buras Marina (CAP 206)
u. Calcasieu River and Pass (CAP 204)
v. Calcasieu Lock Replacement
w. Morganza to the Gulf PAC
x. Morganza to the Gulf Supplemental NEPA documents –total number unknown
y. Southwest Coastal
z. Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) – West Bay Closure
aa. Houma Navigation Canal Deepening
bb. West Shore Lake Pontchartrain Hurricane & Flood Risk Reduction
cc. LCA Terrebonne Basin Barrier Shoreline Restoration
dd. LCA Demonstration Projects Grand Isle and Vicinity Project
ee. CAP 103 Grand Isle Highway 1 Shoreline Stabilization
ff. Donalsonville to the Gulf
gg. NOV Plaquemines Parish
hh. NFL Plaquemines Parish

CECW-P
SUBJECT: Wetland Value Assessment Models – Coastal Marsh Module Version 1.0 – Approval for Use

2. Version 1.0 of the Coastal Marsh Community model is approved for use for the above projects. This approval for use is based on the decision of the HQUSACE Model Certification Panel which considered the ECO-PCX assessment of the model. Adequate technical reviews have been accomplished and the model meets the certification criteria contained in EC 1105-2-412. As indicated by the ECO-PCX, there are a number of unresolved issues related to the form of suitability graphs for Variables 1, 2 and 3 and the aggregation methods used to combine the marsh habitat units and open water habitat units for each sub-model. To increase the understanding of the sensitivity of the model to the unresolved issues and the impact the model differences may have on decision-making, the ECO-PCX is to work with the project delivery teams to conduct sensitivity analyses for each application of the marsh models. A summary of the sensitivity analyses must be presented in the project documentation and Agency Technical Review teams must be charged with reviewing the adequacy and findings of the sensitivity analyses.

3. It is expected that compiliation of the findings of the multiple sensitivity analyses will lead to updates and improvements of the model. As such, version control is imperative. The PCX must ensure that project delivery teams are are utilizing the most appropriate version of the model for their analyses and that they are properly identifiying the version of the model being used.

APPLICABILITY: This approval for use expires 28 February 2017 and is limited to the above studies with the caveat that updated versions of the model be used if appropriate.

[redacted]

HARRY E. KITCH, P.E.
Deputy Chief, Planning and Policy Division
Directorate of Civil Works

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10. ENCLOSURE 2: 33 CFR § 332.3 GENERAL COMPENSATORY MITIGATION REQUIREMENTS

(a)General considerations.

(1) The fundamental objective of compensatory mitigation is to offset environmental losses resulting from unavoidable impacts to waters of the United States authorized by DA permits. The district engineer must determine the compensatory mitigation to be required in a DA permit, based on what is practicable and capable of compensating for the aquatic resource functions that will be lost as a result of the permitted activity. When evaluating compensatory mitigation options, the district engineer will consider what would be environmentally preferable. In making this determination, the district engineer must assess the likelihood for ecological success and sustainability, the location of the compensation site relative to the impact site and their significance within the watershed, and the costs of the compensatory mitigation project. In many cases, the environmentally preferable compensatory mitigation may be provided through mitigation banks because they usually involve consolidating compensatory mitigation projects where ecologically appropriate, consolidating resources, providing financial planning and scientific expertise (which often is not practical for permittee-responsible compensatory mitigation projects), reducing temporal losses of functions, and reducing uncertainty over project success. Compensatory mitigation requirements must be commensurate with the amount and type of impact that is associated with a particular DA permit. Permit applicants are responsible for proposing an appropriate compensatory mitigation option to offset unavoidable impacts.

(2) Compensatory mitigation may be performed using the methods of restoration, enhancement, establishment, and in certain circumstances preservation. Restoration should generally be the first option considered because the likelihood of success is greater and the impacts to potentially ecologically important uplands are reduced compared to establishment, and the potential gains in terms of aquatic resource functions are greater, compared to enhancement and preservation.

(3) Compensatory mitigation projects may be sited on public or private lands. Credits for compensatory mitigation projects on public land must be based solely on aquatic resource functions provided by the compensatory mitigation project, over and above those provided by public programs already planned or in place. All compensatory mitigation projects must comply with the standards in this part, if they are to be used to provide compensatory mitigation for activities authorized by DA permits, regardless of whether they are sited on public or private lands and whether the sponsor is a governmental or private entity.

(b) Type and location of compensatory mitigation.

(1) When considering options for successfully providing the required compensatory mitigation, the district engineer shall consider the type and location options in the order presented in paragraphs (b)(2) through (b)(6) of this section. In general, the required compensatory mitigation should be located within the same watershed as the impact site and should be located where it is most likely to successfully replace lost functions and services, taking into

account such watershed scale features as aquatic habitat diversity, habitat connectivity, relationships to hydrologic sources (including the availability of water rights), trends in land use, ecological benefits, and compatibility with adjacent land uses. When compensating for impacts to marine resources, the location of the compensatory mitigation site should be chosen to replace lost functions and services within the same marine ecological system (e.g., reef complex, littoral drift cell). Compensation for impacts to aquatic resources in coastal watersheds (watersheds that include a tidal water body) should also be located in a coastal watershed where practicable. Compensatory mitigation projects should not be located where they will increase risks to aviation by attracting wildlife to areas where aircraft-wildlife strikes may occur (e.g., near airports).

(2) *Mitigation bank credits.* When permitted impacts are located within the service area of an approved mitigation bank, and the bank has the appropriate number and resource type of credits available, the permittee's compensatory mitigation requirements may be met by securing those credits from the sponsor. Since an approved instrument (including an approved mitigation plan and appropriate real estate and financial assurances) for a mitigation bank is required to be in place before its credits can begin to be used to compensate for authorized impacts, use of a mitigation bank can help reduce risk and uncertainty, as well as temporal loss of resource functions and services. Mitigation bank credits are not released for debiting until specific milestones associated with the mitigation bank site's protection and development are achieved, thus use of mitigation bank credits can also help reduce risk that mitigation will not be fully successful. Mitigation banks typically involve larger, more ecologically valuable parcels, and more rigorous scientific and technical analysis, planning and implementation than permittee-responsible mitigation. Also, development of a mitigation bank requires site identification in advance, project-specific planning, and significant investment of financial resources that is often not practicable for many in-lieu fee programs. For these reasons, the district engineer should give preference to the use of mitigation bank credits when these considerations are applicable. However, these same considerations may also be used to override this preference, where appropriate, as, for example, where an in-lieu fee program has released credits available from a specific approved in-lieu fee project, or a permittee-responsible project will restore an outstanding resource based on rigorous scientific and technical analysis.

(3) Omitted

(4) *Permittee-responsible mitigation under a watershed approach.* Where permitted impacts are not in the service area of an approved mitigation bank or in-lieu fee program that has the appropriate number and resource type of credits available, permittee-responsible mitigation is the only option. Where practicable and likely to be successful and sustainable, the resource type and location for the required permittee-responsible compensatory mitigation should be determined using the principles of a watershed approach as outlined in paragraph (c) of this section.

(5) *Permittee-responsible mitigation through on-site and in-kind mitigation.* In cases where a watershed approach is not practicable, the district engineer should consider opportunities to offset anticipated aquatic resource impacts by requiring on-site and in-kind compensatory

mitigation. The district engineer must also consider the practicability of on-site compensatory mitigation and its compatibility with the proposed project.

(6) *Permittee-responsible mitigation through off-site and/or out-of-kind mitigation.* If, after considering opportunities for on-site, in-kind compensatory mitigation as provided in paragraph (b)(5) of this section, the district engineer determines that these compensatory mitigation opportunities are not practicable, are unlikely to compensate for the permitted impacts, or will be incompatible with the proposed project, and an alternative, practicable off-site and/or out-of-kind mitigation opportunity is identified that has a greater likelihood of offsetting the permitted impacts or is environmentally preferable to on-site or in-kind mitigation, the district engineer should require that this alternative compensatory mitigation be provided.

11. ENCLOSURE 3: MITIGATION SUCCES CRITERIA AND OTHER GENERAL MITIGATION GUIDELINES

The following guidelines are provided as an example if Corps-Construction BLH-Wet Mitigation Project(s) are required in the future.

MITIGATION PLANTTING GUIDELINES

Planting Guidelines for Bottomland Hardwood (BLH) Habitats: Canopy species will be planted on 9-foot centers (average) to achieve a minimum initial stand density of 538 seedlings (trees) per acre. Midstory species will be planted on 20-ft centers (average) to achieve a minimum initial stand density of 109 seedlings per acre. Stock will be at least 1 year old, at least 2 feet in height, have a minim root collar diameter of 0.5 inch, and must be obtained from a registered licensed regional nursery/grower and of a regional eco-type species properly stored and handled to ensure viability. The plants will typically be installed during the period of December through March 15 (planting season/dormant season); however, unanticipated events such as spring flooding may be delay plantings until late spring or early summer. The seedlings will be installed in a manner that avoids monotypic rows of canopy and midstory species (i.e., goal is to have spatial diversity and mixture of planted species). If herbivory may threaten seedling survival, then seedling protection devices such as wire-mesh fencing or plastic seedling protectors will be installed around each planted seedling.

Species for BLH-Wet Habitats: The canopy species installed will be in general accordance with the species lists provided in Table 1A and 1B. Plantings will be conducted such that the total number of plants installed in a given area consists of approximately 60% hard mast-producing species (Table 1A) and approximately 40% soft mast-producing species (Table 1B). The species composition of the plantings for each of the two groups of canopy species should mimic the percent composition guidelines indicated in Tables 1A and 1B. However, site conditions and planting stock availability may necessitate deviations from the species lists and/or the percent composition guidelines indicated in these tables. In general, a minimum of 3 hard mast species and a minimum of 3 soft mast species should be used.

The midstory species installed will be selected from the species lists provided in Table 1C. Plantings will consist of at least 3 different species. The species used and the proportion of the total midstory plantings represented by each species (percent composition) will be dependent on various factors including site conditions (composition and frequency of existing native midstory species, hydrologic regime, etc.) and planting stock availability.

Table 1A. Preliminary Planting List for BLH-Wet Habitat - Hard mast-producing canopy species (60% of total)

Common Name	Scientific Name	Percent Composition
Nuttail oak	Quercus nuttalli	30%-40%
Willow oak	Q. phellos	30%-40%
Water oak	Q. nigra	5%
Overcup oak	Q. lyrata	10%-20%
Swamp chestnut oak	Q. michauxii	10%-20%
Bitter pecan	Carya x lecontei	10%-20%
Water hickory	C. aquatica	10%-20%

Table 1B. Preliminary Planting List for BLH-Wet Habitat - Soft mast-producing canopy species (40% of total)

Common Name	Scientific Name	Percent Composition
Drummond red maple	Acer rubrum var. drummondii	15%-25%
Sugarberry	Celtis laevigata	15%-25%
Green ash	Fraxinus pennsylvanica	15%-25%
Sweetgum	Liquidambar styraciflua	10%-20%
American elm	Ulmus americana	10%-20%
Slippery elem	U. rubra	10%-20%
Pumpkin ash	F. profunda	5%-15%
Bald cypress	Taxodium distichum	5%-15%

Table 1C. Preliminary Planting List BLH-Wet Habitat – Midstory Species

Common Name	Scientific Name	Percent Composition
Saltbush	Baccharis halimifolia	TBD
Buttobush	Cephalanthus occidentalis	TBD
Roughleaf dogwood	Cornus drummondii	TBD
Mayhaw	Crataegus opaca	TBD
Green hawthorn	Cratagus virginiana	TBD
Honey locust	Gleditsia tricanthos	TBD
Possumhaw	Ilex decidua	TBD
Red mulberry	Morus rubra	TBD
Wax myrtle	Myrica cerifera	TBD

TBD = To Be Determined

DEVIATIONS FROM TYPICAL PLANTING GUIDELINES:

Proposed mitigation features that involve restoration will commonly require planting the entire feature using the prescribed planting guidance addressed above. In contrast, mitigation features that involve enhancement will often require adjustments to the typical plant spacing/density guidelines and may further require adjustments to the guidelines pertaining to the species composition.

Where initial enhancement activities include the eradication of invasive/nuisance species, significant numbers of native canopy and/or midstory species may remain, but in a spatial distribution that leaves relatively large “gaps” in the canopy stratum and/or midstory stratum. In such cases, areas measuring approximately 25 x 25 feet that are devoid of native canopy species should be planted and areas measuring approximately 45 x 45 feet that are devoid of native midstory species should be planted.

The initial enhancement actions involved within a particular mitigation site could include a variety of measures such as the eradication of invasive species, topographic alterations, and hydrologic enhancement actions. These actions may result in areas of variable size that require planting of both canopy and midstory species using the typical densities/spacing described previously. There may also be areas where several native canopy and/or midstory species remain, thus potentially altering the general guidelines described as regards the spacing of plantings and/or species to be planted, and/or percent composition of planted species. Similarly, areas that must be replanted due to failure in achieving applicable mitigation success criteria may involve cases where the general guidelines discussed above will not necessarily be applicable.

Given these uncertainties, initial planting plans specific to enhancement features will be required and must be specified in the Mitigation Work Plan for the mitigation site. The initial planting plans will be developed by the USACE in cooperation with the interagency team. Initial plantings will be the responsibility of the USACE. If re-planting of an area is necessary following initial plantings, a specific replanting plan must also be prepared and must be approved by the USACE in cooperation with the interagency team prior to replanting. With the exception of any replanting actions necessary to attain the initial survivorship success criteria, the Sponsor will be responsible for preparing replanting plans and conducting replanting activities. Replanting necessary to achieve the initial survivorship criteria will be the responsibility of the USACE.

ADDITIONAL MITIGATION GUIDELINES

Guidelines for the Eradication and Control of Invasive and Nuisance Plant Species

The eradication of invasive and nuisance plant species may incorporate a variety of eradication methods including mechanized removal, non-mechanized removal, aerial herbicide applications, and ground herbicide applications. Regardless of the methods involved, care will be exercised to avoid damage to desirable native species to the greatest extent possible.

During the initial eradication process in forested habitats, larger quantities of felled materials may be removed from the mitigation site and disposed in a duly-licensed facility. Some felled woody plants may be chipped on-site with the chips spread in a layer not exceeding

approximately 3 to 4 inches thick. Felled woody plants may also be gathered and stacked "teepee" style in scattered locations. In certain cases, larger invasive trees may be killed and allowed to remain standing if it is determined this would not interfere with mitigation goals. The Mitigation Work Plan must address the specific measures proposed to conduct initial eradication efforts, including handling of vegetative debris, and the recommended measures for the subsequent control of invasive and nuisance plant species.

Guidelines for Clearing, Grading, and Other Earthwork Activities

Enhancement or restoration activities in certain mitigation areas where the proposed habitat is BLH-Wet may include alterations to existing topography. This includes an array of potential actions such as lowering grades over relatively large areas, breaching or removal of existing berms and spoil banks, filling of drainage canals and ditches, construction of containment berms, etc. The construction process could involve mechanized clearing and grubbing of the areas to be graded followed by the actual grading work.

Prior to the clearing, grubbing, grading, and related earthwork activities, the exact limits of zones requiring clearing and grading/earthwork will be determined in the field and will be marked with protective barriers such as flagging. These marker barriers will remain in place until grading activities are completed. Prior to initiation of the clearing and grading/earthwork activities, silt fences will also be installed at appropriate location adjacent to existing wetlands to control erosion and sediment transport. These erosion/sediment control devices will remain in place until earthwork activities are completed and the disturbed areas are stabilized. Machinery/vehicle ingress and egress routes to the areas requiring earthwork will be restricted to avoid unnecessary damage to nearby upland and wetland areas.

Cleared vegetation will be removed from the mitigation site for disposal either within the duly licensed off-site disposal facility, or will be burned on-site if practicable. Soil removed during the grading/earthwork process will either be disposed of off-site in a licensed facility or used within the mitigation site itself if material suitable and fill is needed. All other debris generated during the clearing and grading process will be disposed in a duly-licensed off-site facility.

If grading or other earthwork activities are necessary, the Mitigation Work Plan must include detailed plans depicting the required activities. These plans will be developed by the USACE in coordination with the interagency team. The Sponsor will be responsible for LERRDs acquisition and for any placement area improvements (improvements required on real property to enable the ancillary placement of material that has been dredged or excavated during construction, operation, and maintenance of the project), including but not limited to, retaining dikes, waste weirs, bulkheads, embankments, monitoring features, stilling basins, and de-watering pumps and pipes. The USACE will be responsible for the successful completion of all other initial earthwork construction activities. The Sponsor will be responsible for any subsequent earthwork activities necessary for the proper maintenance of the mitigation site. However, if the primary purpose of the initial grading/earthwork activities is to enhance site hydrology, then the USACE will be responsible for conducting any additional grading/earthwork activities necessary to ensure the hydrologic enhancement objectives are achieved. Once it is demonstrated that these

objectives have been satisfied, the Sponsor will then be responsible for any further earthwork activities needed to ensure proper maintenance.

Guidelines for Surface Water Management Features and Structures:

If enhancement or restoration efforts include construction of surface water management systems and/or installation of water conveyance or water control structures then actions are necessary. The Mitigation Work Plan must include detailed plans for these activities as well as operational specifications if applicable. These plans and specifications will be developed by the USACE in coordination with the interagency team. The Sponsor will be responsible for LERRDs acquisition and for any placement area improvements (improvements required on real property to enable the ancillary placement of material that has been dredged or excavated during construction, operation, and maintenance of the project), including but not limited to, retaining dikes, waste weirs, bulkheads, embankments, monitoring features, stilling basins, and de-watering pumps and pipes. The USACE will be responsible for the successful construction of any other surface water management features, drainage structures, and water control structures. The Sponsor will be responsible for the subsequent maintenance and operation activities required.

It is noted that there is a strong preference for mitigation sites that are self-sustaining from a hydrologic perspective. While active water management might be needed in the short-term for establishment of plantings or other reasons, sites that require active hydrologic management to achieve long-term success should generally be avoided.

BLH-Wet Hydrology Guidelines:

The optimal hydrologic regime for BLH-Wet forests involves both brief seasonal flooding and sufficient surface water exchange between the forest and adjacent systems. BLH-Wet forests are commonly flooded for some portion of the year, although the timing, extent, depth, duration, and source of floodwaters can by highly variable. The hydroperiod commonly includes temporary flooding for brief periods during the growing season; however, the water table is typically below the soil surface for the majority of the growing season. When flooding does occur, freshwater input from riverine systems is most desirable as is relatively consistent surface water flow through the forest. Having good surface water exchange between the BLH forest and adjacent habitats is the primary objective, thus other sources of sheetflow into the forest besides riverine sources can be similarly beneficial.

The following provides some general hydrologic guidelines for mitigation projects involving BLH-Wet habitat restoration and for those mitigation projects involving BLH-Wet habitat enhancement where enhancement of the existing hydrologic regime is a component of the mitigation work program. These are simply guidelines and the attainment of one or more of these guidelines may not be possible in some situations:

- Avoid extended periods of inundation, particularly during early portions of the growin season. Brief periods of flooding typically should occur during the winter and early spring, but the water table should be greater than 1 foot below the soil surface for an extended period during the growing season.

- The hydroperiod should be such that the forest is irregularly inundated or soils are saturated to the soil surface for period ranging from approximately 15 to 30 days during the growing season.
- Locate the mitigation area such that it naturally receives occasional freshwater inputs via surface flow from adjacent lands and such that, during periods of inundation, there is good sheet flow through the mitigation area including a means for surface water discharge from the mitigation area. If the mitigation area cannot be located to attain these goals naturally, then mitigation activities should include actions to achieve these goals to the greatest degree practicable, while at the same time not jeopardizing hydrology objectives pertaining to the forest's hydroperiod.

MITIGATION SUCCESS CRITERIA AND MITIGATION MONITORING: BLH-Wet Mitigation Features

Mitigation Success Criteria

1. General Construction

A. As applicable, complete all necessary initial earthwork and related construction activities in Mitigation TY1 (2024). The necessary activities will vary with the mitigation site. Examples include, but are not limited to: clearing, grubbing, and grading activities; construction of new water management features (weirs, flap-gates, diversion ditches, etc.); modifications/alterations to existing water control structures and surface water management systems; construction of perimeter containment dikes and installation of fill (dredged sediments or other soil).

B. For mitigation features established in existing open water areas, complete all final construction activities in Mitigation TY2 (2025). The necessary activities will vary with the mitigation site. Examples include, but are not limited to: degrading or "gapping" of perimeter retention dikes; construction of water management structures (weirs, etc.).

2. Native Vegetation

A. Complete initial planting of canopy and midstory species.

B. 1 Year Following Completion of Initial Plantings (at end of first growing season following plantings):

- Achieve a minimum average survival of 50% of planted canopy species (i.e. achieve a minimum average canopy species density of 269 seedlings/ac.). The surviving plants must approximate the species composition and the species percentages specified in the initial plantings component of the Mitigation Work Plan. These criteria will apply to the initial plantings as well as any subsequent replantings necessary to achieve this initial success requirement.
- Achieve a minimum average survival of 85% of planted midstory species (i.e. achieve a minimum average midstory species density of 93 seedlings/ac.). The surviving plants must approximate the species composition percentages specified in the initial plantings component of the Mitigation Work Plan. These criteria will apply to the initial plantings as

well as any subsequent replantings necessary to achieve this initial success requirement.

C. 4 Years Following Completion of Initial Plantings:

- Achieve a minimum average density of 300 living native canopy species per acre (planted trees and/or naturally recruited native canopy species).
- Achieve a minimum average density of 120 living, native, hard mast-producing species in the canopy stratum but no more than approximately 150 living hard-mast producing species in the canopy stratum (planted trees and/or naturally recruited native canopy species). The remaining trees in the canopy stratum must be comprised of soft-mass producing native species. These criteria will thereafter remain in effect for the duration of the overall monitoring period. Modifications to these criteria could be necessary for reasons such as avoidance of tree thinning if thinning is not warranted and the long-term effects of sea level rise on tree survival. Proposed modifications must first be approved by the USACE in coordination with the Interagency Team.
- Achieve a minimum average density of 85 living native midstory species per acre (planted midstory and/or naturally recruited native midstory species).
- For BLH-Wet habitats only -- Demonstrate that vegetation satisfies USACE hydrophytic vegetation criteria. This criterion will thereafter remain in effect for the duration of the overall monitoring period.

D. Within 10 Years Following Completion of Initial Plantings:

- Attain a minimum average cover of 80% by planted canopy species and/or naturally recruited native canopy species. This criterion will thereafter remain in effect for the duration of the overall monitoring period.

E. 15 Years Following Completion of Initial Plantings:

- Achieve a minimum average density of 75 living native plants per acre in the midstory stratum (planted midstory and/or naturally recruited native midstory species).

F. 25 Years Following Completion of Initial Plantings:

- Average cover by native species in the midstory stratum must be greater than 20% but cannot exceed 50%. This criterion will thereafter remain in effect for the duration of the overall monitoring period.
- Average cover by native species in the understory stratum must be greater than 30% but cannot exceed 60%. This criterion will thereafter remain in effect for the duration of the overall monitoring period.

Note: The requirement that the above criteria remain in effect following attainment of initial success may need to be modified later due to factors such as the effect of sea level rise on vegetative cover. Proposed modifications must first be approved by the USACE in coordination with the Interagency Team.

3. Invasive and Nuisance Vegetation

A. Complete the initial eradication of invasive and nuisance plant species.

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 vegetative cover accounted for by invasive and nuisance species each constitute less than 5% of the total plant cover during periods between maintenance events. Note -These criteria must be satisfied throughout the duration of the overall monitoring period.

4. Topography

A. For mitigation features requiring earthwork to attain desired grades (excluding areas restored from existing open water features – Following completion of initial construction activities (anticipated in TY1, 2024), demonstrate that at least 80% of the total graded area within each feature is within approximately 0.5 feet of the proposed target soil surface elevation (e.g. the desired soil surface elevation).

B. For mitigation features restored from existing open water areas – (a) In the year that final construction activities are completed (anticipated in TY2, 2025), demonstrate that at least 80% of the total graded area within each feature is within approximately 0.5 feet of the proposed target soil surface elevation (e.g. the desired soil surface elevation), and; (b) In the year after final construction activities are completed, demonstrate that at least 85% of the total graded area within each feature is within approximately 0.5 feet of the proposed target soil surface elevation

5. Thinning of Native Vegetation (Timber Management)

The USACE, in cooperation with the Interagency Team, may determine that thinning of the canopy and/or midstory strata is warranted to maintain or enhance the ecological value of the site. This determination will be made approximately 15 to 20 years following completion of initial plantings. If it is decided that timber management efforts are necessary, the Sponsor will develop a Timber Stand Improvement/Timber Management Plan in coordination with the USACE and Interagency Team. Following approval of the plan, the Sponsor will perform the necessary thinning operations and demonstrate these operations have been successfully completed. Timber management activities will only be allowed for the purposes of ecological enhancement of the mitigation site.

6. Hydrology

A. In a year having essentially normal rainfall, demonstrate that the water table is less than or equal to 12 inches below the soil surface for a period of at least 14 consecutive days.

B. If the mitigation program includes actions intended to enhance site hydrology or hydroperiod, demonstrate that the affected site is irregularly inundated or soils are saturated to the soil surface for a period ranging from 7% to approximately 13% of the growing season during a year having essentially normal rainfall. The Mitigation Work Plan for a specific site may establish more specific hydrologic enhancement goals. If this is the case, demonstrate attainment of the specific goals identified in the plan.

MITIGATION MONITORING GUIDELINES

"Time Zero" Monitoring Report

Shortly after completion of all initial mitigation activities (e.g. initial eradication of invasive and nuisance plants, first/initial planting of native species, completion of initial earthwork, grading, surface water management system alterations/construction, etc.), the mitigation site will be monitored and a "time zero" or "baseline" monitoring report prepared. Information provided will include the following items:

- A detailed discussion of all mitigation activities completed.
- A description of the various features and habitats within the mitigation site.
- A plan view drawing of the mitigation site showing the approximate boundaries of different mitigation features (ex. planted areas, areas only involving eradication of invasive and nuisance plant species; surface water management features, etc.), monitoring transect locations, sampling plot locations, photo station locations, and, if applicable, piezometer and staff gage locations.
- An as-built survey of finished grades for any relatively large areas subject to topographic alterations and an as-built survey of any surface water drainage features, drainage culverts, and/or water control structures constructed. Detailed surveys of topographic alterations simply involving the removal of existing linear features such as berms/spoil banks, or involving the filling of existing linear ditches or canals, will not be required. However, the as-built survey will include spot cross-sections of such features sufficient to represent typical conditions. The as-built survey must include a survey of areas where existing berms, spoil banks, or levees have been breached in sporadic locations. For mitigation areas involving habitat restoration in existing open water areas, the as-built survey must include a topographic survey of the entire restoration feature.
- A detailed inventory of all canopy and midstory species planted, including the number of each species planted and the stock size planted. In addition, provide a breakdown itemization indicating the number of each species planted in a particular portion of the mitigation site and correlate this itemization to the various areas depicted on the plan view drawing of the mitigation site.

Additional Monitoring Reports

All monitoring reports generated after the initial "time zero" report will provide the following information unless otherwise noted:

- A plan view drawing of the mitigation site showing the approximate boundaries of different mitigation features (ex. planted areas, areas only involving eradication of invasive and nuisance plant species; surface water management features, etc.), monitoring transect locations, sampling plot locations, photo station locations, and, if applicable, piezometer and staff gage locations
- A brief description of maintenance and/or management and/or mitigation work performed since the previous monitoring report along with a discussion of any other significant occurrences
- Photographs documenting conditions in the mitigation site at the time of monitoring. Photos will be taken at permanent photo stations within the mitigation site. At least two

photos will 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. The number of photo stations required as well as the locations of these stations will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. For mitigation features involving habitat enhancement rather than restoration, the permanent photo stations will primarily be established in areas slated for planting of canopy and midstory species, but some may also be located in areas where plantings are not needed.

- Quantitative plant data collected from permanent monitoring plots measuring approximately 90 feet X 90 feet in size or from circular plots having a radius of approximately 53 feet. Data recorded in each plot will include: number of living planted canopy species present and the species composition; number of living planted midstory species present and the species composition; average density of all native species in the canopy stratum, the total number of each species present, and the wetland indicator status of each species; average cover by native species in the canopy stratum; average density of all native species in the midstory stratum, the total number of each species present, and the wetland indicator status of each species; average cover by native species in the midstory stratum; average percent cover accounted for by invasive plant species (all vegetative strata combined); average percent cover accounted for by nuisance plant species (all vegetative strata combined). The permanent monitoring plots will be located within mitigation areas where initial planting of canopy and midstory species is necessary. The number of plots required as well as the locations of these plots will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. Typically there will be at least one monitoring plot for every 20 acres planted.
- Quantitative plant data collected from either: (1) permanent transects sampled using the point-centered quarter method with a minimum of 20 sampling points established along the course of each transect, or; (2) permanent belt transects approximately 50 feet wide. The number of transects necessary as well as the location and length of each transect will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. Data recorded from the sampling transects will include: average density of living planted canopy species present and the species composition; average density of living planted midstory species present and the species composition; average density of all native species in the canopy stratum along with the species composition and the wetland indicator status of each species; average percent cover by all native species in the canopy stratum; average height of native species in the canopy stratum; average density of native species in the midstory stratum, the total number of each species present, and the wetland indicator status of each species; average percent cover by native species in the midstory stratum; average height of native species in the

midstory stratum; if present, average percent cover accounted for by invasive and nuisance species present in the canopy and midstory strata (combined).

- Quantitative data concerning plants in the understory (ground cover) stratum and concerning invasive and nuisance plant species will be gathered from sampling quadrats. These sampling quadrats will be established either along the axis of the belt transects discussed above, or at sampling points established along point-centered quarter transects discussed above, depending on which sampling method is used. Each sampling quadrat will be approximately 2 meters X 2 meters in size. The total number of sampling quadrats needed along each sampling transect will be determined by the USACE with the Interagency Team and will be specified in the Mitigation Monitoring Plan. Data recorded from the sampling quadrats will include: average percent cover by native subcanopy species; composition of native subcanopy species and the wetland indicator status of each species; average percent cover by invasive plant species; average percent cover by nuisance plant species.
- A summary of rainfall data collected during the year preceding the monitoring report based on rainfall data recorded at a station located on or in close proximity to the mitigation site. Once all hydrology success criteria have been achieved, collection and reporting of rainfall data will no longer be required.
- A summary of water table elevation data collected from piezometers coupled with staff gages installed within the mitigation site. Data (water table elevations) will be collected at least bi-weekly. Once the monitoring indicates the water table may be rising to an elevation that would meet hydrologic success criteria, water table elevations will be collected on a daily basis until it is evident the success criteria has been satisfied. The schedule of water table elevation readings can shift back to a bi-weekly basis for the remainder of the monitoring period. The number of piezometers and staff gages required as well as the locations of these devices will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. Once hydrology success criteria have been satisfied, water table monitoring will no longer be required. However, monitoring reports generated subsequent to the attainment of success criteria will include a general discussion of water levels and hydroperiod based on qualitative observations.
- Various qualitative observations will be made in the mitigation site to help assess the status and success of mitigation and maintenance activities. These observations will include: general estimates of the average percent cover by native plant species in the canopy, midstory, and understory strata; general estimate of the average percent cover by invasive and nuisance plant species; general estimates concerning the growth of planted canopy and midstory species; general observations concerning the colonization by volunteer native plant species. General observations made during the course of monitoring will also address potential problem zones, general condition of native vegetation, trends in the composition of the plant communities, wildlife utilization as observed during monitoring, and other pertinent factors.

- For mitigation features restored from existing open water areas, provide an as-built topographic survey of all such mitigation features in the year immediately following the "time zero" monitoring event. No additional topographic surveys will typically be required following this second survey. However 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 will be made by USACE in coordination with the Interagency Team.
- Rectified aerial photographs of all mitigation features. This aerial photography will only be provided in the following monitoring reports: (a) The monitoring report prepared for monitoring conducted in the year immediately preceding the year the mitigation project is transferred to the Sponsor; (b) The monitoring report prepared for monitoring conducted approximately 15 years following completion of initial plantings.
- 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
- A brief description of anticipated maintenance/management work to be conducted during the period from the current monitoring report to the next monitoring report

Monitoring Reports Involving Timber Management Activities

In cases where timber management activities (thinning of trees and/or shrubs in the canopy and/or midstory strata) have been approved by the USACE in coordination with the Interagency Team, monitoring will be required in the year immediately preceding and in the year following completion of the timber management activities (i.e. pre-timber management and post-timber management reports). These reports must include data and information that are in addition to the typical monitoring requirements. The Sponsor's proposed Timber Stand Improvement/Timber Management Plan must include the proposed monitoring data and information that will be included in the pre-timber management and post-timber management monitoring reports. The proposed monitoring plan must be approved by the USACE in coordination with the Interagency Team prior to the monitoring events and implementation of the timber management activities.

Monitoring Reports Following Re-Planting Activities

Re-planting of certain areas within the mitigation site 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, cross-referenced to a listing of the species and number of each species planted in each area.

MITIGATION MONITORING SCHEDULE AND RESPONSIBILITIES

Monitoring will typically take place in 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 will be submitted by December 31 of each year of monitoring. Monitoring

reports will be provided to the USACE, the Sponsor, and the agencies comprising the Interagency Team.

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

1. General Construction – 1.A or 1.B, as applicable.
2. Native Vegetation – A and B.
3. Invasive & Nuisance Vegetation – A, plus B until such time as project is transferred to the Sponsor.
4. Topography – A, as applicable, or B, as applicable.

Monitoring events associated with the above will include the “time zero” (first or baseline) monitoring event plus annual monitoring events thereafter until the mitigation project is transferred to the Sponsor. The years applicable to these monitoring events will vary depending on the type of mitigation involved (restoration or enhancement) and site conditions present at the time mitigation activities are initiated. For example, the first monitoring event may occur in 2025 (TY2) for certain mitigation sites while this event may not occur until 2026 (TY3) for other mitigation sites.

The Sponsor will be responsible for conducting the required monitoring events and preparing the associated monitoring reports after the USACE has determined the mitigation success criteria listed above have been achieved. The overall responsibility for management, maintenance, and monitoring of the mitigation will be transferred to the Sponsor during the first quarter of the year immediately following submittal of the monitoring report that demonstrates attainment of said criteria.

Once monitoring responsibilities have been transferred to the Sponsor, the next monitoring event will take place during the year that attainment of success criterion 2.C (native vegetation criterion applicable 4 years after completion of initial plantings) must be demonstrated. Thereafter, monitoring will be conducted every 5 years throughout the period of analysis or the mitigation project (based on 50-year period of analysis beginning in 2022 (TY0) and ending in 2073 (TY50).

If the initial survival criteria for planted canopy and midstory species are not achieved (i.e. the 1-year survival criteria specified in success criteria 2.B), a monitoring report will be required for each consecutive year until two annual sequential reports indicate that all survival criteria have been satisfied (i.e. that corrective actions were successful). The USACE will be responsible for conducting this additional monitoring and preparing the monitoring reports. The USACE will also be responsible for the purchase and installation of supplemental plants needed to attain these success criteria.

If the native vegetation success criteria specified for 4 years following completion of initial plantings are not achieved (i.e. success criteria 2.C) , a monitoring report will be required for each consecutive year until two annual sequential reports indicate that these criteria have been satisfied. The Sponsor will be responsible for conducting this additional monitoring and

preparing the monitoring reports. The Sponsor will also be responsible for the purchase and installation of supplemental plants needed to attain these success criteria.

If timber management activities conducted in the mitigation features by the Sponsor, the Sponsor will be responsible for conducting the additional monitoring and preparing the associated monitoring reports necessary for such activities (e.g. one monitoring event and report in the year immediately preceding timber management activities and one monitoring event and report in the year that timber management activities are completed).

The year in which mitigation features are first planted, a key milestone triggering the start of mitigation monitoring, may vary depending on the type of mitigation involved and the mitigation construction activities involved. In certain cases, it is also possible that the BLH mitigation features may be established along with other mitigation features like swamp or marsh habitats at the same mitigation site. Such factors make it necessary to develop a reasonable and efficient monitoring schedule at the time final mitigation plans are generated. This schedule must be in general accordance with the guidance provided above and will be prepared by the USACE in coordination with the Interagency Team and the Sponsor.

Once monitoring responsibilities have transferred to the Sponsor, the Sponsor will 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 initial plantings, the number of monitoring plots and/or monitoring transects 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.

DEFINITION OF TERMS

Certain terms used herein shall have the meaning discussed in the following section.

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. In cases where proposed mitigation features will be established within Jean Lafitte National Historical Park and Preserve, representatives from the National Park Service would also comprise the Interagency Team.

Sponsor
This term refers to the Non-Federal Sponsor for the mitigation projects.

Target Year
This document often refers to mitigation “target years” or a particular mitigation “target year” (abbreviated “TY”). Target Year 0 (TY0) is the year in which mitigation construction activities are anticipated to commence, which is presently estimated to occur in calendar year 2022, but subject to change. Target years increase from this time forward.

Invasive Plant Species
All plant species identified as invasive or as non-indigenous (exotic) based on the Louisiana Aquatic Invasive Species Task Force [3] and USGS guide on Nonindigenous Aquatic Species for Louisiana[4].

In addition, invasive plant species include; Japanese climbing fern (*Lygodium japonicum*), tall fescue (*Festuca arundinacea*), chinaberry (*Miscanthus sinensis*), Brazil vervain (*Verbena litoralis* var. *brevibrateata*), and rescuegrass (*Bromus catharticus*).

Nuisance Plant Species
Nuisance plant species will include native species deemed detrimental due to their potential adverse competition with desirable native species. Examples of potential nuisance plant species 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.), black willow (*Salix nigra*), and boxelder (*Acer negundo*). The determination of whether a particular plant species should be considered as a nuisance species and therefore eradicated or controlled will be determined by the USACE in coordination with the Interagency Team, based on conditions present within a particular mitigation area.

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.

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

[3] 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)

[4] U.S. Geological Survey. 2011. NAS – Nonindigenous Aquatic Species, Louisiana. Website - http://nas.er.usgs.gov/queries/SpeciesList.aspx?group=Plants&state=LA&Sortby=2

set forth in the following reference, using the Region 2 listing contained therein. However, if the USACE approves and adopts a new list in the future, then the currently approved list will apply.

Reed, P. B., Jr. 1988. National List of Plant Species that Occur in Wetlands: 1988 National Summary. Biological Report 88(24). Washington, DC: U.S. Fish and Wildlife Service. (website - http://www.usace.army.mil/CECW/Documents/cecwo/reg/plants/list88.pdf)

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.

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.

Point-Centered Quarter Method
A plot-less method of forest sampling. Use of this method will be in general compliance with the applicable methodology described in the following reference:

Cottam, Grant and J. T. Curtis. 1956. The use of distance measures in phytosociological sampling. Ecology, 37(3):451-460.

Piezometer
Typically a small-diameter observation well employed as a means of measuring water elevations in the surficial aquifer (water table elevations). Piezometers used for monitoring purposes should be constructed in general accordance with the following reference, unless otherwise approved by the USACE:

U. S. Army Corps of Engineers. 2005. Technical standard for water-table monitoring of potential wetland sites. ERDC TN-WRAP-05-02. Vicksburg, MS: U.S. Army Engineer Research and Development Center. (website - http://el.erdc.usace.army.mil/wrap/pdf/tnwrap05-2.pdf)

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.

12. ENCLOSURE 4: EXAMPLE MITIGATION MONITORING PLAN WITH COST

If mitigation banks are not available, then the Corps-Constructed BLH-Wet Mitigation project(s) would be required. The following mitigation plan and monitoring is only provided as an example. Once a Corps-Constructed BLH-Wet Mitigation project(s) is selected then a mitigation plan and monitoring plan specific to that site would be developed.

APPENDIX C

MITIGATION PLAN AND MONITORING

Coleman Brackish Marsh Creation Mitigation Project Feature
Environmental Assessment #543

INTRODUCTION

This document follows the general mitigation guidelines, outlined in Appendix J, Environmental Assessment (EA) #543, developed for New Orleans to Venice (NOV) Hurricane Risk Reduction Project: Incorporation of Non-Federal Levees (NFL) from Oakville to St . Jude and the NOV Federal Hurricane Protection Levee, Plaquemines Parish, Louisiana (hereafter NFL NOV). Mitigation guidelines were developed by the U.S. Army Corps of Engineers, New Orleans District (CEMVN) in coordination with an Interagency Team and the non-Federal project sponsor (NFS), Louisiana Coastal Protection and Restoration Authority Board (LA CPRAB). This appendix describes project-specific mitigation actions and guidelines including plans for planting, monitoring, and reporting only for the Coleman brackish marsh mitigation project feature, the only constructible feature of the Tentatively Selected Plan (TSP) as documented in EA #543. The TSP also includes additional mitigation features including the purchase of In Lieu Fee and mitigation bank credits not the subject of this appendix. Mitigation success criteria are also presented in this appendix. The Coleman brackish marsh mitigation feature is fully described in EA #543 and summarized in Table 1.

Table 1. Mitigation Projects included in EA #543

Habitat	Project	Action	Acres
Intermediate/ Brackish/Saline Marsh (IM/BM/SM)	Coleman	Construct marsh platform from open water on Coleman property and plant IM/BM/SM species. Action includes constructing retention dikes that will be degraded after settlement and dewatering (approximately 1 year).	230

The mitigation actions include construction of marsh platform suitable for primarily brackish marsh, temporary retention dikes, brackish marsh vegetation plantings, and degrading of retention dikes after settlement and dewatering (approximately 1 year post construction. The NFS will be responsible for operation and maintenance of functional portions of the work as they are completed.

The CEMVN would monitor the completed mitigation site, on a cost-shared basis with the NFS, to determine whether additional construction, invasive species control and/or plantings would be necessary to achieve mitigation success. The CEMVN would undertake additional actions necessary to achieve mitigation success in accordance with cost-sharing applicable to the project and subject to the availability of funds.

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Once the CEMVN determines that the mitigation has achieved 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 CEMVN would consult with other agencies and the NFS to determine whether operational changes would be sufficient to achieve ecological success criteria. If additional structural changes are deemed necessary to achieve ecological success, the CEMVN 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.

The respective responsibilities for the construction, monitoring, and maintenance of the Coleman brackish marsh mitigation feature described in EA #543 are as follows:

1. Construction and planting (the "construction phase") - performed by the CEMVN per applicable cost-sharing;

2. After construction and planting, the CEMVN 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, the CEMVN would 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, the CEMVN would perform these items subject to applicable cost-sharing and availability of funds;

5. After Initial Success Criteria are achieved, the NFS would monitor project;

6. If, after Initial Success Criteria are achieved, there is a problem that can be corrected through a change in operation, the NFS would 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, the CEMVN would implement adaptive management according to applicable cost-sharing and subject to availability of funds.

For the Coleman brackish marsh creation 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. Dredging material from the bottom of Mississippi River and pumping the material via hydraulic pipeline along a defined access corridor to the designated fill site to establish marsh platforms at design elevation.

4. Surveying to determine fill height during dredge material disposal, at the end of the dredging operation, and 1 year after conclusion of the dredging operation.

5. Degrading the perimeter dikes and gapping the dikes to allow water exchange once target elevations have been reached.

6. Initial (typically during first year after establishment of marsh platforms) invasive and nuisance plant species control.

7. Testing of the soil 1 year after fill event and before planting to determine the suitability of the soil for the planting of marsh species if required. If soil parameters are not met for marsh, delay planting until achieved.

8. One year after the establishment of the marsh platforms, the planting of native, herbaceous, and wetland vegetation species throughout the fill areas would occur.

COLEMAN INTERMEDIATE/BRACKISH/SALINE MARSH RESTORATION

Mitigation Work Plan
Section 2.5.6.1 of the EA #543 provides a detailed description of the Coleman mitigation feature construction/implementation work plan. Figures 1 and 2 depict the proposed mitigation (marsh restoration) features discussed herein. The key elements of the construction/implementation plan are as follows.

- Placement of fill (borrow material) within the mitigation features as necessary to attain the desired final target grade elevation of approximately +1.5 feet NAVD88. The borrow material for the Coleman site would be dredged from the Mississippi River, north of the mitigation site and transported to the mitigation site using existing pipeline corridors adjacent to West Point A La Hache. To minimize marsh impacts, the pipeline and equipment would follow open water and canals as much as possible.

- As necessary, follow-up eradication of invasive/nuisance plant species within the mitigation features through ground-based application of appropriate herbicides to the target species, prior to the initial planting of native marsh species within these features.

- Initial planting (initial installation) of native marsh species in the mitigation features following the settling/dewatering necessary to meet the final target elevation of the mitigation feature. Refer to the following planting specifications.

The successful completion of this initial planting event will mark the end of the mitigation construction phase.

- As necessary, follow-up eradication of invasive/nuisance plant species within the mitigation features through ground-based application of appropriate herbicides to the target species, following the initial planting cited above.

MITIGATION PLANTING GUIDELINES

Because salinities fluctuate between intermediate and brackish conditions, depending on rainfall and tidal conditions, the Coleman brackish marsh mitigation feature includes plantings of intermediate, brackish, and saline marsh species. The site would either be planted with intermediate or brackish or a combination of intermediate, brackish and saline marsh species depending upon local site conditions the year planting is scheduled to occur. Such determinations would be made in coordination with the Interagency Team.

Herbaceous species would be planted on 7-foot centers (average) to achieve a minimum density of 889 plants per acre. Stock would typically be either 4-inch container size, bare-root, or liner stock, depending on the species availability at the time of plantings. Plants must be obtained from a registered licensed regional nursery/grower and of a regional eco-type species properly stored and handled to ensure viability. Plantings should be conducted during the period from March 15 through June 15. Plantings should not be undertaken later than approximately July 15, unless approval is obtained from the CEMVN, CPRAB, and Interagency Team. Planting during the early fall may be deemed acceptable on a case-by-case basis.

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

Table 2: Preliminary Planting List for Intermediate Marsh Habitats

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

Species planted in proposed brackish and saline marsh habitats would be selected from the species list provided in Table 3. Plantings would consist of at least two different brackish and saline marsh species. The species used and the proportion of the total plantings represented by each species would be dependent on various site factors including local site conditions and planting stock availability at the time of the plantings.

Table 3: Preliminary Planting List for Brackish and Saline Marsh Habitats

Common Name	Scientific Name
Marsh-hay cordgrass	*Spartina patens*
Black needle rush	*Juncus roemerianus*
Smooth cordgrass	*Spartina alterniflora*
Common threesquare	*Schoenoplectus americanus*
Saltmarsh bulrush	*Schoenoplectus robustus*
Salt grass	*Distchilis spicata*

1 . General Construction

A. Within approximately 8 months following the start of mitigation construction, complete all initial mitigation construction activities (e.g. construction of temporary retention/perimeter dikes, placement of fill (borrow material/dredged material) into mitigation site, construction of permanent dikes if applicable, etc.), in accordance with the mitigation work plan and in accordance with final project plans and specifications. Complete an as-built survey. These requirements classify as initial success criteria.

B. Approximately 1 to 3 years following completion of all initial mitigation construction activities (when the restored marsh feature has attained the desired target soil surface elevation), complete all final mitigation construction activities, in accordance with the mitigation work plan and in accordance with final project plans and specifications. Such activities could include, but are not limited to: degrading temporary retention dikes such that the areas occupied by these dikes have a surface elevation equivalent to the desired target marsh elevation; completion of armoring, if required, of any permanent dikes; “gapping” or installation of “fish dips” in permanent dikes; and construction of trenasses or similar features within marsh features as a means of establishing shallow water interspersion areas within the marsh. Finishing the aforementioned construction components would be considered as the “completion of final mitigation construction activities.” As noted previously, this is anticipated to occur approximately 1 year after placement of fill material in the mitigation feature is completed. The requirements stated herein classify as initial success criteria.

2. Topography

A. Upon completion of final mitigation construction activities (after 1 year dewatering, approximate Target Year 2)

- Demonstrate that at least 80 percent of each mitigation feature has a surface elevation that is within 0.5 feet of the desired target surface elevation. This requirement classifies as an initial success criterion.

B. 1 Year following completion of final mitigation construction activities (approximate Target Year 3)

- Demonstrate that at least 80 percent of the mitigation site has a surface elevation that is within 0.5 feet of the desired target surface elevation. This requirement classifies as an initial success criterion.

C. 3 years following completion of final mitigation construction activities (approximate Target Year 5)

- Demonstrate that at least 90 percent of the mitigation site has a surface elevation that is within the functional marsh elevation range. This requirement classifies as an intermediate success criterion.

3. Native Vegetation

A. For intermediate, brackish and saline marsh restoration features –
- Complete initial marsh planting in accordance with applicable initial marsh planting guidelines. This requirement classifies as an initial success criterion.

B. For intermediate, brackish, and saline marsh restoration features only; 1 year following completion of initial plantings–
- Attain at least 80 percent survival of planted species, or; Achieve a minimum average cover of 25 percent, comprised of native herbaceous species (includes planted species and volunteer species).
- Demonstrate that vegetation satisfies the CEMVN hydrophytic vegetation criteria. This criterion would thereafter remain in effect for the duration of the overall monitoring period.
- The requirements above classify as initial success criteria; with the exception that the requirement to demonstrate vegetation satisfies the CEMVN hydrophytic vegetation criteria throughout the duration of the overall monitoring period classifies as a long-term success criterion.

C. For intermediate, brackish, and saline marsh restoration features; 3 years following completion of initial plantings –
- Achieve a minimum average cover of 75 percent, comprised of native herbaceous species (includes planted species and volunteer species). This requirement classifies as an intermediate success criterion.

D. For all marsh restoration features (intermediate, brackish, and saline) –
- For the period beginning 5 years following completion of final mitigation construction activities and continuing through 20 years following completion of

final mitigation construction activities, maintain a minimum average cover of 80 percent, comprised of native herbaceous species. This requirement classifies minimum average cover of 80 percent, 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 final mitigation construction activities. This requirement 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 percent 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 CEMVN 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

The guidelines for mitigation monitoring provided herein are applicable to all the types of marshes being restored (i.e. intermediate, brackish, and saline), unless otherwise indicated.

Table 4. Mitigation Success Criteria by Habitat Type

Performance Categories	Marsh
Mitigation Construction	Criteria 1A: Complete initial construction activities. Criteria 1B: Complete final construction activities.
Native Vegetation	Criteria 3A. Complete initial plantings for intermediate and brackish marsh. Criteria 3C: For intermediate, brackish, and saline marsh , 1 year after initial plantings, achieve: • ≥80% survival of planted species OR ≥25% cover by native herbaceous species • meets hydrophytic vegetation criteria. Criteria 3E: For intermediate, brackish, & saline marsh 3 years after initial plantings, achieve: ≥75% cover by native herbaceous species.

Performance Categories	Marsh
	Criteria 3F: For all marshes, between year 5 through 20 years following completion of final construction, achieve: ≥80% cover by native herbaceous species.
Invasive and Nuisance Vegetation (INV)	Criteria 4A. Complete initial Eradication of INV. Criteria 4B. Maintain <5% cover by INV.
Topography	Criteria 2A: Upon completion of construction, ≥ 80% of total area must be within 0.5 ft of target elevation. Criteria 2B: 1 to 3 years after completion of construction, ≥ 80% of total area must be within 0.5 ft of target elevation. Criteria 2C: 3 years after completion of construction, ≥ 90% of mitigation site must be within functional marsh elevation range.
Thinning of Native Vegetation	Not applicable.
Hydrology	Not applicable.

Baseline Monitoring Report

The Coleman brackish marsh mitigation site will be monitored and a baseline monitoring report prepared. Shortly after completion of all initial mitigation activities (e.g. initial eradication of invasive plants, first/initial planting of native species, completion of initial earthwork, grading, surface water management system alterations/construction, etc.), the mitigation site will be monitored and a baseline or monitoring report will be prepared for the Coleman site. Monitoring and reporting requirements for the baseline report 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, monitoring transect locations, sampling quadrat locations, photo station locations, and a staff gage location. The exact locations will be determined and documented using GPS coordinates and coordinated with the CEMVN, CRPA, and Interagency Team during the initial site visit and the baseline monitoring event. If aerial imagery of the mitigation site is available, it will also be included.

C. An as-built survey of surface elevations (topographic survey) within each marsh feature, along with an as-built survey of any permanent dikes constructed as part of the marsh restoration features including any “gaps” or “fish dips” established in such dikes. The layout of the as-built surveys is shown on Figure 3. If a particular

marsh feature is immediately adjacent to existing marsh habitat, the topographic survey will 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 will be provided addressing attainment of topographic success criteria.

Figure 1. Areas of interest for monitoring plan design at the Coleman Brackish Marsh site. A minimum of 100 quadrats would be established for this 230 acre site.

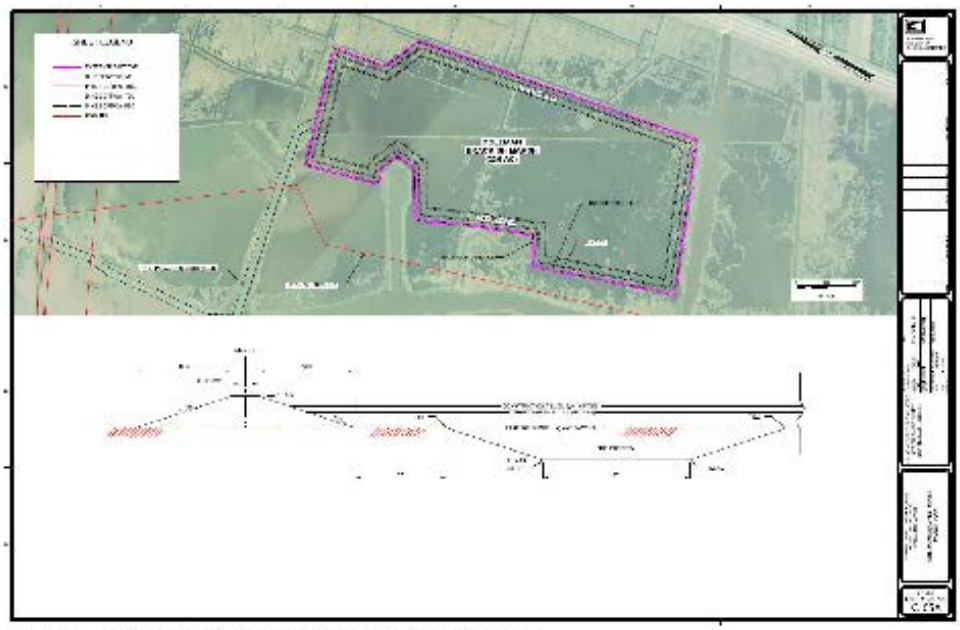

Figure 2. Project Area and Plans for Dike Construction

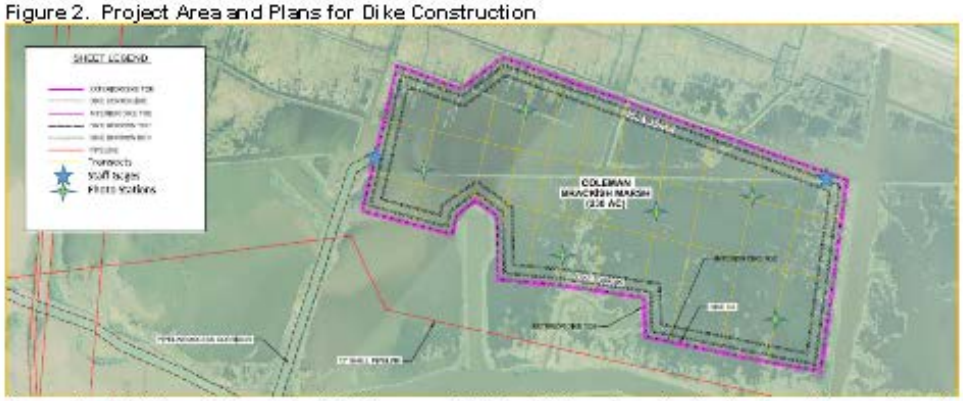

Figure 3. Preliminary Transect, Staff Gage, and Photo Station Layout, drawing is not to scale and will be further refined by Interagency Team

D. Photographs documenting conditions in each restored marsh feature at the time of monitoring. Photos will be taken at permanent photo stations within the marsh features. At least two photos will 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. The number of photo stations required as well as the locations of these stations will vary depending on the mitigation site and will be finalized during the baseline monitoring event. Figure 3 illustrates potential locations and areas of

interest for the photo stations and should represent the minimal number of stations.

E. Water level elevation readings collected at the time of monitoring from a single staff gage installed right outside of each of the restored marsh features. The final location of the staff gage will be determined during the initial site visit and installation of the gauges. Potential areas of interests for the gages are indicated in Figure 3. The monitoring report will provide the staff gage 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 stations will be identified and referenced within the monitoring report). The report will further address estimated mean high and mean low water elevations at the mitigation site based on field indicators such as observations of inundation, soil saturation, water marks, drift lines, sediment deposits or drainage patterns.

F. Various qualitative observations will be made in the mitigation site to help assess the status and success of mitigation and maintenance activities. These observations will 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 condition of interspersion features (tidal channels, trenasses, depressions, etc.) constructed within the marsh features, noting any excessive scouring and/or siltation occurring within such features; the natural formation of interspersion features within restored marshes; observations regarding general surface water flow characteristics within marsh interspersion features; the general condition of “gaps”, “fish dips”, or similar features constructed in permanent dikes; if present, the general condition of any armoring installed on permanent dikes. General observations made during the course of monitoring will also address potential problem zones and other factors deemed pertinent to the success of the mitigation program.

G. Quantitative data concerning plants in the ground cover stratum. Data will be collected from permanent sampling quadrats established at approximately equal intervals along permanent monitoring transects established within each marsh feature. Each sampling quadrat will be approximately 2 meters X 2 meters in size, although the dimensions of each quadrat may be increased if necessary to provide better data if planted marsh features are added after initial construction. The number of monitoring transects and number of sampling quadrats per transect will vary depending on the mitigation site and will be finalized during the initial site visit and coordinated with the CEMVN, but should consist of at least one quadrat per 2 acres. A conceptual design showing areas of interest and minimal number of transects is provided in Figure3. The methodology and

locations chosen for the initial monitoring report must be followed for all subsequent reports.

Data recorded from the sampling quadrats will 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

H. 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.

I. 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 will provide the following information unless otherwise noted:

A. All items listed for the time zero baseline monitoring report.

B. A brief description of maintenance and/or management work performed since the previous monitoring report along with a discussion of any other significant occurrences.

C. In addition to the above items, the monitoring report prepared for 1 year following completion of mitigation construction activities and the monitoring report prepared for TY 3 and 5 will include a topographic survey of each marsh restoration feature. These surveys will 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 will 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 will be made by the CEMVN in coordination with the Interagency Team.

D. Although not proposed in the initial mitigation plan, plantings of herbaceous species within the restored marsh features may also be necessary to attain applicable native vegetation success criteria. Any monitoring report submitted following completion of initial plantings 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 planted cross-referenced to a listing of the species and number of each species planted in each area.

Monitoring Reports Following Re-Planting Activities in Intermediate, Brackish or Saline Marsh Features

Re-planting of certain areas within restored intermediate and/or brackish and saline marsh habitats 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, cross-referenced to a listing of the species and number of each species planted in each area.

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 provided to the CEMVN, the NFS, and the agencies comprising the Interagency Team. The various monitoring and reporting responsibilities addressed in this section are all subject to the provisions set forth in the Introduction section.

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

1. General Construction – A and B.
2. Topography – A and B.
3. Native Vegetation – For intermediate, brackish and saline marsh features, criteria 3.A and 3.B
4. Invasive & Nuisance Vegetation – A, plus B until monitoring responsibilities are transferred to the NFS.

Monitoring events associated with the above would include the “time zero” (first or baseline) monitoring event (estimated in TY2, 2021) and a second monitoring event 1 year after the time zero monitoring event (estimated in TY3, 2022). The CEMVN would be responsible for conducting these monitoring activities and preparing the associated monitoring reports.

The NFS is responsible for conducting the required monitoring events and preparing the associated monitoring reports after the CEMVN 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 2024 (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 2019 (TY0) and ending in 2069 (TY50)).

If prescribed 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 CEMVN would be responsible for conducting such additional monitoring and preparing the associated monitoring reports until the mitigation site satisfies all initial success criteria. The following lists instances requiring additional monitoring that would be the responsibility of the CEMVN:

(A) For intermediate, brackish and saline marsh features –

- 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.C), 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 CEMVN would also be responsible for the purchase and installation of supplemental plants needed to attain the success criteria.

(B) For all types of marsh features (intermediate, brackish and saline) –

- 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 CEMVN would also be responsible for performing the necessary corrective actions.

There could also be cases where failure to attain certain success criteria would trigger the need for additional monitoring events for which the NFS would be responsible:

(A) For intermediate, brackish and saline marsh features –

- If the vegetative cover criterion specified for 3 years after the initial planting of marsh features is not achieved (i.e. success criterion 3.E), 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 Sponsor would also be responsible for the purchase and installation of supplemental plants needed to attain the success criterion.

(C) For all types of marsh features (intermediate, brackish, saline) –

- 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 subject marsh

feature, the Sponsor would also be responsible for performing the necessary corrective actions.

- Native vegetation success criterion 3.D is applicable to the period extending from 5 years through 20 years following completion of mitigation construction activities and is applicable to all marsh features. If this criterion is not satisfied at the time of monitoring, the NFS would be responsible for implementing corrective actions. 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.

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 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 CEMVN in coordination with the Interagency Team.

MITIGATION MONITORING COSTS

Table 4 provides a cost estimate based on the currently available information and may need to be revised in the future as additional information regarding the mitigation feature designs and construction schedule become available.

Table 4. Estimated Monitoring Costs for the Coleman Brackish Marsh Projects

Target Year	Calendar Year	FY	Work Item	Work Item Description	Cost
0	2019	2019	Construction Contract	Mob/Demob, Diking, and Dredging. (Feb 2019 - July 2019)	
		2019	Monitoring	Monitoring to ensure initial success criteria is met (Aug - Sept)	$22,800
		2020	Monitoring Report	Submit report (Oct - Dec 2019)	$34,200
1	2020				
		2020	Topographic Survey	Perform as-built topographic survey of restored marsh areas. Results documented in mitigation monitoring report. (May 2020)	$30,000
		2020	O&M Contract Dike Degrade	Degrade dike to target marsh elevation, as-built surveys. (June - Aug 2020)	$935,878
		2020	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas. Assume not required. May	$69,000
		2020	Brackish Marsh Planting	If brackish marsh vegetation does not establish, planting of brackish marsh vegetation.	$621,000

Target Year	Calendar Year	FY	Work Item	Work Item Description	Cost
		2020	Monitoring	Perform field mitigation monitoring to determine if planting may be required. Assume planting is not required. (Aug - Sep 2020)	$22,800
		2021	Monitoring Report	Submit report (Oct - Dec 2020)	$34,200
2	2021	2021	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April 2021).	$69,000
		2021	Topographic Survey	Perform as-built topographic survey of restored marsh areas. Results documented in monitoring report.	$50,000
		2021	Monitoring	Perform field mitigation monitoring (Aug 2015 - Sep 2015)	$17,400
		2022	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (late Oct.).	$69,000
		2022	Monitoring Report	Submit report (Oct - Dec 2021)	$26,100
3	2022	2022	Analysis for Notice of Construction Complete	Review monitoring report from prior year and other data to make determination to issue NCC to Non-Federal Sponsor (Jan 2016)	$10,000
		2022	Issue NCC to NFS	Issue Notice of Construction Complete (NCC) to Non-Federal Sponsor (Feb 2022 - Apr 2022)	
		2022	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (May 2016)	$69,000
		2022	Topographic Survey	Perform as-built topographic survey of restored marsh areas. Results documented in mitigation monitoring report.	$50,000
		2022	Monitoring	Perform field mitigation monitoring (Aug 2016 - Sep 2016)	$17,400
		2023	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (Oct 2022)	$69,000
		2023	Monitoring Report	Submit report (Oct 2016 - Dec 2022)	$26,100
4	2023	2023	Topographic Survey	Perform as-built topographic survey of restored marsh areas. Results documented in mitigation monitoring report.	$50,000
		2023	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2023	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$21,840
		2024	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (late Oct.).	$69,000
		2024	Monitoring Report	Submit report Oct-Dec. Includes aerial photography.	$32,760
5	2024	2024	Topographic Survey	Perform as-built topographic survey of restored marsh areas. Results documented in mitigation monitoring report.	$50,000
		2024	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2024	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$21,840
		2025	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (late Oct.).	$69,000
		2025	Monitoring Report	Submit report Oct-Dec. Includes aerial photography.	$32,760
		2025	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (late Oct.).	$69,000
6	2025	2025	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April - May?).	$69,000
7	2026				
8	2027	2027	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April - May?).	$69,000

Target Year	Calendar Year	FY	Work Item	Work Item Description	Cost
9	2028	2028	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April - May?).	$69,000
10	2029	2029	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2029	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2030	Monitoring Report	Submit report Oct-Dec.	$17,940
11	2030	2030	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
12	2031	2031	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
13	2032	2032	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
14	2033	2033	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
15	2034	2034	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2034	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2035	Monitoring Report	Submit report Oct-Dec.	$17,940
16	2035	2035	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
17	2036	2036	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
18	2037	2037	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
19	2038	2038	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
20	2039	2039	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2039	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2040	Monitoring Report	Submit report Oct-Dec.	$17,940
25	2044	2044	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2044	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2045	Monitoring Report	Submit report Oct-Dec.	$17,940
30	2049	2049	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2049	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2050	Monitoring Report	Submit report Oct-Dec.	$17,940
35	2054	2054	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2054	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2055	Monitoring Report	Submit report Oct-Dec.	$17,940
40	2059	2059	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2059	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2060	Monitoring Report	Submit report Oct-Dec.	$17,940

Target Year	Calendar Year	FY	Work Item	Work Item Description	Cost
45	2064	2064	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2064	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2065	Monitoring Report	Submit report Oct-Dec.	$17,940
50	2069	2069	Invasive/Nuisance Plant Eradication	Eradicate invasive and nuisance plant species in restored marsh areas (April or May).	$69,000
		2069	Monitoring	Perform field mitigation monitoring (Aug-Sept).	$11,960
		2070	Monitoring Report	Submit report Oct-Dec.	$17,940

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. *brevibrateata*), 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 would 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 wouldow (*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 CEMVN 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.

CEMVN Hydrophytic Vegetation Criteria

Reference to satisfaction of the CEMVN 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 CEMVN approves and adopts a new list in the future, the new list would 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.

13. ENCLOSURE 5: EXAMPLE ADAPTIVE MANAGEMENT PLAN

If mitigation banks are not available, then the Corps-Constructed BLH-Wet Mitigation project(s) would be required. The following adaptive management plan is only provided as an example. Once a Corps-Constructed BLH-Wet Mitigation project(s) is selected then an adaptive management plan specific to that site would be developed.

APPENDIX D

ADAPTIVE MANAGEMENT PLAN

Coleman Brackish Marsh Creation Mitigation Project Feature
Environmental Assessment #543

1.0. Introduction

This Adaptive Management (AM) Plan addresses only the Coleman brackish marsh mitigation project feature, the only constructible feature of the Tentatively Selected Plan (TSP) documented in Environmental Assessment #543 (EA #543). The TSP also includes additional mitigation features including the purchase of In Lieu Fee (ILF) and mitigation bank credits. The TSP is designed to mitigate for impacts to intermediate, brackish and saline marsh resulting from construction of the New Orleans to Venice (NOV) Hurricane Risk Reduction Project: Incorporation of Non-Federal Levees (NFL) from Oakville to St. Jude and the NOV Federal Hurricane Protection Levee, Plaquemines Parish, Louisiana (hereinafter NFL NOV). Detailed description of the Coleman brackish marsh mitigation project feature as well as the purchase of ILF and Mitigation Bank credits mitigation features for the NOV NFL are provided in the EA #543 (Figure 1).

2.0. Adaptive Management Planning

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 AM and monitoring plans be included in all mitigation plans for fish and wildlife habitat and wetland losses.

Adaptive Management is an iterative and structured process which reduces ecological and other uncertainties that could prevent successful project implementation and performance. AM establishes a framework for decision making which utilizes monitoring results and other information, as it becomes available, as a feedback mechanism used to update project knowledge and adjust management and mitigation actions to better achieve project goals and objectives.

Hence, early implementation of AM and monitoring better enables a project to succeed under a wide range of conditions which can be adjusted as necessary. Furthermore, careful monitoring of project outcomes not only helps to adjust project management operations to changing conditions, but also advances scientific understanding as part of an iterative learning process.

AM is warranted when there are consequential decisions to be made, there are high uncertainties, when there is an opportunity to apply learning, when the value of reducing uncertainty is high, and when a monitoring system can be put in place to reduce uncertainty.

D-1

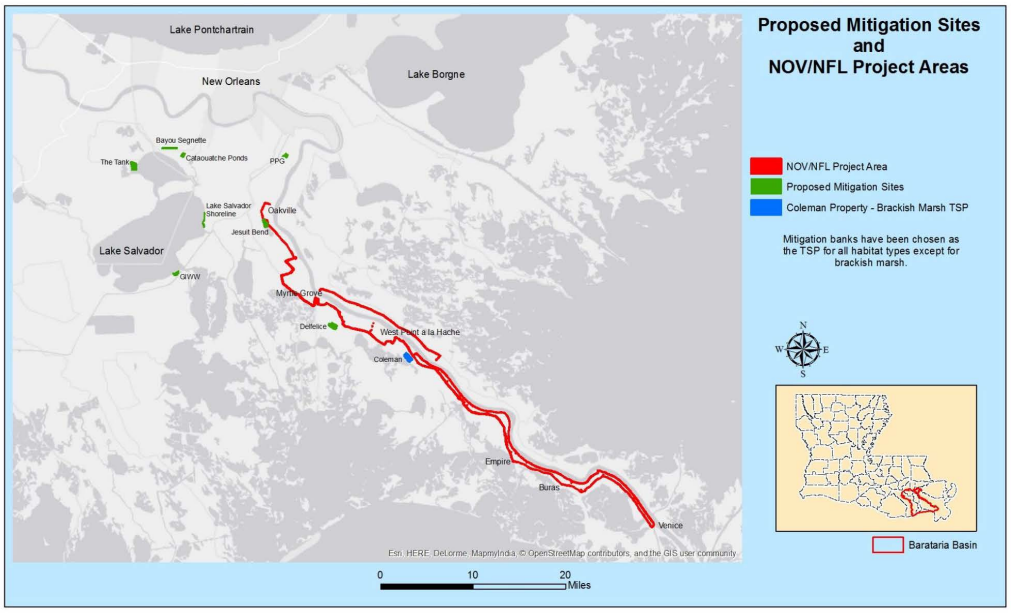

Figure 1. The Tentatively Selected Plan includes the Coleman brackish marsh project and purchase of ILF and Mitigation Bank Credits.

In cases where AM is not warranted, the project would still develop an AM Plan but the plan would clearly describe the rationale as to why AM actions would not be warranted. A project where AM is not warranted would still contain a Monitoring Plan to measure project success.

Adaptive management planning was incorporated into the project planning process and development and selection of the Tentatively Selected Plan (TSP) as documented in EA #543. Adaptive management planning elements include:

1. development of a Conceptual Ecological Model (CEM),
2. identification of key project uncertainties and associated risks,
3. evaluation of mitigation projects as a candidate for adaptive management, and
4. identification of potential adaptive management actions (contingency plan) to better ensure the mitigation project meets identified success criteria.

The AM Plan is a living document and will be refined as necessary. Adaptive Management planning was conducted by using the AM program framework structure developed by the CEMVN that includes both a Set-up Phase (Figure 2) and an Implementation Phase (Figure 3).

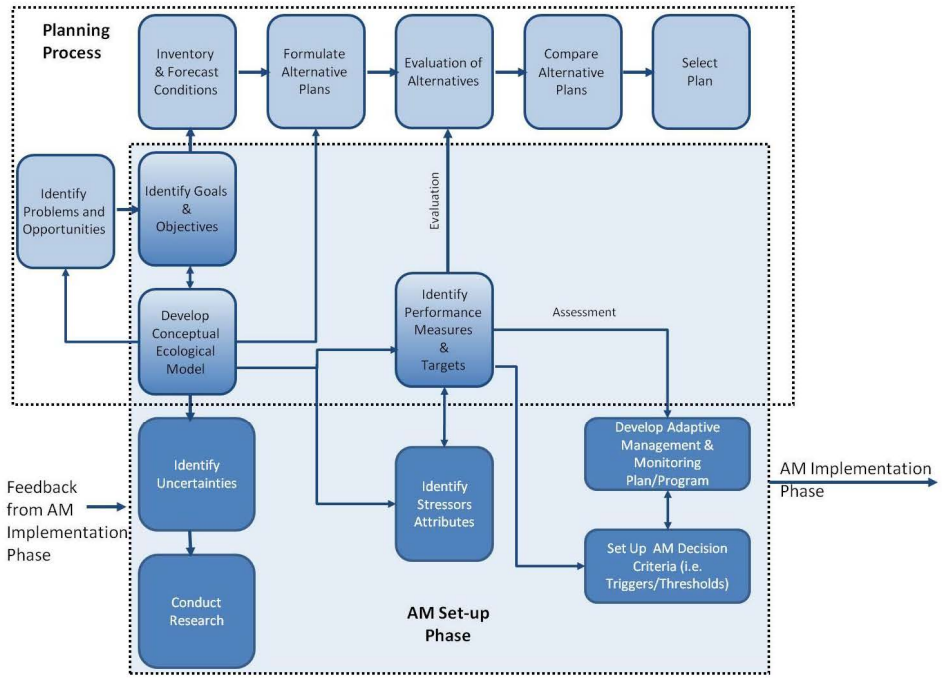

Figure 2. Set-up Phase of Adaptive Management Framework.

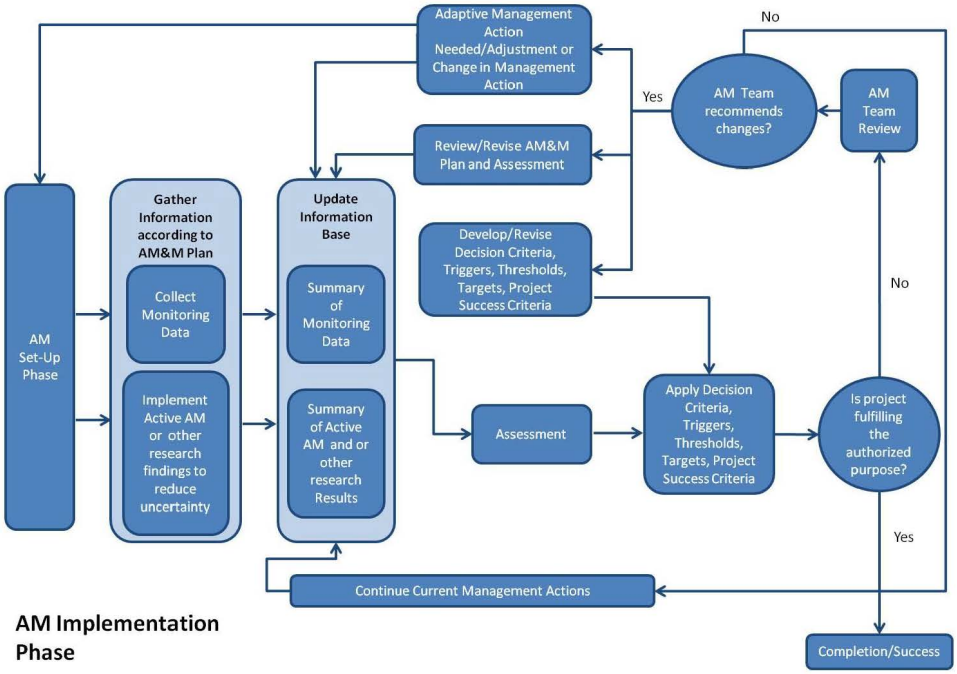

Figure 3. Implementation Phase of the Adaptive Management Framework.

Consistent with the AM Set-up Phase, Adaptive Management and Monitoring Plans were developed concurrently during the alternative plan formulation process. During the Implementation Phase, Adaptive Management and Monitoring Plans will be put into action. The overall goal of the AM process is to design, construct, monitor and assess the responses of the ecological system to implementation of the project relative to stated targets, goals, objectives and project success criteria.

2.1. Conceptual Ecological Model

A CEM was developed to identify the major stressors and drivers affecting the proposed mitigation project in the EA (table 1). The CEM does not attempt to explain all possible relationships of potential factors influencing the mitigation site; 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 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	Flood Side Intermediate Marsh	Flood Side Saline Marsh
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 alternatives considered were evaluated and ranked to select the TSP with minimal risk and uncertainty. 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:
    a. Water, sediment, and nutrient requirements for marsh
    b. Magnitude and duration of wet/dry cycles for marsh
    c. Nutrients required for desired productivity for marsh
    d. Growth curves based on hydroperiod and nutrient application for marsh
    e. Marsh litter production based on nutrient and water levels for marsh
    f. Marsh propagation in relation to management/regulation of hydroperiod for marsh
D. Loss rate of vegetative plantings due to herbivory
E. Long-term sustainability of Project benefits

Issues such as climate change and relative sea level change (i.e., combination of eustatic sea level change and regional subsidence) are significant scientific uncertainties for all coastal Louisiana ecosystem restoration and mitigation projects. These uncertainties were incorporated into the AEP. Specifically, relative sea level rise (RSLR) USACE EC-1165-2-212 provides an 18-step process for developing a "low", "intermediate", and "high" future relative sea level rise scenario and provides guidance to incorporate these potential effects into project management, planning, engineering, design, construction, operation and maintenance. The PDT, in accordance with EC-1165-65-2-212, evaluated the final array of alternatives under three potential future RSLR scenarios.

2.3. Adaptive Management Evaluation

The TSP mitigation project features were evaluated against the potential need for AM actions. However, prior to AM evaluation, the proposed alternatives were evaluated through the AEP to select a TSP with minimal risk and uncertainty. The AM Team, in coordination with the PDT, determined that uncertainties and risk elements identified for the majority of the TSP mitigation project features had been avoided during the AEP evaluation and project implementation process. To further reduce the remaining uncertainties and diminish potential future risks, a monitoring feedback loop was developed to help determine project success. This feedback loop included contingency actions if criterions were not achieved. The items listed below have already been incorporated into the NFL NOV Mitigation project implementation plan and Operations, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) plan to ensure the plan achieves success.

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

Project features were 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 AM 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 need for a planting event could trigger the need for additional mitigation monitoring. Hence, funding for three monitoring and reporting events was included as potential AM actions (i.e., two additional monitoring/reporting events for the one planting event). Costs were also included for invasive or nuisance plant eradication, if necessary. The total cost for the plantings, invasive species eradication, and monitoring/reporting AM operation and maintenance actions is estimated to be approximately $2,011,378 for the Coleman brackish marsh mitigation project feature.

The USACE is 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 non-Federal Sponsor (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 would be 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 retains 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 potential adverse impacts of placing additional fill onto the mitigation site once plantings have become established, future sediment lifts 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/In Lieu Fee (ILF) credits would be options that could be considered through additional coordination with the NFS and the Interagency Team. However, such options would have to undergo further analysis in a supplemental NEPA document.

3.0. Monitoring for Project Success

Independent of AM, an effective Monitoring Program, consistent with WRDA 2007 Section 2036, is required to determine if Project management and mitigation outcomes are consistent with the identified success criteria. The Monitoring Plan, specific to the Coleman brackish marsh mitigation project feature is presented in Appendix C. The monitoring plan identifies success criteria and targets, a schedule for the monitoring events, a monitoring report card, and the specific content for the monitoring reports that document progress towards meeting the success criteria.

The cost associated with implementing the Monitoring Program was estimated based on currently available data and information. The current estimate for set-up and implementing the Monitoring Program for the Coleman brackish marsh mitigation project feature is $316,500. These costs include data collection, data assessment, data management, and development of required reports.