APPENDIX C

General Mitigation Guidelines:

Plantings, Success Criteria, Monitoring and Other General Guidance

SIER36

Bayou Sauvage, Turtle Bayou & New Zydeco Ridge Restoration Projects

(as provided in the Draft SIER36)

APPENDIX C

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

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

INTRODUCTION

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

The proposed mitigation actions include construction, with the NFS responsible for operation and maintenance of functional portions of work as they are completed. On a cost shared basis, USACE would monitor completed mitigation to determine whether additional construction, invasive species control and/or planting are necessary to achieve mitigation success. USACE 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. Once USACE 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, USACE would consult with other agencies and the NFS to determine whether operational changes would be sufficient to achieve ecological success criteria. If, instead, structural changes are deemed necessary to achieve ecological success, USACE 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 responsibilities for the construction, monitoring, and maintenance of this project are as follows:

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

2. After construction and planting, USACE issues Notice of Construction Complete (NCC) and provides the Operation, Maintenance, Repair, Replacement, and Rehabilitation manual to the NFS (the "O&M phase");

3. Notwithstanding NCC, USACE 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, USACE would perform these items subject to applicable cost-sharing and availability of funds;

5. After Initial Success Criteria are achieved, 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, 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, USACE would implement adaptive management according to applicable cost-sharing and subject to availability of funds.

For the Bayou Sauvage, Turtle Bayou, and New Zydeco Ridge Restoration projects, "construction" is defined as:

1. Mobilization and de-mobilization of required construction equipment to the site.

2. Construction of temporary retention/perimeter dikes and associated spill boxes to contain dredged material.

3. Construction of the shoreline restoration feature along the eroded shoreline of Lake Pontchartrain, including planting of the feature with specified vegetation, dredging the access channel to the site, and filling the access channel once the feature has been constructed.

4. Dredging material from the bottom of Lake Pontchartrain and pumping the material via hydraulic pipeline along a defined access corridor to the designated fill site to establish a marsh platform at design elevation.

5. Surveying to determine fill height during and at the end of the dredging operation.

6. Degrading the perimeter dikes and gapping the dikes to allow water exchange.

7. Initial (during first year after establishment of marsh and BLH-WET platforms) invasive and nuisance plant species control.

8. Surveying 1 year after fill event and before planting to determine fill elevation.

9. One year after establishment of marsh and BLH-WET platform, planting native, herbaceous, wetland vegetation and BLH-WET species throughout the fill areas.

MITIGATION PLANTING GUIDELINES

PLANTING GUIDELINES FOR BOTTOMLAND HARDWOOD (BLH) HABITATS

Canopy species would be planted on 9-foot centers (average) to achieve a minimum initial stand density of 538 seedlings (trees) per acre. Midstory species would be planted on 18-foot centers (average) to achieve a minimum initial stand density of 134 seedlings per acre. Stock would be at least 1 year old, at least 2 feet in height, have a minimum root collar diameter of 3/8 inch, have a root length of at least 8 to 10 inches with at least 4 to 8 lateral roots, 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 would typically be installed during the period from December through March 15 (planting season/dormant season); however unanticipated events such as spring flooding may delay plantings until late spring or early summer. The seedlings would 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 would be installed around each planted seedling.

Species for Wet Bottomland Hardwood Habitats (BLH-Wet Habitats)

The canopy species installed would be in general accordance with the species lists provided in tables 1A and 1B. Plantings would be conducted such that the total number of plants installed in a given area consists of approximately 60 percent hard mast-producing species (table 1A) and approximately 40percent soft mast-producing species (table 1B). The species composition of the plantings for each of the two groups of canopy species (e.g. hard mast species and soft mast species) should mimic the percent composition guidelines indicated in tables 1A and 1B. However, site conditions (factors such as hydrologic regime, soils, composition of existing native canopy species, etc.) 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 three hard mast species and a minimum of three soft mast species should be utilized.

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

Table 1A: Preliminary Planting List for Wet Bottomland Hardwood Habitat, Hard Mast-Producing Canopy Species (60% of Total Canopy Species)

Common Name	Scientific name	Percent Composition
Nuttall oak	Quercus nuttalli, Q. texana	30% - 40%
~~Wouldow~~ oak, Willow	Quercus phellos	30% - 40%
Water oak	Quercus nigra	5%
Overcup oak	Quercus lyrata	10% - 20%
Swamp chestnut oak	Quercus michauxii	10% - 20%
Water hickory	Carya aquatica	10% - 20%

Table 1B: Preliminary Planting List for Wet Bottomland Hardwood Habitat, Soft Mast-Producing Canopy Species (40% of Total Canopy Species)

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%
Bald cypress	Taxodium distichum	5% - 15%

Table 1C: Preliminary Planting List for Wet Bottomland Hardwood Habitat, Midstory Species

Common Name	Scientific name	Percent Composition
Saltbush	Baccharis halimifolia	TBD
Buttonbush	Cephalanthus occidentalis	TBD
Roughleaf dogwood	Cornus drummondii	TBD
Mayhaw	Crataegus opaca	TBD
Green hawthorn	Crataegus viridis	TBD
Common persimmon	Diospyros virginiana	TBD
Honey locust	Gleditsia triacanthos	TBD
Possumhaw	Ilex decidua	TBD
Dahoon holly	Ilex cassine	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 would commonly require planting the entire feature using the prescribed planting guidance addressed in the preceding sections. In contrast mitigation features that involve enhancement would often require adjustments to the typical plant spacing/density guidelines and may further require adjustments to the guidelines pertaining to species composition.

Where initial enhancement activities include the eradication of invasive and nuisance plant 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 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 initial enhancement actions involved within a particular mitigation site could include a variety of measures such as the eradication of invasive and nuisance plant species, topographic alterations (excavation, filling, grading, etc.), and hydrologic enhancement actions (alterations to drainage patterns/features, installation of water control structures, etc.). 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 the species to be planted, and/or the percent mitigation success criteria may involve cases where the general guidelines discussed above would not necessarily be applicable.

Given these uncertainties, initial planting plans specific to enhancement features would be required and must be specified in the Mitigation Work Plan for the mitigation site. The initial planting plans would be developed by the USACE in cooperation with the Interagency Team. Initial plantings would be the responsibility of the USACE. If re-planting of an area is necessary following initial plantings, a specific re-planting plan must also be prepared and must be approved by the USACE in cooperation with the Interagency Team prior to re-planting. With the exception of any re-planting actions necessary to attain the initial survivorship success criteria (i.e. survival required 1 year following completion of initial plantings), the NFS would be responsible for preparing re-planting plans and conducting re-planting activities, subject to the provisions mentioned in the Introduction section. Re-planting necessary to achieve the initial survivorship criteria would be the responsibility of the USACE. Re-planting necessary to achieve the initial survivorship criteria to the provisions mentioned in the Introduction section.

PLANTING GUIDELINES FOR INTERMEDIATE AND BRACKISH MARSH HABITATS

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 or bare-root or liner stock, depending on the species involved. The required stock size for each plant species proposed for installation must be specified in the Mitigation Work Plan. 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. Plant installation should be conducted during the period from March 15 through June 15. Planting should not be undertaken later than approximately July 15, although planting during the early fall may be deemed acceptable on a case-by-case basis.

Species installed in proposed intermediate marsh habitats would be selected from the species list provided in table 4. 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 site conditions and plantings represented by planting stock availability.

Table 4: 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 installed in proposed brackish marsh habitats would be selected from the species list provided in table 5. 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 site conditions and planting stock availability.

Table 5: Preliminary Planting List for Brackish 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

Deviations from Typical Planting Guidelines

Initial planting plans specific to an intermediate marsh or to a brackish marsh mitigation site would be required and must be specified in the Mitigation Work Plan for the site. The initial planting plans would be developed by the USACE in cooperation with the Interagency Team. Initial plantings would be the responsibility of the USACE, subject to the provisions set forth in the Introduction section. If re-planting of an area is necessary following initial plantings, a specific re-planting plan must also be prepared and must be approved by the USACE in cooperation with the Interagency Team prior to re-planting.

It may be determined that the initial planting of brackish marsh features would best be conducted in phases. Using this approach, a certain percentage of the total number of plants required would be installed in the year that final marsh construction activities are completed while the remainder would be installed in the following year. The determination of whether to use phased planting or to install all the necessary plants

upon completion of construction activities would be made during the final design phase of the mitigation project. The proposed planting scheme would be subject to review and approval by the Interagency Team.

As previously discussed, planting of fresh marsh features could be necessary if the initial vegetative cover goal is not achieved. Re-planting of intermediate marsh features and/or brackish marsh features could also be required if the initial plant survivorship goal is not attained or if initial vegetative cover goals are not achieved. In such cases, re-planting or supplemental planting of such mitigation features would be the responsibility of the USACE (subject to the provisions in the Introduction section). Once the initial success criteria are achieved, the NFS would be responsible for conducting any re-planting activities necessary to achieve success, subject to the provisions in the Introduction section. All re-planting plans would be subject to review and approval by the USACE and Interagency Team prior to plant installation. These plans may deviate from the general planting guidelines as regards the density of plantings, the species utilized, or the plant stock size in an effort to rapidly establish appropriate vegetative cover.

MITIGATION SUCCESS CRITERIA AND MITIGATION MONITORING

BOTTOMLAND HARDWOOD MITIGATION FEATURES

1. General Construction

A. As applicable, complete all necessary initial earthwork and related construction activities in Mitigation TY1 (2014), and in accordance with the mitigation work plan as well as the final project plans and specifications. The necessary activities would 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). These requirements classify as initial success criteria.

B. For mitigation features established in existing open water areas, complete all final construction activities in Mitigation TY2 (2015), and in accordance with the mitigation work plan as well as the final project plans and specifications. The necessary activities would 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.). These requirements classify as initial success criteria.

2. Native Vegetation

A. Complete initial planting of canopy and midstory species in accordance with the authorized initial planting plan. This requirement classifies as an initial success criterion.

B. 1 Year Following Completion of Initial Plantings (at end of first growing season following the year plants are first installed) –

- Achieve a minimum average survival of 50 percent 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 would 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 percent of planted midstory species (i.e. achieve a minimum average midstory species density of 114 seedlings/ac.). The surviving plants must approximate the species composition percentages specified in the initial plantings component of the Mitigation Work Plan. These criteria would apply to the initial plantings as well as any subsequent replantings necessary to achieve this initial success requirement.
- The requirements above classify as initial success criteria.

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 would 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 (requirement) would thereafter remain in effect for the duration of the overall monitoring period.
- The requirements above classify as intermediate success criteria; with the exception that the requirement to demonstrate vegetation satisfies USACE hydrophytic vegetation criteria throughout the duration of the overall monitoring period classifies as a long-term success criterion.

D. Within 10 Years Following Completion of Initial Plantings –

- Attain a minimum average cover of 80 percent by planted canopy species and/or naturally recruited native canopy species. This criterion would thereafter remain in effect for the duration of the overall monitoring period. This requirement to meet the specified minimum average cover within 10 years following completion of initial plantings classifies as an intermediate success criterion. The requirement to meet the specified minimum average cover for the duration of the overall monitoring period classifies as a long-term success criterion.

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). This requirement classifies as an intermediate success criterion.

F. 25 Years Following Completion of Initial Plantings –

- Average cover by native species in the midstory stratum must be greater than 20 percent, but cannot exceed 50 percent. This criterion would 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 percent, but cannot exceed 60 percent. This criterion would thereafter remain in effect for the duration of the overall monitoring period.
- The requirements above classify as long-term success criteria.

Note: The requirement that the above criteria remain in effect for the duration of the overall monitoring period may need to be modified later due to factors such as the effect of sea level rise on vegetative cover, 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. 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. Note -These criteria must be satisfied throughout the duration of the overall monitoring period. Until such time that monitoring responsibilities are transferred from the USACE to the NFS, this requirement classifies as an initial success criterion. Following

the transfer of monitoring responsibilities, this requirement classifies as a long-term success criterion.

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, 2014), demonstrate that at least 80 percent 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). This requirement classifies as an initial success criterion.

B. For mitigation features restored from existing open water areas – (a) In the year that final construction activities are completed (anticipated in TY2, 2015), demonstrate that at least 80 percent 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 percent of the total graded area within each feature is within approximately 0.5 feet demonstrate that at least 85 percent of the total graded area within each feature is within approximately 0.5 foot of the proposed target soil surface elevation. These requirements classify as initial success criteria.

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 would be made approximately 15 to 20 years following completion of initial plantings. If it is decided that timber management efforts are necessary, the NFS would develop a Timber Stand Improvement/Timber Management Plan, and associated long-term success criteria, in coordination with the USACE and Interagency Team. Following approval of the plan, the NFS would perform the necessary thinning operations and demonstrate that these operations have been successfully completed. Timber management activities would only be allowed for the operations that have been successfully completed.

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. This requirement classifies as an intermediate success criterion.

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 percent to approximately 13 percent 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. These hydrology/hydroperiod requirements classify as long-term success criteria.

MITIGATION MONITORING GUIDELINES

"Time Zero" Monitoring Report (Monitoring Report #1)

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 would be monitored and a "time zero" or "baseline" monitoring report prepared. Information provided would typically 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, would not be required. However, the as-built survey would 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 would typically 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 would be taken at permanent photo stations within the mitigation site. At least two photos would be taken at each station with the view of each photo always oriented in the same general direction from one monitoring event to the next. The number of photo stations required, as well as the locations of these stations, would vary depending on the mitigation site. The USACE would make this determination in coordination with the Interagency Team and would specify the requirements in the Mitigation Monitoring Plan. For mitigation features involving habitat enhancement rather than restoration, the permanent photo stations would 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 would 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 would 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 would vary depending on the mitigation site. The USACE would make this determination in coordination with the Interagency

Team and would specify the requirements in the Mitigation Monitoring Plan. Typically there would 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 would vary depending on the mitigation site. The USACE would make this determination in coordination with the Interagency Team and would specify the requirements in the Mitigation Monitoring Plan. Data recorded from the sampling transects would 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 would be gathered from sampling quadrats. These sampling quadrats would be established either along the axis of the belt transects discussed previously, or at sampling points established along point-centered quarter transects discussed previously, depending on which sampling method is used. Each sampling quadrat would be approximately 2 meters by 2 meters in size. The total number of sampling quadrats needed along each sampling transect would be determined by the USACE with the Interagency Team and would be specified in the Mitigation Monitoring Plan. Data recorded from the sampling quadrats would 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.

- For BLH-Wet habitats only -- 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 would no longer be required.

- For BLH-Wet habitats only -- A summary of water table elevation data collected from piezometers coupled with staff gages installed within the mitigation

site. Data (water table elevations) would 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 would 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 would vary depending on the mitigation site. The USACE would make this determination in coordination with the Interagency Team and would specify the requirements in the Mitigation Monitoring Plan. Once hydrology success criteria have been satisfied, water table monitoring would no longer be required. However, monitoring reports generated subsequent to the attainment of success criteria would include a general discussion of water levels and hydroperiod based on qualitative observations.

- Various qualitative observations would be made in the mitigation site to help assess the status and success of mitigation and maintenance activities. These observations would include: general 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 would 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 would 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 would be made by USACE in coordination with the Interagency Team.

- 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 would 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 NFS's proposed Timber Stand Improvement/Timber Management Plan must include the proposed monitoring data and information that would 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 include a depiction of the area species planted in each area.

MITIGATION MONITORING SCHEDULE AND RESPONSIBILITIES

Monitoring would 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 would be submitted by December 31 of each year of monitoring. Monitoring reports would be provided to the USACE, 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 USACE 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 – 1.A or 1.B, as applicable.
2. Native Vegetation – A and B.
3. Invasive & Nuisance Vegetation – A, plus B until such time as monitoring responsibilities are transferred to the NFS.
4. Topography – A, as applicable, or B, as applicable.

Monitoring events associated with the above would include the "time zero" (first or baseline) monitoring event plus annual monitoring events thereafter until the monitoring responsibilities are transferred to the NFS. The years applicable to these monitoring events would 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 2014 (TY2) for certain mitigation sites while this event may not occur until 2015 (TY3) for other mitigation sites.

The NFS would be responsible for conducting the required monitoring events and preparing the associated monitoring reports after the USACE has demonstrated the mitigation success criteria listed above have been achieved. The overall responsibility for management, maintenance, and monitoring of the mitigation would typically 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, subject to the provisions identified in the Introduction section.

Once monitoring responsibilities have been transferred to the NFS, the next monitoring event would typically 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 would typically be conducted every 5 years throughout the 50-year period of analysis (based on 50-year period of analysis beginning in 2013 (TY0) and ending in 2063 (TY50)).

If the initial survival criteria for planted canopy and midstory species are not achieved (i.e. the 1-year survival criteria specified in native vegetation success criteria 2.B), a monitoring report would 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 would be responsible for conducting this additional monitoring and preparing the monitoring reports. The USACE would also be responsible for the purchase and installation of supplemental plants needed to attain this success criterion, subject to the provisions mentioned in the Introduction section.

If the native vegetation success criteria specified for 4 years following completion of initial plantings are not achieved (i.e. native vegetation success criteria 2.C), a monitoring report would be required for each consecutive year until two annual sequential reports indicate that these criteria have been satisfied. The NFS would be responsible for conducting this additional monitoring and preparing the monitoring reports. The NFS would 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 NFS, the NFS would 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 would be prepared by the USACE in coordination with the Interagency Team and the NFS.

Once monitoring responsibilities have 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 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.

MARSH MITIGATION FEATURES (Intermediate and Brackish Marsh Habitats)

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. These requirements classify as initial success criteria

B. Approximately 1 year 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 (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.

Notes: The desired target elevation for each marsh feature would be determined during the final design phase. The "functional marsh elevation range", i.e. the range of the marsh surface elevation that is considered adequate to achieve proper marsh functions and values, would also be determined during the final design phase. The target elevation and functional marsh elevation range would be determined by the USACE in conjunction with the Interagency Team. These determinations would apply to the topographic success criteria above and could potentially alter the marsh area percentages set forth in these criteria.

3. Native Vegetation

A. For intermediate marsh and brackish marsh restoration features only –

- Complete initial marsh planting in accordance with applicable initial marsh planting guidelines. This requirement classifies as an initial success criterion.

B. For intermediate marsh and brackish 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 USACE 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 USACE hydrophytic vegetation

criteria throughout the duration of the overall monitoring period classifies as a long-term success criterion.

C. For intermediate marsh and brackish marsh restoration features only; 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 and brackish) –

- 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 USACE to the NFS, this requirement classifies as an initial success criterion. Following the transfer of monitoring responsibilities, this requirement classifies as a long-term success criterion.

MITIGATION MONITORING GUIDELINES

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

"Time Zero" Monitoring Report (First Monitoring Report)

The mitigation site would be monitored and a "time zero" or "baseline" monitoring report prepared . Information provided would typically include the following items:

- A detailed discussion of all mitigation activities completed.

- A plan view drawing of the mitigation site showing the approximate boundaries of the restored marsh features, significant interspersion features

established within the marsh features (as applicable), monitoring transect locations, sampling plot locations, photo station locations, and staff gage locations.

- 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. If a particular marsh feature is immediately adjacent to existing marsh habitat, the topographic survey would include spot elevations collected within the existing marsh habitat near the restored marsh feature. In addition to the survey data, an analysis of the data would be provided addressing attainment of topographic success criteria.

- Photographs documenting conditions in each restored marsh feature at the time of monitoring. Photos would be taken at permanent photo stations within the marsh features. At least two photos would be taken at each station with the view of each photo always oriented in the same general direction from one monitoring event to the next. The number of photo stations required as well as the locations of these stations would vary depending on the mitigation site. The USACE would make this determination in coordination with the Interagency Team and would specify the requirements in the Mitigation Monitoring Plan. At a minimum, there would be at least 4 photo stations established within each marsh feature.

- For restored intermediate marsh and brackish marsh features only -- A detailed inventory of all species planted, including the number of each species planted and the stock size planted. For mitigation sites that include more than one restored marsh feature, provide a breakdown itemization indicating the number of each species planted in each marsh and correlate this itemization to the marsh features depicted on the plan view drawing of the mitigation site.

- Water level elevation readings collected at the time of monitoring from a single staff gage installed within one of the restored marsh features. The location of the staff gage would be determined by the USACE in coordination with the Interagency Team during the final design phase of the mitigation project and would be specified in the Mitigation Monitoring Plan. The monitoring report would 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 report would further address estimated mean high and mean low water elevations at the mitigation site based on field indicators.

- Various qualitative observations would be made in the mitigation site to help assess the status and success of mitigation and maintenance activities. These observations would include: general estimate of the average percent cover by native plant species; general estimates of the average percent cover by

invasive and nuisance plant species; general observations concerning colonization of the mitigation site by volunteer native plant species; general condition of native vegetation; trends in the composition of the plant community; wildlife utilization as observed during monitoring (including fish species and other aquatic organisms); the 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 would also address potential problem zones and other factors deemed pertinent to the success of the mitigation program.

- 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.

Additional Monitoring Reports

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

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

- Quantitative data concerning plants in the ground cover stratum. Data would be collected from permanent sampling quadrats established at approximately equal intervals along permanent monitoring transects established within each marsh feature. Each sampling quadrat would be approximately 2 meters by 2 meters in size, although the dimensions of each quadrat may be increased if necessary to provide better data in planted marsh features. The number of monitoring transects and number of sampling quadrats per transect

would vary depending on the mitigation site. This would be determined the USACE in coordination with the Interagency Team during the final design phase of the mitigation project and the resulting requirements, including quadrat dimensions, would be specified in the final Mitigation Monitoring Plan for the project. Data recorded from the sampling quadrats would include: average percent cover by native plant species; average percent cover by invasive plant species; average percent cover by nuisance plant species; composition of plant species and the wetland indicator status of each species. The average percent survival of planted species (i.e. number of living planted species as a percentage of total number of plants installed) would also be recorded in intermediate and brackish marsh features. However, data for percent survival of planted species would only be recorded until it is demonstrated that success criteria for plant survivorship has been achieved.

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

- In addition to the above items, the monitoring report prepared for 1 year following completion of mitigation construction activities (estimated TY3) and the monitoring report prepared for 3 years following completion of mitigation construction activities (estimated TY5) would include a topographic survey of each marsh restoration feature. These surveys would cover the same components as described for the topographic survey conducted for the "time zero" monitoring report. In addition to the surveys themselves, each of the two monitoring reports involving topographic surveys would include an analysis of the data as regards attainment of applicable topographic success criteria. If the second survey indicates topographic success criteria have not been achieved and supplemental topographic alterations are necessary, then another topographic survey may be required following completion of the supplemental alterations. This determination would be made by USACE in coordination with the Interagency Team.

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

Re-planting of certain areas within restored intermediate and/or brackish 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 (for intermediate and brackish marshes) must include an inventory of the number of each species planted and the stock size used. It must also include a depiction of the areas re-planted or those planted, as applicable, cross-referenced to a listing of the species and number of each species planted in each area.

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 USACE, 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 USACE 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 marsh and brackish marsh features, criteria 3.A and 3.C
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, 2015) and a second monitoring event 1 year after the time zero monitoring event (estimated in TY3, 2016). The USACE would be responsible for conducting these monitoring activities and preparing the associated monitoring reports.

The NFS would be responsible for conducting the required monitoring events and preparing the associated monitoring reports after the USACE has demonstrated the mitigation success criteria listed above have been achieved. The overall responsibility for management, maintenance, and monitoring of the mitigation would typically be transferred to the NFS 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 NFS, the next monitoring event should take place in 2019 (TY5) in order to demonstrate attainment of success criteria 2.C and either 3.D (for fresh marsh) or 3.E (for intermediate and brackish marsh). 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 2013 (TY0) and ending in 2063 (TY50)).

In certain cases it is possible that the marsh mitigation features may be established along with other mitigation features, like swamp or bottomland hardwood habitats, at the same mitigation site. This scenario could require some adjustments to the typical

monitoring schedule described previously in order to develop a reasonable and efficient monitoring schedule that covers all the mitigation features. Such adjustments, if necessary, would be made at the time final mitigation plans are generated. This schedule must be in general accordance with the guidance provided above and would be prepared by the USACE in coordination with the Interagency Team and the NFS.

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

(A) For intermediate and brackish 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 USACE 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) –

- If topographic success criteria 2.A or 2.B are not achieved, a monitoring report would be required for each consecutive year until two sequential annual reports indicate the applicable criteria have been satisfied. Since failure to meet topographic success criteria would mandate corrective actions such as addition of fill, removal of fill, or other actions to change grades within the subject marsh feature, the USACE would also be responsible for performing the necessary corrective actions.

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 and brackish 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) –

- 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 substantially if it is clear that mitigation success is proceeding as anticipated. Any significant modifications to the monitoring plan or the monitoring schedule must first be approved by the USACE in coordination with the Interagency Team.

MITIGATION MONITORING COSTS

The total estimated cost of monitoring each proposed project is approximately $399,870. The estimated costs are provided in table 3.

Table 3. Estimates Mitigation Monitoring Costs

Target Year	Calendar Year	Work Item	Work Item Description	Cost
1	2016	Initial Construction	Mob and Demob, Dredge, Dike & Weir Construction (May-Aug)	0.00
2	2017	Topographic Survey	Perform as-built topographic survey of restored marsh areas. Results documented in mitigation monitoring report.	40,000.00
		Monitoring	Perform field mitigation monitoring (Aug-Sept).	13,828.00
		Idle	Sep	0.00
		Monitoring Report	Submit report Oct-Dec.	20,742.00
		Idle	(Oct-Feb)	0.00
3	2018	Initial Plantings	(Mar-Apr) Initial (first) planting of restored marsh features. Install herbaceous species	0.00
		Idle	(May-Aug)	0.00
		Topographic Survey	Perform as-built topographic survey of restored marsh areas. Results documented in mitigation monitoring report.	40,000.00
		Monitoring	Perform field mitigation monitoring (Sep).	6,562.50
		Monitoring	Perform field mitigation monitoring (Oct).	6,562.50

		Monitoring Report	Submit report Nov-Dec.	13,125.00
		Analysis for Notice of Construction Complete	Review monitoring report from prior year and other data to make determination to turn over project to Non-Federal Sponsor. (Jan.)	2,800.00
		Transfer to NFS	Transfer (turn-over) project to Non-Federal Sponsor (Feb thru April). Note: transfer occurs early this year unless topographic corrections and/or marsh planting required in TY5.	0.00
		Begin OMRR&R	(May)	
5	**2020**	Topographic Survey	Perform as-built topographic survey of restored marsh areas. Results documented in mitigation monitoring report.	50,000.00
		Monitoring	Perform field mitigation monitoring (Aug-Sept).	10,500.00
		Monitoring Report	Submit report Oct-Dec. Includes aerial photography.	15,750.00
7	**2022**	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
10	**2025**	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
15	**2030**	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
20	**2035**	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
25	**2040**	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
30	**2045**	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
35	**2050**	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
40	**2055**	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
45	**2060**	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
50	**2065**	Monitoring	Perform field mitigation monitoring (Aug-Sept).	7,200.00
		Monitoring Report	Submit report Oct-Dec.	10,800.00
		End OMRR&R	(Dec)	
			Total Project Cost	**$399,870.00**

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 USACE in coordination with the NFS and Interagency Team.

Planting Season

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

Target Year

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

USACE Hydrophytic Vegetation Criteria

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

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

Wetland Indicator Status of Plant Species

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