LOUISIANA TRUSTEE IMPLEMENTATION GROUP

FINAL RESTORATION PLAN/ENVIRONMENTAL ASSESSMENT #1.3

RABBIT ISLAND RESTORATION PROJECT & SHORELINE PROTECTION AT JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE PROJECT

Cameron Parish & Jefferson Parish, Louisiana

FEBRUARY 2020

TABLE OF CONTENTS

List of Acronyms v

SECTION **PAGE NO.**

1.0 INTRODUCTION 1
1.1 Background 3
1.2 OPA and NEPA Compliance 3
1.3 Purpose and Need 4
1.3.1 Rabbit Island Project Purpose and Need 4
1.3.2 Jean Lafitte Project Purpose and Need 5
1.4 Proposed Action 5
1.4.1 Rabbit Island Project 6
1.4.2 Jean Lafitte Project 6
1.5 Other Design Alternatives Analyzed in this Phase 2 RP/EA #1.3 6
1.6 No Action Alternative 6
1.7 Coordination with Other Gulf Restoration Programs 6
1.8 Severability of Projects 7
1.9 Public Involvement 7
1.9.1 Public Review and Comment Opportunities 7
1.9.2 Administrative Record 7
2.0 RESTORATION PLANNING PROCESS: PROJECT ALTERNATIVES AND SCREENING 8
2.1 Phase 1 Final RP 8
2.2 Phase 2 RP/EA #1.3 9
2.3 Design Alternatives and OPA Screening 9
2.3.1 Rabbit Island Project Design Alternatives and OPA Screening 10
2.3.2 Jean Lafitte Project Design Alternatives and OPA Screening 12
2.3.3 Natural Recovery Alternative 15
3.0 REASONABLE RANGE OF ALTERNATIVES 16
3.1 Rabbit Island Project 16
3.1.1 Alternative 2A 16
3.1.2 Design Alternative 2 19
3.1.3 No Action Alternative 19
3.1.4 The LA TIG's Preferred Alternative for the Rabbit Island Project and Summary Rationale 19
3.2 Jean Lafitte Project 20
3.2.1 Alternative 4C 20
3.2.2 Alternative 4A 22
3.2.3 No Action Alternative 22
3.2.4 The LA TIG's Preferred Alternative for the Jean Lafitte Project and Summary Rationale 23
4.0 NEPA Analysis: Affected Environment and Environmental Consequences 24
4.1 Physical Environment 24
4.1.1 Geology and Substrates 24
4.1.1.1 Rabbit Island Project Geology and Substrates 24
4.1.1.2 Jean Lafitte Project Geology and Substrates 26
4.1.2 Air Quality 27
4.1.2.1 Rabbit Island Project Air Quality 28

4.1.2.2 Jean Lafitte Project Air Quality 28
4.1.3 Hydrology and Water Quality 29
4.1.3.1 Rabbit Island Project Hydrology and Water Quality 29
4.1.3.2 Jean Lafitte Project Hydrology and Water Quality 31
4.1.4 Noise 32
4.1.4.1 Rabbit Island Project Noise 33
4.1.4.2 Jean Lafitte Project Noise 33
4.2 Biological Environment 34
4.2.1 Habitats 34
4.2.1.1 Rabbit Island Project Habitat 34
4.2.1.2 Jean Lafitte Project Habitat 36
4.2.2 Wildlife Species 38
4.2.2.1 Rabbit Island Project Wildlife Species 38
4.2.2.2 Jean Lafitte Project Wildlife Species 40
4.2.3 Marine and Estuarine Fauna, Essential Fish Habitat, and Managed Fish Species 41
4.2.3.1 Rabbit Island Project Marine and Estuarine Fauna, Essential Fish Habitat, and Managed Fish Species 42
4.2.3.2 Jean Lafitte Project Marine and Estuarine Fauna, Essential Fish Habitat, and Managed Fish Species 43
4.2.4 Protected Species 45
4.2.4.1 Rabbit Island Project Protected Species 45
4.2.4.2 Jean Lafitte Project Protected Species 47
4.3 Socioeconomics and Environmental Justice 47
4.3.1 Infrastructure 48
4.3.1.1 Rabbit Island Project Infrastructure 48
4.3.1.2 Jean Lafitte Project Infrastructure 48
4.3.2 Aesthetics and Visual Resources 49
4.3.2.1 Rabbit Island Project Aesthetics and Visual Resources 49
4.3.2.2 Jean Lafitte Project Aesthetics and Visual Resources 49
4.3.3 Public Health and Safety 50
4.3.3.1 Rabbit Island Project Public Health and Safety 50
4.3.3.2 Jean Lafitte Project Public Health and Safety 51
4.3.4 Socioeconomics and Environmental Justice 51
4.3.4.1 Rabbit Island Project Socioeconomics and Environmental Justice 52
4.3.4.2 Jean Lafitte Project Socioeconomics and Environmental Justice 52
4.3.5 Cultural Resources 53
4.3.5.1 Rabbit Island Project Cultural Resources 53
4.3.5.2 Jean Lafitte Project Cultural Resources 54
4.3.6 Tourism and Recreational Resources 55
4.3.6.1 Rabbit Island Project Tourism and Recreational Resources 55
4.3.6.2 Jean Lafitte Project Tourism and Recreational Resources 55
4.3.7 Fisheries and Aquaculture 56
4.3.7.1 Rabbit Island Project Fisheries and Aquaculture 56
4.3.7.2 Jean Lafitte Project Fisheries and Aquaculture 57
4.3.8 Land and Marine Management 57
4.3.8.1 Rabbit Island Project Land and Marine Management 57
4.3.8.2 Jean Lafitte Project Land and Marine Management 58
4.4 Cumulative Impacts 59

4.4.1 Resources Affected 59
4.4.2 Cumulative Action Scenario 60
4.4.2.1 Rabbit Island Project Cumulative Action Scenario 61
4.4.2.2 Jean Lafitte Project Cumulative Action Scenario 61
4.4.3 Cumulative Impacts of the No Action Alternatives 61
4.4.3.1 Cumulative Impacts of the No Action Alternative for the Rabbit Island Project 61
4.4.3.2 Cumulative Impacts of the No Action Alternative for the Jean Lafitte Project 62
5.0 COMPLIANCE WITH OTHER LAWS AND REGULATIONS 63
5.1 Federal Laws 63
5.2 State and Local Laws 64
5.3 Compliance and Next Steps 64
6.0 MONITORING/ADAPTIVE MANAGEMENT AND OPERATIONS/MAINTENANCE PLANS 66
7.0 RESPONSE TO PUBLIC COMMENTS 67
7.1 Comment Summary 67
8.0 LIST OF REPOSITORIES 71
9.0 LIST OF PREPARERS, AGENCIES, AND PERSONS CONSULTED 72
10.0 REFERENCES 73

LIST OF FIGURES

Figure 1: Project Location Map 2
Figure 2: Rabbit Island Project Design Elements 10
Figure 3: Rabbit Island Project Fill Area Alternatives 11
Figure 4: Jean Lafitte Project Alternatives 13
Figure 5: Rabbit Island Alternative 2A 17
Figure 6: Rabbit Island Borrow Area and Access Route for Alternate 2A 18
Figure 7: Rabbit Island Alternative 2 19
Figure 8: Jean Lafitte Project Area and Alternatives 20
Figure 9: Proposed Rock Elbows 22

LIST OF TABLES

Table 1: Rabbit Island Project Design Alternatives Elements 11
Table 2: Jean Lafitte Project Design Alternatives Elements 14
Table 3: Rabbit Island Project Cell Construction Elevations and Areas 17
Table 4: Bird Species Observed or Near the Rabbit Island and Jean Lafitte Project Areas 39
Table 5: Federally Managed Species in the Rabbit Island Project Area 42
Table 6: Cumulative Resource Analysis Findings 60
Table 7: Current Status of Federal Regulatory Compliance Reviews and Approvals of Preferred Alternatives in the Final RP/EA 65
Table 8: List of Repositories 71
Table 9: List of Preparers, Agencies, and Persons Consulted 72

APPENDICES

Appendix A: Guidelines for NEPA Impact Determinations in the Final PDARP/PEIS A-1
Appendix B: Monitoring and Adaptive Management Plan for Deepwater Horizon NRDA Project: Rabbit Island Restoration Project B-1

Appendix C: Monitoring and Adaptive Management Plan for Deepwater Horizon NRDA Project: Shoreline Protection at Jean Lafitte National Historical Park and Preserve C-1
Appendix D: Past, Present, and Reasonably Foreseeable Future Actions D-1
Appendix E: Finding of No Significant Impact E-1

LIST OF ACRONYMS

BMPs	Best Management Practices
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CPRA	Costal Protection and Restoration Authority
CWPPRA	Coastal Wetlands Planning, Protection, and Restoration Act
CZMA	Coastal Zone Management Act
DOI	Department of the Interior
DPFD	Davis Pond Freshwater Diversion
DWH	Deepwater Horizon
E&D	Engineering and Design
EA	Environmental Assessment
EFH	Essential Fish Habitat
EMUs	Environmental Management Units
EO	Executive Order
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
GMFMC	Gulf of Mexico Fishery Management Council
LA TIG	Louisiana Trustee Implementation Group
LDAHP	Louisiana Division of Archaeology and Historic Preservation
LDEQ	Louisiana Department of Environmental Quality
LDWF	Louisiana Department of Wildlife and Fisheries
LDNR	Louisiana Department of Natural Resources
LNHP	Louisiana Department of Wildlife and Fisheries Natural Heritage Program
MAM	Monitoring and Adaptive Management
MBTA	Migratory Bird Treaty Act
MMPA	Marine Mammal Protection Act
MPH	Morris P. Hebert, Inc.
MSFCA	Magnuson-Stevens Fishery Conservation Act
NAAQS	National Ambient Air Quality Standards
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	National Resource Conservation Service
NRDA	Natural Resource Damage Assessment
NRDAR	Natural Resource Damage Assessment and Restoration
O&M	Operations and Maintenance
OPA	Oil Pollution Act of 1990
PDARP	Programmatic Damage Assessment and Restoration Plan
PEIS	Programmatic Environmental Impact Statement
ROW	Right-of-Way
RP	Restoration Plan
SAV	Submerged Aquatic Vegetation

SHPO	State Historic Preservation Office
SONRIS	Strategic Online Natural Resources Information System
SWPPP	Stormwater Pollution Prevention Plan
TIG	Trustee Implementation Group
U.S.C	United States Code
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WCRA	Wetlands Conservation and Restoration Authority

1.0 INTRODUCTION

The Louisiana Trustee Implementation Group[1] (LA TIG) prepared this Phase 2 Restoration Plan (RP)/Environmental Assessment (EA) #1.3 and Finding of No significant Impact (FONSI) for the restoration and conservation of bird habitat and to restore and conserve habitat projects on federally managed lands that were injured in the Louisiana Restoration Area as a result of the 2010 Deepwater Horizon (DWH) oil spill. During this event, approximately 3.19 million barrels (134 million gallons) of oil were released into the ocean (U.S. v. BP et al. 2015), by far the largest offshore oil spill in the history of the United States.

Many of the coastal islands in the Gulf of Mexico provide important habitat for birds, including threatened and endangered bird species and species of concern. These include piping plover (*Charadrius melodus*), least tern (*Sternula antillarum*), black skimmer (*Rynchops niger*), American oystercatcher (*Haematopus palliates*), and brown pelican (*Pelecanus occidentalis*). Rabbit Island is Louisiana's westernmost colony for a host of colonial waterbirds and provides habitat conducive to breeding colonies of pelicans, herons, egrets, and gulls (Selman and Davis, 2015). Seventy bird species have been recorded near Rabbit Island (Cornell, 2019). Rabbit Island is the only significant brown pelican habitat in western Louisiana, and this project would significantly accelerate restoration of that species, which was injured by the DWH oil spill. Further, Rabbit Island is a significant priority project due to the accelerated erosion of the island. If this island is not restored soon, continued land loss over time may result in it being neither feasible nor cost effective to restore at a later date, potentially resulting in the permanent loss of the only significant brown pelican rookery in western Louisiana (LA TIG, 2017).

In response to the DWH oil spill, fresh water was released from the Davis Pond Structure to Lake Cataouatche, adjacent to the Jean Lafitte National Historical Park and Preserve, to reduce the potential for oil intrusion into inland marshes. The sustained increased flows from the Davis Pond Structure reduced salinity in Lake Cataouatche and Jean Lafitte National Historical Park and Preserve, resulting in an 83% loss of submerged aquatic vegetation (SAV) between March 2010 and November 2012. SAV beds were apparently unable to withstand the increased flow rate and turbidity associated with the 2010 freshwater releases. (DWH Trustees, 2016a). Freshwater SAV is a particularly important resource at the Barataria Preserve, a unit of the Jean Lafitte National Historical Park and Preserve in Louisiana (Poirrier et al., 2010). SAV beds provide many ecological functions. SAV habitats provide food and shelter for birds, fish, shellfish, invertebrates, and other aquatic species, and are highly productive. The loss of SAV and proliferation of dense floating aquatic vegetation can result in significant habitat changes with implications for fish and wildlife (Poirrier et al., 2009), which can impact both the birds' habitats as well as the birds' selection of foraging habitat. The goal of this restoration effort is to restore suitable colonial waterbird nesting and brood-rearing habitat on Rabbit Island as well as to restore habitat on the federally managed land of the Jean Lafitte National Historical Park and Preserve (Figure 1).

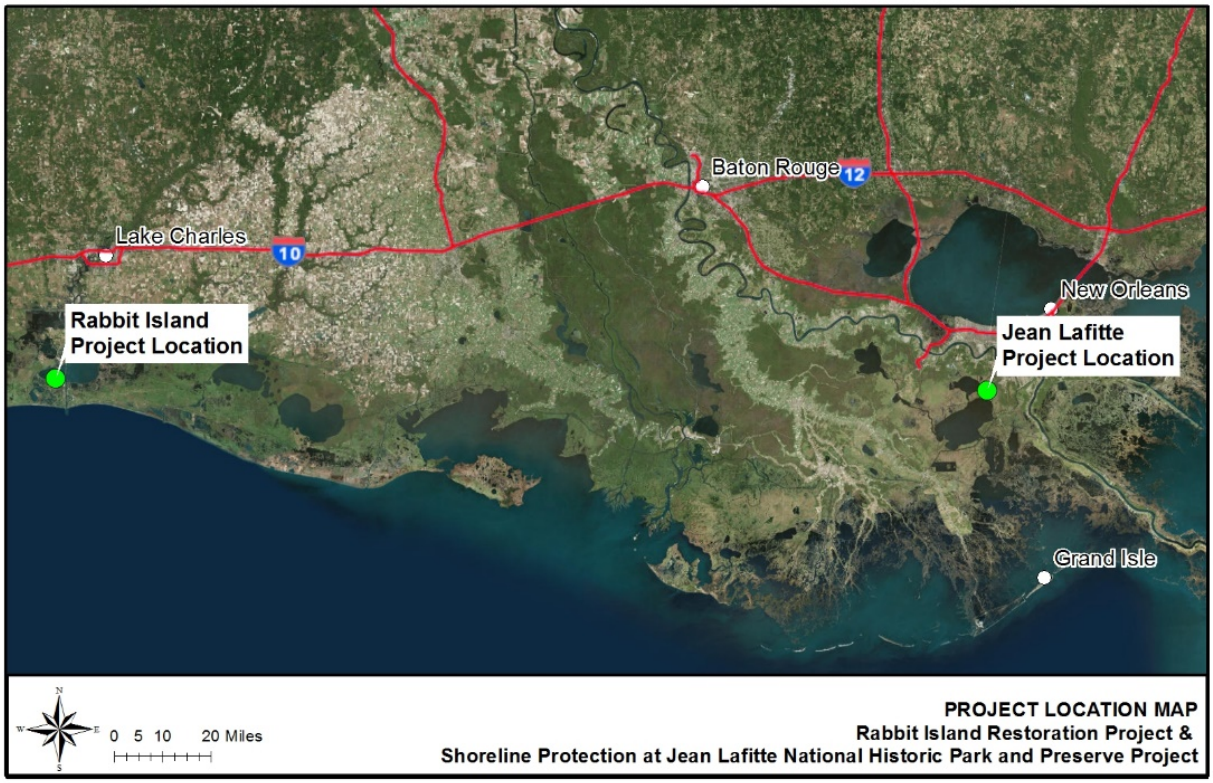
Barataria Preserve, one of six units that make up Jean Lafitte National Historical Park and Preserve, encompasses 23,000 acres of Louisiana wetlands, and offers boardwalks and trails through the area's bayous, swamps, marshes, and forests to view animals (including over 200 species of birds), and vegetative communities. Barataria Preserve, bordering Lake Cataouatche and Lake Salvador has historically contained important SAV habitat. SAV habitat serves critical ecological functions such as

[1] The Louisiana Trustee Implementation Group includes five Louisiana state trustee agencies and four federal trustee agencies: Coastal Protection and Restoration Authority (CPRA), Louisiana Department of Natural Resources (LDNR), Louisiana Department of Environmental Quality (LDEQ), Louisiana Oil Spill Coordinator's Office, Louisiana Department of Wildlife and Fisheries (LDWF), National Oceanic and Atmospheric Administration (NOAA), U.S. Department of the Interior (DOI), U.S. Department of Agriculture (USDA), and U.S. Environmental Protection Agency (USEPA).

providing habitat and foraging for fish and wildlife, decreased wave energy, soil protection, and increased sediment accretion.

The LA TIG prepared this Phase 2 RP/EA #1.3 and FONSI in accordance with the *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* (Final PDARP/PEIS) (DWH Trustees, 2016a) and record of decision, Oil Pollution Act of 1990 (OPA) and its associated natural resource damage assessment (NRDA) regulations, and the National Environmental Policy Act of 1969 (NEPA). This Phase 2 RP/EA #1.3, which tiers from the *Louisiana Trustee Implementation Group Final Restoration Plan #1: Restoration of Wetlands, Coastal, and Nearshore Habitats; Habitat Projects on Federally Managed Lands; and Birds* (Phase 1 Final RP) (LA TIG, 2017), describes the DWH oil spill restoration planning process, considers design alternatives, and identifies the Preferred Alternatives that would best help compensate the public for injuries to resources and habitats caused by the DWH oil spill in the Louisiana Restoration Area. The Rabbit Island Restoration Project (Rabbit Island Project) and the Shoreline Protection at Jean Lafitte National Historical Park and Preserve Project (Jean Lafitte Project) were selected for engineering and design (E&D) in the Phase 1 Final RP. When the E&D for these projects was at a stage sufficient to conduct NEPA analysis in a Phase 2 plan, the LA TIG prepared a draft Phase 2 RP/EA #1.3 analyzing design alternatives. In the draft Phase 2 RP/EA #1.2 the LA TIG proposed a reasonable range of alternatives and identified their Preferred Design Alternatives for these projects. In this final Phase 2 RP/EA #1.3 they select the Preferred Design Alternatives for implementation, as those that would best help compensate the public for impacts caused by the DWH oil spill in the Louisiana restoration area.

Figure 1: Project Location Map



1.1 Background

This Phase 2 RP/EA #1.3 is based on the LA TIG's selection of projects to fund for E&D as described and analyzed in the Phase 1 Final RP (LA TIG, 2017), pursuant to OPA NRDA regulations (15 CFR part 990) and is consistent with the Final PDARP/PEIS (DWH Trustees, 2016a). These documents are herein incorporated by reference. Links to online versions of these documents are included with their respective citations in Section 9.0.

The Final PDARP/PEIS sets forth the process for DWH restoration planning to select specific projects for implementation and establishes a distributed governance structure that assigns a Trustee Implementation Group (TIG) for each restoration area. The LA TIG makes all restoration decisions for the funding allocated to the Louisiana Restoration Area. The Final PDARP/PEIS also outlines provisions for TIGs to phase restoration projects across multiple restoration plans. For example, a TIG may propose funding a planning phase (e.g., initial engineering, design, and compliance) in one plan for a conceptual project. This would allow the TIG to develop information needed to fully consider a subsequent implementation phase of that project in a future restoration plan. The LA TIG initiated this planning process in the Phase 1 Final RP with the selection of projects for E&D. The E&D phase of both the Rabbit Island Project and the Jean Lafitte Project have reached a point at which sufficient information is available to develop the Phase 2 RP/EA #1.3; therefore, the LA TIG is now evaluating design alternatives for each project in this document.

In selecting projects for the Phase 1 Final RP, the LA TIG considered:

- OPA screening criteria
- Restoration goals and other criteria identified by the Trustees in the Final PDARP/PEIS (DWH Trustees, 2016a)
- Contents of *Louisiana's Comprehensive Master Plan for a Sustainable Coast* from 2012 (CPRA, 2012)
- The need to provide restoration benefits across the numerous Louisiana basins impacted by the DWH oil spill
- Input from the public
- Current and future availability of funds under the DWH oil spill NRDA settlement payment schedule

The Phase 1 Final RP described the DWH NRDA restoration planning process, identified a reasonable range of restoration project alternatives to continue to address injuries to resources and habitats caused by the DWH oil spill, and selected from those alternatives a suite of restoration alternatives on which the LA TIG conducted E&D. As project alternatives were analyzed in the Phase 1 Final RP, only design alternatives are analyzed in this Phase 2 RP/EA #1.3.

1.2 OPA and NEPA Compliance

As an oil pollution incident, the DWH oil spill is subject to the provisions of OPA (33 United States Code [U.S.C.] § 2701 et seq.). A primary goal of OPA is to make the environment and public whole for injuries to natural resources and services resulting from incidents involving an oil discharge or substantial threat of an oil discharge. Federal Trustees must comply with NEPA, 42 U.S.C. § 4321 et seq. and its regulations, and 40 Code of Federal Regulations (CFR) § 1500 et seq., among others, when planning restoration projects. As authorized under NEPA at 40 CFR 1502.20, the NEPA analysis in this RP/EA #1.3 tiers from the programmatic analysis in the Final PDARP/PEIS where appropriate.

In accordance with 40 CFR § 1501.5(a), DOI serves as the lead federal agency responsible for NEPA compliance for this Phase 2 RP/EA #1.3, ensuring its compliance with the CEQ's NEPA implementing regulations (40 CFR § 1501.5(a) and DOI NEPA implementing procedures (43 CFR § 46). Each of the other co-Trustees on the LA TIG is participating as a cooperating agency. Each federal cooperating agency reviewed the NEPA analysis for adequacy in meeting the standards set forth in its own NEPA implementing procedures, and subsequently adopts the NEPA analysis (40 CFR § 1508.5).

Accordingly, a FONSI has been prepared and is included as Appendix E.

1.3 Purpose and Need

Restoration of natural resources and the services they provide in the Louisiana Restoration Area is needed to address the injuries caused by the DWH oil spill. The Phase 2 RP/EA #1.3 is consistent with the Final PDARP/PEIS (DWH Trustees, 2016a), which identifies extensive and complex injuries to natural resources and services across the Gulf of Mexico as well as a need and plan for comprehensive restoration consistent with OPA.

As described in Section 5.3 of the Final PDARP/PEIS, five programmatic goals are described for restoration work independently and together to benefit injured resources and services. The programmatic goals addressed by this Phase 2 RP/EA #1.3 are to restore and conserve habitat and replenish and protect living coastal and marine resources (DWH Trustees, 2016a).

1.3.1 Rabbit Island Project Purpose and Need

The DWH NRDA evaluated injury to natural resources and their services due to the DWH oil spill. These injuries occurred at the species, community, and habitat level and affected a wide variety of ecosystem components over an area extending along many hundreds of miles of the northern Gulf of Mexico coastline. At least 93 species of birds, including both resident and migratory species across all five Gulf Coast states, were exposed to DWH oil in multiple northern Gulf of Mexico habitats, including open water, islands, beaches, bays, and marshes. Laboratory studies showed that exposure to DWH oil leads to injuries, including feather damage, abnormal blood attributes, organ damage, and death. The magnitude of the injury and the number of species affected makes the DWH oil spill an unprecedented human-caused injury to birds of the region (DWH Trustees, 2016a).

Consistent with programmatic goals, the Trustees also developed goals for each restoration type (Final PDARP/PEIS Sections 5.5.2 through 5.5.14 [DWH Trustees, 2016a]). These specific goals help to guide restoration planning and project selection for each restoration type. This Phase 2 RP/EA #1.3 addresses the Bird Restoration Type (Section 5.5.12.1, Final PDARP/PEIS). Specific restoration goals for injuries to birds resulting from the DWH oil spill are as follows:

- Restore bird populations by facilitating additional production and/or reduced mortality of injured bird species
- Restore or protect habitats on which injured birds rely
- Restore injured birds by species where actions would provide the greatest benefits within geographic ranges that include the Gulf of Mexico

Bird habitat restoration would enhance bird reproductive success and survival. Although bird species using the Gulf of Mexico are varied and diverse, many face similar threats to reproduction and survival,

including human disturbance, habitat degradation or alteration, high predation rates from introduced invasive and native predators, disease, pollution, and climate change. Others experience additional, unique threats, such as becoming fisheries bycatch and colliding with at-sea structures. To mitigate these threats, restoration would address injuries to birds resulting from the DWH oil spill. Restoration to mitigate threats to birds would address habitat loss and alteration, including managing bird predators and detrimental changes to bird habitat vegetative structure (DWH Trustees, 2016a).

1.3.2 Jean Lafitte Project Purpose and Need

The DWH NRDA evaluated injury to habitat on federally managed lands and their services due to the DWH oil spill. These injuries occurred over hundreds of miles of coastline, within multiple interconnected shoreline habitats, affecting diverse species that use these coastal habitats for some or all of their life cycle. Increased amounts of freshwater from the Davis Pond Freshwater Diversion reduced salinity, resulting in reductions in SAV species diversity and percent cover. Along the Lake Cataouatche shoreline in the Jean Lafitte National Historical Park and Preserve, the Trustees documented an 83% loss of SAV cover between March 2010 and November 2012 (DWH Trustees, 2016a).

Consistent with programmatic goals, the Trustees also developed goals for each restoration type (Final PDARP/PEIS Sections 5.5.2 through 5.5.14 [DWH Trustees, 2016a]). These specific goals help to guide restoration planning and project selection for each restoration type. This Phase 2 RP/EA #1.3 addresses restoration of habitats on federally managed lands type (Section 5.5.3.1, Final PDARP/PEIS). Specific restoration goals for injuries to habitat on federally managed lands resulting from the DWH oil spill are as follows:

- Restore federally managed habitats that were affected by the DWH oil spill and response actions through an integrated portfolio of restoration approaches across a variety of habitats
- Restore for injuries to federally managed lands by targeting restoration on federal lands where the injuries occurred, while considering approaches that provide resiliency and sustainability
- Ensure consistency with land management plans for each designated federal land and its purpose by identifying actions that account for the ecological needs of these habitats

Habitat restoration on federally managed lands can be accomplished by restoring wetlands, dunes and beaches, oyster reefs, SAV, and barrier islands. Some habitats on lands managed by federal agencies are threatened due to rising sea levels, coastal erosion, and increased visitor traffic. Restoration can help address these threats and align with the existing management priorities on federal lands (DWH Trustees, 2016a).

Additional information about the purpose and need for DWH NRDA restoration can be found on page 5-11 in Section 5.3.2 of the Final PDARP/PEIS (DWH Trustees, 2016a).

1.4 Proposed Action

To address the restoration goals and purpose and need for action, in the draft Phase 2 RP/EA #1.3 the LA TIG proposed to implement the final design of the TIG's preferred design alternatives for the Rabbit Island and Jean Lafitte Projects using funds made available in the DWH Consent Decree. Based on the analyses presented and FONSI, in this final Phase 2 RP/EA #1.3 the LA TIG selects their preferred design alternatives for construction of the Rabbit Island (Alternative 2A) and Jean Lafitte Projects (Alternative 4C) as best meeting the TIG's goals and objectives for restoration.

1.4.1 Rabbit Island Project

The LA TIG addresses the programmatic restoration goal of replenishing and protecting birds by proposing implementation of the Rabbit Island Project Design Alternative 2A. Design Alternative 2A would meet the goal of replenishing and protecting birds by restoring 87.8 acres of the island's original 200-acre footprint. This would be done by raising the elevation of Rabbit Island using dredged fill material from the Calcasieu Ship Channel as the borrow source area. See Section 3.1.1 for a more detailed description.

1.4.2 Jean Lafitte Project

The LA TIG addresses the programmatic restoration goal of restoring habitats on federally managed lands by proposing implementation of the Jean Lafitte Project Design Alternative 4C. To protect the shoreline and provide conditions for SAV to thrive, Alternative 4C would implement a nearly continuous rock breakwater, with rock elbows protecting fish gaps and existing infrastructure along the eastern shorelines of Lake Cataouatche, Lake Salvador, and Bayou Bardeaux in the Jean Lafitte National Historical Park and Preserve. The northern portion of the rock breakwater would extend approximately 5.3 miles from Bayou Verret to tie into an existing riprap shoreline protection project at Lake Salvador near Couba Island with canal openings and pipeline right-of-way (ROW) access where needed. The southern portion of the proposed rock breakwater would tie into the southernmost end of the pre-existing riprap shoreline protection and extend approximately 2.2 miles to the area near Isle Bonne with pipeline ROW access where necessary. See Section 3.2.1 for a more detailed description.

1.5 Other Design Alternatives Analyzed in this Phase 2 RP/EA #1.3

In this document, the LA TIG evaluates a reasonable range of design alternatives, and includes the Rabbit Island Project Design Alternative 2 and Jean Lafitte Project Design Alternative 4A as Non-Preferred Alternatives (See Sections 3.1.2 and 3.2.2 for detailed descriptions).

1.6 No Action Alternative

Under the No Action alternative, the Rabbit Island and Jean Lafitte projects would not be implemented. Conditions would continue to deteriorate over the long term. No Action Alternatives are considered in accordance with NEPA (40 CFR §1502.14(d)). No action alternatives are discussed in Section 4, NEPA Analysis.

1.7 Coordination with Other Gulf Restoration Programs

As discussed in Section 1.5.6 of the Final PDARP/PEIS and Section 2.1.3 of the Phase 1 Final RP, the LA TIG is committed to coordination with other Gulf of Mexico restoration programs to maximize the overall ecosystem impact of DWH NRDA restoration efforts. This coordination will ensure that funds are allocated for critical restoration projects across the affected regions of the Gulf of Mexico and within Louisiana.

During the restoration planning process, the LA TIG has coordinated and will continue to coordinate with other DWH Oil Spill and Gulf of Mexico restoration programs, including the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States (RESTORE Act); the National Fish and Wildlife Foundation (NFWF) Gulf Environmental Benefit Fund; and the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) programs. In doing so, the LA TIG has reviewed the implementation of projects in other coastal restoration programs and is striving to develop synergies with those programs to ensure the most effective use of available funds for the maximum coastal benefit.

1.8 Severability of Projects

In this Phase 2 RP/EA #1.3, the LA TIG may select one or more of the preferred project design alternatives with a full life cycle cost (including engineering and design, construction, O&M, and MAM) of approximately $36,888,556 ($16,440,000 for the Rabbit Island Project Preferred Alternative and $20,448,556 for the Jean Lafitte Project Preferred Alternative). As discussed in more detail in Section 2, the Rabbit Island and Jean Lafitte projects are independent of each other and may be selected independently for implementation in this and/or future restoration plans by the LA TIG.

1.9 Public Involvement

Public input is an integral part of NEPA, OPA, and the DWH oil spill restoration planning effort. On October 1, 2010, the Trustees published a NOI to Conduct Restoration Planning (75 Federal Register 60800). Since then, the Trustees have sought restoration project ideas from the public through a variety of means. In addition, the Trustees implemented an extensive public outreach process as part of Final PDARP/PEIS development efforts; that process and associated public comments are described more fully in Chapter 8 of the Final PDARP/PEIS (DWH Trustees, 2016a).

1.9.1 Public Review and Comment Opportunities

On January 23, 2017, the LA TIG posted in the Federal Register a Notice of Availability of the Draft Phase 1 RP for public review and comment (82 Federal Register 7884). The Rabbit Island Project and the Jean Lafitte Project were two projects in that plan proposed for E&D. After a 30-day public comment period, the Rabbit Island Project and the Jean Lafitte Project were approved for E&D funding.

On June 22, 2018, the LA TIG posted a NOI on the NOAA Gulf Spill Restoration website (https://www.gulfspillrestoration.noaa.gov/), informing the public that it was beginning to draft a second phase of planning to evaluate construction of the Rabbit Island and Jean Lafitte projects under different design scenarios.

The draft Phase 2 RP/EA #1.3 was made available for public review and comment for 30 days following release as specified in the public notice published in the Federal and Louisiana Registers on November 20, 2019. To facilitate public comment, a public webinar took place on December 2, 2019, as summarized in the NOA. Comments received during the comment period were compiled and are addressed in Section 7 of this document.

1.9.2 Administrative Record

Concurrent with publication of the 2010 NOI (pursuant to 15 CFR § 990.45), the DWH Trustees opened a publicly available Administrative Record for the DWH oil spill, which includes restoration planning activities. DOI is the lead federal Trustee for maintaining the Administrative Record, which can be found at https://www.doi.gov/deepwaterhorizon/adminrecord. The LA TIG also uses this Administrative Record site for DWH restoration planning.

Information about restoration project implementation is provided to the public through the Administrative Record and through other outreach efforts, including at https://www.gulfspillrestoration.noaa.gov.

2.0 RESTORATION PLANNING PROCESS: PROJECT ALTERNATIVES AND SCREENING

Following the DWH oil spill, the Trustees initiated an injury assessment pursuant to OPA NRDA regulations, which established the nature, degree, and extent of injuries from the DWH incident to both natural resources and the services they provide. The Trustees then used the results of the injury assessment to inform restoration planning so that restoration can address the nature, degree, and extent of the injuries caused by the DWH oil spill. The LA TIG assembled an initial list of restoration projects to create a Project Universe of potential projects that would restore ecosystem services injured during the DWH oil spill. The initial list included projects developed by the DWH Trustees for possible inclusion in the Early Restoration program, projects submitted in response to the LA TIG Notice of Intent (NOI), projects identified by the Louisiana Department of Wildlife and Fisheries (LDWF), and projects suggested from the public comment portals. The LA TIG used the Planning Tool to evaluate these projects as documented in the Final Restoration Plan #1: *Restoration of Wetlands, Coastal, and Nearshore Habitats; Habitat Projects on Federally Managed Lands; Birds* (Phase 1 Final RP) (LA TIG, 2017).

2.1 Phase 1 Final RP

Consistent with the 13 restoration types described in the Final PDARP/PEIS (DWH Trustees, 2016a) and the Phase 1 Final RP, the LA TIG addressed three restoration types: wetlands, coastal, and nearshore habitats; habitat projects on federally managed lands; and birds. The Phase 1 Final RP analyzed a reasonable range of project alternatives anticipated to meet the restoration goals for each of the three restoration types. In addition to the OPA NRDA regulatory standards that were applied, the LA TIG established and applied additional incident-specific evaluation and selection criteria (LA TIG, 2017b).

In the Phase 1 Final RP, the LA TIG screened project alternatives at the conceptual design stage that could provide suitable colonial waterbird habitat on coastal islands based on geographic location, immediacy, and sustainability of project benefits provided to the injured resources. Through this analysis, the LA TIG narrowed the range of alternatives to a suite of projects that is consistent with the restoration goals identified in the Final PDARP/PEIS:

- Pass-a-Loutre Restoration
- New Harbor Island
- Queen Bess Island
- Cat Island/Mangrove Island
- Rabbit Island
- Shoreline Protection at Jean Lafitte National Historical Park and Preserve
- New Orleans East Land Bridge Marsh Creation
- Lake Borgne Marsh Creation
- Barataria Basin Ridge and Marsh Creation
- Terrebonne Basin Ridge and Marsh Creation
- Mid-Barataria Sediment Diversion
- Raccoon Island
- Wine Island
- Freshwater Bayou Shoreline Protection

Of the 14 project alternatives fully evaluated according to OPA NRDA regulations, the LA TIG selected six projects to undergo further E&D development:

- Rabbit Island Restoration Project
- Queen Bess Island Restoration Project
- Lake Borgne Marsh Creation: Increment 1
- Barataria Basin Ridge and Marsh Creation: Spanish Pass Increment
- Terrebonne Basin Ridge and Marsh Creation: Bayou Terrebonne Increment
- Shoreline Protection at Jean Lafitte National Historical Park and Preserve

Section 2.2 of the Phase 1 Final RP describes the screening and evaluation process used to select projects for inclusion in Phase 2 restoration plans. The six selected projects, including the Rabbit Island Project and the Jean Lafitte Project, were carried forward to the engineering and design phase during which alternatives were further developed. Screening of the project alternatives adheres to project selection criteria consistent with OPA NRDA regulations (15 CFR. § 990.54), the Final PDARP/PEIS, and additional evaluation criteria established by the LA TIG (Phase 1 Final RP Section 2.2.1) (LA TIG, 2017).

The six selected project alternatives were carried further into the screening and evaluation process. Each project identified within the Final RP was evaluated according to the OPA screening criteria (15 CFR. § 990.54(a)), which include:

- The cost to carry out the alternative
- The extent to which each alternative is expected to meet the goals and objectives of returning the injured natural resources and services to baseline and/or compensating for interim losses
- The likelihood of success of each alternative
- The extent to which each alternative would prevent future injury as a result of the incident and avoid collateral injury as a result of implementing the alternative
- The extent to which each alternative benefits more than one natural resource and/or service
- The effect of each alternative on public health and safety

The OPA evaluation for the Rabbit Island Project and the Jean Lafitte Project can be found in Section 2.2.2.3.2 and 2.2.2.2.1, respectively of the Phase 1 Final RP (LA TIG, 2017) and have been incorporated by reference herein.

Of the six projects, Queen Bess Island Restoration Project has completed Phase 2 restoration planning and Lake Borgne Marsh Creation: Increment 1 and Barataria Basin Ridge and Marsh Creation: Spanish Pass Increment Projects are both in the process of completing Phase 2 restoration planning.

2.2 Phase 2 RP/EA #1.3

The Rabbit Island Project and the Jean Lafitte Project are at a sufficient stage in the E&D process to conduct meaningful OPA and NEPA analyses on the reasonable range of design alternatives; therefore, the LA TIG initiated preparation of this Phase 2 RP/EA #1.3.

2.3 Design Alternatives and OPA Screening

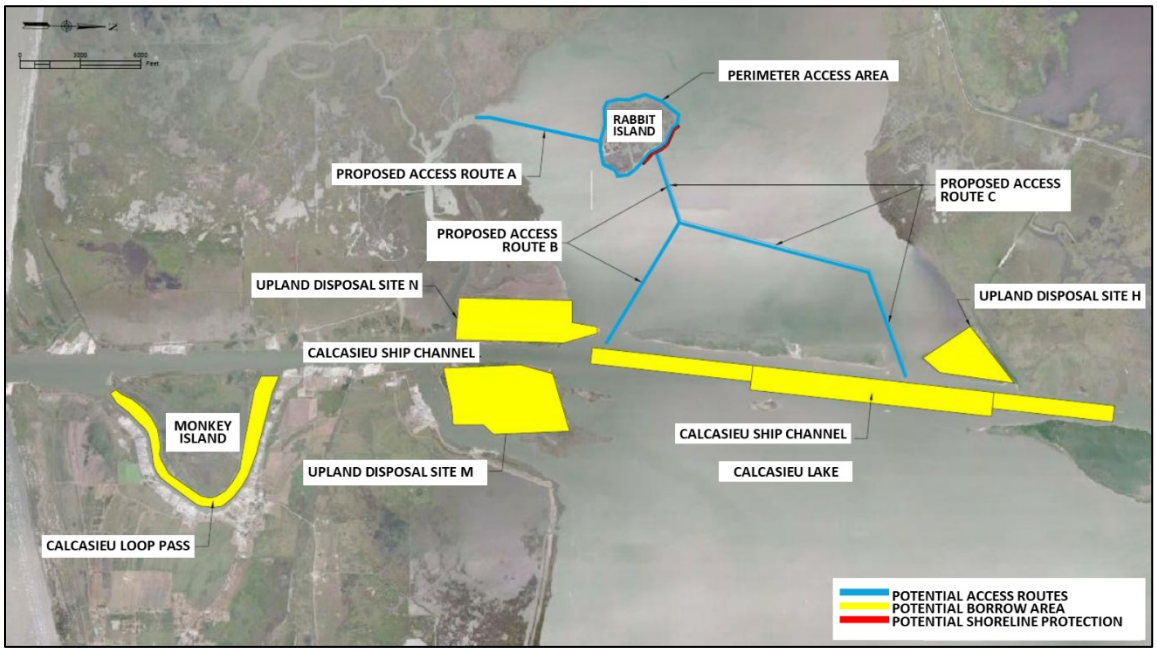
Once the projects entered the E&D phase, conceptual and preliminary design alternatives were developed and evaluated. The LA TIG again applied each of the OPA evaluation standards as outlined in

Section 2.1 to affirm consistency with the initial OPA evaluation completed in the Phase 1 RP and determine how well each met the screening criteria. The following sections summarize the design alternatives and the OPA screening for the two projects.

2.3.1 Rabbit Island Project Design Alternatives and OPA Screening

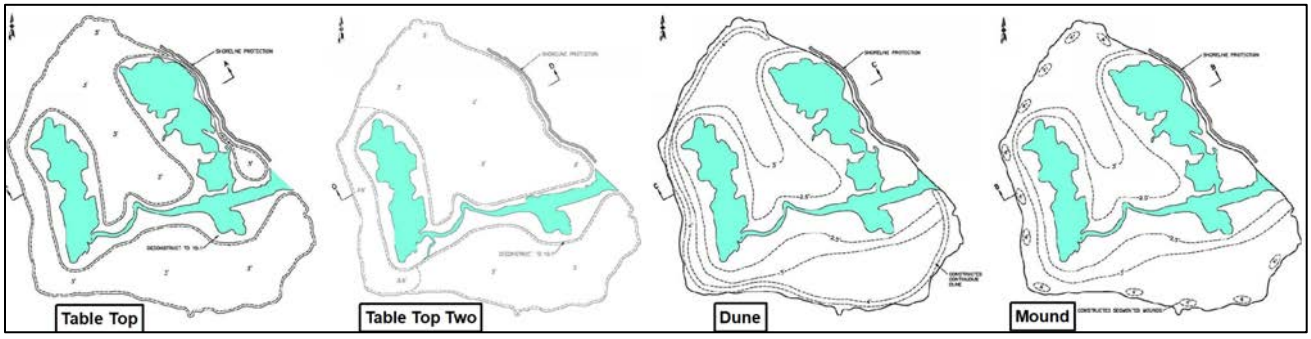
Eight design alternatives were originally developed and evaluated for the Rabbit Island Project. Alternative components included various borrow areas, sediment and construction equipment transport corridors, fill area configurations, and shoreline protection features. These design elements are displayed in Figure 2 and Figure 3.

Figure 2: Rabbit Island Project Design Elements



Four fill configurations to elevate the island were developed, including two table-top configurations, one dune configuration, and one mound configuration. These fill area alternatives are displayed in Figure 3. Various borrow locations were considered early during project development; however, confined disposal facilities were eliminated for further consideration due to logistical, permitting, and budgetary concerns. Thus, two borrow areas were considered—the Calcasieu Ship Channel and the Calcasieu Loop Pass. Three access routes were originally considered (A, B, and C). The project team identified Access Route C as a preferred route; however, due to the presence of oyster resources adjacent to the access route, this option was eliminated.

Figure 3: Rabbit Island Project Fill Area Alternatives



From the consideration of fill configurations, borrow locations, and access routes, eight alternatives were developed. These alternatives and their associated design elements are shown in Table 1.

Table 1: Rabbit Island Project Design Alternatives Elements

Alternatives	Borrow Area	Access Route	Fill Area
1	Calcasieu Ship Channel	B	Table-Top 1
2	Calcasieu Ship Channel	B	Table-Top 2
3	Calcasieu Ship Channel	B	Dune
4	Calcasieu Ship Channel	B	Mound
5	Calcasieu Loop Pass	A	Table-Top 1
6	Calcasieu Loop Pass	A	Table-Top 2
7	Calcasieu Loop Pass	A	Dune
8	Calcasieu Loop Pass	A	Mound

The LA TIG evaluated the design alternatives under the OPA restoration evaluation criteria as described below:

- **Cost Effectiveness:** Conceptual costs were developed at the beginning of the E&D phase and were refined as the design alternatives were further developed. Design Alternative 4 was the most cost effective ($7,526,094), followed by Design Alternative 3 ($7,535,000). The least cost-effective option was Design Alternative 6 ($12,610,938). Alternatives were scored based upon cost per acre of habitat restored by normalizing to factors including sediment composition, navigational safety issues, oyster seed grounds, transport distance, pipeline crossings, infrastructure and obstructions, habitat goals, construction duration, and construction cost. Alternative 2 received the best score based upon cost per acre with a total estimated cost of $9,267,969, followed by Design Alternatives 3 and 4 (Royal, 2018a).
- **Goals and Objectives:** All design alternatives are consistent with the Final PDARP/PEIS and the Phase 1 Final RP. All alternatives meet the LA TIG's goals and objectives for the project because all alternatives would restore bird populations by facilitating additional production and/or reduced mortality of injured bird species, restore or protect habitats on which injured birds rely, and restore injured birds by species where actions would provide the greatest benefits within geographic ranges that include the Gulf of Mexico.
- **Likelihood of Success:** All design alternatives are likely to succeed because they are technically feasible and utilize proven and established restoration methods, which have been implemented successfully on other projects in the region.

- **Avoid Collateral Injury:** All design alternatives would maintain an interior tidal pond and creek, thereby providing measures to minimize collateral injury to fishery resources. A dike containment system is only being proposed to partially contain Cells 1 and 2. This feature is not proposed in other locations that would cause closure to the tidal channel leading to the island; thus, more tidal pond areas would be unfilled, allowing the alternatives to be more suitable to the requirements of the Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat (MSFCMA EFH).
- **Benefits to Natural Resources:** All design alternatives would provide a primary benefit of improvement to colonial waterbird habitat for foraging and breeding by creating usable bird habitat on Rabbit Island. All design alternatives would provide benefits to a range of bird species that utilize the habitat.
- **Health and Safety:** The LA TIG does not anticipate impacts to public health and safety from implementing any of the design alternatives. Rabbit Island is uninhabited, remote, and accessible only by boat. During construction, all laws and regulations pertaining to worker safety would be followed.

In summary, the OPA evaluation demonstrates that the infrastructure costs of the Proposed Alternative are well documented, reasonable, and appropriate. This Proposed Alternative has a strong nexus to the bird related injury caused by the DWH Oil Spill and can reasonably be expected to provide benefits to restoring habitat and breeding populations over an extended timeframe. Further, this Proposed Alternative would provide new and improved bird habitat to trust resources that were injured by the DWH Oil Spill and has a high probability of success. Finally, public safety issues are not expected to be a concern.

2.3.2 Jean Lafitte Project Design Alternatives and OPA Screening

As stated in the PDARP, "In planning and conducting SAV restoration activities, site selection criteria should be established and critically evaluated before implementation." The selection criteria include conducting SAV restoration activities in areas with suitable water quality conditions for SAV growth, protected from wave energy, and where light, depth, temperature, and sediment quality are appropriate, and ideally, where SAV has previously existed. The Jean Lafitte Project meets all these conditions except for SAV protection from wave energy. The PDARP further included the following approaches for restoring and enhancing SAV: backfill scars with sediment, revegetate SAV beds via propagation and/or transplanting, enhance SAV beds through nutrient addition, protect SAV beds with buoys, signage, and/or other protective measures, and protect and enhance SAV through wave attenuation structures. DOI further evaluated these approaches against the OPA criteria for applicability, and the results are documented in a White Paper, *Submerged Aquatic Vegetation Restoration Approaches, Deepwater Horizon Natural Resource Damage Assessment and Restoration (NRDAR) Habitat Projects on Federally Managed Lands, Jean Lafitte National Historical Park and Preserve* (DOI, 2017).

To protect and enhance SAV, the approach most applicable for the project is through the use of wave attenuation structures. Segmented living shorelines or permeable barriers that dissipate wave energy and enable SAV to regenerate naturally behind them have been used previously in the coastal areas of Louisiana and throughout the Gulf Coast. Similar projects on a limited scale were constructed in the park and have proven successful at decreasing exposure factors and increasing SAV establishment. Wave attenuation structures are expected to provide the necessary conditions for SAV to regenerate and recover the 50-acre loss that occurred during the DWH response activities.

Within the wave attenuation devices approach, a screening process evaluated the alternatives based on their general ability to meet the following criteria:

- Protect and enhance SAV growth by wave attenuation
- Slow or halt shoreline retreat by reducing wave impacts
- Allow water circulation for enhanced water quality
- Be constructed to have a functional life of 20 years

Six general alternative devices were initially considered to meet the criteria listed above. The following initial approaches were considered: rock breakwaters, sheet piles/bulkheads, concrete panels, sand-filled geotextile tubes/bags, floating breakwaters, and living reefs (EcoBale© and Reefmaker©). These six general approaches were then screened to eliminate any methods that could be ruled out without a need for a more detailed analysis. Following the screening, the highest-ranking approaches included the rock breakwater and living reef, followed by the concrete panels, floating breakwaters, sheet piles/bulkheads, and sand filled geotextile tubes/bags. Floating breakwaters and sand-filled geotextile tubes/bags were eliminated due to their inability to meet the design life goal of 20 years.

A secondary screening of the remaining four approaches (rock breakwater, sheet pile/bulkhead, EcoBale©, and Reefmaker©) was then conducted. Two variations for each application were considered—contouring along the shoreline and straightening along the shoreline. Based upon the results of this screening, the rock breakwater, EcoBale©, and Reefmaker© alternatives were further evaluated in a schematic value analysis study.

Seven design alternatives resulted from the secondary screening for the Jean Lafitte Project. The following paragraphs provide a brief description and Figure 4 displays each of the alternatives considered. A complete description can be found in the Schematic Value Analysis Study (NPS, 2019). These alternatives and their associated design elements are shown in Table 2. Following the descriptions, a summary of the OPA screening of the seven alternatives is provided.

Figure 4: Jean Lafitte Project Alternatives

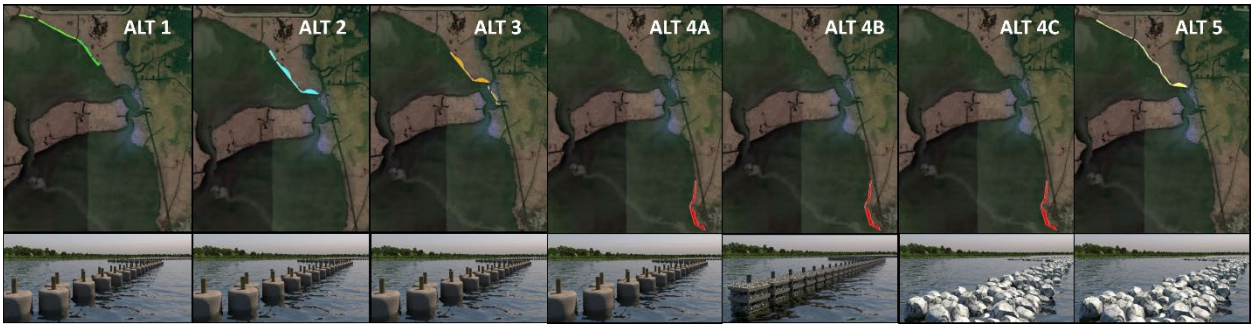


Table 2: Jean Lafitte Project Design Alternatives Elements

Alternatives	Material	Location
1	EcoBale©	Northern Portion of Lake Cataouatche
2	EcoBale©	Southern Portion of Lake Cataouatche
3	EcoBale©	Southern Portion of Lake Cataouatche to Bayou Bardeaux near Couba Island
4A	EcoBale©	Southern Portion of Lake Salvador
4B	Reefmaker©	Southern Portion of Lake Salvador
4C	Rock Breakwaters	Southern Portion of Lake Salvador
5	Rock Breakwaters	Northern and Southern Portions of Lake Cataouatche

The LA TIG evaluated the design alternatives under the OPA restoration evaluation criteria as described below:

- **Cost Effectiveness:** Conceptual costs were developed at the beginning of the E&D phase and were refined as the design alternatives were further developed. Design Alternative 4A had the lowest initial cost ($15,027,105), followed by Design Alternative 4C ($17,934,156); however, Alternative 4C had the lowest life cycle cost ($20,448,556).
- **Goals and Objectives:** All design alternatives are consistent with the Final PDARP/PEIS and the Phase 1 Final RP. All alternatives meet the LA TIG's goals and objectives for the project because all alternatives would protect existing SAV from wave energy and create favorable conditions for the reestablishment of SAV. Additionally, the alternatives would minimize erosion to the area by reducing wave action to the shorelines.
- **Likelihood of Success:** All design alternatives are likely to succeed because they are technically feasible and utilize proven and established restoration methods. Similar projects on a smaller scale were constructed in the park and have proven successful in decreasing exposure factors and increasing SAV establishment.
- **Avoid Collateral Injury:** To prevent adverse impacts to essential fish habitat (EFH) and associated marine fishery species, gaps for fish passage are included in the design of all alternatives. These allow the passage of water and estuarine organisms between the lake and the area behind the structures. The design has been used successfully in other projects.
- **Benefits to Natural Resources:** All design alternatives would provide a primary benefit of improvement to SAV habitat, which would provide a larger nursery environment for many species of fish and other wildlife.
- **Health and Safety:** The LA TIG does not anticipate impacts to public health and safety from implementing any of the design alternatives. All design alternatives would provide a primary benefit to public health and safety, as the project would protect against erosion. During construction, all laws and regulations pertaining to worker safety would be followed.

In summary, the OPA evaluation demonstrates that the infrastructure costs of the Proposed Alternative are well documented, reasonable, and appropriate. This Proposed Alternative has a strong nexus to the SAV and shoreline injury caused by the DWH Oil Spill and can reasonably be expected to provide benefits over an extended timeframe. Further, this Proposed Alternative would provide new and improved areas for SAV to thrive to trust resources that were injured by the DWH Oil Spill and has a high probability of success. Finally, public safety issues are not expected to be a concern.

2.3.3 Natural Recovery Alternative

Pursuant to the OPA regulations, the Final PDARP/PEIS considered "a natural recovery alternative by which no human intervention would be taken to directly restore injured natural resources and services to baseline" (40 CFR § 990.53(b)(2)). Under a natural recovery alternative, no additional restoration would be carried out by the LA TIG, at this time, to accelerate the recovery of birds in the Louisiana restoration area, or the recovery of SAV at Jean Lafitte National Historical Park and Preserve using DWH NRDA funding. The LA TIG would allow natural recovery processes to occur, which could result in one of four outcomes for injured resources: (1) gradual recovery, (2) partial recovery, (3) no recovery, or (4) further deterioration.

Due to sea level rise and subsidence of Rabbit Island and due to erosion and SAV degradation at the Jean Lafitte Project area, the most likely future outcome is no recovery. If recovery were to occur naturally, it would occur over a longer period of time compared to a scenario by which restoration actions were undertaken. Given that technically feasible restoration approaches are available to compensate for interim natural resource and service losses, the DWH Trustees rejected this alternative from further OPA evaluation in the Final PDARP/PEIS (DWH Trustees, 2016a). Based on this determination and incorporating that analysis by reference, and also incorporating by reference the Natural Recovery analysis found in Section 2 of the Phase 1 Final RP (LA TIG, 2017), the LA TIG did not evaluate further natural recovery as a viable alternative under the OPA.

3.0 REASONABLE RANGE OF ALTERNATIVES

According to the NRDA regulations under OPA, the Trustees are responsible for identifying a reasonable range of restoration project alternatives (15 CFR § 990.53(a)(2)) that can be evaluated according to the OPA evaluation standards (15 CFR § 990.54). As described in Section 2.3.1 and 2.3.2, eight Rabbit Island Project alternatives and seven Jean Lafitte Project alternatives meet the OPA NRDA regulatory criteria. The LA TIG conducted a thorough and comprehensive evaluation to uniformly and objectively assess these alternatives (CPRA, 2018).

During the screening process, a reasonable range of alternatives for both projects was identified after evaluating each design alternative under an initial application of the OPA NRDA criteria. The alternatives that met the OPA NRDA criteria were then further evaluated under a more detailed evaluation method using a thorough and comprehensive set of evaluation criteria. The reasonable range of alternatives is carried forward for a more detailed evaluation under the OPA NRDA criteria in the following sections. The LA TIG applied the OPA NRDA criteria to the reasonable range of alternatives to provide a summary explanation of the questions raised and analyses conducted under the OPA NRDA criteria and a narrative summary of each evaluation with respect to these criteria.

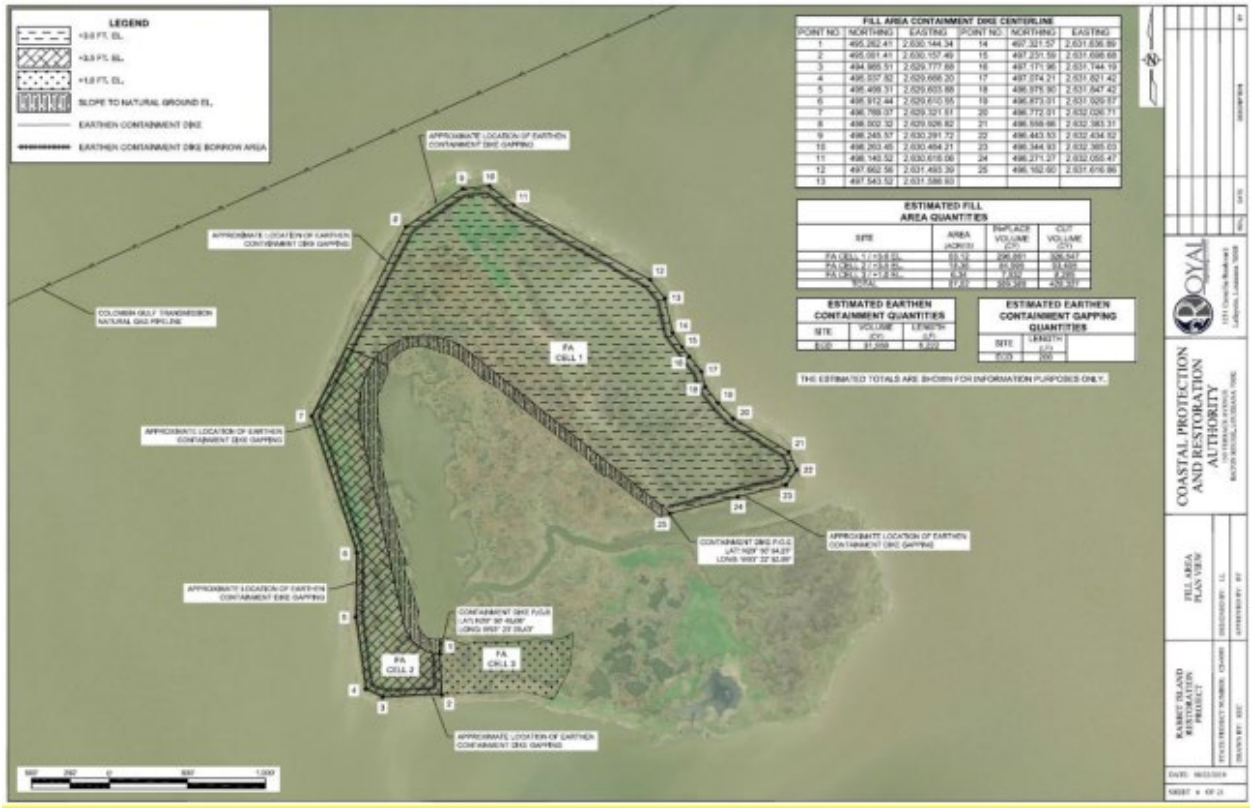
3.1 Rabbit Island Project

The reasonable range of design alternatives for Rabbit Island includes Design Alternative 2 and a modified version of Design Alternative 2, which is referred to as Alternative 2A throughout the report. The decision to proceed to E&D and selection of the project's reasonable range of alternatives is explained in the Alternatives Evaluation Report (Royal, 2018a). This chosen alternative strikes a balance between constructability and creation of optimal habitat features for nesting birds, while minimizing environmental impacts during construction (Royal, 2018a). Additionally, pursuant to NEPA, the No Action Alternative is also considered.

3.1.1 Alternative 2A

Alternative 2A would raise the elevation of Rabbit Island using dredged fill material from the Calcasieu Ship Channel as the borrow source area. Fill would be placed in two partially contained fill area cells and nourishment would occur in the other cell, for construction of optimal nesting and brooding habitat (Figure 5). An estimated 389,388 cubic yards are anticipated to be dredged and placed in these contained cells. Approximately 8,222-ft. of containment dike would be constructed around the island's perimeter. The earthen containment dikes would be approximately 25-ft. wide with potential strategic dike gapping occurring after the fill material has settled. Additional interior containment dikes or training dikes may be used during construction to contain dredge slurry or aid in material placement. This is expected to cause the least environmental impacts while restoring 87.8 acres of the island's original 200-acre footprint. Alternative 2A design features are further described in the following paragraphs.

Figure 5: Rabbit Island Alternative 2A



Fill Area Cells

Alternative 2A consists of three fill area cells that would be constructed to elevations ranging from 1-ft. to 3.5-ft. North American Vertical Datum of 1988 (NAVD88). There is an approximate 12.51-acre transitional area sloped to natural ground located along the interior perimeter of the fill area cells. A summary for each cell is presented in Table 3.

Table 3: Rabbit Island Project Cell Construction Elevations and Areas

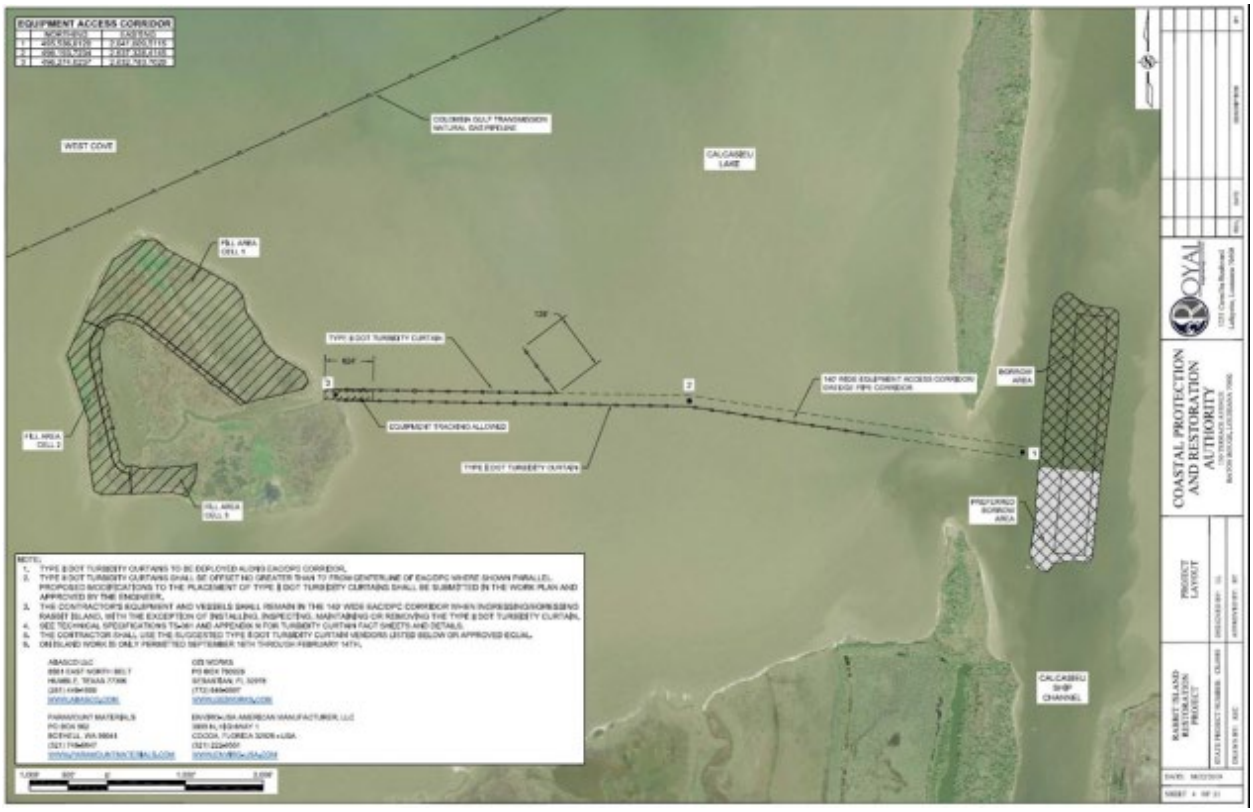
Cell	Construction Elevation (ft.-NAVD88)	Area (Acres)
1	3.0	63.12
2	3.5	18.36
3	1.0	6.34

Consolidated fill would be placed at the eastern edge of the island, raising the elevation to 3-ft. The western edge of the island would be raised to 3.5-ft. and have an estimated 30:1 slope to the western inland tidal pond and creek. Sloped areas are expected to naturally repose over time. Some tidal creeks and ponds would be filled with dredge fill material during the restoration to decrease the required containment dike length. Silt fences would be installed, as necessary, to minimize deposition in the non-filled tidal pond and creek features. This design would allow higher fill elevations and greater nesting and brooding habitat areas to be achieved within the confines of the contained cell.

Borrow Area

Alternative 2A utilizes the Calcasieu Ship Channel borrow area as the source of dredge fill material. Maintenance dredging is implemented within the channel on a regular basis by the U.S. Army Corps of Engineers (USACE) for navigation. The sediment composition is expected to support hydraulic dredging and placement. The clay and sand below the channel bottom may require extra fill handling for dredging and placement, but once established, it should provide more stability against wave action. Material would be excavated using a cutterhead dredge and by way of a pipeline aligned upstream. A preferred dredge area was identified as the primary source of borrow material, as displayed in the gray shaded area in Figure 6. This area is approximately 40 acres and would be used first, prior to excavation of other portions of the borrow area. Maximum cut elevations are −67-ft. NAVD88 in the borrow area.

Figure 6: Rabbit Island Borrow Area and Access Route for Alternate 2A



Access Route

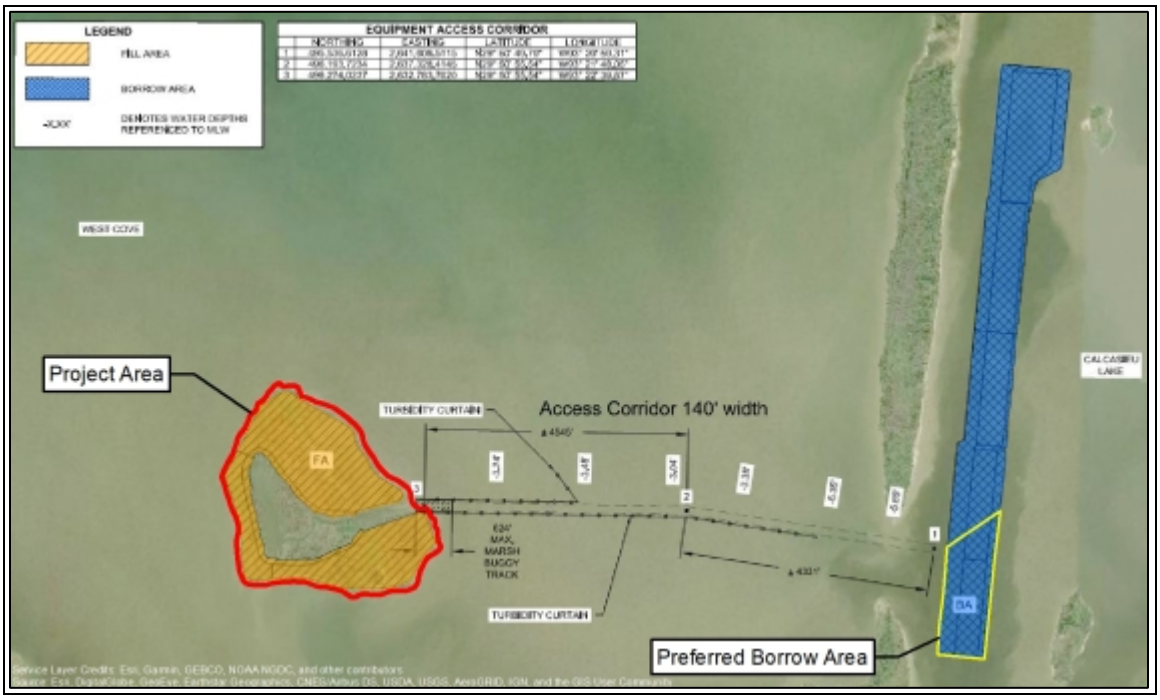
Alternative 2A utilizes Access Route B for construction equipment access and sediment pipeline conveyance. Access Route B extends approximately 8,900-ft. from Rabbit Island through Joe's Cut, near mile 5 of the Calcasieu Ship Channel to the delineated borrow area (Figure 6). The selection of Access Route B was based on limiting potential impacts to oyster resources, available water depths, and distance to the borrow source. The delineated corridor width is 140-ft., and the depths generally range from -3.74-ft. to -5.85-ft. NAVD88. Operating restrictions would be implemented during construction. Turbidity curtains would be required along the full extent of the delineated access route. Vessel drafts would be restricted to 3-ft. or less. A temporary tide gauge would be installed near the Calcasieu Ship Channel, and access would be prohibited during periods of low water depths to minimize propeller washing. Ongoing coordination with LDWF is required to minimize water bottom disturbance. Multiple

best management practices (BMPs) would be implemented, as discussed in Section 4.0 of this report, to protect oysters, water bottoms, and other important features.

3.1.2 Design Alternative 2

Design Alternative 2 (Figure 7), has a sloped fill area layout in Cell 1 and elevations of 3-ft. to 0.5-ft. NAVD88 sloped. The fill elevation in Cell 2 is similar to Alternative 2A (3.5-ft.). The fill elevation in Cell 2 is similar to Alternative 2A (3.5-ft.). For Cell 3, the Alternative 2 has a larger footprint that extends to the east of the island and an elevation of 3-ft. compared to a 1-ft. elevation for the Alternative 2A. The fill area for Alternative 2 includes a total of 137.5 acres compared to a total fill area template of 87.82 acres for Design Alternative 2A. The borrow area is the Calcasieu Ship Channel, which is the same as the Alternative 2A. The access route is the same as Alternative 2A, Access Route B.

Figure 7: Rabbit Island Alternative 2



3.1.3 No Action Alternative

Under the No Action Alternative, Rabbit Island would remain in its current state. The island would continue to lose land over time, resulting in it being neither feasible nor cost effective to restore at a later date, potentially resulting in the permanent loss of the only significant brown pelican rookery in western Louisiana. This would result in the continued loss of colonial waterbird nesting and brooding habitat (LA TIG, 2017).

3.1.4 The LA TIG's Preferred Alternative for the Rabbit Island Project and Summary Rationale

Alternative 2A for Rabbit Island was selected as the Preferred Alternative because it provides enhanced acreage of usable bird habitat over the 20-year life of the project, and protects existing emergent marsh within the island interior, when compared to Alternative 2. Alternative 2A provides a balance between constructability and creation of optimal habitat features for nesting birds, while minimizing environmental impacts during construction.

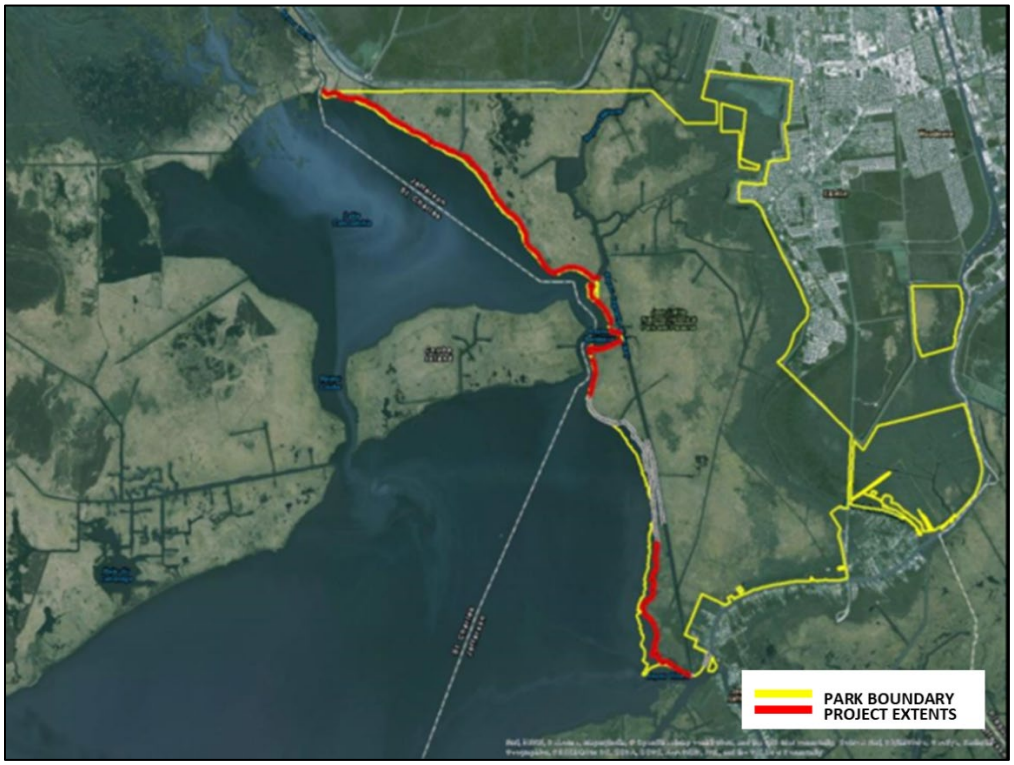
Alternative 2A fulfills the LA TIG's restoration goals to restore or protect habitats on which injured colonial waterbirds rely, thereby facilitating additional production with the intent of restoring a subset of injured birds within the northern Gulf of Mexico.

Alternative 2A provides increased acreage of bird habitat and restored nesting habitat for a number of colonial nesting waterbirds. Attracting mammalian predators to the island is a concern for Alternative 2, and in an attempt to mitigate this risk, a revised fill area with a reduction in the supratidal footprint was made for Alternative 2A. Design Alternative 2A also offers varying elevations for avian nesting and reduction in impacts to areas that have historical pelican nesting observations. Additionally, the Alternative 2A is more cost effective, having a life cycle cost of approximately $15.6 million to implement compared to $17.2 million for Alternative 2.

3.2 Jean Lafitte Project

The reasonable range of design alternatives for the Jean Lafitte Project includes Design Alternative 4C and Design Alternative 4A. The decision to proceed to E&D and selection of the project's reasonable range of alternatives is explained in the Schematic Value Analysis Report (NPS, 2019). This chosen alternative was based on choosing by advantages and life cycle costing decision-making approaches. Additionally, pursuant to NEPA, the No Action Alternative is also considered.

Figure 8: Jean Lafitte Project Area and Alternatives



3.2.1 Alternative 4C

Alternative 4C consists of a north and south section of rock breakwaters. The northern portion runs along the shoreline of Lake Cataouatche and east of Couba Island and the southern portion runs along

the shoreline of Lake Salvador (Figure 8). A funding source has not been identified for the northern portion of the project. It is anticipated that Design Alternative 4C (southern portion of shoreline protection) would advance to final design and construction. However, for compliance purposes and potential future funding both the north and south sections of the project are evaluated with respect to shoreline protection and SAV enhancement and cumulative impacts. If and when future funds would become available for the northern portion, timing, final design and construction would be evaluated for cost effective opportunities. Detailed information for the range of alternatives is provided in the following sections.

Alternative 4C would implement a nearly continuous rock breakwater, with rock elbows protecting fish gaps and existing infrastructure along the eastern shorelines of Lake Cataouatche, Lake Salvador, and Bayou Bardeaux in the Jean Lafitte National Historical Park and Preserve. The northern portion of the rock breakwater would extend approximately 5.3 miles from Bayou Verret to tie into an existing riprap shoreline protection project at Lake Salvador near Couba Island with canal openings and pipeline right-of-way (ROW) access where needed. The southern portion of the proposed rock breakwater would tie into the southernmost end of the pre-existing riprap shoreline protection and extend approximately 2.2 miles to the area near Isle Bonne with pipeline ROW access where necessary. Existing breakwaters within the project area were constructed adjacent to the shoreline and have proven effective at protecting the shoreline. SAV has thrived in the open water areas between the breakwaters and the shoreline. This alternative is expected to restore 50 acres of SAV lost during the DWH response action. Features of Alternative 4C design are further described in the following paragraphs.

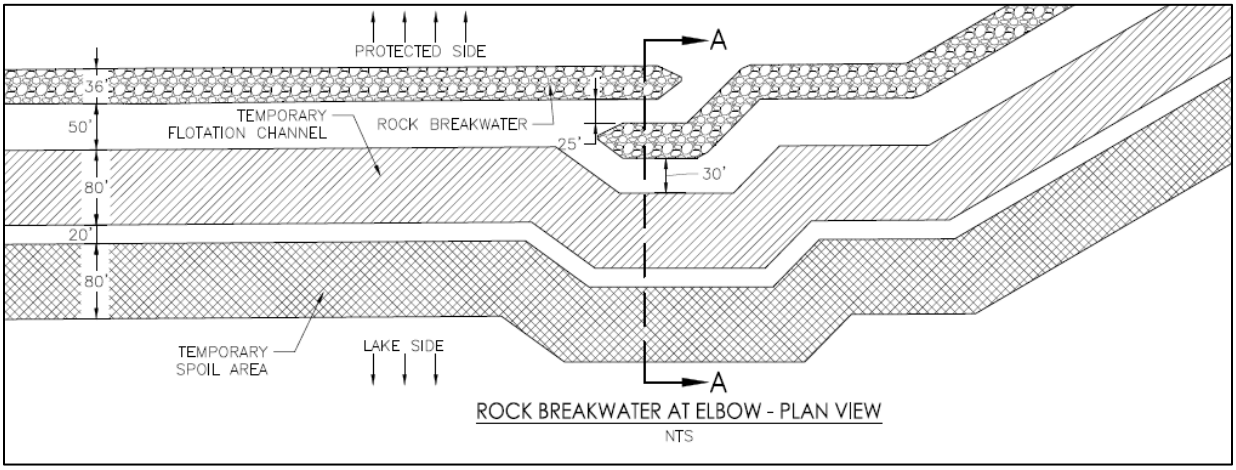
Rock Breakwaters

Rock breakwaters are proposed in two sections, extending 5.3 miles and 2.2 miles, respectively. A graded armor stone is proposed to an elevation of 3-ft. NAVD88, having a crest width of 4-ft., a bottom width of 36-ft., and side slopes of 2:1 on the shore side and 3:1 on the exposed side. A geotextile composite fabric would be placed beneath all the stone and would extend a minimum of 3-ft. beyond the edge of the graded riprap prior to settlement. Additionally, bedding stone consisting of gravel, crushed stone, crushed concrete, or other engineering approved material would be placed on top of the geotextile composite fabric prior to armor stone placement.

Rock Elbows

Rock elbows, or fish gaps, are proposed to prevent adverse impacts to EFH and associated fishery species (Figure 9). Rock elbows allow the passage of water and estuarine organisms between the lake and the area behind the breakwaters. The Jean Lafitte Project also provides fish gaps and open access for canal openings and gas pipeline ROWs where needed to avoid impacts to the existing infrastructure. The fish gaps are proposed to be a minimum of 25-ft. wide at the base of the breakwaters and are proposed to occur at a minimum of 1,000-ft. intervals.

Figure 9: Proposed Rock Elbows



Access Route

Access to the project area is not feasible from land. Heavy equipment such as draglines and tracked excavators would construct the rock breakwater from barges. All construction materials (e.g., geotextile fabric, geogrid, bedding material, riprap) would be transported via barge and floated next to the equipment barge(s).

A "floatation channel" would need to be dredged parallel to the proposed breakwater alignment to accommodate the draft of necessary equipment and material barges. The proposed floatation channel would be 80-ft. wide and 4-ft. below the existing surface bottom to accommodate typical equipment and material barges. The floatation channel would be close enough to the designed breakwater alignment to allow the equipment to reach the entire project footprint without undermining the breakwaters' soil foundation. Material excavated to create the floatation channel would be stockpiled on the western side of the breakwater and re-used post-construction to backfill the channel.

3.2.2 Alternative 4A

Alternative 4A would implement continuous shoreline protection in the exact same footprint as Alternative 4C; however, it would utilize other manufactured construction materials such as Ecobale© or Reefmaker©. Construction methods would be entirely water-based but a flotation channel may not be required for these alternative construction methods due to the wave attenuator material being lighter than limestone riprap. This alternative would require treated timber piles to be driven at the project site. A similar access route would be used for Alternative 4A if the contractor chose construction methods that require access routes (NPS, 2019).

3.2.3 No Action Alternative

Under the No Action Alternative, SAV within the boundary of the project area would remain in its current state. The SAV community in the impacted area has not recovered since the injury occurred, indicating the current conditions are not conducive for SAV reestablishment in areas where it once thrived. Under the No Action Alternative, the expected benefits from action alternatives would not occur, full SAV recovery is not anticipated, and the shoreline would continue to degrade.

3.2.4 The LA TIG's Preferred Alternative for the Jean Lafitte Project and Summary Rationale

Alternative 4C was selected because it provides the most effective design for shoreline protection and SAV restoration. The rock breakwaters dissipate wave energy and enable SAV to regenerate naturally behind them. Additionally, previous experimental projects such as Lake Salvador Shoreline Protection Demonstration (BA-15) proved that riprap structures had the most potential to stabilize wetland shorelines when compared to other experimental treatments. Data collected three years post-construction prove the riprap structures were structurally stable and resistant to erosion (Curole, et al., 2002).

The National Park Service (NPS) conducted a value analysis workshop and completed a thorough and comprehensive benefits analysis to assess and compare the various design alternatives (NPS, 2019). The analysis was a systematic approach to obtain optimum value for each dollar spent. The evaluation involved identifying attributes or characteristics of each alternative relative to the evaluation criteria, determining the advantages for each alternative with each evaluation factor, and weighing the importance of each advantage. Alternative 4C offered the highest benefit to cost ratio and overall best value. Alternative 4C fulfills the LA TIG's restoration goal for habitat restoration on federally managed lands by constructing rock breakwaters for shoreline protection and SAV habitat restoration. Additionally, the advantages over the other alternatives included the following: moderately better at minimizing potential navigation hazards, much better enhancing likelihood of successful SAV habitat protection, moderately better improving secondary benefits, better at preventing future environmental injury and avoiding collateral injury, moderately better at preserving cultural resources, slightly better at maintaining visitor enjoyment, much better minimizing maintenance, much better at minimizing project risks, slightly better constructability, much better improving partnerships, and it was the second lowest initial construction cost and lowest life cycle cost of all alternatives (NPS, 2019).

In summary, the LA TIG believes that the Rabbit Island Project Design Alternative 2A, and the Jean Lafitte Project Design Alternative 4C best meet the goals for replenishing and protect bird habitats and for restoration of habitats on federally managed lands respectively, in accordance with the PDARP/PEIS and the Louisiana Coastal Management Plan, and best meet the screening criteria set forth in the OPA NRDA regulations.

4.0 NEPA Analysis: Affected Environment and Environmental Consequences

This section includes a description of the affected environment and an analysis of the environmental consequences for the Rabbit Island and the Jean Lafitte Project design alternatives. The alternatives addressed in this section are proposed under OPA and meet the level of federal agency involvement to require NEPA review. For purposes of this document, the proposed action is considered implementation of the preferred alternatives, Alternative 2A for the Rabbit Island Project, and Alternative 4C for the Jean Lafitte Project. A Non-Preferred Alternative and the No Action Alternative are also analyzed for each project.

To determine whether an action has the potential to result in significant impacts, the context and intensity of the action must be considered. Context refers to the area of impacts (e.g., local, statewide,) and their duration (e.g., whether they are short- or long-term impacts). Intensity refers to the severity of an impact and could include the timing of the action (e.g., more intense impacts would occur during critical periods of high visitation or wildlife breeding/rearing). Intensity is also described in terms of whether the impact would be beneficial or adverse. For purposes of this document, impacts are characterized as minor, moderate or major, and short-term or long-term. Impacts were assessed in accordance with the guidelines in the Final PDARP/PEIS Table 6.3-2. The results of any completed protected resources consultations are included in the Administrative Record.

The following sections describe the Affected Environment by resource category followed by the environmental consequences of each alternative.

4.1 Physical Environment

Within the natural environment, there are several relevant resources such as geology, soils, topography, climate and weather, air quality, hydrology and water quality, and noise. This section discusses impacts to these components of the existing natural and physical environment.

4.1.1 Geology and Substrates

Between 1932 and 2010, Louisiana's coast lost more than 1,800 square miles of land. From 2004 through 2008 alone, more than 300 square miles of marshland were lost to Hurricanes Katrina, Rita, Gustav, and Ike. The major causes of this land loss include the effects of climate change, sea level rise, subsidence, hurricanes, storm surges, disconnection of the Mississippi River from coastal marshes, and human impacts (CPRA, 2017). Both Cameron Parish and Jefferson Parish face severely increased wetland loss across most of each parish over the next 50 years (under the medium environmental scenario as defined in CPRA, 2017). With no further coastal protection or restoration actions, Cameron and Jefferson Parish could lose an additional 444 square miles (40% of the parish's land area) and 112 square miles (42% of the parish's land area), respectively (CPRA, 2017).

4.1.1.1 Rabbit Island Project Geology and Substrates

Rabbit Island is a coastal island located in Calcasieu Lake in Cameron Parish, Louisiana. Cameron Parish's coastal marshes make up approximately 82% of the total acreage of the parish. The marshes are used mainly as habitat for wildlife and for recreational purposes, rangeland, and oil and gas fields. The major physiographic areas that make up the parish are the coastal marshes and the cheniers in the Gulf Coast Marsh major land resource area and the prairies in the Gulf Coast Prairies major land resource area (USDA, 1995).

According to the U.S. Department of Agriculture (USDA) soil survey map, one soil type exists at the Rabbit Island site, Creole mucky clay. Creole mucky clay is a poorly drained, very fluid, mineral soil found in brackish marshes. It is ponded for long periods and is frequently flooded. This soil is well suited as habitat for wetland wildlife (USDA, 2019). Island elevation ranges from approximately -0.57-ft. to 1.60-ft. NAVD88 (Royal, 2018b).

Geotechnical investigations were performed in January 2018 and confirmed that the regional stratigraphy generally consists of deposits formed in the last several thousand years. Subsurface conditions generally consisted of very soft clay having organic matter from the mudline to approximately 4-ft. below the mudline. This layer was followed by a very soft clay and sandy/silty clay soil to 10-ft. to 16-ft. below the mudline, which are deposits created by coastal mud deposition of the Chenier Plain. Below that layer, generally medium to stiff, relatively low moisture clay soils with sand and silt lenses and occasional sand/silt layers, typical of the Pleistocene-era clay soils were encountered (Royal, 2018b).

Based on recent surveys, elevations along the eastern access route were as low as -22-ft. NAVD88 at the confluence of West Cove and the Calcasieu Ship Channel east of Rabbit Island; however, the elevation sharply increased in West Cove and ranged between -3 and -5-ft. NAVD88 along the majority of the proposed route. Additionally, the elevation of the outer banks of the maintained Calcasieu Ship Channel ranged from -8 to -12-ft. NAVD88; and middle elevations within the Calcasieu Ship Channel ranged from -45 to -51-ft. NAVD88. Subsurface conditions in the Calcasieu Ship Channel generally included a thin layer of soft clay material over high plasticity, medium-to-stiff strength, relatively low-moisture Pleistocene-age clay with occasional silt and sand layers (Royal, 2018b).

Borrow material would be excavated from the Calcasieu Ship Channel via hydraulic cutterhead dredge. The maximum depth of cut is -67-ft. NAVD88. Currently, a total cut volume of 428,327 cubic yards has been calculated, and the preferred borrow area is estimated to include an available borrow quantity of 707,000 cubic yards.

Alternative 2A Rabbit Island Environmental Consequences

Alternative 2A involves placing fill material to create elevated habitat for nesting pelicans and other waterbirds. Fill material would consist of clay and sand dredged from the Calcasieu Ship Channel borrow area and transported via a pipeline through Joe's Cut and across West Cove to Rabbit Island within a delineated 140-ft. access route (Access Route B). The access corridor would be bordered by Type II turbidity curtains as a measure to minimize the impacts of sediment plumes on nearby oyster seed grounds. Short-term impacts include construction activities via mechanical equipment on Rabbit Island for up to approximately 6 months. Ingress and egress of marsh buggies may also impact water bottoms within the access corridor for a maximum distance of 624-ft. within West Cove.

Environmental consequences from the in-water construction activities would result in localized disturbances to aquatic substrates, constituting short-term, minor, adverse impacts. No staging areas are proposed, as the contractor would be required to stay within the access corridor. The establishment of construction BMPs would help to minimize impacts of construction, access areas, and site preparation on substrates. BMPs could include the implementation of erosion controls, development of and adherence to a stormwater management plan, and consistent construction monitoring. Avoiding fill placement before or during severe weather would minimize erosion during construction.

The placement of large quantities of substrates across the island constitutes a long-term, moderate, adverse impact to the island's substrates; however, Alternative 2A is expected to have minimal impact on the island's overall footprint. Short-term, minor, adverse impacts to terrestrial substrates, such as localized soil disturbances or compaction, may result from use of heavy equipment during site preparation/staging and restoration implementation. These impacts would likely be localized to small areas and would be offset by the beneficial restoration activities. Dredge material placed on the island is expected to settle rapidly, given its grain size distribution. Turbidity concerns from the dredge outfall pipe would be addressed by the use of silt fences along tidal creeks and ponds to capture solids that don't settle. Turbidity curtains would also be used to contain any turbidity caused by vessels accessing Rabbit Island. Following fill placement, the existing Creole mucky clay would be buried, and the island's surface soils would be predominantly clay and sand. Cells 1 and 2 would be planted with suitable native vegetation, which would help stabilize soils and reduce long term soil loss due to erosion. Therefore, this revegetation would have a long-term, beneficial impact on substrates.

Overall, the Alternative 2A would result in long- and short-term, minor to moderate, adverse impacts and long-term, beneficial effects on substrates.

Alternative 2 Rabbit Island Environmental Consequences

Under Alternative 2, impacts to the island's existing surface soils would be similar to those under Alternative 2A, including localized soil disturbances or compaction from the use of heavy equipment during site preparation and short-term, minor, adverse impacts related to in-water construction activities. However, there would be more surficial sediment burial and an increased impact from construction activities compared to Alternative 2A. The Alternative 2 would result in the same short-term, minor, adverse impacts and long-term, beneficial effects on substrates as Alternative 2A but would impact a greater area.

No Action Alternative Rabbit Island Environmental Consequences

Under the No Action Alternative, the Rabbit Island Project would not be implemented. None of the proposed alterations to the island's geology or substrates would occur. In the short-term, the geology and substrate conditions at the project site would remain the same as described above; however, due to local subsidence and sea level rise, long-term, moderate to major, adverse impacts would occur due to inundation and erosion. Therefore, under the No Action Alternative, impacts to substrates would be long-term and major.

4.1.1.2 Jean Lafitte Project Geology and Substrates

Jean Lafitte is located in Jefferson Parish within the Bayou des Familles-Bayou Barataria deltaic lobe, which is a distributary of the Mississippi River. The parish is entirely within the Mississippi River Delta. The majority of soils in the parish consist of ponded and frequently flooded, mucky soils in marshes and swamps. These soils make up approximately one-third of the total land area of the parish. They are used mainly as habitat for wetland wildlife and recreation (USDA, 1983).

According to the USDA soil survey map, two soil types exists at the northern Jean Lafitte Project area, and four soil types exist within the southern Jean Lafitte Project area. The northern project site consists of Kenner muck and Allemands muck. Kenner muck and Allemands muck are mostly level, very poorly drained semifluid organic soils commonly found in freshwater marshes. The southern project site consists of Kenner muck, Allemands muck, Lafitte-Clovelly, and Barbary muck. Barbary muck is a level, very poorly drained, semifluid mineral soil commonly found in swamps. Lafitte-Clovelly is a level, poorly

drained, saline, semifluid organic soil commonly found in brackish marshes. These soils are well suited to use as habitat for wetland wildlife (USDA, 2019).

Alternative 4C Jean Lafitte Environmental Consequences

Alternative 4C involves placing rock material along the shorelines of Lake Cataouatche and Lake Salvador to protect and restore SAV habitat. The placement of large quantities of rock breakwaters would provide a short- and long-term beneficial impact as they would provide shoreline erosion protection via wave energy dissipation.

To accommodate typical construction equipment and material barges, Alternative 4C proposes dredging a floatation channel with maximum dimensions of 80-ft. wide and a draft of 4-ft. NAVD88. The spoil would be temporarily placed nearby during construction. The channel would be backfilled with the stockpiled material as construction progresses and the channel is no longer necessary. These activities would affect vegetation, benthic substrates, and organisms within the construction zone; however, the overall impact associated with the Proposed Alternative is expected to be minimal. To protect existing soils including SAV and surrounding wetlands, BMPs would be used to control turbidity during dredging. Construction activities would result in localized disturbances to aquatic substrates that would constitute short-term, minor, adverse impacts.

Overall, the Alternative 4C would result in short-term, minor, adverse impacts and short- and long-term, beneficial effects on substrates.

Alternative 4A Jean Lafitte Environmental Consequences

Under Alternative 4A, impacts to the existing surface soils would be similar to those under Alternative 4C, including localized soil disturbances or compaction from the use of heavy equipment during site preparation and short-term, minor, adverse impacts related to in-water construction activities; however, under Alternative 4A, a floatation channel may not be required for these alternative construction methods because wave attenuator material is less dense than the rock material. The selected contractor would determine his own means and methods for construction and could choose to still utilize a floatation channel.

Overall, the Alternative 4A would result in similar short-term, minor, adverse impacts and short- and long-term, beneficial effects on substrates as Alternative 4C.

No Action Alternative Jean Lafitte Environmental Consequences

Under the No Action Alternative, the Jean Lafitte Project would not be implemented. None of the proposed alterations to the geology or substrates would occur. In the short-term, the geology and substrate conditions at the project site would remain the same as described above; however, due to local subsidence, erosion, and sea level rise, long-term, moderate to major, adverse impacts would occur due to inundation and erosion. Therefore, under the No Action Alternative, impacts to substrates would be long-term and major.

4.1.2 Air Quality

The U.S. Environmental Protection Agency (USEPA) established criteria for evaluating air quality in accordance with the 1990 Clean Air Act Amendments. The USEPA developed the National Ambient Air Quality Standards (NAAQS) that list six atmospheric pollutants considered harmful to public health. The six pollutants are carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. The Louisiana Department of Environmental Quality (LDEQ) is responsible for regulating and ensuring

compliance with the Clean Air Act in Louisiana. For compliance purposes, geographic areas within the United States are classified as either in attainment or nonattainment for air quality. Geographic areas that have all six criteria pollutants below NAAQS are considered in attainment, whereas areas exceeding these levels are considered nonattainment areas. In nonattainment areas, USEPA requires states to develop and/or revise a state implementation plan to ensure the standards would be attained.

4.1.2.1 Rabbit Island Project Air Quality

A qualitative analysis was completed for the Rabbit Island alternatives regarding the Clean Air Act Amendments of 1990. As of September 30, 2019, the USEPA has determined that Cameron Parish is currently below NAAQS and thus in compliance with the standards; as such, the project is within attainment areas for air quality (USEPA, 2019).

Alternative 2A Rabbit Island Environmental Consequences

Impacts to air quality would be minor and limited to construction activities. An increase in vegetation could potentially provide a long-term benefit to the air quality for the area. Under all alternatives, short-term, minor, adverse air quality impacts may occur during construction due to dust and fumes generated from equipment and earthwork activities. Additional effects may also arise from an increase in boat traffic required to deliver equipment, materials, and construction workers to the island. Mitigation measures would be implemented using BMPs to limit temporary impacts during construction such as limiting idling time either by shutting equipment off when not in use or reducing the idling time and limiting the creation of dust-sized particles.

Overall, Alternative 2A would result in short-term, minor, adverse impacts and potential long-term, beneficial impacts to air quality.

Alternative 2 Rabbit Island Environmental Consequences

Under Alternative 2, impacts to air quality would be similar to those under Alternative 2A, including short-term, minor adverse air quality impacts during construction and potential long-term benefits. Under all alternatives, short-term, minor, adverse air quality impacts may occur during construction due to dust and fumes generated from equipment and earthwork activities. Additional effects may also arise from an increase in boat traffic required to deliver equipment, materials, and construction workers to the island.

No Action Alternative Rabbit Island Environmental Consequences

Under the No Action Alternative, the Rabbit Island Project would not be implemented. Therefore, none of the adverse impacts to air quality from implementation of the alternatives would occur.

4.1.2.2 Jean Lafitte Project Air Quality

A qualitative analysis was completed for the Jean Lafitte alternatives regarding the Clean Air Act Amendments of 1990. As of September 30, 2019, the USEPA has determined that Jefferson Parish is currently below NAAQS and thus in compliance with the standards; as such, the project is within attainment areas for air quality (USEPA, 2019).

Alternative 4C Jean Lafitte Environmental Consequences

Impacts to air quality would be minor and limited to construction activities. Under all alternatives, short-term, minor, adverse air quality impacts may occur during construction due to dust and fumes from equipment and earthwork activities. Additional effects may also arise from an increase in boat traffic

required to deliver equipment, materials, and construction workers to the project area. Mitigation measures can be implemented using BMPs to limit temporary impacts during construction such as limiting idling time either by shutting equipment off when not in use or reducing the idling time and limiting the creation of dust-sized particles.

Overall, Alternative 4C would result in short-term, minor, adverse impacts to air quality.

Alternative 4A Jean Lafitte Environmental Consequences

Under Alternative 4A, impacts to air quality would be similar those under Alternative 4C, including short-term, minor adverse air quality impacts during construction. Under all alternatives, short-term, minor, adverse air quality impacts may occur during construction due to dust and fumes from equipment and earthwork activities. Additional effects may also arise from an increase in boat traffic required to deliver equipment, materials, and construction workers to the project area.

No Action Alternative Jean Lafitte Environmental Consequences

Under the No Action Alternative, the Jean Lafitte Project would not be implemented. Therefore, none of the adverse impacts to air quality from implementation of the alternatives would occur.

4.1.3 Hydrology and Water Quality

4.1.3.1 Rabbit Island Project Hydrology and Water Quality

Rabbit Island is within the Calcasieu/Sabine Basin, which is a shallow coastal wetland system, containing approximately 312,500 acres of wetlands. Freshwater inputs to the basin occur primarily through Calcasieu and Sabine Lakes via their respective rivers (CWPPRA, 2019). Water circulation patterns allow for higher salinity water to enter the interior marshes (saltwater intrusion). The basin soils, which are 87% organic and support lower salinity marsh vegetation, are infiltrated by the more saline waters. This leads to increased stress and loss of plant communities, and eventually erosion and sediment transport out of the inner marsh areas.

Based on the Final 2016 Louisiana Water Quality Integrated Report, Calcasieu Lake (subsegment LA030402_00), which includes Rabbit Island, is listed as fully supporting the designated use for primary contact recreation, secondary contact recreation, fish and wildlife propagation, and oyster propagation. There are no current water quality impairments at Rabbit Island and the adjacent waters (LDEQ, 2016). As a part of a Biological Oyster Assessment, conducted by T. Baker Smith in September 2017, water quality assessments including water temperature and salinity data were collected using a calibrated YSI model Pro 30. Temperature ranged from 75.9 to 78.3°F and averaged 76.8°F (Royal, 2018b).

Rabbit Island is located within the Federal Emergency Management Agency (FEMA)-designated Flood Zone VE, which are subject to inundation by the 1-percent-annual-chance flood event, with additional hazards due to storm-induced velocity wave action in the VE zone (FEMA Map Number 22023C0675H 2012).

Alternative 2A Rabbit Island Environmental Consequences

Soil erosion is generally the most critical water quality impact resulting from construction activities. The degree of erosion is dependent on factors such as the amount of vegetation and soil removal, slope of the exposed area, and the effectiveness of erosion-control measures. Erosion can lead to deposition of sediment in waterways causing a degradation of water quality. Fill material placement would result in impacts to island hydrology and water quality while impacts to the surrounding area should be minimal.

Alternative 2A involves sediment placement across the island to raise the elevation, which would alter the island's surface conditions; therefore, Alternative 2A would result in long-term, moderate adverse impacts to hydrology within the island. These impacts would be minimized through implementation of construction BMPs listed below.

Due to the installation of containment dikes and other erosion control features, most of the dredge material should be contained within the island, limiting runoff. Silt fences or training dikes would be installed along inland ponds and tidal creeks to limit deposition in these features. Spill boxes are also an option that could allow for effluent to empty onto existing marshes. Additionally, the natural establishment of vegetation would serve to stabilize soils and reduce soil loss; therefore, the impacts to local water quality from surface soil erosion are expected to be short-term, minor, and adverse.

Long-term impacts to water quality would result from the increase in the bird population following restoration. The increased bird population would result in increased fecal matter loading to waters on and surrounding the island, representing a long-term, moderate, adverse impact to water quality. However, this fecal matter loading would be similar to historical conditions at the island.

Loss of sediment during dredge operations and pumping to the island may result in localized, temporary increases in suspended sediment concentrations near the dredge and dredge pipe areas. Sediment loss would be a short-term, negligible, adverse impact to turbidity.

Short-term, minor, adverse impacts to water quality on and near Rabbit Island are expected during implementation of restoration and construction activities. Localized erosion and sediment transport are expected during fill material placement. The use of barges, other vehicles, and equipment during implementation and monitoring could result in short-term, minor, adverse impacts to water quality due to potential fuel leaks or vehicle fluid leaks. Construction BMPs, in addition to other avoidance and mitigation measures as required by state and federal regulatory agencies, would minimize water quality and hydrology impacts. Silt fencing or training dikes would be used to limit runoff. BMPs such as limiting idling time either by shutting equipment off when not in use or reducing the idling time would minimize impacts to water quality and hydrology. Other BMPs such as using suitable measures to avoid impacts to the waterbody when implementing construction activities, stockpiling material, maintaining spill prevention measures, and other BMPs would be utilized to limit impacts. Adverse impacts to water quality would be reduced by application of BMPs and adhering to an erosion and sedimentation control plan. Appropriate measures, such as provisions for proper disposal and storage of materials and wastes, would also be taken to avoid accidental spillage of fuels or other chemicals and to control runoff into adjacent water bodies. National Pollutant Discharge Elimination System (NPDES) guidelines for Phase 2 construction activities would be followed during construction, and a site-specific Stormwater Pollution Prevention Plan (SWPPP) would be developed.

Construction in federal jurisdictional waters of the United States requires permits from the USACE as required by Section 404 of the Clean Water Act and/or Sections 9 and 10 of the Rivers and Harbors Act of 1899. USACE permitting, authorizing activities pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act was issued on August 26, 2019. Additionally, state permits would be obtained as necessary, including Section 401 Water Quality Certification and Section 402 NPDES permits.

Overall, Alternative 2A would result in short- and long-term, minor to moderate adverse effects on hydrology and water quality.

Alternative 2 Rabbit Island Environmental Consequences

Under Alternative 2, impacts to hydrology and water quality would be similar in nature to those under Alternative 2A, but would have the potential to impact a larger area as the project footprint is larger for Alternative 2.

No Action Alternative Rabbit Island Environmental Consequences

Under the No Action Alternative, the proposed placement of fill material would not occur, and the hydrology of the island would remain unchanged in the short-term. The No Action Alternative would result in fewer short-term, minor, adverse impacts compared to the action alternatives because no restoration and construction activities would occur. The No Action Alternative also would result in fewer long-term, moderate, adverse impacts to fecal coliform water quality due to smaller colonial waterbird populations. However, local subsidence and sea level rise would continue, which would result in long-term, major, adverse impacts to both hydrology and water quality within Rabbit Island and in the adjacent waters in the long term. Under the No Action Alternative, there would be long-term, major, adverse impacts to water current patterns, normal water fluctuations, and salinity gradients.

4.1.3.2 Jean Lafitte Project Hydrology and Water Quality

Jean Lafitte National Historical Park and Preserve lies within the Barataria Basin, which comprises four terrestrial habitat types covering approximately 1,565,000 acres: agricultural crop-grasslands, bottomland hardwood forests, cypress tupelo swamps, and coastal marshes, that range from fresh water to saltwater. Freshwater input is mostly from local precipitation with minor inflow from the Gulf Intracoastal Waterway and the Davis Pond Freshwater Diversion (CWPPRA, 2019).

The state's 2004 Water Quality Inventory Report indicated that 35% of the 26 waterbody subsegments within the basin were fully supporting their three primary designated uses. However, 65% of the subsegments were not supporting their designated use for fish and wildlife propagation. The suspected causes for these water quality problems include: metals, nutrients, oil and grease, fecal coliform, low concentration of dissolved oxygen, dissolved and suspended solids, and turbidity. The suspected sources of the water quality problems include: crop production, pastureland, urban runoff, septic tanks, spills, minor industrial point sources, petroleum activities, highway and maintenance runoff, hydraulic modification, and dredging (LDEQ, 2004).

The project area is located within the FEMA-designated Flood Zone VE, which is subject to inundation by the 1-percent-annual-chance flood event, with additional hazards due to storm-induced velocity wave action in the VE zone (FEMA Map Number 22051C0250F, 2018) and Zone AE, which is subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods (FEMA, 2018).

Alternative 4C Jean Lafitte Environmental Consequences

Dredging the floatation channel, placing geotextile fabric, and placing riprap would all disturb the waterbottom. Once construction has been completed, water quality would return to ambient levels. The filtering function created by the restored SAV would provide a long-term benefit to water quality.

Short-term, minor, adverse impacts to water quality on and near Jean Lafitte are expected during implementation of restoration and construction activities. These impacts would include a temporary increase in turbidity and a decrease in dissolved oxygen levels. Adverse impacts to water quality would be reduced by application of BMPs to control the turbidity during dredging of the floatation channel.

The use of barges, other vehicles, and equipment during implementation and monitoring could result in short-term, minor, adverse impacts to water quality due to potential fuel leaks or vehicle fluid leaks. Construction BMPs, in addition to other avoidance and mitigation measures as required by state and federal regulatory agencies, would minimize water quality and hydrology impacts. Appropriate measures, such as provisions for proper disposal and storage of materials and wastes, would also be taken to avoid accidental spillage of fuels or other chemicals and to control runoff into adjacent water bodies. NPDES guidelines for Phase 2 construction activities would be followed during construction, and a site-specific Stormwater Pollution Prevention Plan (SWPPP) would be developed for the project.

Construction in federal jurisdictional waters of the United States requires permits from the USACE as required by Section 404 of the Clean Water Act and/or Sections 9 and 10 of the Rivers and Harbors Act of 1899. Coordination and permitting with the USACE is ongoing and would be completed prior to construction. Additionally, state permits would be obtained as necessary, including Section 401 Water Quality Certification and Section 402 NPDES permits.

Overall, Alternative 4C would result in short-term, minor effects and long-term beneficial effects on hydrology and water quality resulting from the establishment and propagation of SAV and its ability to remove suspended sediments and nutrients from the water column.

Alternative 4A Jean Lafitte Environmental Consequences

Under Alternative 4A, impacts to hydrology and water quality would be similar to those under the Alternative 4C.

No Action Alternative Jean Lafitte Environmental Consequences

Under the No Action Alternative, the proposed placement of riprap material would not occur, and the hydrology of the area would remain unchanged in the short-term. The No Action Alternative would result in fewer short-term, minor, adverse impacts compared to the action alternatives because no restoration and construction activities would occur. However, local subsidence, erosion, and sea level rise would continue, which would result in long-term, major, adverse impacts to both hydrology and water quality within Jean Lafitte and in adjacent waters in the long-term. Under the No Action Alternative, there would be long-term, major, adverse impacts to water quality and erosion.

4.1.4 Noise

Noise is emitted from many sources including airplanes, factories, railroads, power generating plants, and highway vehicles. The Final PDARP/PEIS (Chapter 6) states the primary sources of terrestrial noise in the coastal environment are transportation- and construction-related activities and natural sounds such as wind and wildlife, which is consistent with areas affected by this RP/EA #1.3.

The primary sources of ambient (background) noise in the project areas for this Phase 2 RP/EA #1.3 are recreational boating vessels and natural sounds such as wind and wildlife. The level of noise in the project areas vary, depending on the season, time of day, number and types of noise sources, and distance from the noise source.

4.1.4.1 Rabbit Island Project Noise

Alternative 2A Rabbit Island Environmental Consequences

Noise impacts associated with the alternatives would be mainly from construction activities. The dominant noise sources from construction elements are expected to be dredging, earth-moving and dirt-hauling activities. General construction noise impacts would include short-term, minor, adverse effects. Because the closest human activity to Rabbit Island is over 5 miles away, noise impacts to residential populations would not occur. Minor noise impacts to wildlife, such as colonial waterbirds, could occur; however, construction could be conducted during the nonbreeding season to limit noise impacts to colonial waterbirds. Marine mammals may be temporarily disturbed by the noise and vibrations of the proposed work, but these impacts are of short duration. The use of BMPs, such as monitoring for presence would reduce negative impacts. If marine mammals are observed in the project area, work would temporarily stop until they have left the area. The noise and vibrations would likely cause marine mammals to temporarily leave the area until construction activities have been completed. Therefore, adverse impacts to marine mammals are not anticipated under the Proposed Alternative.

Overall, construction noise impacts are expected to be minimal and of short duration; therefore, impacts to noise would be short-term, minor to negligible, and adverse, and limited to construction activities.

Alternative 2 Rabbit Island Environmental Consequences

Under Alternative 2, noise impacts would be similar to those under Alternative 2A.

No Action Alternative Rabbit Island Environmental Consequences

Under the No Action Alternative, the proposed placement of fill material would not occur, and the impacts to noise would not occur.

4.1.4.2 Jean Lafitte Project Noise

Alternative 4C Jean Lafitte Environmental Consequences

Noise impacts associated with the alternatives would be mainly from construction activities. The dominant noise sources from construction elements are expected to be associated with the dredging of access channels and transport and placement of riprap. General construction noise impacts would include short-term, minor, adverse effects. Because no large population areas are located adjacent to the project area, and only a few residences and vacation homes are nearby, impacts on residential populations associated with construction would be minimal. Minor noise impacts to wildlife could occur.

Overall, construction noise impacts are expected to be minimal and of short duration; therefore, impacts to noise would be short-term, minor to negligible, and adverse, and limited to construction activities.

Alternative 4A Jean Lafitte Environmental Consequences

Under Alternative 4A, noise impacts would be similar or moderately of less duration to those under the Alternative 4C, as impacts would be limited to pile driving and activities associated with moving construction equipment and material.

No Action Alternative Jean Lafitte Environmental Consequences

Under the No Action Alternative, the proposed dredging and placement of riprap would not occur, and the impacts to noise would not occur.

4.2 Biological Environment

Within the biological environment, there are several relevant resources such as vegetative communities, fish and wildlife, EFH, protected species, wetlands, and SAV. Both Rabbit Island and Jean Lafitte have unique biological environments and provide habitat to a variety of species. This section discusses the existing biological environments specific to each project and the potential impacts to these components of the existing biological environment.

4.2.1 Habitats

4.2.1.1 Rabbit Island Project Habitat

Rabbit Island is primarily characterized by low-elevation, emergent salt marshes and tidal pond habitats, which provide habitat for a diversity of plant and animal species. The emergent marshes are of importance to colonial nesting birds such as pelicans, gulls, egrets, and herons. Due to erosion via wave action, winds and severe weather, sea level rise, tidal influence, and influence from the nearby Calcasieu Ship Channel, much of the island's current footprint is open water. A primary goal of the alternatives is to restore elevation to historical contours and create new marsh habitat to provide greater nesting and brood-rearing habitat for brown pelicans and other colonial nesting birds. The island contains no infrastructure, and habitats have not been disturbed by human development. The habitat types currently present on Rabbit Island include emergent marsh, inland tidal ponds, intertidal shell beaches, and surrounding open water; these are described further in the following paragraphs.

Emergent marsh: This habitat type includes low-elevation, saltwater wetlands that are regularly tidally flooded, flat areas dominated by salt-tolerant grasses and few other species. Dominant vegetation species on Rabbit Island interior include smooth cordgrass (*Spartina alterniflora*), saltgrass (*Distichlis spicata*), and saltmeadow cordgrass (*Spartina patens*). Dominant vegetation around the island's perimeter include smooth cordgrass, saltgrass, black needlerush (*Juncus roemerianus*), big cordgrass (*Spartina cynosuroides),* and Jesuit's bark (*Iva frutescens*) (Selman and Davis, 2015). This habitat type is considered an important nursery area for shrimp, crabs, and a variety of fish species and enhances the production of marine organisms in adjacent waters (Holcomb et al., 2015).

Interior Tidal Creeks and Ponds: This habitat type includes open saltwater ponds that are subject to tidal influence. A tidal creek that enters the island from the eastern side allows tidal exchange to multiple interior tidal creeks and ponds (Selman and Davis, 2015). Large tidal ponds, which fluctuate in size based on water levels, are present across the island. These tidal ponds average 1.5 to 2-ft. deep (CPRA, 2017a). The shallow ponds provide habitat for various fish species and aquatic invertebrates. These areas are also important foraging habitat for shorebirds.

Intertidal shell beaches: Some of the intertidal areas around the island's outer rim contain short stretches of beach that are comprised mainly of shell fragments. The intertidal zone is underwater during high tide and exposed to air during low tide. The animals and plants that reside in this zone must cope with being submerged in water and exposed to the air during different times of day. Many species of worms, snails, clams, oysters, and other benthic invertebrates make the intertidal zone their home. The intertidal areas also provide foraging habitat for shorebirds, as well as fish and aquatic invertebrates during periods of inundation.

Open water: Calcasieu Lake, which includes the Calcasieu Ship Channel borrow area and the access route, is a moderate to high salinity estuary (during tidal fluctuations/surge from the Gulf) that provides habitat for various estuarine species. The lake, including the Calcasieu Ship Channel borrow area and access corridor, is also classified as a public oyster seed ground. Substrates around Rabbit Island and the access corridor are suitable mollusk habitat and known to support populations of eastern oyster (*Crassostrea virginica*) and other mollusks such as rangia clam (*Rangia cuneata*) (CPRA, 2017a). Depths in West Cove of Calcasieu Lake are typically under 6-ft., and depths in the ship channel can be up to around 50-ft. (CPRA, 2017b; Selman and Davis, 2015).

Alternative 2A Rabbit Island Environmental Consequences

Alternative 2A would involve placing dredged fill material to create a flat, elevated non-tidal marsh while leaving open certain tidal ponds to the continued influence of tidal ingress and egress. Containment dikes would be installed to contain dredged material. The project team will assess the fill area near the end of construction to determine if containment dike gapping and construction of tidal creeks will be required in strategic locations to combat any ponding on the island interior. The elevated marsh and stability of new habitat would result in short- and long-term, beneficial impacts to colonial waterbird habitat on the island.

Dredge material would be hydraulically pumped from the ship channel to Rabbit Island via a pipeline along Access Route B. Dredging would have adverse impacts on habitats in and adjacent to the dredging areas. Short-term, minor, adverse impacts would occur in the habitats above the Calcasieu Lake bottom as local disturbances from dredging would be minor. Dredging operations are proposed within the Calcasieu Ship Channel, which experiences regular disruption from ship traffic travelling to the Port of Lake Charles. The channel is regularly dredged to maintain necessary water depths; therefore, the use of this area as a borrow source would cause short-term, minor, adverse impacts to habitats. LDWF recommended the selection of Access Route B for construction equipment access and sediment pipeline conveyance based upon necessary vessel water depth and the avoidance of oyster resources. There are limited active oyster reefs present along Access Route B, which limit the potential for direct impacts compared to other potential access routes. Installation of a pipeline along the lake bottom would result in short-term, moderate, adverse impacts to habitats directly in the pipeline path, including oyster habitats. In aquatic habitats above the lake bottom, short-term, minor impacts would result from the use of vehicles and equipment during pipeline implementation. The establishment of construction BMPs, such as restrictions on allowable vessel size, would be implemented to minimize the effects of vessel traffic on oyster habitats. Compliance with permit conditions, establishing construction BMPs, and implementing monitoring programs are required and will minimize adverse effects of Alternative 2A on habitats.

Some tidal ponds and creeks on the east side of the island would be filled to create non-tidal marsh habitat, which would constitute short-term, moderate, adverse impacts to those affected tidal habitats; however, the result of these adverse impacts would be to provide colonial waterbird-nesting habitat. Target fill elevations of 3-ft. and 3.5-ft. are proposed for the project; however, sediments are expected to settle and compact to be at lower elevations. No upland elevations are proposed for project construction; the proposed construction is projected to establish and sustain supratidal wetland habitat conditions, which will consequently restore and enhance critical nesting habitat on the island. USACE has determined that long-term project benefits adequately outweigh the planned wetland habitat alterations. Additionally, some of the tidal habitat on the island would remain; emergent marsh and shallow open water areas are features of this habitat type.

Within and adjacent to the island, there would be short-term, minor, adverse impacts associated with construction activities during fill material placement. The use of boats, construction machinery, and other heavy equipment may result in short-term, minor, adverse impacts to habitats due to localized soil or sediment disturbances and contamination from possible vehicle fuel and fluid leaks. Short-term, minor, adverse impacts may also result during site preparation and staging. The establishment of construction BMPs, specifically the avoidance of construction equipment tracking on emergent vegetation outside of the project area footprint, are intended to minimize tidal marsh habitat impacts related to construction activities. Construction would be timed to avoid pelican nesting or brood-rearing seasons.

Natural revegetation of the filled areas would be planted with the intention of improving habitat substrate stability and provide a variety of nesting substrate options for colonial waterbirds. Increasing the amount of overall land area and improving existing habitats would increase the quantity and quality of colonial waterbird nesting and brood-rearing habitat while reducing habitat susceptibility to relative sea level rise.

Overall, Alternative 2A would have a short- and long-term, beneficial impact on habitats suitable for colonial waterbird nesting and brooding. There would be short-term, minor, adverse impacts on and around the island during site preparation, construction, and fill placement. There would be short-term, moderate, adverse impacts to the tidal habitats that are filled with dredged material. In the Calcasieu Ship Channel borrow area and along the access route, there would be short-term, minor, adverse impacts on aquatic habitats above the lake bottom during conveyance pipeline installation and dredging activities due to construction activities and equipment traffic. There would be short-term, minor, adverse impacts to habitats on the lake bottom in the Calcasieu Ship Channel borrow area and access route due to installation of the conveyance pipeline and dredging activities.

Alternative 2 Rabbit Island Environmental Consequences

Impacts to habitats from Alternative 2 would be similar to those for Alternative 2A, including short-term, minor, adverse impacts during construction; short-term, moderate, adverse impacts associated with dredging and access; and short- and long-term, beneficial impacts to colonial waterbird habitat. However, under Alternative 2, there would be larger areas of the tidal ponds and creeks along the central and southern portion of the island that would be filled to create elevated non-tidal habitat compared to the Alternative 2A.

No Action Alternative Rabbit Island Environmental Consequences

Under the No Action Alternative, colonial waterbird nesting and brood-rearing habitat would not be restored; therefore, there would be no short- and long-term, beneficial impacts to colonial waterbird habitat. There would be no tidal ponds and creeks filled under the No Action Alternative, thus no short-term, moderate adverse impacts to tidal habitats would occur. There would be no short- or long-term, minor to major adverse impacts associated with construction or dredging activities; however, under the No Action Alternative, habitat loss due to erosion and sea level rise would continue, which would result in long-term, major, adverse impacts to all nesting and brooding bird habitat on the island.

4.2.1.2 Jean Lafitte Project Habitat

The Barataria Preserve unit of Jean Lafitte National Historical Park and Preserve is about 26,000 acres in size and contains a remnant bottomland hardwood ridge along a former distributary of the Mississippi River, cypress/tupelo swamps, and large expanses of fresh and intermediate marshes. It is located within the Barataria-Terrebonne National Estuary, one of the most ecologically productive areas in

North America. Lake Salvador and Lake Cataouatche form the Barataria Preserve's western border and are both primary fresh and intermediate waterbodies. While the lakes are distinct water bodies separated by Couba Island, their waters intermingle through their connections via Bayou Bardeaux and Bayou Couba. The project area in its entirety is located along the shorelines of Lake Salvador and Lake Cataouatche (Figure 8).

Marsh habitat in the Jean Lafitte Project area includes low-elevation, regularly tidally flooded, flat areas containing emergent herbaceous (non-woody) vegetation adapted to predominately freshwater conditions. SAV is commonly found along the shoreline where it serves critical ecological functions, including habitat and forage for fish and wildlife. A SAV survey of the Preserve found seven native species: fanwort (*Cabomba caroliniana)*; coontail (*Ceratophyllum demersum)*; water stargrass (*Heteranthera dubia)*; water nymph (*Najas guadalupensis)*; pondweed (*Potamogeton pusillus)*; eelgrass (*Vallisneria americana)*; and horned pondweed (*Zannichellia palustris)*. Three exotic species also were present: Brazilian waterweed (*Egeria densa)*; hydrilla (*Hydrilla verticillata)*; and Eurasian watermilfoil (*Myriophyllum spicatum)* (Poirrier et al, 2010). Contiguous SAV beds reduce erosion on the adjacent marsh shoreline and decrease the resuspension of sediments in the water column by stabilizing the benthic substrate and reducing wave action. Recent field data indicate that SAV presence in the Jean Lafitte Project area is not limited by source SAV populations, water depth, turbidity, salinity, or nutrient availability; however, it has continued to experience a significant decline in species diversity and coverage. In general, the primary drivers for decreasing SAV coverage are exposure to wave energy and increased sediment suspension with exposure to wave energy may be the primary driver. The reduced coverage of these SAV beds has likely created a positive feedback loop where reduced cover has further increased sediment suspension and wave energy, thereby increasing nearshore erosion and diminishing SAV recruitment (LA TIG, 2019).

Additionally, the Davis Pond Freshwater Diversion (DPFD) has altered aquatic habitat in Lake Cataouatche and into the Barataria Basin. Freshwater from the Mississippi River stimulated growth of SAV in the Jean Lafitte Project outfall area. However, beginning in 2008, a combination of natural and anthropogenic influences contributed to a major decline of SAV coverage (Hurricanes Gustav and Ike, DWH oil spill). Water quality changes associated with periods of increased flow and varying operations of the DPFD may include increased turbidity and decreased water clarity beyond the immediate outfall area (Dennison et al., 1993).

Alternative 4C Jean Lafitte Environmental Consequences

Alternative 4C involves placing rock breakwaters along the shorelines of Lake Salvador and Lake Cataouatche to enhance SAV growth and protect the shoreline against erosion. Approximately 125 acres of shallow open water would be protected initially. The rock breakwaters would create protected areas of water parallel to the shoreline that would serve as increased nursery habitat for many fish species and enhance SAV habitat by reducing wave energy. The restored SAV would provide a long-term benefit to critical ecological functions, including habitat and forage for fish and wildlife, decreased wave energy, soil protection, and increased sediment accretion. Protection of the shoreline would diminish the loss of wetlands that provide habitat for current wildlife populations.

Dredging access channels would be required for construction operations. Dredging would have short-term, minor, adverse impacts in the aquatic habitats as local disturbances from dredging equipment would be temporary.

The use of boats, construction machinery, and other heavy equipment may result in short-term, minor, adverse impacts to habitats due to localized soil or sediment disturbances, resulting in turbidity and contamination from possible vehicle fuel and fluid leaks. Short-term, minor, adverse impacts may also result during site preparation and staging. The establishment of construction BMPs would minimize impacts of construction activities on habitats.

Overall, Alternative 4C would have a short- and long-term, beneficial impact on habitats suitable for SAV growth. There would be short-term, minor, adverse impacts during construction and dredging efforts.

Alternative 4A Jean Lafitte Environmental Consequences

Impacts to habitats from Alternative 4A (which consists of utilizing different construction materials for shoreline protection, i.e. Ecobale© or Reefmaker© versus rock breakwaters) would be similar to those for Alternative 4C, including short-term, minor, adverse impacts during construction and short- and long-term, beneficial impacts to SAV habitat.

No Action Alternative Jean Lafitte Environmental Consequences

Under the No Action Alternative, SAV habitat would not be enhanced; therefore, there would be no short- and long-term, beneficial impacts to SAV habitat. There would be no short-term, minor adverse impacts associated with construction or dredging activities; however, under the No Action Alternative, habitat loss due to erosion and relative sea level rise would continue, which would result in long-term, major, adverse impacts to all habitats in the Jean Lafitte Project area.

4.2.2 Wildlife Species

4.2.2.1 Rabbit Island Project Wildlife Species

Rabbit Island is used by a variety of bird species including gulls, herons, night herons, egrets, sandpipers, sparrows, swallows, terns, shorebirds, and waterfowl. The island contains habitats conducive to breeding colonies of pelicans, egrets, gulls, and herons.

Rabbit Island is the only brown pelican nesting island in southwestern Louisiana (Ritenour, 2019). Rabbit Island was used by LDWF to relocate rehabilitated brown pelicans following the DWH oil spill. Additionally, the first successful nesting of American oystercatcher (*Haematopus palliatus*) and reddish egret (*Egretta rufescens*) were reported on Rabbit Island in 2013 (Selman and Davis, 2015).

Wildlife species that are most prevalent on Rabbit Island during the breeding season include brown pelicans, great egret (*Ardea alba*), laughing gull (*Leucophaeus atricilla*), roseate spoonbill (*Platalea ajaja*), tricolored heron (*Egretta tricolor*), snowy egret (*Egretta thula*), reddish egret, and American oystercatcher (Selman and Davis, 2015). Numerous other bird species have been recorded at or in close proximity to Rabbit Island (Table 4) (Cornell, 2019).

Evidence of mammalian predation has never been recorded on Rabbit Island. According to Ritenour (2019), tracks, photographs, or siting of mammalian species, were not recorded during the study period between 2017 and 2018. Therefore, impacts to wildlife are restricted to bird species.

Table 4: Bird Species Observed or Near the Rabbit Island and Jean Lafitte Project Areas

Common Name	Scientific Name	Common Name	Scientific Name
American avocet	*Recurvirostra americana*	little blue heron	*Egretta caerulea*
American oystercatcher	*Haematopus palliatus*	long-billed dowitcher	*Limnodromus scolopaceus*
American white pelican	*Pelecanus erythrorhynchos*	magnificent frigatebird	*Fregata magnificens*
barn swallow	*Hirundo rustica*	mallard	*Anas platyrhynchos*
belted kingfisher	*Megaceryle alcyon*	marsh wren	*Cistothorus palustris*
black skimmer	*Rynchops niger*	mottled duck	*Anas fulvigula*
black tern	*Chlidonias niger*	neotropic cormorant	*Phalacrocorax brasilianus*
black vulture	*Coragyps atratus*	northern harrier	*Circus hudsonius*
black-bellied whistling duck	*Dendrocygna autumnalis*	northern rough-winged swallow	*Stelgidopteryx serripennis*
black-crowned night heron	*Nycticorax*	northern shoveler	*Spatula clypeata*
black-legged kittiwake	*Rissa tridactyla*	osprey	*Pandion haliaetus*
black-necked stilt	*Himantopus mexicanus*	prothonotary warbler	*Protonotaria citrea*
blue-winged teal	*Spatula discors*	purple martin	*Progne subis*
Bonaparte's gull	*Chroicocephalus philadelphia*	reddish egret	*Egretta rufescens*
brown pelican	*Pelecanus occidentalis*	ring-billed gull	*Larus delawarensis*
Caspian tern	*Hydroprogne caspia*	roseate spoonbill	*Platalea ajaja*
cattle egret	*Bubulcus ibis*	royal tern	*Thalasseus maximus*
cliff swallow	*Petrochelidon pyrrhonota*	ruddy turnstone	*Arenaria interpres*
common loon	*Gavia immer*	sanderling	*Calidris alba*
common tern	*Sterna hirundo*	Savannah sparrow	*Passerculus sandwichensis*
double-crested cormorant	*Phalacrocorax auritus*	seaside sparrow	*Ammodramus maritimus*
Dunlin	*Calidris alpina*	semipalmated plover	*Charadrius semipalmatus*
fish crow	*Corvus ossifragus*	snowy egret	*Egretta thula*
Forster's tern	*Sterna forsteri*	sora	*Porzana carolina*
fulvous whistling-duck	*Dendrocygna bicolor*	stilt sandpiper	*Calidris himantopus*
great blue heron	*Ardea herodias*	swamp sparrow	*Melospiza georgiana*
great egret	*Ardea alba*	tree swallow	*Tachycineta bicolor*
greater yellowlegs	*Tringa melanoleuca*	tricolored heron	*Egretta tricolor*
green heron	*Butorides virescens*	turkey vulture	*Cathartes aura*
gull-billed tern	*Gelochelidon nilotica*	western sandpiper	*Calidris mauri*
herring gull	*Larus argentatus*	whimbrel	*Numenius phaeopus*
Killdeer	*Charadrius vociferus*	white-faced ibis	*Plegadis chihi*
laughing gull	*Leucophaeus atricilla*	white-tailed kite	*Elanus leucurus*
least bittern	*Ixobrychus exilis*	willet	*Tringa semipalmata*
least tern	*Sternula antillarum*	yellow-crowned night heron	*Nyctanassa violacea*

(Cornell, 2019)

Alternative 2A Rabbit Island Environmental Consequences

Alternative 2A would restore and/or enhance nesting and brood-rearing habitat for brown pelicans and other colonial nesting colonial waterbirds currently using Rabbit Island, including egrets, gulls, herons, oystercatchers, and spoonbills. Alternative 2A would result in long-term, beneficial impacts to breeding

colonial nesting bird populations of Rabbit Island and the State of Louisiana. Secondary, long-term benefits to overwintering bird populations that forage on the island would also occur.

During construction, birds inhabiting the island would be temporarily displaced, and would need to find other areas to forage and loaf. Short-term, moderate adverse impacts to birds inhabiting the island and brood-rearing habitat would occur during construction.

As identified by LDWF and USFWS, on island construction activities would be accomplished within a distinct time period (September 16th through February 15th) to limit potential conflicts within the annual nesting season. (Royal, 2018b). It is anticipated that the majority of the nesting would be completed prior to initiating construction. However, the contractor would be required to take all precautions to not disturb any remaining nests. Short-term, adverse impacts to birds nesting and brood-rearing is anticipated to be minor during construction.

Overall, Alternative 2A would have short-term, minor to moderate adverse impacts on wildlife species during construction. There would be long-term beneficial impacts to the wildlife habitats following the completion of construction. The contractor would be required to minimize the magnitude and duration of short-term, minor to moderate impacts to wildlife by performing construction tasks during non-nesting seasons and by implementing BMPs to avoid impacts to wildlife.

Alternative 2 Rabbit Island Environmental Consequences

Under Alternative 2, there would be larger areas of the island footprint that would be filled to create elevated bird habitat compared to Alternative 2A; however, impacts to wildlife would be similar to those under Alternative 2A. There would be short-term, minor to moderate impacts on wildlife species during construction, and long-term beneficial impacts to the wildlife habitats following the completion of construction.

No Action Alternative Rabbit Island Environmental Consequences

Under the No Action Alternative, colonial waterbird nesting and brood-rearing habitat would not be restored; therefore, there would be no long-term, beneficial impacts to wildlife. There would be no short- minor to moderate adverse impacts associated with construction; however, under the No Action Alternative, habitat loss due to erosion and relative sea level rise would continue, which would result in long-term, major, adverse impacts to waterbirds that utilize the island.

4.2.2.2 Jean Lafitte Project Wildlife Species

The Jean Lafitte National Historical Park and Preserve supports a diverse wildlife community, such as migratory, wintering, and wading avian species, mammals, insects, amphibians, and reptiles (Table 4).

Over 200 species of birds use the park's waterways and vegetation for foraging, nesting, and resting (NPS, 2015). Open water habitats such as Lakes Salvador and Cataouatche provide wintering and multiple use functions for brown pelicans, seabirds, and other open water residents and migrants (LCWCRTF & WCRA, 1999). White-tailed deer (*Odocoileus virginianus*) are the most commonly reported mammal in the Jean Lafitte National Historical Park and Preserve (Hood, 2006, 2012). However, a multitude of smaller mammals and wildlife species found in the park are listed on the NPSpecies, a web-based database that contains information on species in national park units (NPS, 2019a).

A fundamental responsibility of the NPS is to understand and protect the variety of life the parks support. A comprehensive inventory of wildlife was conducted from 2003 to 2006 and these results are

presented in a document titled *A Summary of Biological Inventories Conducted at Jean Lafitte National Historical Park and Preserve* (NPS, 2010) and an update to the inventory was completed through a resurvey in 2012 (Hood, 2012).

Alternative 4C Jean Lafitte Environmental Consequences

Alternative 4C involves placing rock breakwaters along the shorelines of Lake Salvador and Lake Cataouatche that would create protected waters where SAV cover may be enhanced or restored. Some short-term, minor impacts are expected from construction noise and emissions, increased turbidity, and loss of benthic invertebrates from stone placement and dredging of the access channel. Potential indirect impacts on wildlife from this alternative would be the creation of a lower wave energy environment and the establishment of SAV habitat for fish and invertebrates and protection of marsh habitat for birds, insects, amphibians, reptiles, and mammals. Wildlife is expected to return to the area shortly after construction is completed.

The use of boats, construction machinery, and other heavy equipment may result in short-term, minor, adverse impacts to habitats due to localized soil or sediment disturbances and contamination from possible vehicle fuel and fluid leaks. Short-term, minor, adverse impacts may also result during site preparation and staging. Existing SAV should be avoided to the extent practicable in placement of the breakwater. The establishment of construction BMPs would minimize impacts of construction activities on wildlife.

The installation of rock breakwaters would provide short- and long-term beneficial impacts in protecting shallow open water areas, which would substantially enhance SAV habitat and create a lower wave energy environment for birds, insects, amphibians, reptiles, and mammals.

Overall, the Alternative 4C would have a short- and long-term, beneficial impact on wildlife. There would be short-term, minor, adverse impacts during construction and dredging efforts.

Alternative 4A Jean Lafitte Environmental Consequences

Overall, under Alternative 4A, impacts to wildlife would be similar to those under Alternative 4C. There would be short-term, minor impacts on wildlife species during construction, and short- and long-term beneficial impacts to the wildlife habitats following the completion of construction.

No Action Alternative Jean Lafitte Environmental Consequences

Under the No Action Alternative, SAV habitat would not be restored; therefore, there would be no short- or long-term, beneficial impacts to wildlife. There would be no short-term minor adverse impacts associated with construction; however, under the No Action Alternative, habitat loss due to erosion and relative sea level rise would continue, which would result in long-term, major, adverse impacts to all wildlife that utilize the Jean Lafitte project area.

4.2.3 Marine and Estuarine Fauna, Essential Fish Habitat, and Managed Fish Species

The MSFCA (50 CFR 600) states EFH is “those waters and substrate necessary for fish spawning, breeding, or growth to maturity.” The amendments to the MSFCA set forth a mandate for the National Marine Fisheries Service (NMFS), regional Fishery Management Councils, and other federal agencies to identify and protect EFH of economically important marine and estuarine fish.

4.2.3.1 Rabbit Island Project Marine and Estuarine Fauna, Essential Fish Habitat, and Managed Fish Species

The water bodies and wetlands within and adjacent to the project area provide essential nursery and foraging habitats supportive of a variety of aquatic fauna, including economically important estuarine and saltwater species. Historically, shrimp generate the largest share of this income followed by oysters, Gulf menhaden (*Brevoortia patronus*), and blue crab (*Callinectes sapidus*) (LDWF, 2008). There are also important recreational fisheries for shrimp and crab in the project area, as well as for fish species including red drum *(Sciaenops ocellatus*), spotted seatrout (*Cynoscion nebulosus*), sand seatrout (*Cynoscion arenarius*), black drum (*Pogonias cromis*), sheepshead (*Archosargus probatocephalus*), and southern flounder *(Paralichthys lethostigma*).

The Gulf of Mexico Fishery Management Council (GMFMC) has delineated EFH for various life stages of federally managed species in coastal Louisiana (GMFMC, 2005). At Rabbit Island, EFH has been designated in the estuarine emergent marsh, oyster reef, sand and shell bottom, mud/soft bottom, and open water habitats for shrimp, fish, and sharks (Table 5). Specific federally managed species that are likely to occur in the Rabbit Island project area include brown shrimp (*Farfantepenaeus aztecus*), white shrimp (*Litopenaeus setiferus*), red drum, gray snapper (*Lutjanus griseus*), lane snapper (*Lutjanus synagris*), and bull shark (*Carcharhinus leucas*). In addition to being designated as EFH for federally managed species, the wetlands, water bottom, and water column in the project area provide nursery and foraging habitats for a variety of fish and invertebrate species, some of which serve as prey for other federally managed species. Wetlands in the project area also produce nutrients and detritus, which are important components of the aquatic food web that contributes to the overall productivity of the Calcasieu estuary.

Table 5: Federally Managed Species in the Rabbit Island Project Area

Common Name	Scientific Name
brown shrimp	*Farfantepenaeus aztecus*
white shrimp	*Litopenaeus setiferus*
red drum	*Sciaenops ocellatus*
gray snapper	*Lutjanus griseus*
lane snapper	*Lutjanus synagris*
bull shark	*Carcharhinus leucas*

(NMFS, 2019)

Alternative 2A Rabbit Island Environmental Consequences

Alternative 2A would result in short-term, moderate impacts to marine and estuarine aquatic fauna, crustaceans, mollusks, and other aquatic organisms within the project vicinity. According to the USACE Consultation Under the Magnuson-Stevens Fishery Conservation and Management Act with NMFS, there would be short-term, moderate adverse impacts to a portion (81.48) acres of EFH within the island footprint due to the filling and conversion of some tidal ponds and creeks on the east side of the island to create non-tidal marsh habitat. The result of these adverse impacts would be to provide colonial waterbird-nesting habitat. Target fill elevations of 3-ft. and 3.5-ft. are proposed for the project; however, sediments are expected to settle and compact to be at lower elevations. No upland elevations are proposed for project construction; the proposed construction is projected to establish and sustain supratidal wetland habitat conditions, which will consequently restore and enhance critical nesting habitat on the island. USACE has determined that long-term project benefits adequately outweigh the planned wetland habitat alterations. Additionally, some of the tidal habitat on the island would remain; emergent marsh and shallow open water areas are features of this habitat type. These impacts would be

avoided in the areas not filled, and partially offset through marsh nourishment in Cell 3 (6.34 acres filled to 1.0-ft. NAVD88) and the transitional sloped area (approximately 12.51 acres). There would be long-term, beneficial effects on marine and estuarine aquatic fauna and EFH due to the stabilization of the substrates and habitats, which would reduce erosion.

Dredging operations are proposed within the Calcasieu Ship Channel, which experiences regular disruption from ship traffic travelling to the Port of Lake Charles. The channel is regularly dredged to maintain necessary water depths; therefore, the use of this area as a borrow source would cause short-term, minor, adverse impacts to aquatic fauna, fisheries, and EFH. To minimize the magnitude and duration of impacts to EFH and aquatic fauna, BMPs would be implemented to control erosion and sedimentation due to construction, dredging, and the delivery of dredge material from the Calcasieu Ship Channel. Specifically, the construction equipment and vehicles would avoid tracking on emergent vegetation outside of the fill areas in the project area footprint.

Overall, Alternative 2A would have short-term, minor adverse impacts on marine species and EFH outside of the island footprint during construction. There would be short-term, moderate, adverse impacts to EFH on the island due to filling some inland tidal ponds; however, elevations are expected to settle, and the island is expected to enhance critical nesting habitat on the island. Some of these impacts to EFH would be avoided and minimized in the non-filled areas of the island and partially offset through marsh nourishment which would provide long-term beneficial impacts to EFH in these areas.

Alternative 2 Rabbit Island Environmental Consequences

Overall, under Alternative 2, impacts to marine and estuarine fauna, EFH, and managed fish species would be similar to those under Alternative 2A; however, there would be greater short-term, moderate, adverse impacts associated with the Alternative 2, because a larger area of existing EFH would be filled to non-tidal elevations. There would be short-term, minor, adverse impacts on marine and estuarine aquatic fauna, including EFH, crustaceans, mollusks, and other aquatic organisms, due to construction, dredging, and transport of dredge material.

No Action Alternative Rabbit Island Environmental Consequences

Under the No Action Alternative, no additional adverse or beneficial short-term impacts to aquatic fauna, EFH, or managed fisheries would be expected. The conditions at the project site would remain largely the same. The No Action Alternative would have a long-term, minor to moderate, adverse impact to the existing aquatic habitats at Rabbit Island as those habitats continue to degrade over time due to subsidence and sea level rise.

4.2.3.2 Jean Lafitte Project Marine and Estuarine Fauna, Essential Fish Habitat, and Managed Fish Species

Lake Cataouatche and Lake Salvador are each distinct lakes separated by the land mass of Couba Island; however, their waters intermingle through their connection with Bayou Bardeaux. Lake Salvador is considered an estuary because of its free connection with the Gulf of Mexico and tidal influence. The area incorporates a complex set of aquatic habitats since the waters are primarily fresh, having brackish influence near the southern end of the park. The estuarine habitat allows for a variety of fish. According to the NPSpecies database, sixty fish are reported to be present in the Jean Lafitte National Historical Park and Preserve. These estuarine habitats also provide nursery and foraging habitat for many economically important fishery species (shrimp, Gulf menhaden, Atlantic croaker, striped mullet, blue crab), prey species, as well as shellfish.

Federally managed species with EFH designated for various life stages in the Jean Lafitte project area include brown shrimp, white shrimp, red drum, and shark. Invertebrates including crawfish, crabs, and shrimp form the basis of a complex food web that supports larger wildlife species. Additionally, plankton (phytoplankton and zooplankton) are also present. Continued erosion leads to increasing water depth and decreases habitat value and availability of food and protected nursery areas. SAV found in shallow open water areas provide both a substrate for attracting prey species and a source of shelter for fish and invertebrate species. Open water habitat is estuarine and supports a variety of commercially fished species.

Alternative 4C Jean Lafitte Environmental Consequences

With the implementation of Alternative 4C, and installation of access channels to install the breakwaters, benthic communities located within the access channels in the open water areas would experience short-term, minor adverse impacts. Any benthic species that live on or in the material to be dredged would most likely be adversely impacted during construction. These areas are expected to re-colonize quickly with similar species because abundant similar habitat exists adjacent to the channel site. Due to the lack of escape mobility, some life stages of invertebrate and fish species may also be adversely impacted during access channel material placement; however, these species are common throughout the area and similar shallow water environments exist in abundance. As such, impacts on the overall population of these species from spoil placement activities are expected to be minor. Impacts caused by increases in suspended sediments during dredging and spoil placement are expected to be minor and short-term. To minimize the magnitude and duration of impacts to EFH and aquatic fauna, BMPs, such as silt curtains could be implemented to control turbidity and sedimentation.

Alternative 4C would result in short-term, minor impacts to marine and estuarine aquatic fauna, EFH, crustaceans, mollusks, and other aquatic organisms within the project vicinity during placement of rock breakwaters. The adverse impacts caused by increased suspended sediments during placement of stabilization materials would be short-term and minor. To minimize the magnitude and duration of impacts to EFH and aquatic fauna, BMPs, such as silt curtains could be implemented to control erosion and sedimentation.

Additionally, there would be long-term beneficial impacts to marine and estuarine fauna, EFH, and managed fish species through the installation of the breakwaters. The filtering function created by enhanced or restored SAV would provide a long-term benefit to water quality, which would be beneficial to marine habitat and would create a lower wave energy.

To minimize adverse impacts to EFH and fishery species, rock elbows (fish gaps) would be included in the rock breakwater design. Fish gaps are gaps in the structure that allow the passage of water and estuarine organisms between the lake and the areas behind the breakwaters. The gaps are to be at least 25-ft. wide at the base of the breakwaters and would occur at a minimum of 1,000-ft. intervals.

Overall, Alternative 4C would have short-term, minor impacts on marine species and EFH during construction. There would be long-term, beneficial impacts from the installation of the breakwaters, which would create a lower wave energy environment, and have the potential to enhance or restore SAV.

Alternative 4A Jean Lafitte Environmental Consequences

Under Alternative 4A, impacts to marine and estuarine fauna, EFH, and managed fish species would be similar to those under Alternative 4C; however greater short-term impacts could occur for Alternative

4A compared to Alternative 4C due to required pile driving activities. There would be short-term, minor impacts on species during construction, and short- and long-term beneficial impacts following the completion of construction.

No Action Alternative Jean Lafitte Environmental Consequences

Under the No Action Alternative, efforts to enhance or restore SAV habitat would not occur; therefore, there would be no long-term, beneficial impacts to marine and estuarine fauna, EFH, and managed fish species. There would be no short-term, minor, adverse impacts associated with construction; however, under the No Action Alternative, habitat loss due to erosion and relative sea level rise would continue, which would result in long-term, moderate, adverse impacts to all marine and estuarine fauna, EFH, and managed fish species.

4.2.4 Protected Species

Protected species include wildlife and plant species that have regulatory protections that prevent the harm or harassment of these species. The ESA of 1973 (16 USC §1531-1543) protects all federally listed threatened and endangered species and designated critical habitat of such species occurring both in the United States and abroad. Section 7 of the ESA requires that federal agencies ensure that any action authorized, funded, or carried out by an agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat. The U.S. Fish and Wildlife Service (USFWS) and NMFS are the primary regulatory agencies responsible for ESA compliance. Additionally, protected species also include marine mammals that are protected under the Marine Mammal Protection Act (MMPA) and migratory birds that are protected under the Migratory Bird Treaty Act (MBTA). The LDWF Natural Heritage Program (LNHP) maintains a database with the known locations of federally listed threatened and endangered species as well as a list of state species of special concern.

4.2.4.1 Rabbit Island Project Protected Species

A list of federally threatened and endangered species and other protected species with the potential to occur within the project areas was developed based on information from NOAA and USFWS. According to that list, species with the potential to occur within the Rabbit Island Project area include green sea turtle, hawksbill sea turtle, Kemp's Ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, bottlenose dolphin, West Indian manatee, piping plover, pallid sturgeon, and red knot. The project area is outside of the range of Gulf sturgeon.

Alternative 2A Rabbit Island Environmental Consequences

Alternative 2A consists of placing fill materials within open water and inter-tidal areas. It is not anticipated that Alternative 2A would impact suitable habitat or foraging habitat for the piping plover or red knot because there is little to no habitat or foraging habitat in this area; therefore, no impacts are expected to occur.

Suitable nesting habitat does not occur for sea turtles on Rabbit Island; however, these species could be present in the waters adjacent to Rabbit Island and within the access and borrow areas. Alternative 2A could result in potential impacts to green sea turtles, Kemp's Ridley sea turtles, loggerhead sea turtles, and West Indian manatees. Potential indirect effects to protected aquatic species include temporary, localized impacts to water quality due to construction activities, which could affect the adjacent waters. Pollution prevention plans including silt curtains would be prepared in conjunction with the NPDES

permitting process prior to construction of Alternative 2A. These plans would include all specifications and BMPs necessary for control of erosion and sedimentation during construction.

The implementation of BMPs for in-water work would minimize the potential for impacts to sea turtles, West Indian manatee, and bottlenose dolphin. The BMPs include measures from the NMFS's *Sea Turtle and Smalltooth Sawfish Construction Condition*s (2006), *Measures for Reducing Entrapment Risk to Protected Species* (2012), *Vessel Strike Avoidance Measures and Reporting for Mariners* (2008), and *USACE's Standard Manatee Conditions for In-Water Work* (2011). Additionally, construction BMPs and other avoidance and mitigation measures required by state and federal regulatory agencies would minimize water quality impacts that could affect aquatic habitat and are described in the following sections.

The implementing trustee would implement and enforce the Standard Manatee Conditions BMPs, as listed in the biological evaluation forms to avoid and minimize impacts to manatees. If marine mammals are observed in the project area, work would temporarily stop until they have left the area. Marine mammals may be temporarily disturbed by the noise and vibrations of the proposed work, but these impacts are of short duration, and BMPs would be implemented to mitigate these effects. The noise and vibrations would likely cause marine mammals to temporarily leave the area until construction activities have been completed. Therefore, adverse impacts to marine mammals are not anticipated under the Proposed Alternative. The construction BMPs, in addition to other avoidance and mitigation measures as required by state and federal regulatory agencies, would minimize water quality impacts that could affect aquatic habitat.

During dredging, monitoring for marine mammals would be conducted on either side of the barge. Specifically: (a) If dolphins come within 50-ft. of active dredging and are not just traveling through the area (e.g. remaining within 50-ft. to forage), dredge operations should not start, or, if dredging has already begun, they should cease until the dolphins are beyond and are not likely to re-enter (i.e., are on a dedicated path away from the 50-ft. area). This is to avoid physical harm from dredge equipment. (b) To avoid perceived physical barriers to dolphins, avoid trans-versing waterbodies with any floating pipelines from the dredge activities. With the implementation of these BMPs, adverse impacts to marine mammals are not anticipated under Alternative 2A.

ESA consultations with NMFS and USFWS for this project have been initiated. More detail about compliance status is included in Section 5.3 of this report. If species protected under the ESA are encountered in the Rabbit Island Project area, further consultation with USFWS would be necessary. Any avoidance or conservation measures recommended would be evaluated and incorporated into the final design. All required agency consultations would be completed prior to alternative implementation.

Alternative 2 Rabbit Island Environmental Consequences

Under Alternative 2 similar to Alternative 2A, minimal impacts to protected species could occur as described above.

No Action Alternative Rabbit Island Environmental Consequences

Under the No Action Alternative, no impacts to protected species would occur because no actions would take place that may cause impacts to protected species.

4.2.4.2 Jean Lafitte Project Protected Species

According to the listing of threatened, endangered, and candidate species by USFWS, Jefferson Parish provides habitat for the following protected species: West Indian manatee, piping plover, red knot, Atlantic sturgeon, green sea turtle, Kemp's Ridley sea turtle, and loggerhead sea turtle. Observation of dolphins in the Jean Lafitte Project area is rare, and the presence of sea turtles is rare given water salinity and distance from Gulf waters. This project is not expected to affect dolphins or sea turtles. Jean Lafitte is outside the range of Gulf sturgeon. However, the potential for manatees to enter the Jean Lafitte Project area is possible. No critical habitat for threatened or endangered species was identified in the Jean Lafitte Project area.

Alternative 4C Jean Lafitte Environmental Consequences

Alternative 4C is not anticipated to have any adverse impacts on protected species, as there are no known species or suitable habitat for any protected species in the Jean Lafitte Project area. Sightings of manatees in northern Barataria Basin are extremely rare, but the possibility still exists that manatees could visit the project area during construction activities. Foraging habitat for visiting bird species and manatees may be briefly affected in a localized area, but impacts would be minor.

The implementation of BMPs for in-water work would minimize the potential for impacts to the West Indian manatee. BMPs include measures from the *USACE's Standard Manatee Conditions for In-Water Work* (2011). Additionally, construction BMPs and other avoidance and mitigation measures required by state and federal regulatory agencies would minimize water quality impacts that could affect aquatic species and habitats.

ESA consultation with USFWS is in progress for this project. No consultation with NMFS was needed as the project was determined to have no effect on ESA-listed species or habitat under NMFS' jurisdiction. More detail about compliance status is included in Section 5.3 of this report.

The rock breakwaters would provide long-term benefits, such as foraging places for fish, loafing areas for pelicans, and increased SAV habitat provides fish nursery habitat.

Alternative 4A Jean Lafitte Environmental Consequences

Under Alternative 4A, and similar to Alternative 4C no impacts to protected species would occur because suitable habitat for these species does not exist within the Jean Lafitte Project area.

No Action Alternative Jean Lafitte Environmental Consequences

Under the No Action Alternative, and similar to the action alternatives, no impacts to protected species would occur because suitable habitat for these species does not exist within the Jean Lafitte Project area.

4.3 Socioeconomics and Environmental Justice

Since the Rabbit Island and Jean Lafitte projects are located in secluded areas, direct impacts to populations are minimal; however, both projects have the potential to affect infrastructure, aesthetic and visual resources, public health and safety, economic activities, cultural resources, tourism and recreation, fisheries and aquaculture, and land and marine management, which are all considered to be relevant human resources.

4.3.1 Infrastructure

4.3.1.1 Rabbit Island Project Infrastructure

A magnetometer survey was performed in 2011. Royal Engineers reviewed this survey in 2017 and indicated that it did not show any significant anomalies that fall in a linear pattern, which would be indicative of a pipeline (Royal, 2018b). To supplement this effort, Morris P. Hebert, Inc. (MPH) conducted a magnetometer survey around the perimeter of Rabbit Island, consisting of 3 transects, each at 50-ft. offsets. Additionally, magnetometer data was collected along the proposed access corridors from Rabbit Island to the Calcasieu Ship Channel and in the proposed borrow area within the Calcasieu Ship Channel. No pipelines were found in the Rabbit Island Project area.

Existing pipelines within the vicinity of the project were identified using the National Pipeline Mapping System Public Viewer and Strategic Online Natural Resources Information System (SONRIS). Three active natural gas pipelines were found. Two of these are approximately 1.25 miles north of Rabbit Island operated by National Gas Pipeline Company of America, LLC and one is approximately 0.1 miles north of Rabbit Island operated by Columbia Gulf Transmission, LLC. All three pipelines run in a general northeast-southwest direction, north of Rabbit Island, crossing the Calcasieu Ship Channel near River Mile 7, north of the delineated borrow area. These pipelines are not anticipated to be affected by any of the proposed actions.

A review of the SONRIS database indicates there are oil and gas wells in the vicinity of Rabbit Island; however, they all are plugged and abandoned (LDNR, 2018).

All Alternatives Rabbit Island Environmental Consequences

For the Alternative 2A, Alternative 2, and the No Action Alternative, no adverse impacts to the existing infrastructure are anticipated because construction is not expected to cross any of these features.

4.3.1.2 Jean Lafitte Project Infrastructure

A review of the SONRIS database indicated there are several oil and gas wells and natural gas pipelines within the Jean Lafitte Project area. A Shell pipeline runs adjacent to the shore near the northern breakwater area, and a Bridgeline Holdings pipeline crosses the area near the center of the northern breakwater area. A Gulf South Pipeline crosses the southern breakwater area, near the southern section of the breakwaters. Other pipelines in the project vicinity include: Helis Oil & Gas Pipeline, Koch Gateway Pipeline Co., and Azimuth Energy LLC.

The Jean Lafitte Project provides fish gaps and open access for canal openings and gas pipeline ROWs where needed to avoid long-term impacts to the existing infrastructure. To minimize any potential impacts to the infrastructure near the project during construction, the contractor is required to notify pipeline and utility operators three working days prior to any work at the site. All pipelines and underground utilities shall be field located and marked by the contractor prior to mobilization.

Alternative 4C, Alternative 4A, and No Action Alternative Jean Lafitte Environmental Consequences

For Alternative 4C, Alternative 4A, and the No Action Alternative, no adverse impacts to the existing infrastructure are anticipated because the Jean Lafitte Project is not expected to be built on any of these features.

4.3.2 Aesthetics and Visual Resources

4.3.2.1 Rabbit Island Project Aesthetics and Visual Resources

The Rabbit Island Project area is located entirely within Cameron Parish, which is located in the southwest corner of Louisiana. Cameron Parish is the largest geographic parish in Louisiana with 1,285 square miles of land and 652 square miles of water (CPRA, 2017). Most of Rabbit Island's remaining 200 acres are either open water or tidal wetlands that are at or slightly above sea level. This low elevation is subject to frequent inundation due to impacts by wind-driven waves and tidal effects propagating through the Calcasieu Ship Channel; therefore, the island no longer provides the critical colonial-nesting waterbird habitat it once did (Royal, 2018b). The area remains relatively natural and scenic. Viewsheds to the project site are offered only from aircraft and boat. All Rabbit Island Project design alternatives would involve elevating the existing island, and enhancing the island's waterbird habitat, allowing for more nesting habitat, which would restore the visual and aesthetic look of the island.

Alternative 2A Rabbit Island Environmental Consequences

Alternative 2A would cause long-term beneficial visual impacts, as fill material would be added to the island, increasing the elevations. Additionally, the Alternative 2A would result in long-term, beneficial impacts to aesthetics and visual resources as it would enhance the island's waterbird habitat, allowing for more nesting on the island; thereby, enhancing the natural aesthetics and visual resources of the area. Short-term, minor, adverse impacts to the aesthetics and visual resources of the island may occur during construction due to equipment and materials on and around the island.

Alternative 2 Rabbit Island Environmental Consequences

Impacts to aesthetic and visual resources for the Alternative 2 would be similar to those for Alternative 2A, including long-term, beneficial impacts and short-term, minor, adverse impacts due to construction equipment and materials.

No Action Alternative Rabbit Island Environmental Consequences

Under the No Action Alternative, colonial waterbird nesting and brood-rearing habitat would not be restored; therefore, there would be no long-term, beneficial impacts to aesthetic and visual resources. However, under the No Action Alternative, loss of land due to erosion and relative sea level rise would continue, which would result in long-term, moderate, adverse impacts to the aesthetics and viewshed of the island.

4.3.2.2 Jean Lafitte Project Aesthetics and Visual Resources

The Jean Lafitte Project area is located entirely within Jefferson Parish, within the Barataria Preserve unit of the Jean Lafitte National Historical Park and Preserve. The Jean Lafitte National Historical Park and Preserve includes an abundance of water and landscape types, terrain, and habitat. The area remains relatively natural and scenic. Viewsheds to the project site are offered only from aircraft and boat.

Structures currently exist within project area, and the proposed project would connect to these existing structures. At Lake Cataouatche, the northern rock breakwater extends from Bayou Verret to Bayou Bardeaux near Couba Island. South of Couba Island, a pre-existing riprap shoreline protection project was constructed. The southern rock breakwater would tie into the southernmost end of the existing rock breakwater to form continuous protection along the shoreline of Lake Salvador from Couba Island to Bonne Island.

Alternative 4C Jean Lafitte Environmental Consequences

Alternative 4C would cause long-term, adverse visual impacts, as proposed rock breakwaters would be constructed along the shoreline; however, the impacts would be minor because existing structures already affect the aesthetics of the area. Short-term, minor, adverse impacts to the aesthetics and visual resources of the project area may occur during construction due to equipment and materials in and around the project area.

Alternative 4A Jean Lafitte Environmental Consequences

Impacts to aesthetic and visual resources for the Alternative 4A would be similar to those for Alternative 4C, including long-term, minor adverse impacts and short-term, minor, adverse impacts due to construction equipment and materials.

No Action Alternative Jean Lafitte Environmental Consequences

Under the No Action Alternative, the Jean Lafitte Project would not be implemented; therefore, there would be no impacts to aesthetic and visual resources. However, under the No Action Alternative, loss of land due to erosion and relative sea level rise would continue, which would result in long-term, moderate, adverse impacts to the visual resources of the shoreline.

4.3.3 Public Health and Safety

Public health and safety considered in this EA include the health and safety of the general public, including boaters and that of the personnel involved in activities related to the construction of the proposed projects.

4.3.3.1 Rabbit Island Project Public Health and Safety

The Rabbit Island Project alternatives propose to elevate part of the existing island footprint. Coastal islands act as a buffer to reduce the effects of wave action, saltwater intrusion, storm surge, and tidal current. The Rabbit Island Project area does not represent disproportionately high and adverse environmental health or safety risks to children in the United States. Implementation of this project would not increase shoreline erosion or create other health and safety concerns.

Alternative 2A Rabbit Island Environmental Consequences

Alternative 2A involves the use of marine vessels as well as heavy construction equipment. This equipment would follow the navigational safety measures to ensure public safety during all construction operations. BMPs such as developing a SWPPP and implementing warning signs would minimize the possibility of impacts to public health and safety. Given these measures, no short or long-term adverse effects to public health and safety are anticipated from Alternative 2A.

Alternative 2A would elevate the existing island and act as a buffer to reduce the effects of wave action, saltwater intrusion, storm surge, and tidal current; therefore, Alternative 2A would result in long-term, beneficial impacts to public health and safety through the maintenance and enhancement of Rabbit Island. Additionally, the elimination of stagnant water on the island could potentially reduce available mosquito breeding habitat, which could potentially benefit public health.

Alternative 2 Rabbit Island Environmental Consequences

Impacts to public health and safety for Alternative 2 would be similar to those for Alternative 2A, including long-term, beneficial impacts.

No Action Alternative Rabbit Island Environmental Consequences

Under the No Action Alternative, construction activities involving the use of marine vessels and heavy construction equipment would not be used; therefore, there would be no adverse impacts to safety. The long-term, beneficial impacts to public health and safety from the buffer action of elevating Rabbit Island would not be realized if Rabbit Island is not restored.

4.3.3.2 Jean Lafitte Project Public Health and Safety

The alternatives propose to protect the shoreline along Lake Salvador and Lake Cataouatche. Breakwaters act as a buffer to reduce the effects of wave action, thereby reducing coastal erosion. The Jean Lafitte Project area does not represent disproportionately high and adverse environmental health or safety risks to children in the United States. Implementation of the Jean Lafitte Project would not increase shoreline erosion or create other health and safety concerns.

Alternative 4C Jean Lafitte Environmental Consequences

Alternative 4C involves the use of marine vessels as well as heavy construction equipment. This equipment would follow the navigational safety measures to ensure public safety during all construction operations. BMPs such as developing a SWPPP and installing warning signs would minimize the possibility of impacts to public health and safety during construction. Post construction, the rock breakwaters pose navigational hazards; however, the Jean Lafitte Project would include permanent warning signs, in compliance with United States Coast Guard (USCG) regulations. Additionally, the breakwaters are to be constructed with gaps every 1,000-ft. to provide access behind the breakwater. Given these measures, no short or long-term, adverse effects to public health and safety are anticipated from Alternative 4C.

Additionally, Alternative 4C proposes breakwaters along the shoreline to act as a buffer to reduce the effects of wave action; therefore, Alternative 4C would result in long-term, beneficial impacts to public health and safety through the maintenance and enhancement of the shoreline.

Alternative 4A Jean Lafitte Environmental Consequences

Impacts to public health and safety for Alternative 4A would be similar to those for Alternative 4C, including long-term, beneficial impacts.

No Action Alternative Jean Lafitte Environmental Consequences

Under the No Action Alternative, breakwaters would not be installed, and erosion would continue; therefore, there would be no long-term, beneficial impacts to public health and safety.

4.3.4 Socioeconomics and Environmental Justice

The intent of an environmental justice evaluation under EO 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations, is to identify communities and groups that meet environmental justice criteria and suggest strategies to reduce potential adverse impacts of projects on affected groups. The purpose of EO 12898 is to identify and address the disproportionate placement of adverse environmental, economic, social, or health impacts from federal actions and policies on minority and/or low-income communities. This order requires lead agencies to evaluate impacts on minority or low-income populations during preparation of environmental and socioeconomic analyses of projects or programs that are proposed, funded, or licensed by federal agencies.

4.3.4.1 Rabbit Island Project Socioeconomics and Environmental Justice

The Rabbit Island Project area is a salt marsh island located within Calcasieu Lake in Cameron Parish. The island is uninhabited by people and would remain so under all alternatives. Therefore, none of the alternatives would impact minority communities or low-income populations as defined by EO 12898 criteria.

Alternative 2A Rabbit Island Environmental Consequences

Alternative 2A would result in construction activities, which could result in short-term increase in the demand for employment. Additionally, Alternative 2A would result in construction contracts and the associated purchase of materials, supplies, and fuel, as well as the purchase of meals, incidentals, and lodging in the surrounding areas for the duration of construction. While some short-term closures to localized areas could occur during project construction, none of these are anticipated where minority or low-income populations reside.

Overall, Alternative 2A would cause short-term, beneficial impacts to the economy in the area by boosting employment and increasing revenue associated with the construction activities.

Alternative 2 Rabbit Island Environmental Consequences

Impacts to socioeconomics and environmental justice would be similar to those for the Alternative 2A.

No Action Alternative Rabbit Island Environmental Consequences

There would be no impacts to socioeconomics and environmental justice from the No Action Alternative.

4.3.4.2 Jean Lafitte Project Socioeconomics and Environmental Justice

The Jean Lafitte Project area is in Lake Cataouatche and Lake Salvador, within the preserve boundary of the Jean Lafitte National Historical Park and Preserve, and not near any significant human populations. NPS currently manages the area, and the area is expected to remain a preserve into the foreseeable future.

Alternative 4C Jean Lafitte Environmental Consequences

Alternative 4C would result in construction activities, which could result in short-term increase in the demand for employment. Additionally, Alternative 4C would result in construction contracts and the associated purchase of materials, supplies, and fuel, as well as the purchase of meals, incidentals, and lodging in the surrounding areas for the duration of construction. While some short-term closures to localized areas could occur during project construction, none of these are anticipated where minority or low-income populations reside. Therefore, Alternative 4C would not create a disproportionately high and adverse effect on minority or low-income populations, as it aims to provide habitat benefits to uninhabited areas.

Overall, Alternative 4C would cause short-term, beneficial impacts to the economy in the area by boosting employment and increasing revenue associated with the construction activities.

Alternative 4A Jean Lafitte Environmental Consequences

Impacts to socioeconomics and environmental justice would be similar to those for the Alternative 4C.

No Action Alternative Jean Lafitte Environmental Consequences

There would be no impacts to socioeconomics and environmental justice for the No Action Alternative.

4.3.5 Cultural Resources

Historical properties and archaeological sites are physical resources that also represent cultural values and human history. These may include pioneer homes, buildings, or old roads; structures with unique architecture; prehistoric village sites; historical or prehistoric artifacts or objects; rock inscription; human burial sites; or earthworks such as battlefield entrenchments, prehistoric canals, or mounds.

As stated in the Final PDARP/PEIS, all projects implemented under subsequent restoration plans and tiered NEPA analyses consistent with the Final PDARP/PEIS would secure all necessary state and federal permits, authorizations, consultations, or other regulatory processes and ensure the project is in accordance with all applicable laws and regulations, including those concerning the protection of cultural and historical resources (DWH Trustees, 2016a).

4.3.5.1 Rabbit Island Project Cultural Resources

A cultural resources investigation was performed for the Rabbit Island Project site, which included an aerial evaluation and literature and records review of historic documents and surveys. Data collected from the Louisiana Division of Archaeology and Historic Preservation (LDAHP) indicated no sensitive features to be known on Rabbit Island. There are no anticipated effects to any sites listed in the National Register of Historic Places and no direct effects anticipated on any of the Indigenous Tribes (ELOS, 2018a).

Additionally, a cultural resource investigation was completed near the potential borrow area which included an underwater archaeologic survey, analysis of remote sensing data, and reporting findings. The survey utilized magnetometer, sidescan sonar, and sub-bottom profiler to locate a total of 129 magnetic anomalies, 35 sidescan sonar or acoustic contacts, and 24 sub-bottom impedance contrast features. A total of 22 anomalies and targets of varying kinds were identified throughout the Rabbit Island Project area as having the potential to represent historic submerged cultural resources. Avoidance measures were recommended, which includes 40-ft. avoidance buffers originating from coordinates either centered directly on the anomaly or from a set of coordinates at the center of the target in the case of clustered anomalies (ELOS, 2018b).

Cultural resources were further analyzed in July 2019, with particular emphasis on one linear set of anomalies. As a result of these analyses, the target was not indicative of a submerged cultural resource. Rather, the single linear object ensonified in the acoustic record was a modern metal pipe, perhaps discarded during previous dredging actions within the Calcasieu Ship Channel or lost from a passing barge. This target does not constitute a historic property (36 CFR 800.4[c]), and a determination of “No historic properties affected” (36 CFR 800.4[d]) was recommended and concurrence with this recommendation is being sought from the Louisiana State Historic Preservation Office (SHPO) (Goodwin, 2019).

Alternative 2A Rabbit Island Environmental Consequences

Alternative 2A includes island construction and sediment and ground disturbance, which could impact cultural resources on the island; however, no evidence of cultural resources on and near Rabbit Island exists. Thus, potential impacts to cultural resources on Rabbit Island are not anticipated. Alternative 2A would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historical resources.

Alternative 2 Rabbit Island Environmental Consequences

Impacts to cultural resources would be similar to those for Alternative 2A.

No Action Alternative Rabbit Island Environmental Consequences
There is no evidence of cultural resources on or near Rabbit Island; thus, no impacts to cultural resources are expected to occur for the No Action Alternative.

4.3.5.2 Jean Lafitte Project Cultural Resources

Archeological investigations in the Jean Lafitte National Historical Park and Preserve have documented the continuous span of human occupation within Louisiana's Mississippi Delta region from the Tchefuncte period (600–200 B.C.) to modern times. More than 80 prehistoric archeological sites have been discovered within the park boundary, ranging from the earliest Tchefuncte, through the Marksville, Troyville, Coles Creek, Plaquemine, and Mississippian periods. The park also contains prehistoric Native American archeological sites, including Chenier Grand Coquille (Site 16JE46), a large midden complex on the shore of Lake Salvador.

Alternative 4C Jean Lafitte Environmental Consequences
This project is located in a culturally and archaeologically rich area and will serve to protect the Lake Salvador large midden complex by minimizing the shoreline erosion that is occurring there now.

Consultations pursuant to Section 106 of the National Historic Preservation Act with SHPO are currently in progress. NPS continues to work with the SHPO to determine the potential for adverse impacts to cultural resources from implementation of Alternative 4C. Any mitigation arising from consultation would be adhered to. Consultation with federally recognized American Indian tribes that have indicated an interest in the project would continue in accordance with Section 106 and EO 13175. Alternative 4C would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historical resources.

Through that process, NPS will survey to identify the specific location of one small midden site. Depending on the location of the site, NPS will either place rock on all or part of the site to cover the midden or leave it outside of the project area. Both scenarios would result in long-term, minor adverse effects. In the former scenario, the impacts would be slightly less as the midden would be protected from erosion by the placement of rock on top of it. In the latter scenario, the project would have the same impacts as the No Action Alternative, and it would slowly erode from wave impacts and sea level rise. All the alternatives, including no action, result in long-term, minor adverse effects to cultural resources.

Alternative 4A Jean Lafitte Environmental Consequences
Impacts to cultural resources would be similar to those for Alternative 4C.

No Action Alternative Jean Lafitte Environmental Consequences
There would be no erosion protection measures constructed along the shoreline, thus no impacts to cultural resources from construction would occur from the No Action Alternative; however, the shoreline would continue to erode, which has the potential to degrade cultural resources and cause long-term, adverse impacts to cultural resources.

4.3.6 Tourism and Recreational Resources

4.3.6.1 Rabbit Island Project Tourism and Recreational Resources

The Rabbit Island Project is located on a coastal island uninhabited by people. Visitors may reach the waters adjacent to the island by private or charter boats, which offer opportunities to fish, birdwatch, and sightsee.

Alternative 2A Rabbit Island Environmental Consequences

Because visitors are not permitted on the island, there would be no adverse effects to tourism and recreational use. Construction activities may temporarily discourage boaters from visiting the area, resulting in short-term, minor adverse impacts; however, Alternative 2A would result in long-term, beneficial impacts on tourism and recreational resources by restoring bird habitat for recreational bird watching activities.

Alternative 2 Rabbit Island Environmental Consequences

Impacts to tourism and recreational resources would be similar to those for Alternative 2A.

No Action Alternative Rabbit Island Environmental Consequences

No impacts to tourism and recreational resources are expected to occur under the No Action Alternative.

4.3.6.2 Jean Lafitte Project Tourism and Recreational Resources

The resources and surrounding natural landscapes of the Jean Lafitte National Historical Park and Preserve provide significant opportunities for public recreational use. More than 10 miles of walking trails provide park visitors with an avenue to explore forests, swamps, and marshes. Nine miles of trails plus an additional 40 miles of natural bayous, canals, and waterways are available for recreational boating and fishing. Ranger-guided walks, canoe trips, summer camps, and environmental education programs are available, along with interpretive exhibits at the visitor center on hunting, trapping, fishing, and regional ways of life.

The Jean Lafitte Project is located on a coastal shoreline uninhabited by people. Visitors may reach Lake Salvador and Lake Cataouatche by private or charter boats, which offer opportunities to fish, birdwatch, and sightsee. The only significant recreational use of the lake is for fishing from small boats. The lakeshore project area is shallow and turbid. Recreational fishing boats typically do not approach any nearer than casting distance to the shore. The shoreline does not have a dock and there is nowhere to walk on the shoreline.

Most construction activities would not occur near navigable waterways except for the farthest southern end near Isle Bonne. The breakwater to be tied into the shoreline would encroach a short distance into the canal area but would not impede navigation. The breakwaters would include permanent warning signs spaced every 1,000-ft. to aid boaters away from the breakwaters.

Alternative 4C Jean Lafitte Environmental Consequences

Though not the primary goal, Alternative 4C would enhance recreational fishing. Construction activities may temporarily discourage boaters from visiting the area, resulting in short-term, minor adverse impacts; however, the Alternative 4C would result in long-term, beneficial impacts on tourism and recreational resources by restoring SAV and fish habitat.

Alternative 4A Jean Lafitte Environmental Consequences
Impacts to tourism and recreational resources would be similar to those for Alternative 4C.

No Action Alternative Jean Lafitte Environmental Consequences
Under the No Action Alternative, the project would not be implemented, and there would be no action taken to control the erosion along the shoreline of Lake Salvador and Lake Cataouatche; thus, there would be no long-term beneficial impacts or short-term, minor adverse impacts. The shoreline would continue to erode and cause long-term, major adverse impacts to tourism and recreational resources, as land loss would continue.

4.3.7 Fisheries and Aquaculture

4.3.7.1 Rabbit Island Project Fisheries and Aquaculture

The area surrounding Rabbit Island is open to recreational and commercial fishing and contains public oyster seed ground. A Biological Oyster Assessment was conducted in September 2017. The area surveyed included waterbottoms within a 1,500-ft. radius of the project footprint and within 500-ft. of either side of the proposed access route centerlines. “Direct impact areas” included 75-ft. on each side of the route centerline. The assessment determined that approximately 336 acres of public oyster seed ground is located within the direct impact area and approximately 1,000 acres of oyster seed ground is located outside of the direct impact area.

Alternative 2A Rabbit Island Environmental Consequences
Existing oyster seed ground was identified near Rabbit Island and in the proposed borrow area and access channels. Alternative 2A would result in short-term, minor adverse impacts to oysters due to the increase in traffic within the access corridor. The access channel placement was coordinated with LDWF to minimize impacts to existing oyster resources. The contractor would be required to avoid any additional impacts to oyster resources during construction. Additionally, Alternative 2A would result in short-term, minor adverse impacts to fisheries and aquaculture during construction by restricting recreational fishing from the area where these activities are taking place.

Such impacts would be minimized through the use of BMPs. These would include practices necessary for control of erosion and sedimentation due to construction, dredging, and the delivery of dredge material from the Calcasieu Ship Channel, thereby protecting fisheries and aquaculture. Additionally, heavy equipment would be moved across oyster seed ground only at high tide. Any damage to oyster seed grounds caused by construction activities would be noted, and all stipulations and procedures outlined in the applicable permits would be followed accordingly.

Overall, Alternative 2A would result in short-term, minor adverse impacts to fisheries and aquaculture.

Alternative 2 Rabbit Island Environmental Consequences
Under Alternative 2, impacts to fisheries and aquaculture would be similar to those under Alternative 2A, including the short-term, minor, adverse impacts to fisheries and aquaculture during construction.

No Action Alternative Rabbit Island Environmental Consequences
Under the No Action Alternative, no changes to the island would occur; thus, there would be no impacts to fisheries and aquaculture.

4.3.7.2 Jean Lafitte Project Fisheries and Aquaculture

A review of the SONRIS database indicates there are no oyster seed grounds or oyster leases in the Jean Lafitte Project area. Lake Salvador and Lake Cataouatche are both open to recreational fishing within the boundary of the park.

Alternative 4C Jean Lafitte Environmental Consequences

Construction activities would cause short-term, minor, adverse impacts to fisheries and aquaculture, by restricting recreational fishing from the area where these activities are taking place. However, restored SAV would provide long-term benefits to fisheries and aquaculture by creating fish habitat and nurseries for many fish species; thus, potentially improving the opportunity for recreational fishing. To minimize the magnitude and duration of impacts to fisheries and aquaculture, BMPs could be implemented. These would include BMPs necessary for control of erosion and sedimentation due to construction, dredging, and the placement of riprap, thereby protecting fisheries and aquaculture.

Overall, Alternative 4C would cause short-term, minor, adverse impacts to fisheries and aquaculture.

Alternative 4A Jean Lafitte Environmental Consequences

Under Alternative 4A, impacts to fisheries and aquaculture would be similar to those under Alternative 4C, including the short-term, minor, adverse impacts to fisheries and aquaculture during construction, and long-term, beneficial impacts following construction.

No Action Alternative Jean Lafitte Environmental Consequences

Under the No Action Alternative, the project would not be implemented, and there would be no action taken to control the erosion along the shoreline of Lake Salvador and Lake Cataouatche and restore SAV habitat; thus, there would be no long-term beneficial impacts or short-term, adverse impacts to fisheries and aquaculture. The shoreline would continue to erode and SAV habitat would continue to degrade, which would cause long-term, major adverse impacts to fisheries and aquaculture, as habitat would not be restored.

4.3.8 Land and Marine Management

The Coastal Zone Management Act (CZMA) is a federal act that encourages states to develop coastal management programs for preserving statewide coastal resources. Under this act, once a state develops a federally approved coastal management program, “federal consistency” requires that any federal actions affecting coastal land or water resources (the coastal zone) must be consistent with the state’s program. In Louisiana, the Louisiana Department of Natural Resources (LDNR) Office of Coastal Management oversees the state’s Coastal Zone Management Program. The design alternatives are located within the Louisiana Coastal Zone established by the State and Local Coastal Resources Management Act of 1978 and modified in 2012.

4.3.8.1 Rabbit Island Project Land and Marine Management

The *Cameron Parish Coastal Resource Management Plan* divided the parish into 23 environmental management units (EMUs); Rabbit Island is included in the Calcasieu Lake EMU. One objective of this EMU is to reduce shoreline erosion to achieve the goal of ensuring “good water quality levels to enhance recreational and commercial fishing activities…” (Cameron Parish, 1983).

The Rabbit Island Restoration Project has been reviewed for consistency with the approved Louisiana Coastal Resources Program (LCRP) as required by Section 307 of the Coastal Zone Management Act of

1972, as amended. The project as proposed in the application was determined to be consistent with the LCRP on September 7, 2018.

Alternative 2A Rabbit Island Environmental Consequences
Alternative 2A would result in long-term, beneficial impacts to land and marine management due to the project's aim of enhancing nesting and brood-rearing habitat.

Alternative 2 Rabbit Island Environmental Consequences
Under Alternative 2, impacts to land and marine management would be similar to those under the Alternative 2A.

No Action Alternative Rabbit Island Environmental Consequences
Under the No Action Alternative, no changes to the island would occur; thus, there would be no impacts to land and marine management; however, erosion would still continue which would cause long-term, adverse impacts to land and marine management.

4.3.8.2 Jean Lafitte Project Land and Marine Management

The Jefferson Parish Coastal Zone Management Program was developed to regulate certain uses within the coastal zone and to develop, seek funding for, and implement coastal protection and restoration projects. The Jefferson Parish Coastal Zone Management is divided into 12 Management Units, and the project area is within the Bayou Segnette Management Unit.

The Jean Lafitte National Historical Park and Preserve is divided into six physically separate sites. The Jean Lafitte Project area is within the Barataria Preserve unit. Jean Lafitte is part of the NPS within the DOI. In accordance with NPS Management Policies (2006), the NPS must apply appropriate land protection methods to protect park resources and values from incompatible land uses.

"The Preserve is of particular importance as a natural resource responsibility for NPS. The NPS vision and management focuses on providing or restoring for park visitors an undisturbed environment, an opportunity for recreation in a natural setting, and unimpaired resources. Hurricanes, variations in sediment and freshwater supply, subsidence, and sea level rise anticipated from global warming would drive changes in the Preserve's shoreline and habitats. Effective management requires adaptation to these dynamics. Restoration of natural processes would help to re-establish more natural biological and hydrological conditions within the Preserve's boundaries" (NPS, 2008).

The Jean Lafitte Project has been reviewed for consistency with the approved Louisiana Coastal Resources Program (LCRP) as required by Section 307 of the Coastal Zone Management Act of 1972, as amended. The project as proposed in the application was determined to be consistent with the LCRP on August 21, 2019.

Alternative 4C Jean Lafitte Environmental Consequences
Alternative 4C would result in long-term, beneficial impacts to land and marine management due to the project's aim of enhancing and restoring SAV, benefitting fish habitats, and reducing erosion. NPS has been involved with all phases of the project and consultations are ongoing to determine the potential for adverse impacts to land and marine management from implementation of Alternative 4C. Any mitigation arising from consultation would be adhered to.

Alternative 4A Jean Lafitte Environmental Consequences

Under Alternative 4A, impacts to land and marine management would be similar to those under Alternative 4C.

No Action Alternative Jean Lafitte Environmental Consequences

Under the No Action Alternative, the Jean Lafitte Project would not be implemented, and there would be no action taken to control the erosion along the shoreline of Lake Salvador and Lake Cataouatche and restore SAV habitat; thus, there would be no long-term beneficial impacts to land and marine management. The shoreline would continue to erode and SAV habitat would continue to degrade, which would cause long-term, major adverse impacts to the goals outlined in NPS management plans.

4.4 Cumulative Impacts

The Council on Environmental Quality regulations (40 CFR Subsections 150-1508) define three types of impacts routinely assessed for proposed federal actions:

1. Direct impacts, as discussed in previous sections of the report, are effects caused by the action and occur at the same time as the action.
2. Indirect impacts, as discussed in previous sections of the report, are caused by the action and occur later in time or farther away from the project vicinity but are still reasonably foreseeable.
3. Cumulative impacts, which include the incremental impacts of the action when added to the other past, present, and future actions which may become significant as time passes.

As stated in the Council on Environmental Quality (CEQ) handbook, Considering Cumulative Effects Under the National Environmental Policy Act (CEQ, 1997), cumulative impacts need to be analyzed in terms of the specific resource, ecosystem, and human community being affected and should focus on effects that are truly meaningful. The Non-Preferred Alternatives are similar to the Preferred Alternatives from a cumulative impact analysis standpoint, thus, this cumulative impact analysis focused on the Preferred Alternative of both Rabbit Island and Jean Lafitte projects.

Cumulative impacts are typically analyzed using four steps:

- Step 1 – Identify resources affected.
- Step 2 – Establish boundaries. Appropriate spatial and temporal boundaries may vary for each resource.
- Step 3 – Identify a cumulative action scenario.
- Step 4 – Cumulative impact analysis.

4.4.1 Resources Affected

The cumulative impacts were evaluated in a manner consistent with the methods developed for the Final PDARP/PEIS (DWH Trustees, 2016a). Cumulative impacts include each of the resources identified in the Physical Environment, Biological Environment, and Socioeconomics and Environmental Justice sections discussed previously. Several of the resources would have no effects, negligible effects, or only short-term, minor effects and, based on their magnitude with respect to context and intensity, would not contribute to adverse cumulative impacts, and are noted as “resources not analyzed further” in Table 6. Environmental impacts that were found to have adverse and long-term impacts are noted as “resources analyzed further” in Table 6.

The spatial boundary includes those areas where the alternatives would occur and adjacent areas, focusing on actions occurring along, on, and in the vicinity of Rabbit Island and Jean Lafitte Project areas.

Future actions are identified as those actions that are reasonably foreseeable and likely to contribute to the overall cumulative impacts, which include projects that have overlapping impacts with the alternatives. These include projects that are likely to be started prior to finalization of this Phase 2 RP/EA #1.3 and actions that are likely to occur after finalization of this Phase 2 RP/EA #1.3.

Table 6: Cumulative Resource Analysis Findings

Project	Resources Not Analyzed Further	Resources Analyzed Further
Rabbit Island	Air Quality Noise Wildlife Species Protected Species Infrastructure Aesthetic and Visual Resources Public Health and Safety Socioeconomics and Environmental Justice Cultural Resources Tourism and Recreational Resources Fisheries and Aquaculture Land and Marine Management	Geology, Soils, Topography Hydrology and Water Quality Habitats Marine and Estuarine Fauna, Essential Fish Habitat, and Managed Fish Species
Jean Lafitte	Geology, Soils, Topography Air Quality Hydrology and Water Quality Noise Habitats Wildlife Species Marine and Estuarine Fauna, Essential Fish Habitat, and Managed Fish Species Protected Species Infrastructure Public Health and Safety Socioeconomics and Environmental Justice Cultural Resources Tourism and Recreational Resources Fisheries and Aquaculture Land and Marine Management	Aesthetic and Visual Resources

4.4.2 Cumulative Action Scenario

Past, present, and reasonably foreseeable future actions near the Rabbit Island Project alternatives were identified to effectively consider the potential cumulative impacts. A list of past, present, and future projects was compiled for each project using Louisiana state, USACE, USEPA, USFWS, USDA, and the National Oceanic and Atmospheric Administration (NOAA) databases and internet searches for more detail as needed. The Rabbit Island and Jean Lafitte Project areas are located in the coastal zone, and regulations pertaining to coastal permits were considered appropriate for developing a list of past and

reasonably foreseeable future activities that may affect the resources. Based on information obtained from permitting databases, past and potential future activities near the Rabbit Island and Jean Lafitte Project areas include marsh creation, shoreline protection, hydrologic improvement, beach nourishment, road maintenance, additional recreational improvements, and pipeline installation.

4.4.2.1 Rabbit Island Project Cumulative Action Scenario

Based on the assessment summarized in Appendix D, the resource areas with potential for cumulative impacts are geology, soils, and topography; hydrology and water quality; habitats; and marine and estuarine fauna, EFH, and managed fish species, and protected species. The preferred alternative would create long-term benefits to these resources and some short-term impacts. The anticipated short-term impacts to habitats and wildlife could be minimized with the development and implementation of BMPs. The resources would likely have short-term, adverse impacts but would also have long-term benefits from the preferred alternative. The cumulative effects from the preferred alternative and the identified actions are expected to result in cumulative beneficial impacts to geology and substrates; hydrology and water quality; habitats; wildlife species; marine and estuarine fauna, EFH, and managed fish species; protected species; infrastructure; tourism and recreational resources; aesthetics and visual resources; land and marine management; and public health and safety.

4.4.2.2 Jean Lafitte Project Cumulative Action Scenario

Based on the assessment summarized in Appendix D, the resource areas with potential for cumulative impacts are geology and substrates; hydrology and water quality; habitats; wildlife species; marine and estuarine fauna, EFH, and managed fish species; and protected species. The preferred alternative would create long-term benefits to these resources and some short-term impacts. The anticipated short-term impacts to habitats, wildlife, and protected species from construction could be minimized with the development and implementation of BMPs. The resources would likely have short-term, adverse impacts but would also have long-term benefits from the preferred alternative. The cumulative effects from the preferred alternative and the identified actions are expected to result in cumulative beneficial impacts to geology and substrates; hydrology and water quality; habitats; wildlife species; marine and estuarine fauna, EFH, and managed fish species; protected species; infrastructure; aesthetics and visual resources; tourism and recreational resources; land and marine management; and public health and safety.

4.4.3 Cumulative Impacts of the No Action Alternatives

Under the No Action Alternatives, the Rabbit Island and Jean Lafitte Projects would remain in their current state. The future effects of local subsidence, relative sea level rise, erosion, and degrading habitats would continue occurring. The two project areas would be impacted in the future by erosion, local subsidence, and sea level rise, which could inundate the areas. When the No Action Alternative is analyzed in combination with other past, present, and reasonably foreseeable future actions, short- and long-term, adverse, cumulative impacts on hydrology and water quality; wildlife; habitats; and marine and estuarine fauna, EFH, and managed fish species would likely occur. There would be continued degradation of habitats and coastal zone buffering. Therefore, the No Action Alternative for both the Rabbit Island and Jean Lafitte Projects would be expected to contribute to adverse, cumulative impacts on environmental resources.

4.4.3.1 Cumulative Impacts of the No Action Alternative for the Rabbit Island Project

There would be continued degradation of the island that provides colonial waterbird nesting, foraging, and brood-rearing habitats; therefore, the No Action Alternative could contribute to adverse, cumulative impacts.

Under the No Action Alternative, the following resources are expected to have adverse impacts:

- Hydrology and Water Quality
- Habitats
- Wildlife Species
- Marine and Estuarine Fauna, EFH, and Managed Fish Species
- Protected Species
- Aesthetics and Visual Resources
- Public Health and Safety
- Tourism and Recreational Resources
- Land and Marine Management

4.4.3.2 Cumulative Impacts of the No Action Alternative for the Jean Lafitte Project

There would be continued degradation of the SAV habitat that serves critical ecological functions such as providing habitat and foraging for fish and wildlife, decreased wave energy, soil protection, and increased sediment accretion; therefore, the No Action Alternative could contribute to adverse, cumulative impacts. Under the No Action Alternative, the following resources are expected to have adverse impacts:

- Geology, Soils, and Topography
- Hydrology and Water Quality
- Habitats
- Marine and Estuarine Fauna, EFH, and Managed Fish Species
- Public Health and Safety
- Cultural Resources
- Tourism and Recreational Resources
- Land and Marine Management

5.0 COMPLIANCE WITH OTHER LAWS AND REGULATIONS

In addition to the requirements of OPA and NEPA, other laws may apply to the selected alternatives in the Phase 2 RP/EA #1.3. The LA TIG ensures compliance with applicable laws or executive orders. Details on each of these laws or executive orders can be found in Chapter 6 of the Final PDARP/PEIS (DWH Trustees, 2016a).. Legal authorities applicable to restoration alternative development were fully described in the context of the DWH restoration planning in the Final PDARP/PEIS, Section 6.9 Compliance with Other Applicable Authorities and Appendix 6.D Other laws and executive orders (DWH Trustees, 2016a). That material is incorporated by reference here.

5.1 Federal Laws

Additional federal laws, regulations, and executive orders that may be applicable include but are not limited to:

- Endangered Species Act (16 U.S.C. §§ 1531 et seq.)
- Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §§ 1801 et seq.)
- Marine Mammal Protection Act (16 U.S.C. §§ 1361 et seq.)
- Coastal Zone Management Act (16 U.S.C. §§ 1451 et seq.)
- National Historic Preservation Act (16 U.S.C. §§ 470 et seq.)
- Coastal Barrier Resources Act (16 U.S.C. §§ 3501 et seq.)
- Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668 et seq.)
- Clean Air Act (42 U.S.C. §§ 7401 et seq.)
- Federal Water Pollution Control Act (Clean Water Act, 33 U.S.C. §§ 1251 et seq.)
- Rivers and Harbors Act (33 U.S.C. §§ 401 et seq.)
- Marine Protection, Research and Sanctuaries Act
- Archaeological Resource Protection Act
- National Marine Sanctuaries Act
- Farmland Protection Policy Act
- EO 11988: Floodplain Management (as augmented by EO 13690, January 30, 2015)
- EO 11990: Protection of Wetlands
- EO 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
- EO 12962: Recreational Fisheries
- EO 13112: Safeguarding the Nation from the Impacts of Invasive Species
- EO 13175: Consultation and Coordination with Indian Tribal Governments
- EO 13186: Responsibilities of Federal Agencies to Protect Migratory Birds
- EO 13693: Planning for Federal Sustainability in the Next Decade
- Fish and Wildlife Coordination Act (16 U.S.C. §§ 661-666c)
- National Park Service Procedural Manual #77-2: Floodplain Management
- National Park Service Procedural Manual #77-1: Wetland Protection
- Estuary Protection Act

Federal environmental compliance responsibilities and procedures follow the Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the Deepwater Horizon (DWH) Oil Spill (DWH Trustees, 2016b). By following these standard operating procedures, the Implementing Trustee for each project ensures that the status of environmental compliance is tracked through the Restoration Portal. Implementing Trustees will keep a record of compliance documents and ensure they are submitted for inclusion to the Administrative Record.

A Wetland Statement of Findings (WSOF) for the Jean Lafitte National Historic Park and Preserve Lake Cataouatche shoreline protection project will be considered excepted under the guidance of PM 77-1 Wetlands Protection. The large majority of the project does not represent an impact to wetlands under the Cowardin, et al., (1979) Classification as the breakwaters will be constructed in estuarine deepwater habitats below the elevation of the extreme low water of spring tide or permanently flooded areas. The structures will tie into the existing shorelines and may impact relatively small areas of aquatic bed and unconsolidated shore wetlands. The area of new, long-term adverse impact associated with restoration is designed to be less than 0.25 acres. The placement of rock breakwater along small sections of the shoreline is considered a long-term benefit, which would also be justification for a restoration exemption under PM 77-1.

The NPS reviewed Executive Order 11988, "Floodplain Management," which directs federal agencies to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative, as well as NPS Director's Order 77-2, and NPS Procedural Manual 77-2, which are agency-specific guidance documents produced by the NPS describing how the agency would comply with EO-11988. This project will be constructed to produce a net benefit to floodplain functions and values and will not pose a threat to human health or safety. Therefore, it is excluded from the requirement to produce a Floodplain Statement of Findings per DO 77-2.

5.2 State and Local Laws

The LA TIG will ensure compliance with all applicable state and local laws and other applicable federal laws and regulations relevant to the State of Louisiana. Additional laws and regulations are listed below.

- Archeological Finds on State Lands (Louisiana Revised Statute [La. Rev. Stat.] 41:1605)
- Coastal Wetlands Conservation and Restoration Authority (La. Rev. Stat. 49:213.1)
- Coastal Wetlands Conservation and Restoration Plan (La. Rev. Stat. 49:213.6)
- Louisiana State and Local Coastal Resources Management Act (La. Rev. Stat. 49:214.21 – 214.42)
- Louisiana Oil Spill Prevention and Response Act (La. Rev. Stat. 30:2451 et seq.)
- Management of State Lands (La. Rev. Stat. 41:1701.1 et seq.)
- Louisiana Coastal Resources Program (Louisiana Administrative Code [La. Admin. Code] 43:700 et seq.)
- Louisiana Surface Water Quality Standards (La. Admin. Code 33.IX, Chapter 11)
- Management of Archaeological and Historic Sites (La. Rev. Stat. 41:1605)
- Oyster Lease Relocation Program (La. Admin. Code 43:I, 850-859, Subchapter B

5.3 Compliance and Next Steps

The LA TIG has completed environmental compliance technical assistance and reviews with the applicable state and federal agencies. NOAA, on behalf of the LA TIG, has requested ESA consultation from NMFS for the Rabbit Island project. This request is seeking concurrence with the determination of a *not likely to adversely affect* determination for sea turtles associated with the Rabbit Island project. DOI, on behalf of the LA TIG, requested ESA consultation with USFWS. On January 21, 2020, USFWS concurred with the determination of a *not likely to adversely affect* determination for West Indian

manatees associated with the Rabbit Island project. USFWS has concurred with the ESA determination for the Jean Lafitte project. Table 7 below provides a summary of environmental compliance status for the two preferred alternatives.

The LA TIG will ensure compliance reviews and/or approvals under all applicable state and local laws and other applicable federal laws and regulations that are relevant to the selected design alternative are complete before implementation. Implementing Trustees are required to implement alternative-specific mitigation measures, including BMPs, that are identified in this Phase 2 RP/EA #1.3 and in the completed consultations/permits and biological evaluation forms. Implementing Trustees will provide oversight with regard to ensuring no unanticipated effects to listed species and habitats occur, including ensuring that BMPs are implemented and continue to function as intended.

Table 7: Current Status of Federal Regulatory Compliance Reviews and Approvals of Preferred Alternatives in the Final RP/EA

Federal Regulatory Compliance Reviews	Rabbit Island (Alternative 2A)	Jean Lafitte (Alternative 4C)
Bald and Golden Eagle Protection Act (USFWS)	In Progress	In Progress
Coastal Zone Management Act	Complete	
Endangered Species Act (USFWS)*	Complete – NLAA	Complete – NLAA
Endangered Species Act (NMFS)*	In progress – NLAA	Complete – NE
Magnuson Stevens Fishery Conservation and Management Act (EFH NMFS)	Complete	Complete
Marine Mammal Protection Act (NMFS)	Complete	Complete
Marine Mammal Protection Act (USFWS)	In Progress	In Progress
National Historic Preservation Act	In Progress	In Progress
Rivers and Harbors Act/Clean Water Act Permits (USACE)	Complete	

*For ESA effect determinations: NE = no effect, NLAA = may affect, not likely to adversely affect, LAA = may affect, likely to adversely affect

6.0 MONITORING/ADAPTIVE MANAGEMENT AND OPERATIONS/MAINTENANCE PLANS

According to the NRDA regulations for OPA (15 CFR § 990.55), a restoration plan should include "a description of monitoring for documenting restoration effectiveness, including performance criteria that will be used to determine the success of restoration or need for interim corrective action." Given the temporal, spatial, and funding scales associated with this Phase 2 RP/EA #1.3, the LA TIG recognizes the need for a robust monitoring and adaptive management (MAM) framework to measure the beneficial impacts of restoration and support restoration decision-making. To increase the likelihood of successful restoration, the LA TIG will conduct the monitoring and evaluation needed to inform decision-making for current alternatives and refine the selection, design, and implementation of future restoration. This monitoring and adaptive management framework may be more robust for elements of the RP/EA #1.3 with higher degrees of uncertainty or where large amounts of restoration are planned within a given geographic area and/or for the benefit of a resource.

A MAM plan and an O&M plan was developed for both the Rabbit Island Project and the Jean Lafitte Project and is included in Appendix B and Appendix C, respectively. The MAM plan includes measurable objectives with associated performance standards to track progress toward achieving restoration goals, establishing methodologies and parameters for data collection, identifying key uncertainties, and assuring compliance with appropriate regulations.

7.0 RESPONSE TO PUBLIC COMMENTS

The public comment period for this Phase 2 RP/EA #1.3 opened on November 20, 2019 and closed on December 20, 2019. During the public review period, the LA TIG hosted one public meeting via webinar on December 2, 2019.

The LA TIG accepted comments via the web, U.S. Mail, and during the public webinar. All comments submitted are represented in the summary comment descriptions listed in this chapter, and all public comments, whether written or oral, will be included in the Administrative Record (https://www.doi.gov/deepwaterhorizon/adminrecord).

7.1 Comment Summary

The comments received by the LA TIG during the comment period and the LA TIG's response to that comments are as follows:

1. **Comment:** I am in favor of these restoration projects for habitat restoration, as habitat loss has become a main threat to biodiversity. In Louisiana, we are facing extreme habitat loss along the coast, any reasonable effort to combat this issue should be implemented. However, I would encourage the LA TIG to consider the fact that while these restoration efforts may be warranted right now, they are also ban-aid solutions to the root cause of the problems. Sea level rise from climate change will continue, as well as the drilling activities that caused the habitat issues to begin with. No amount of dredging or rock wall implementation will change these events. We cannot undo the past, so these responsive measures should be taken. However, we can not only rely on responsive actions, preventative measures to maintain the restoration should also be considered in this project. Such measures means funding for large scale climate action and regulating the oil industry. While these are by no means easy tasks to take on, they are necessary. If agencies work together and put forward the effort and funding put into responsive efforts, such as the proposed restoration project, taking on and implementing large scale preventative measures can be possible.

   Response: The LA TIG acknowledges and appreciates this comment and suggestion. CPRA, on behalf of the State of Louisiana and as Lead Trustee for the State of Louisiana on the LA TIG, is committed to a long-term solution to address the changing conditions along Louisiana's coast. CPRA is currently in the process of developing its updated master plan which will build off of prior master plans and will contain projects intended to restore and protect our coast over the long term. Bird restoration projects such as Rabbit Island will bring near term solutions to address critical nesting bird habitat losses and will complement our long-term strategy for restoring and protecting our coast.

2. **Comment:** The Coalition to Restore Coastal Louisiana (CRCL) is the oldest coastal advocacy non-profit in Louisiana. The mission of CRCL is to drive bold, science-based action to rebuild coastal Louisiana through outreach, restoration and advocacy. In general, we support this restoration plan for the restoration and conservation of bird habitat on Rabbit Island. However, we would like the Louisiana TIG (TIG) to consider the need for shoreline protection for this project. Specifically, we would like the TIG to consider using oyster shell to create a living shoreline around the project which would provide habitat as well as protect against erosion.

An oyster shell shoreline provides many benefits. Over time, the oyster reef will grow vertically, which will allow it to keep pace with sea level rise, helping to sustain the project's restoration benefits farther into the future. Also, the use of oyster shells will encourage oyster spat settlement which will benefit the nearby oyster leases identified in the project report. An oyster shell shoreline will provide erosion protection as well as intertidal habitat for birds and various marine organisms.

CRCL has conducted restoration in Southwest Louisiana for the past decade. We have conducted beach dune and marsh grass plantings in this region and engaged hundreds of volunteers. We also conduct extensive outreach in Southwest Louisiana and have been there multiple times this year to promote coastal restoration. We partner closely with the National Audubon Society who conducts bird monitoring in Southwest Louisiana. The construction of this project will not only contribute to our coastal restoration success in the region by providing more bird habitat, it will have the potential to provide oyster habitat if a living shoreline option is considered for shoreline protection.

Response: The LA TIG acknowledges and appreciates the comment and suggestion of the Coalition to Restore Coastal Louisiana. The Louisiana TIG will continue to consider available opportunities to fund restoration planning and implementation in Louisiana and to supplement available DWH NRDA restoration funds and projects. Several shoreline protection features were considered during the design phase and all were ultimately dropped from consideration due to the impacts to the adjacent tier 1 oyster seed grounds. The depth of water around the island is very shallow and oyster reefs are abundant. To deploy the amount of oyster shell necessary to protect the island would require large equipment and additional dredging through productive oyster reefs. To protect the existing high-quality oyster resources, all shoreline protection features were omitted from the plan including a living shoreline feature. We certainly acknowledge that oysters are a vital part of our coastal ecology and economy and will continue to evaluate, propose, and construct oyster restoration projects with available DWH funds. The Louisiana TIG will continue to consider available opportunities to fund restoration planning and implementation in Louisiana and to supplement available DWH NRDA restoration funds and projects.

3. **Comment:** Thank you for providing the opportunity to comment on the Draft Assessment Plan #1.3: Rabbit Island Restoration Project and Shoreline Protection at Jean Lafitte National Historical Park and Preserve Project. The Deepwater Horizon Oil Spill and related response efforts impacted a variety of habitats and resources across Louisiana. Addressing the injuries to these habitats and resources is critical for the long-term help of our coast.

   Rabbit Island Restoration Project

   We support restoration of bird habitat to address oil spill injuries to birds. As the westernmost colony for colonial waterbirds and only significant brown pelican habitat in western Louisiana, Rabbit Island is a good candidate for restoration. We support the fill design and borrow source of the selected alternative 2A. However, given the accelerated erosion of the island in recent years, we suggest that the Louisiana TIG (LA TIG) consider also adding a living shoreline feature around the perimeter of the project. The living shoreline could help protect the island from future erosion, lengthening the lifespan of this project while also providing additional habitat for birds, oysters and other marine organisms.

Jean Lafitte National Historical Park and Preserve Project

The Barataria Preserve is a public resource that provides opportunity for visitors to connect with nature and experience the swamps and marshes of Louisiana. It also provides vital estuarine habitat.

We support the restoration of submerged aquatic vegetation (SAV) in lakes Salvador and Cataouatche. We have questions about the proposed project design and the selection criteria used to screen project alternatives that resulted in the selection of alternative 4C that we feel are not adequately addressed in the draft assessment plan.

Restoring SAV habitat in the Preserve is an appropriate means of addressing impacts that happened during the oil spill. Wave attenuation, along with adequate nutrient inputs, can create the conditions needed to promote the establishment of SAV. In turn, well established SAV can attenuate waves and reduce shoreline erosion while providing productive habitat for fish, shellfish and insects, in addition also providing forage for waterfowl.

Since the opening of the Davis Pond Freshwater Diversion, lakes Salvador and Cataouatche have experienced at times explosive growth of SAVs. However, the pattern of SAV growth has been erratic, and we are unaware of any definitive explanation for the differences in aerial coverage from year to year, though a reasonable inference could be drawn that turbidity and salinity are drivers.

The goal defined for the Jean Lafitte project alternative evaluation was to protect existing SAV from wave energy and create favorable conditions for SAV re-establishment and reduce erosion of shorelines due to wave action. While a number of alternatives were evaluated, the screening criteria emphasized the wave attenuation device have a lifespan of 20 years which eliminates alternatives, such as coconut fiber logs, which can provide wave attenuation for shorelines and create conditions needed for SAV re-establishment. The goal of the project is about re-establishing SAV damaged by the spill, not to build a hard structure that lasts 20 years.

Placing rock upon or parallel to the shoreline may provide erosion prevention benefits in the near-term ancillary to promotion of SAV, but it is unclear from the draft document if the rock placement is being optimized for this purpose. The existing rock revetment is presumably the model for this proposal, but that design was intended to optimize shoreline protection, and only where cost savings could be realized by cutting across indentations in the shoreline were the quiescent shallow open water conditions conducive to SAV establishment created. Has the subsidence rate of the existing rock revetment been calculated? Is it different between sections placed on existing marsh edge and sections across open lake bottom?

Since SAV also established on the lake bottom outside the rock, do the higher energies at the rock face suppress SAV establishment?

We suggest that the measure of success for the project should not be a 20 year life span of the structure, but the amount of SAV established at the end of 20 years. We request that the Trustees examine whether or not use of lighter weight organic materials, placed farther offshore, could create larger areas of optimal habitat than the proposed rock structure for the

same cost. Staggered lines of lighter weight organic material perpendicular to the lake's fetch could help lower turbidity and wave energy more effectively than rocks near the shoreline. Once established, the SAV along the shoreline could theoretically continue to maintain the conditions needed for SAV and provide adequate wave attenuation for shoreline protection.

We commend the LA TIG on its continued progress to identify and make progress on implementing comprehensive and beneficial restoration projects in coastal Louisiana. Thank you for this opportunity to engage and comment of these projects. We support restoration of bird habitat to address oil spill injuries to birds. As the westernmost colony for colonial waterbirds and only significant brown pelican habitat in western Louisiana, Rabbit Island is a good candidate for restoration. We support the fill design and borrow source of the selected alternative 2A. However, given the accelerated erosion of the island in recent years, we suggest that the Louisiana TIG (LA TIG) consider also adding a living shoreline feature around the perimeter of the project. The living shoreline could help protect the island from future erosion, lengthening the lifespan of this project while also providing additional habitat for birds, oysters and other marine organisms.

Response: The LA TIG acknowledges and appreciates the comment and suggestion of the National Wildlife Foundation. The Louisiana TIG will continue to consider available opportunities to fund restoration planning and implementation in Louisiana and to supplement available DWH NRDA restoration funds and projects.

For the Rabbit Island project, several shoreline protection features were considered during the design phase and all were ultimately dropped from consideration due to the impacts to the adjacent tier 1 oyster seed grounds. The depth of water around the island is very shallow and oyster reefs are abundant. To deploy the equipment and materials necessary to install a living shoreline protection feature around the perimeter of the island would require additional dredging through productive oyster reefs. To protect the existing high-quality oyster resources, all shoreline protection features were omitted from the plan including a living shoreline feature.

With regard to the comment related to the Jean Lafitte National Historical Park and Preserve Project, the proposed wave attenuation structure was not selected based upon or modeled after the existing rock revetment along the shoreline of Barataria Preserve. A number of alternative materials, including geotextiles, and alignments were evaluated during the design process through a choosing by advantages and value analysis workshop, and all but those evaluated in the EA were rejected based on function and cost criteria. The proposed design and alignment, including its 20-year design lifespan, were selected as the best alternative for the purpose of promoting SAV growth within the Park’s boundary to recover the SAV lost during the response to the DWH Oil Spill, as well as secondarily to protect the shoreline from further erosion. The alternative was developed based on project specific SAV modeling performed by LSU/USGS staff, bathymetric and geotechnical surveys, and hydrodynamic and wave modeling. It also considered forecasted subsidence and sea level rise in the area, as well as calculated settling of the structure based on the geotechnical sampling and analysis. As noted in the RP/EA and the MAM plan, the primary goal and measure of success for the project is the re-establishment of SAV. To help ensure the primary goal is accomplished, the design and alignment were optimized to maximize the acreage and long-term protection of suitable habitat for SAV and the protection of the shoreline, while avoiding impacting other sensitive areas.

8.0 LIST OF REPOSITORIES

Table 8: List of Repositories

Library	Address	City	Zip Code
St. Tammany Parish Library	310 W. 21st Avenue	Covington	70433
Terrebonne Parish Library	151 Library Drive	Houma	70360
New Orleans Public Library, Louisiana Division	219 Loyola Avenue	New Orleans	70112
East Baton Rouge Parish Library	7711 Goodwood Boulevard	Baton Rouge	70806
Jefferson Parish Library, East Bank Regional Library	4747 W. Napoleon Avenue	Metairie	70001
Jefferson Parish Library, West Bank Regional Library	2751 Manhattan Boulevard	Harvey	70058
Plaquemines Parish Library	8442 Highway 23	Belle Chasse	70037
St. Bernard Parish Library	1125 E. St. Bernard Highway	Chalmette	70043
St. Martin Parish Library	201 Porter Street	St. Martinville	70582
Alex P. Allain Library	206 Iberia Street	Franklin	70538
Vermilion Parish Library	405 E. St. Victor Street	Abbeville	70510
Martha Sowell Utley Memorial Library	314 St. Mary Street	Thibodaux	70301
South Lafourche Public Library	16241 E. Main Street	Cut Off	70345
Calcasieu Parish Public Library Central Branch	301 W. Claude Street	Lake Charles	70605
Iberia Parish Library	445 E. Main Street	New Iberia	70560
Mark Shirley, LSU AgCenter	1105 W. Port Street	Abbeville	70510

9.0 LIST OF PREPARERS, AGENCIES, AND PERSONS CONSULTED

Table 9: List of Preparers, Agencies, and Persons Consulted

Agency/Firm	Name	Position
State of Louisiana		
LDWF	Todd Baker	Coastal Resources Scientist Manager
LDWF	Jon Wiebe	Program Manager – Restoration Program
LDWF	Ann Howard	Coastal Resources Scientist Manager
CPRA	James McMenis, P.E.	Project Manager
CPRA	Matt Mumfrey	Attorney
CPRA	Caitlyn Glymph	Coastal Resource Scientist
National Oceanic and Atmospheric Association (NOAA)		
Restoration Center	Christina Fellas	DWH Environmental Compliance Coordinator/Biologist
Restoration Center	Ramona Schreiber	DWH NEPA Coordinator
Restoration Center/Earth Resources Technology	Courtney Schupp	Marine Habitat Resource Specialist
Restoration Center/Earth Resources Technology	Barrett Ristroph	Marine Habitat Resource Specialist
U.S. Department of the Interior		
DOI	Erin Chandler	Environmental Compliance Coordinator
DOI	Robin Renn	DWH NEPA Coordinator
DOI	John Tirpak, PhD	Louisiana Restoration Area Coordinator
U.S. Environmental Protection Agency		
USEPA	Tim Landers	Environmental Protection Specialist
USEPA	Doug Jacobson	Environmental Protection Specialist, Louisiana Team Leader
U.S. Department of Agriculture		
USDA	Mark Defley	Biologist, Gulf Coast Ecosystem Restoration Team
Contractor Team		
C.H. Fenstermaker & Associates, L.L.C.	Bliss Bernard, P.E.	Co-Author
C.H. Fenstermaker & Associates, L.L.C.	John Foret, PhD	Principal
C.H. Fenstermaker & Associates, L.L.C.	Garvin Pittman, PMP	Project Manager
GHD	Jamie Bartel, PG	Co-Author
GHD	Jason Curole, PhD, PMP	Quality Assurance Manager

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Appendix A: Guidelines for NEPA Impact Determinations in the Final PDARP/PEIS

Resource	Impact Duration	Impact Intensity Minor	Impact Intensity Moderate	Impact Intensity Major
Physical Resources				
Geology and Substrates	Short-term: During construction period. Long-term: Over the life of the project or longer.	Disturbance to geologic features or soils could be detectable but could be small and localized. There could be no changes to local geologic features or soil characteristics. Erosion and/or compaction could occur in localized areas.	Disturbance could occur over local and immediately adjacent areas. Impacts to geology or soils could be readily apparent and result in changes to the soil character or local geologic characteristics. Erosion and compaction impacts could occur over local and immediately adjacent areas.	Disturbance could occur over a widespread area. Impacts to geology or soils could be readily apparent and could result in changes to the character of the geology or soils over a widespread area. Erosion and compaction could occur over a widespread area. Disruptions to substrates or soils may be permanent.
Hydrology and Water Quality	Short-term: During construction period. Long-term: Over the life of the project or longer.	Hydrology: The effect on hydrology could be measurable, but it could be small and localized. The effect could only temporarily alter the area's hydrology, including surface and ground water flows. Water quality: Impacts could result in a detectable change to water quality, but the change could be expected to be small and localized. Impacts could quickly become undetectable. State water quality standards as required by the Clean Water Act could not be exceeded. Floodplains: Impacts may result in a detectable change to natural and beneficial floodplain values, but the change could be expected to be small, and localized. There could be no appreciable increased risk of flood loss including impacts on human safety, health, and welfare. Wetlands: The effect on wetlands could be measurable but small in terms of area and the nature of the impact. A small impact on the size, integrity, or	Hydrology: The effect on hydrology could be measurable, but small and limited to local and adjacent areas. The effect could permanently alter the area's hydrology, including surface and ground water flows. Water quality: Effects to water quality could be observable over a relatively large area. Impacts could result in a change to water quality that could be readily detectable and limited to local and adjacent areas. Change in water quality could persist; however, it could likely not exceed state water quality standards as required by the Clean Water Act. Floodplains: Impacts could result in a change to natural and beneficial floodplain values and could be readily detectable but limited to local and adjacent areas. Location of operations in floodplains could increase risk of flood loss, including impacts on human safety, health, and welfare. Wetlands: The action could cause a measurable effect on wetlands	Hydrology: The effect on hydrology could be measurable and widespread. The effect could permanently alter hydrologic patterns including surface and ground water flows. Water quality: Impacts could likely result in a change to water quality that could be readily detectable and widespread. Impacts could likely result in exceedance of state water quality standards and/or could impair designated uses of a water body. Floodplains: Impacts could result in a change to natural and beneficial floodplain values that could have substantial consequences over a widespread area. Location of operations could increase risk of flood loss, including impacts on human safety, health, and welfare. Wetlands: The action could cause a permanent loss of wetlands across a widespread area. The character of the wetlands could be changed so that the functions typically provided by the wetland could be permanently lost.

Resource	Impact Duration	Impact Intensity Minor	Impact Intensity Moderate	Impact Intensity Major
		connectivity could occur; however, wetland function could not be affected, and natural restoration could occur if left alone.	indicators (size, integrity, or connectivity) or could result in a permanent loss of wetland acreage across local and adjacent areas. However, wetland functions could only be permanently altered in limited areas.	
Air Quality	Short-term: During construction period. Long-term: Over the life of the project or longer.	The impact on air quality may be measurable, but could be localized and temporary, such that the emissions do not exceed the Environmental Protection Agency's (EPA's) *de minimis* criteria for a general conformity determination under the Clean Air Act (40 CFR § 93.153).	The impact on air quality could be measurable and limited to local and adjacent areas. Emissions of criteria pollutants could be at EPA's *de minimis* criteria levels for general conformity determination.	The impact on air quality could be measurable over a widespread area. Emissions are high, such that they could exceed EPA's *de minimis* criteria for a general conformity determination.
Noise	Short-term: During construction period. Long-term: Over the life of the project.	Increased noise could attract attention, but its contribution to the soundscape would be localized and unlikely to affect current user activities.	Increased noise could attract attention and contribute to the soundscape including in local areas and those adjacent to the action but could not dominate. User activities could be affected.	Increased noise could attract attention and dominate the soundscape over widespread areas. Noise levels could eliminate or discourage user activities.
Biological Resources				
Habitats	Short-term: Lasting less than two growing seasons. Long-term: Lasting longer than two growing seasons.	Impacts on native vegetation may be detectable but could not alter natural conditions and could be limited to localized areas. Infrequent disturbance to individual plants could be expected but would not affect local or range-wide population stability. Infrequent or insignificant one-time disturbance to locally suitable habitat could occur, but sufficient habitat could remain functional at both the local and regional scales to maintain the viability of the species. Opportunity for increased spread of non-native species could be detectable but temporary and localized and could not	Impacts on native vegetation could be measurable but limited to local and adjacent areas. Occasional disturbance to individual plants could be expected. These disturbances could affect local populations negatively but could not be expected to affect regional population stability. Some impacts might occur in key habitats, but sufficient local habitat could retain function to maintain the viability of the species both locally and throughout its range. Opportunity for increased spread of non-native species could be detectable and limited to local and adjacent areas but could only result in temporary changes to	Impacts on native vegetation could be measurable and widespread. Frequent disturbances of individual plants could be expected, with negative impacts to both local and regional population levels. These disturbances could negatively affectrange- wide population stability. Some impacts might occur in key habitats, and habitat impacts could negatively affect the viability of the species both locally and throughout its range. Actions could result in the widespread increase of non-native species, resulting in broad and permanent changes to native species populations and distributions.

Resource	Impact Duration	Impact Intensity Minor	Impact Intensity Moderate	Impact Intensity Major
		displace native species populations and distributions.	native species population and distributions.	
Wildlife Species (Including Birds)	Short-term: Lasting up to two breeding seasons, depending on length of breeding season. Long-term: Lasting more than two breeding seasons.	Impacts to native species, their habitats, or the natural processes sustaining them could be detectable, but localized, and could not measurably alter natural conditions. Infrequent responses to disturbance by some individuals could be expected, but without interference to feeding, reproduction, resting, migrating, or other factors affecting population levels. Small changes to local population numbers, population structure, and other demographic factors could occur. Sufficient habitat could remain functional at both the local and range- wide scales to maintain the viability of the species. Opportunity for increased spread of non-native species could be detectable but temporary and localized, and these species could not displace native species populations and distributions.	Impacts on native species, theirhabitats, or the natural processes sustaining them could be measurable but limited to local and adjacent areas. Occasional responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, resting, migrating, or other factors affecting local population levels. Some impacts might occur in key habitats. However, sufficient population numbers or habitat could retain function to maintain the viability of the species both locally and throughout its range. Opportunity for increased spread of non-native species could be detectable and limited to local and adjacent areas but could only result in temporary changes to native species population and distributions.	Impacts on native species, their habitats, or the natural processes sustaining them could be detectable and widespread. Frequent responses to disturbance by some individuals could be expected, with negative impacts to feeding, reproduction, migrating, or other factors resulting in a decrease in both local and range-wide population levels and habitat type. Impacts could occur during critical periods of reproduction or in key habitats and could result in direct mortality or loss of habitat that might affect the viability of a species. Local population numbers, population structure, and other demographic factors might experience large changes or declines. Actions could result in the widespread increase of non-native species resulting in broad and permanent changes to native species populations and distributions.
Marine and Estuarine Fauna (Fish, Shellfish, Benthic Organisms)	Short-term: Lasting up to two spawning seasons, depending on length of season. Long-term: Lasting more than two spawning seasons.	Impacts could be detectable and localized but small. Disturbance of individual species could occur; however, there could be no change in the diversity or local populations of marine and estuarine species. Any disturbance could not interfere with key behaviors such as feeding and spawning. There could be no restriction of movements daily or seasonally. Opportunity for increased spread of non-native species could be detectable but	Impacts could be readily apparent and result in a change in marine and estuarine species populations in local and adjacent areas. Areas being disturbed may display a change in species diversity; however, overall populations could not be altered. Some key behaviors could be affected but not to the extent that species viability is affected. Some movements could be restricted seasonally.	Impacts could be readily apparent and could substantially change marine and estuarine species populations over a wide- scale area, possibly river-basin-wide. Disturbances could result in a decrease in fish species diversity and populations. The viability of some species could be affected. Species movements could be seasonally constrained or eliminated. Actions could result in the widespread increase of non-native species resulting in

Resource	Impact Duration	Impact Intensity Minor	Impact Intensity Moderate	Impact Intensity Major
		temporary and localized and these species could not displace native species populations and distributions.	Opportunity for increased spread of non-native species could be detectable and limited to local and adjacent areas but could only result in temporary changes to native species population and distributions.	broad and permanent changes to native species populations and distributions.
Protected Species	Short-term: Lasting up to one breeding/growing season. Long-term: Lasting more than one breeding/growing season.	Impacts on protected species, their habitats, or the natural processes sustaining them could be detectable, but small and localized, and could not measurably alter natural conditions. Impacts could likely result in a "may affect, not likely to adversely affect" determination for at least one listed species.	Impacts on protected species, their habitats, or the natural processes sustaining them could be detectable and some alteration in the numbers of protected species or occasional responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, resting, migrating, or other factors affecting local and adjacent population levels. Impacts could occur in key habitats, but sufficient population numbers or habitat could remain functional to maintain the viability of the species both locally and throughout their range. Some disturbance to individuals or impacts to potential or designated critical habitat could occur. Impacts could likely result in a "may affect, likely to adversely affect" determination for at least one listed species. No adverse modification of critical habitat could be expected.	Impacts on protected species, their habitats, or the natural processes sustaining them could be detectable, widespread, and permanent. Substantial impacts to the population numbers of protected species, or interference with their survival, growth, or reproduction could be expected. There could be impacts to key habitat, resulting in substantial reductions in species numbers. Results in an "is likely to jeopardize proposed or listed species/adversely modify proposed or designated critical habitat (impairment)" determination for at least one listed species.
Socioeconomic Resources				
Socioeconomics and Environmental Justice	Short-term: During construction period. Long-term: Over the life of the project or longer.	A few individuals, groups, businesses, properties, or institutions could be affected. Impacts could be small and localized. These impacts are not expected to substantively alter social and/or economic conditions.	Many individuals, groups, businesses, properties, or institutions could be affected. Impacts could be readily apparent and detectable in local and adjacent areas and could have a noticeable effect on social and/or economic conditions.	A large number of individuals, groups, businesses, properties, or institutions could be affected. Impacts could be readily detectable and observed, extend over a widespread area, and have a substantial influence on social and/or economic conditions.

Resource	Impact Duration	Impact Intensity Minor	Impact Intensity Moderate	Impact Intensity Major
		Actions could not disproportionately affect minority and low-income populations.	Actions could disproportionately affect minority and low-income populations. However, the impact could be temporary and localized.	Actions could disproportionately affect minority and low-income populations, and this impact could be permanent and widespread.
Cultural Resources	Short-term: During construction period. Long-term: Over the life of the project or longer.	The disturbance of a site(s), building, structure, or object could be confined to a small area with little, if any, loss of important cultural information potential.	Disturbance of a site(s), building, structure, or object not expected to result in a substantial loss of important cultural information.	Disturbance of a site(s), building, structure, or object could be substantial and may result in the loss of most or all its potential to yield important cultural information.
Infrastructure	Short-term: During construction period. Long-term: Over the life of the project or longer.	The action could affect public services or utilities, but the impact could be localized and within operational capacities. There could be negligible increases in local daily traffic volumes resulting in perceived inconvenience to drivers but no actual disruptions to traffic.	The action could affect public services or utilities in local and adjacent areas and the impact could require the acquisition of additional service providers or capacity. Detectable increase in daily traffic volumes (with slightly reduced speed of travel), resulting in slowed traffic and delays, but no change in level of service (LOS). Short service interruptions (temporary closure for a few hours) to roadway and railroad traffic could occur.	The action could affect public services or utilities over a widespread area resulting in the loss of certain services or necessary utilities. Extensive increase in daily traffic volumes (with reduced speed of travel) resulting in an adverse change in LOS to worsened conditions. Extensive service disruptions (temporary closure of one day or more) to roadways or railroad traffic could occur.
Land and Marine Management	Short-term: During construction period. Long-term: Over the life of the project or longer.	The action could require a variance or zoning change or an amendment to a land use, area comprehensive, or management plan, but could not affect overall use and management beyond the local area.	The action could require a variance or zoning change or an amendment to a land use, area comprehensive, or management plan, and could affect overall land use and management in local and adjacent areas.	The action could cause permanent changes to and conflict with land uses or management plans over a widespread area.
Tourism and Recreational Use	Short-term: During construction period. Long-term: Over the life of the project or longer.	There could be partial developed recreational site closures to protect public safety. The same site capacity and visitor experience could remain unchanged after construction. The impact could be detectable and/or could only affect some recreationists.	There could be complete site closures to protect public safety. However, the sites could be reopened after activities occur. There could be slightly reduced site capacity. The visitor experience could be slightly changed but still available.	All developed site capacity could be eliminated because developed facilities could be closed and removed. Visitors could be displaced to facilities over a widespread area and visitor experiences could no longer be available in many locations.

Resource	Impact Duration	Impact Intensity Minor	Impact Intensity Moderate	Impact Intensity Major
		Users could likely be aware of the action but changes in use could be slight. There could be partial closures to protect public safety. Impacts could be local. There could be a change in local recreational opportunities; however, it could affect relatively few visitors or could not affect any related recreational activities.	The impact could be readily apparent and/or could affect many recreationists locally and in adjacent areas. Users could be aware of the action. There could be complete closures to protect public safety. However, the areas could be reopened after activities occur. Some users could choose to pursue activities in other available local or regional areas.	The impact could affect most recreationists over a widespread area. Users could be highly aware of the action. Users could choose to pursue activities in other available regional areas.
Fisheries and Aquaculture	Short-term: During construction period. Long-term: Over the life of the project or longer.	A few individuals, groups, businesses, properties, or institutions could be affected. Impacts could be small and localized. These impacts are not expected to substantively alter social and/or economic conditions.	Many individuals, groups, businesses, properties, or institutions could be affected. Impacts could be readily apparent and detectable in local and adjacent areas and could have a noticeable effect on social and/or economic conditions.	A large number of individuals, groups, businesses, properties, or institutions could be affected. Impacts could be readily detectable and observed, extend over a widespread area, and could have a substantial influence on social and/or economic conditions.
Marine Transportation	Short-term: During construction period. Long-term: Over the life of the project or longer.	The action could affect public services or utilities, but the impact could be localized and within operational capacities. There could be negligible increases in local daily marine traffic volumes, resulting in perceived inconvenience to operators but no actual disruptions to transportation.	The action could affect public services or utilities in local and adjacent areas, and the impact could require the acquisition of additional service providers or capacity. Detectable increase in daily marine traffic volumes could occur (with slightly reduced speed of travel), resulting in slowed traffic and delays. Short service interruptions could occur (temporary delays for a few hours).	The action could affect public services utilities over a widespread area resulting in the loss of certain services or necessary utilities. Extensive increase in daily marine traffic volumes could occur (with reduced speed of travel), resulting in extensive service disruptions (temporary closure of one day or more).
Aesthetics and Visual Resources	Short-term: During construction period. Long-term: Over the life of the project or longer.	There could be a change in the view shed that was readily apparent but could not attract attention, dominate the view, or detract from current user activities or experiences.	There could be a change in the view shed that was readily apparent and attracts attention. Changes could not dominate the viewscape, although they could detract from the current user activities or experiences.	Changes to the characteristic views could dominate and detract from current user activities or experiences.
Public Health and Safety, Including Flood and	Short-term: During construction period.	Actions could not result in 1) soil, ground water, and/or surface water contamination; 2) exposure of	Project construction and operation could result in 1) exposure, mobilization and/or migration of existing	Actions could result in 1) soil, ground water, and/or surface water contamination at levels exceeding

Resource	Impact Duration	Impact Intensity Minor	Impact Intensity Moderate	Impact Intensity Major
Shoreline Protection	Long-term: Over the life of the project or longer.	contaminated media to construction workers or transmission line operations personnel; and/or 3) mobilization and migration of contaminants currently in the soil, ground water, or surface water at levels that could harm the workers or general public. Increased risk of potential hazards (e.g., increased likelihood of storm surge) to visitors, residents, and workers from decreased shoreline integrity could be temporary and localized.	contaminated soil, ground water, or surface water to an extent that requires mitigation; and/or 2) could introduce detectable levels of contaminants to soil, ground water, and/or surface water in localized areas within the project boundaries such that mitigation/remediation is required to restore the affected area to the preconstruction conditions. Increased risk of potential hazards to visitors, residents, and workers from decreased shoreline integrity could be sufficient to cause a permanent change in use patterns and area avoidance in local and adjacent areas.	federal, state, or local hazardous waste criteria, including those established by 40 CFR § 261; 2) mobilization of contaminants currently in the soil, ground water, or surface water, resulting in exposure of humans or other sensitive receptors such as plants and wildlife to contaminant levels that could result in health effects; and 3) the presence of contaminated soil, ground water, or surface water within the project area, exposing workers and/or the public to contaminated or hazardous materials at levels exceeding those permitted by the federal Occupational Safety and Health Administration (OSHA) in 29 CFR § 1910. Increased risk of potential hazards to visitors, residents, and workers from decreased shoreline integrity could be substantial and could cause permanent changes in use patterns and area avoidance over a widespread area.

Appendix B: Monitoring and Adaptive Management Plan for Deepwater Horizon NRDA Project: Rabbit Island Restoration Project

Monitoring and Adaptive Management Plan for *Deepwater Horizon* NRDA Project: Rabbit Island Restoration Project

Prepared by: Jon J. Wiebe, D. Todd Baker, John Tirpak, Robert Dobbs

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1.0 Introduction

The Deepwater Horizon (DWH) Louisiana Trustee Implementation Group (LA TIG) developed this Monitoring and Adaptive Management (MAM) plan (Plan) for the Rabbit Island (CS-0080) Restoration Project (Project), which represents one of six projects selected from within the broader Restoration Plan #1: Restoration of Wetlands, Coastal, and Nearshore Habitats; Habitat Projects on Federally Managed Lands; and Birds (RP) in January 2017. The purpose of this MAM Plan is to identify monitoring activities that will be conducted to evaluate and document restoration effectiveness, including performance criteria for determining restoration success or need for interim corrective action (15 CFR 990.55(b)(1)(vii)). Where applicable, this Plan identifies key sources of uncertainty and incorporates monitoring data and decision points that address these uncertainties. It also establishes a decision-making process for making adjustments where needed.

There are three primary purposes for MAM Plans:

1. Identify and document how restoration managers will measure and track progress towards achieving restoration goals and objectives;
2. Increase the likelihood of successful implementation through identification, before a project begins, of potential corrective actions that could be undertaken if the project does not proceed as expected;
3. Ensure the capture, in a systematic way, of lessons learned or new information acquired that can be incorporated into future project selection, design, and implementation.

Figure 1. Rabbit Island. Cameron Parish, Louisiana. Google Earth® 2018

The Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. For example, the Plan may need to be revised should the project design change, if initial data analysis indicates that the sampling design requires adjustment, or if any uncertainties are resolved or new uncertainties are identified during project implementation and monitoring. Any future revisions to the Plan will be made publicly available through the Restoration Portal (https://www.diver.orr.noaa.gov/web/guest/home) and accessible through the Deepwater Horizon NRDA Trustees website (http://www.restoration.noaa.gov/dwh/storymap/).

1.1 Project Overview

Rabbit Island Restoration Project is located within the Calcasieu-Sabine Hydrologic Basin in Cameron Parish, Louisiana (*Figure 1*). This island represents an important colonial waterbird (CWB) nesting colony, and the only such colony located in the southwestern portion of the state. As such, LA TIG proposed the Project as one means to restore for impacts to bird resources associated with the Spill.

The Project will be accomplished by hydraulic dredging and depositing suitable sediment sources within earthen containment dikes. Following construction and dewatering activities, the island will be planted with suitable native vegetation such as smooth cordgrass (*Spartina alterniflora*), groundsel bush

(*Baccharis halimifoli*a), marsh elder (*Iva frutescens*), and matrimony vine (*Lycium carolinianum*) (*Figure 2*).

Figure 2. Proposed Restoration Design for Rabbit Island

The Project is being implemented as restoration for the *Deepwater Horizon* oil spill Natural Resource Damage Assessment (NRDA), consistent with the Programmatic Damage Assessment and Restoration Plan/Programmatic Environmental Impact Statement (PDARP/PEIS) and the Strategic Framework for Bird Restoration Activities (Strategic Framework).

- Programmatic Goal: Replenish and Protect Living Coastal and Marine Resources
- Restoration Type: Birds
- Restoration Approaches: Restore and conserve bird nesting and foraging habitat; Create, restore, and enhance barrier and coastal islands and headlands
- Restoration Techniques: Restore or construct barrier and coastal islands and headlands via placement of dredged sediments; Enhance habitat through vegetation management
- TIG: Louisiana Trustee Implementation Group

The implementing agency is State of Louisiana, partnering with the U.S. Fish and Wildlife Service (USFWS).

1.2 Restoration Type Goals and Project Restoration Objectives

The primary Project goal is to create and/or enhance ~96[2] acres of suitable colonial waterbird nesting and brood-rearing habitat within Rabbit Island with emphasis placed on brown pelican (*Pelecanus occidentalis*), royal tern (*Thalasseus maximus*), sandwich tern (*Thalasseus sandvicensis*) and black skimmer (*Rynchops niger*). In so doing, Trustees envision Project will generate additional CWB nesting opportunities that will compensate, in part, for bird losses associated with the Spill. Specific Project Restoration Type Goals are identified below:

Restoration Type Goals

- Restore lost birds by facilitating additional production and/or reduced mortality of injured bird species;
- Restore and protect habitats on which injured birds rely;
- Restore injured birds by species where actions would provide the greatest benefits within geographic ranges that include the Gulf of Mexico.

[2] ~96 acres is equivalent to ~88 acres of CWB nesting and brooding habitats and ~7.7 acres of total earthen containment dikes

In achieving these identified Restoration Type Goals, Trustees will accomplish the Project's principal Restoration Objectives.

Restoration Objectives

Objective #1: Restore / create Rabbit Island habitat for utilization by brown pelican, gull ssp., wading bird spp., tern spp. and black skimmer nesting activity.

- Parameter #1: Area of potential nesting habitat for brown pelican, gull ssp., wading bird ssp., tern ssp. and black skimmer (CWB)

Objective #2: Support nesting activity for brown pelican, gull ssp., wading bird spp., tern spp. and black skimmer that contributes to making the environment and the public whole for spill-related injuries.

- Parameter #2: CWB nesting activity

While the primary Project goal is well defined, it is acknowledged that the RP is conceptual. Throughout the design process, project team members, including the Coastal Protection and Restoration Authority (CPRA), the Louisiana Department of Wildlife and Fisheries (LDWF) and the USFWS will have the opportunity to refine design parameters as additional information becomes available. Performance criteria will be identified and then implemented to determine restoration success or the need for corrective action in accordance with 15 C.F.R. 990.55(b)(1)(vii)). Specific, measurable performance criteria are defined for monitoring parameters associated with each of the restoration objectives in Section 5.0.

1.3 Conceptual Setting

The purpose of the conceptual setting within the Plan is to identify, document, and communicate interactions and linkages amongst system components at the project site and, to understand how these system works may be affected by the associated restoration (MAM Manual) (*Table 1*).

Table 1. Conceptual Model for Rabbit Island (CS-0080) Restoration Project

Restoration Actions	As-Built	Interim	Restoration Goal
Place hydraulically dredged sediments within earthen containment dikes on the island	Create or enhance ~88 acres of CWB nesting and brooding habitat	• Hydraulically dredged sediments compact and dewater to desired elevation for targeted CWB nesting and brooding habitat • Planted native vegetation survives and expands to achieve desired species composition and percent cover which supports CWB nesting and brooding opportunities	• Newly constructed habitat attracts desired CWB species (brown pelican, gull ssp., wading bird ssp., tern spp. and black skimmer) for nesting and brooding opportunities. • Newly constructed habitat has an estimated 20-year lifespan; • Balance cost, quality, and urgency effectively. • Provide ecological services that contribute to making the environment and the public whole for spill-related injuries to these resources

1.3.1 Potential Sources of Uncertainty

Potential uncertainties are defined as those that may impair achievement of the stated project restoration objective(s). To aid in the identification of these uncertainties, Trustees utilized a variety of sources including (*but not limited to*): Strategic Framework, PDARP/PEIS Restoration Type MAM sections, Monitoring and Adaptive Management Procedures and Guidelines Manual Version 1.0, DWH injury assessment technical reports, and other documents. Select monitoring activities can then be implemented to inform these uncertainties as well as selection of appropriate corrective actions in the event the Project is not meeting its performance criteria (*Table 2*). Potential options to address key uncertainties may be found in the Strategic Framework and other sources.

Table 2. Key Uncertainties

Reference Number	Key Uncertainty	Description on how the uncertainty could impact project success and or decision making
1	Contractor completing Project on time	Contractor's inability to complete Project within designated timeframe would delay resource restoration and require allocation of additional resources for Project completion.
2*	Effects of weather events during construction	Construction for the project must be completed by mid-February 2021 due to the initiation of bird nesting activity; consequently, potential corrective action measures should be available during construction to ensure the placement of sediment remains at the desired elevation.
3	Availability of suitable nesting habitat within the northern Gulf of Mexico (nGOM)	There are a large number of restoration activities taking place across coastal Louisiana and the northern Gulf Coast. Many of these projects could provide habitat for nesting birds especially tern spp. and black skimmers. This additional amount and diversity of potentially high-quality habitat could lower the number of nesting birds on Rabbit Island, reducing the apparent short-term effectiveness of the Project. Potential options to address this uncertainty include, but are not limited to, social attraction techniques, etc.
4	Suitability of restored island to mammalian nest predators	The presence of mammalian predators within CWB colonies may be highly detrimental to nesting success and hatchling/fledgling survival. Potential options to address this uncertainty include, but are not limited to, mammalian predator removal, electric fencing to reduce/eliminate access by mammalian predators, etc.
5	Success of vegetation plantings	Low survival/success of replanting efforts would limit development of preferred nesting habitat (i.e., vertical structure) for many CWB species. This would result in lower quality, or lack of suitable habitat, for brown pelican and a number of wading bird species (e.g., snowy egret, reddish egret, and tricolored heron).
6	Colonization of the island by invasive vegetative species	Colonization by non-native plant species could result in habitat that is less preferred by CWB for nesting and

	such as Roseau cane (*Phragmites australis*) and/or Chinese tallow (*Triadica sebifera*)	brooding, and would, therefore, not support proposed Project objective (i.e., increase CWB nesting opportunities). Potential options to address this uncertainty include, but are not limited to, chemical, mechanical, or other removal techniques.
7	Extreme weather events such as hurricanes, tropical storms, droughts, etc.	These types of ephemeral events may cause mortality in all CWB age classes (adults, subadults, juveniles/young of the year), as well as loss of critical nesting and brooding habitats.
8	Anthropogenic disturbance	Anthropogenic disturbance may negatively impact CWB nesting success and hatchling/fledgling survival directly (e.g., by destroying eggs) or indirectly (e.g., by limiting parental attendance). Potential options to address this uncertainty include, but are not limited to, signage, restricting public use during certain times of year, law enforcement, etc.
9	Avian Disease	Occurrence of avian disease has the potential to harm all CWB age classes (adults, subadults, juveniles/young of the year), and could result in colony failure. Potential options to address this uncertainty include, but are not limited to, creation or enhancement of additional CWB islands to reduce bird densities (thus reducing likelihood of disease outbreaks).

*Given recent observations and lessons learned during the latter part of construction of the Queen Bess Island Restoration project, there is a potential that weather events, i.e., cold fronts and high wind events, may impact sediment placed during construction. In order to reduce the key uncertainty, 5 potential corrective action measures have been identified that could be implemented in order to ensure the project is completed on time and construction target elevations are met. These potential corrective action measures, with estimated costs, include the following: interior containment dike construction ($175,000), increase estimated ratio of fill volume ($225,000), erosion control measure – seeding ($75,000), erosion control measure – hay bales ($225,000), and/or erosion control measure – fencing ($140,000).

2.0 Project Monitoring

The Plan was developed to evaluate Project performance, key uncertainties, and potential corrective actions, if needed. For each of the identified monitoring parameters, information is provided as to their intended purpose (e.g. monitor progress toward meeting one or more of the restoration objectives, regulatory compliance, support adaptive management of the project), monitoring methods, timing and frequency, duration, sample size, and sites. Further, these parameters will be monitored to demonstrate how the restoration project is trending toward the performance criteria and to inform needed for corrective actions (See Section *5.0: Project-Level Decisions*).

Though additional measures may be implemented to more fully characterize the Project effectiveness, LA TIG proposes the continued implementation of the following methodologies:

Objective #1: Restore / create Rabbit Island habitat for utilization by brown pelican, gull ssp., wading bird spp., tern spp., and black skimmer nesting activity.

Parameter #1: Area of potential nesting habitat for brown pelican, gull ssp., wading bird spp., tern spp., and black skimmer.

a) Purpose: This parameter will be used to inform Year 3 planting and invasive plant removal, and to inform post-execution adaptive management.
b) Method: Determine the amount (acreage) of habitat that is suitable for nesting and brooding for each of the targeted avian species/guilds. This will be the result of a complex analysis of plant species composition and percent cover (including overall total cover, total cover by herbaceous species and/or shrubs; percent cover of key species; and/or average height of dominant/key species) using several data types, including:
    - High-resolution, near-vertical aerial imagery;
    - Real-time kinematic (RTK) and;
    - Ground surveys utilizing the Braun-Blanquet method (Mueller-Dombois and Ellenberg 1974) to validate imagery.
c) Timing, Frequency, and Duration: Fall Years 2, 5 & 10
d) Sample Size: A minimum of 20 randomly selected vegetation stations. Exact number of stations will be determined from power analyses.
e) Sites: Vegetation stations will be established interior to the perimeter earthen containment dike in the areas designed for brown pelicans and/or wading birds per the construction design drawings

Objective #2: Support nesting activity for brown pelican, gull ssp., wading bird spp., tern spp., and black skimmer that contributes to making the environment and the public whole for spill-related injuries.

Parameter #2: CWB nesting activity

a) Purpose: This parameter will be used to evaluate the effectiveness of the Project in increasing nesting of targeted CWB species (Framework, Appendix A, Colonial Waterbirds) and to inform adaptive management.
b) Method:
    - Acquire high-resolution aerial digital photography of CWB nest surveys on Rabbit Island utilizing established methodologies (Ford 2010; Appendix A).
    - Photographic counting (aka. Dotting) of aforementioned high-resolution aerial digital photography during CWB surveys will be used to estimate numbers of nests for brown pelican, gull ssp., wading bird ssp., tern ssp. and black skimmer on Rabbit Island (Ford 2010; Appendix B).
c) Timing, Frequency, and Duration: Surveys (aerial nest photography flights and dotting analyses) will be conducted during Pre-Execution and Years 1, 3, 5 and 10. Due to the bimodal nature of the CWB nesting season, two (2) representative surveys will be implemented for each of the years indicated: the initial survey (mid-May) followed by the final survey (mid-June). This timing will follow previous aerial photo nest survey windows

conducted in 2010-2013 (Ford 2010) and in 2018 (LA TIG Resolution: LA-2019-019) in Louisiana.

d) Sample Size: The entire island will be photographed, and associated images will be analyzed to estimate number of nests for each species present.
e) Site: Rabbit Island

3.0 Adaptive Management

Monitoring information collected at the project-level can also inform adaptive management (a form of structured decision-making applied to the management of natural resources in the face of uncertainty of that individual project) (Pastorok et al. 1997; Williams 2011). Within the LA TIG, an Adaptive Management Framework has been developed which identifies and characterizes the four main phases within the adaptive management cycle (Figure 3).

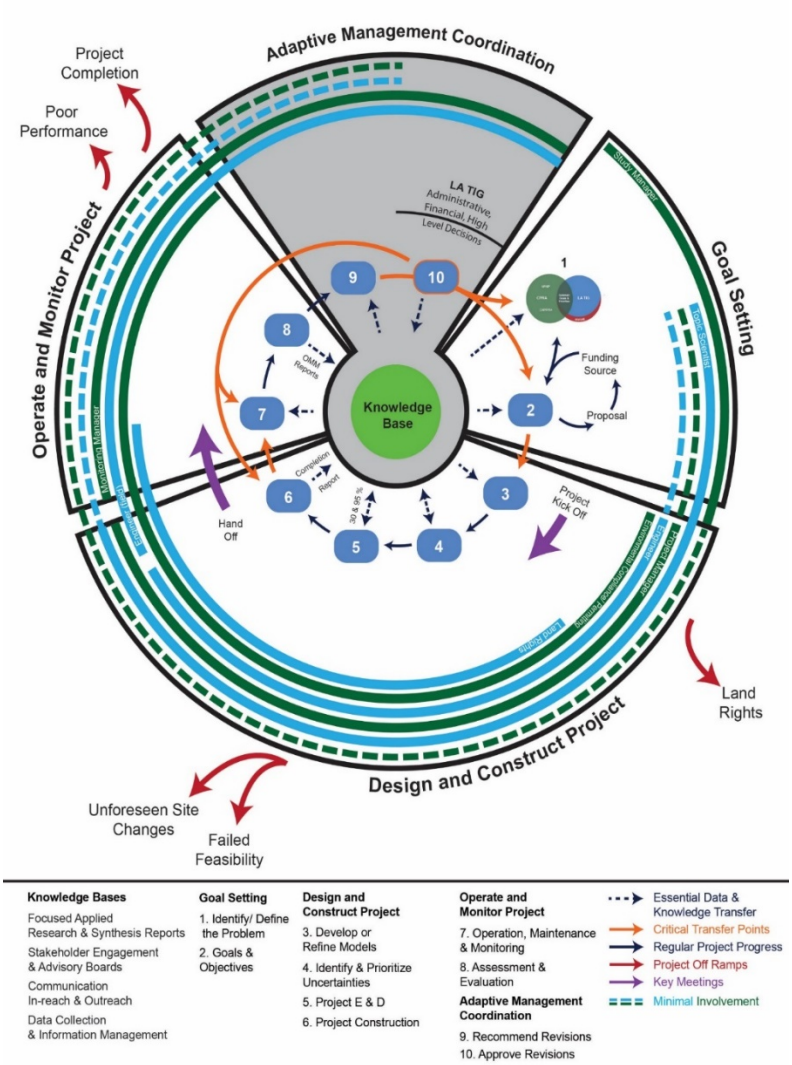

Figure 3. LA TIG Adaptive Management

1. Goal Setting Phase: Problem is identified or defined, and project goals and objectives are established based on multiple sources including lessons learned, data and data synthesis, applied research from previous projects and from the knowledge base as a whole;
2. Development and Execution Phase: Project advances through select steps including model development or refinement, identification and prioritization of uncertainties, plan formulation, engineering, design and project construction;
3. Monitoring and Performance Phase: Project's operations, maintenance and monitoring plans are developed as well as project assessment and evaluation criteria are identified;
4. Adaptive Management Coordination: Encompasses steps for recommending and approving project revisions, so that revisions can:
    - Result in alterations and redesign project elements or changes to project operation and/or;
    - Provide input to either the understanding of the overall problem statements, or the refinement of attainable or realistic goals and objectives for future projects.

Where gaps in scientific understanding exist, Project information collected (Section 1, Project Monitoring) and evaluated (Section 2, Evaluation) may be utilized by the TIG to reduce key uncertainties and/or other analyses that inform the selection, design, and optimization of future restoration projects (Framework).

4.0 Evaluation

Evaluation of monitoring data is needed to assess project implementation and performance in meeting restoration objectives, to resolve uncertainties and increase understanding, and to determine whether corrective actions are needed.

As part of a larger-scale decision-making process, monitoring data from individual projects could also be compiled and assessed at the Restoration Type and TIG levels. In this context, results could be used to update the broader knowledge base and to inform decision-making, including future TIG project prioritization and selection, implementation techniques, and identification of critical uncertainties. The results of these analyses could be used to answer the following questions:

- Were project restoration objectives achieved? If not, can reasons be identified?
- Did the project produce unanticipated effects?
- Were there unanticipated events, unrelated to the project, that potentially affected the monitoring results (e.g., hurricanes)?
- Were any uncertainties identified prior to project implementation resolved?
- Were any new uncertainties identified during or after project implementation?

Proposed analysis methods for monitoring parameters are grouped under stated objective headings and will be updated as necessary:

Objective #1: Restore / create Rabbit Island habitat for utilization of brown pelican, gull ssp., wading bird ssp., tern ssp. and black skimmer nesting activity.

Analysis: Vegetative Structure and Composition: General descriptive statistical analyses may include, but are not limited to, averages/means of the overall total cover, total cover by herbaceous species and/or shrubs; percent cover of key species; and/or average height of dominant/key species. After each data collection effort, all collected and analyzed data will be evaluated to determine existing habitat type and

avian utilization. After multiple data collection efforts, comparisons between each time period will be assessed to determine the evolution of the habitat and how avian species are reacting to the changes.

Objective #2: Support nesting activity for brown pelican, gull ssp., wading bird ssp., tern ssp. and black skimmer that contributes to making the environment and the public whole for spill-related injuries.

Analysis: CWB Nesting Activity: Aerial photographs (Appendix A) will be analyzed using the same methods used to analyze photographs collected in the study area in 2010-2013 (Ford 2010) and in 2018 (LA TIG Resolution: LA-2019-019) in Louisiana. Photos from May and June surveys will be evaluated for their representation of peak breeding population size for each species at each colony. For most species, photos from May surveys will represent peak breeding numbers and will be selected for analysis. For some species, especially black skimmer, photos from June surveys will better represent peak numbers and will be used for analysis. Occasionally, especially for brown pelican, royal tern, and sandwich tern, well-developed colonies will be counted using May photographs, but additional large nesting groups that form after the May survey will be counted from June photographs and summed with May counts for a total number of nests.

All images of each individual colony will be inspected for clarity, location within the colony, and, collectively, extent of colony coverage. Images best suited for nest counts based on those criteria and collectively comprising all areas photographed will be analyzed using counting software (Image-Pro, Media Cybernetics®). Nests and birds will be marked manually, and the software will automatically tally total counts for each category. Although the primary objective will be to determine number of nests, individual birds and chicks of each species will be counted in each photo.

For brown pelican, nests will be categorized by their stage of development. These categories will include the following:

- Well-built nest (with attending adult, and with or without chicks);
- Poorly-built nest (pre egg-laying);
- Nest with chicks, but without attending adults;
- Abandoned nest (with eggs, but unattended);
- Empty nest (early-season unattended without eggs or chicks); and
- Brood (dependent chicks away from an obvious nest and not attended by an adult).

Together, these categories will provide numbers of pelican nests and breeding pairs at each colony based usually on a single aerial photographic survey, even though egg-laying dates may span a period of months. For other species, all nests and territories will be marked more generally as “sites”. The detailed nest categories that will be used for brown pelicans are inappropriate for other species because of their small size (terns and gulls), scrape-nesting habits (terns and skimmers), or partial concealment by vegetation (waders and gulls).

Using the software, unique symbol-color combinations will be assigned to different nest and bird categories for each species. Where overlapping images are used to analyze portions of a colony, one or more lines will be drawn on the selected image to delineate the area to be counted using that image. Areas outside any such lines will then be counted using different images. This process will continue until the colony is counted completely with available photographs.

Compiling Data

After analyzing an image with the software, a screen capture of the analyzed image will be saved as a jpeg file. The screen capture will show all data, including image number, all symbols that marked nests and birds, total counts for each category, colony name, area number, the initials of the photo analyst, the date the image was analyzed, and any other annotations the photo analyst added. All screen captures will be saved with standardized file names and archived in colony-specific folders. All data from each screen capture will be manually entered into a Microsoft® Access database.

Assessing Colony Conditions

Each analyzed image will be evaluated to characterize conditions, for each species, at each colony. Factors that will be considered will include the following:

- The stage of the breeding cycle (e.g., early-, mid-, or late-incubation, early chick-rearing, etc.) for each species;
- Habitat occupancy (numerical and geographic extent to which each species occupied the habitat);
- Reproductive performance (e.g., pattern of abandonment, if any, chick production, etc.), and

Information specific to a particular image will be entered into a notes field in the main data table in the Access database. Information concerning the colony as a whole will be entered in a separate data table in the same database.

5.0 Project-Level Decisions: Performance Criteria and Potential Corrective Actions

In this section, TIG describes how updated knowledge gained from the evaluation of monitoring data will be used at the project-level to determine whether the Project is considered successful or whether corrective actions are needed. A project may not be achieving its intended objectives because of previously identified key uncertainties, unanticipated consequences, previously unknown conditions, or unanticipated environmental drivers. The decision to implement (or not implement) corrective actions is one type of decision within the larger adaptive management decision-making framework.

Learning through monitoring allows for corrective actions to be made to achieve desired outcomes. Table 3 identifies performance criteria, monitoring parameters, and potential corrective actions that could be taken if performance criteria are not met (as defined in OPA regulations (15 C.F.R. 990.55(b)(1)(vii)). This table should not be considered all-encompassing; rather, it is a listing of potential actions for each individual parameter to be considered if the Project is not performing as expected once implemented. Other corrective actions may be identified post-implementation and included in an O&M Plan. The decision of whether or not a corrective action should be implemented for the Project should holistically consider the overall outcomes of the restoration project (i.e., looking at the combined evaluation of multiple performance criteria) in order to understand why project performance deviates from the predicted or anticipated outcome(s) as they pertain to the stated restoration objectives and performance criteria. Corrective action may be deemed unnecessary based on such considerations. Knowledge gained from this process may also inform future restoration decisions, such as the selection, design, and implementation of similar projects.

Table 3. List of project monitoring parameters, performance criteria, and potential corrective actions.

Monitoring Parameter	Final Performance Criteria used to determine Project Success	Interim Performance Criteria	Potential corrective actions or mid-course corrections*
Area of potential nesting habitat for brown pelican, gull ssp., wading bird ssp., tern ssp. and black skimmer	At year 5 post-construction, at least 40 ± 5 acres of select habitat will consist of 50% vegetative cover	At year 2 post-construction, information gathered to inform Year 3 planting effort and invasive vegetative removal	Perform supplemental planting(s) of preferred native vegetation; Eradicate unwanted vegetation (Ref. O&M Plan and Key Uncertainty Reference Number #5)
CWB Nesting Activity	Year 10: brown pelican: as high as 330 nests, gull ssp. as high as 3,000 nests; wading bird ssp. as high as high as 2,330 nests; tern ssp. and black skimmer: as high as 130 nests.	Year 1: brown pelican: as high as 30 nests, gull ssp. as high as 70 nests; wading bird ssp. 0 nests; tern ssp. and black skimmer: as high as 270 nests. Year 3: brown pelican: as high as 160 nests, gull ssp. as high as 2,500 nests; wading bird ssp. as high as high as 30 nests; tern ssp. and black skimmer: as high as 200 nests. Year 5: brown pelican: as high as 270 nests, gull ssp. as high as 3,000 nests; wading bird ssp. as high as 1,670 nests; tern ssp. and black skimmer: as high as 170 nests.	No corrective action is envisioned at Year 1 as the habitat is evolving for optimal bird use. That stated, unforeseen situations can be addressed utilizing adaptive management. (Ref. O&M Plan) Years 3, 5, and 10: Additional preferred native vegetation plantings; Eradicate unwanted vegetation; Construction of artificial nesting platforms. In addition, in Year 5, potential earthen dike modification may be needed, i.e., alter elevation as it relates to the interior island elevation prior to Year 6 nesting season. Predator control will be implemented as needed utilizing established methods. (ref. O&M Plan, Bird Strategic Framework and Key Uncertainty Reference Numbers 3, 4 and 5)

**The table provides the triggers for helping determine whether adjustments to the project are needed based on the performance criteria; potential corrective actions for unknown or unanticipated conditions should they arise would need to be determined.*

6.0 Monitoring Schedule

Project monitoring schedule (*Table 4*) is separated by monitoring activities. Pre-execution monitoring will occur before project execution, if applicable. Execution monitoring occurs when the Project has been fully executed as planned (Year 0), although this timeframe may vary for different parameters. Performance monitoring will occur in the years following initial project execution (Years 1 - 10).

Table 4. Monitoring Schedule.

Monitoring Parameters	Pre-Execution Monitoring	Execution Monitoring (Initial) As-Built Year 0	Post-Execution Monitoring (ongoing) Year 1	Post-Execution Monitoring (ongoing) Year 2	Post-Execution Monitoring (ongoing) Year 3	Post-Execution Monitoring (ongoing) Year 5	Post-Execution Monitoring (ongoing) Year 10
CWB Aerial Nest Surveys	X		X		X	X	X
Vegetation Surveys				X		X	X

7.0 Data Management

7.1 Data Deliverables

CWB Nest Aerial Surveys: LA TIG representatives will receive copies of all data generated (e.g., survey tracks, survey photos that coincide with those tracks, GIS files, KMZ files, associated metadata etc.) in association with the five scheduled sampling events (Pre-Execution, Year 1, Year 3, Year 5 and Year 10). *NOTE: Due to the bimodal nature of colonial waterbird nesting, each sampling event consists of 2 individual aerial surveys (Survey #1: mid-May and Survey #2: mid-June)*.

CWB Nest Dotting Analyses: LA TIG representatives will receive an individual data analysis summary report for each of the five scheduled CWB Nest Aerial Survey sampling events (Pre-Execution, Year 1, Year 3, Year 5 and Year 10). Reports will include all data collected and analyses performed as well as all associated metadata.

Vegetative Surveys: LA TIG representatives will receive an individual summary report for each of the three scheduled sampling events (Year 2, Year 5 and Year 10). Reports will include all data collected and analyses performed as well as all associated metadata.

7.2 Data Description

To the extent practicable, all environmental and biological data generated during monitoring activities will be documented using standardized field datasheets. If standardized datasheets are unavailable or not readily amendable to record Project-specific data, then Project-specific datasheets will be drafted prior to conducting any Project monitoring activities. Original hardcopy datasheets and notebooks and photographs will be retained by the Implementing Trustee.

Relevant Project data that are handwritten on hardcopy datasheets or notebooks will be transcribed (entered) into standard digital format. All field datasheets and notebook entries will be scanned to PDF files. Electronic data files should be named with the date on which the file was created and should include a ReadMe file that describes when the file was created and by whom, and any explanatory notes on the file contents. If a data file is revised, a new copy should be made and the original preserved.

All data will have properly documented FGDC/ISO metadata, a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data were collected, QA/QC procedures, other information about data such as meaning, relationships to other data, origin, usage, and format – can reference different documents).

7.3 Data Review and Clearance

Data will be reviewed for quality assurance and quality control (QA/QC) in accordance with the MAM Manual, and any errors in transcription will be corrected. Implementing Trustees will verify and validate data and information and will ensure that all data are i.) entered or converted into agreed upon/commonly used digital format; ii.) labeled with metadata following FGDC/ISO standards to the extent practicable and in accordance with Implementing Trustee agency requirements.

After all identified errors are addressed, data are considered to be cleared. The implementing Trustee will give the other Louisiana TIG members time to review the data before making such information publicly available (as described below). Before submitting the monitoring data and information package, co-Implementing Trustees shall confirm with one another that the package is approved for submission.

7.4 Data Storage and Accessibility

Once data have been cleared they will be submitted to the Restoration Portal.

Trustees will provide DWH NRDA MAM data and information to the Restoration Portal as soon as possible and no more than one year from when data are collected.

7.5 Data Sharing

Data will be made publicly available, in accordance with the Federal Open Data Policy, through the DIVER Explorer Interface within one year of when the data collection occurred.

8.0 Reporting

Based on Project monitoring schedule (*Section 4*), associated reporting will be submitted in Years 3, 6 and 11.

9.0 Roles and Responsibilities

The LA TIG is responsible for addressing MAM objectives that pertain to their restoration activities and for communicating information to the Trustee Council or Cross-TIG MAM workgroup. LDWF is the Implementing Trustee for the project. DOI will also be the lead federal agency for conducting the environmental evaluation review for implementation. CPRA is a project partner. The Implementing Trustee's roles include:

- Coordination with CPRA to ensure data collection and report composition are completed;
- Ensure the CPRA performs operations and maintenance activities as required;
- Provides project progress information to the LA TIG.

10.0 Monitoring and Adaptive Management Budget

The overall budget for the project monitoring and adaptive management is shown in Table 5, separated by activity.

Table 5. Monitoring and Adaptive Management Budget

Cost Items	Frequency	Unit Cost	Cost Estimates
*Key Uncertainty: Construction**	Once		$840,000
CWB Aerial Nest Surveys	Years 1, 3, 5, 10	$150,000	$600,000
CWB Nest Dotting Efforts	Years 1, 3, 5, 10	$50,000	$200,000
Vegetation Surveys	Years 2, 5, 10	$33,333	$100,000
Invasive Vegetation Species Removal	Annual	$10,000	$100,000
Predator Control	Annual	$10,000	$100,000
Anthropogenic Disturbance	Annual	$25,000	$250,000
Artificial Nesting Structures	As needed	-	$50,000
LDWF Oversight		-	$212,000
TOTAL			**$2,452,000**

*Not all potential corrective action measures will be implemented, but a single or combination of alternatives may be utilized (See footnote to Table 2).

11.0 References

Deepwater Horizon Natural Resource Damage Assessment Trustees. (2016). Deepwater Horizon oil spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement. Retrieved from http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan

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Technical Report: Deepwater Horizon Natural Resource Damage Assessment Technical Report. Evaluation of Potential Exposures and Injuries to Colonial Birds in Coastal Louisiana Caused by the 2010 Deepwater Horizon Oil Spill. Prepared by: D. Todd Baker (LDWF) and Mary Huisenga & Bryan Wallace (Abt Associates Inc.), August 31, 2015. Retrieved from https://www.fws.gov/doiddata/dwh-ar-documents/788/DWH-AR0293621.pdf

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12.0 MAM Plan Revision History

Old Version #	Revision Date	Changes Made	Reason for Change	New Version #

Appendix 1: Bird Colony Aerial Photography Protocol (RG Ford)

Aerial photographic surveys will be used to census waterbird colonies along the Louisiana shoreline based on previous colony photographic surveys carried out in 2010-2013 and 2015 following the Deepwater Horizon oil spill. The list of colonies visited in 2015 will be used as the baseline. The list will be adjusted after each survey session, adding newly discovered colonies and removing any former colonies at small islands that are found to be under water. Colonies containing only cryptic beach nesting birds, such as least terns are not included.

Colony photographic surveys will be carried out from a fixed wing aircraft configured so that two photographers can work simultaneously. Photographers will be familiar with both aerial survey protocols and colony counting methodology so that they can determine immediately whether or not photograph quality is adequate for purposes of counting. Digital SLR cameras equipped with 18-200 mm and 200-300 mm telephoto lenses will be used to acquire photographs. Aircraft waypoints and time will be recorded automatically at 5 second or smaller intervals. Photograph time (recorded as part of the JPG file) will be used to estimate the position of each photograph.

Crews will consist of a pilot, a navigator/data recorder, and two photographers. The navigator will coordinate the sequence of colony visits and optimal aerial approach to each colony with the pilot. One photographer will take 'context' photographs showing a relatively wide area view of the colony, while the other photographer will concentrate on more detailed 'close-up' shots that will actually be used for counting. If time allows, the context photographer also will zoom in to obtain additional close-up photographs. The navigator will record when the aircraft is approaching a colony, when it is leaving, and the range of frame numbers shot over that colony.

As the aircraft approaches a target colony, the crew will assess the spatial distribution of birds on the colony. Photographers, navigator, and pilot will confer to determine the best angle of approach and the ideal altitude for photographic census. Their decision will be based on the shape of the colony, the species present at the colony, the strength and direction of the wind, vegetation around the colony, and angle of the sun. While the approach altitude is variable, all photography will be carried out at an altitude between 600' and 900' ASL, adjusted so that birds present on the colony do not leave their nests. Multiple approaches from different directions or altitudes may be made if photographers feel that they are not obtaining pictures of adequate quality or if birds appear to be responding to the presence of the aircraft.

Photograph files (JPGs) will be downloaded daily to an external back-up device. Flash memory cards from the cameras will be labeled and stored when they are full. After each day's survey, a subset of photographs will be checked to ensure that the photographic quality is such that the photos are usable for counting. If better photographs are required for a particular colony and survey logistics allow, a colony may be visited a second time during a survey session.

Deliverable 2

- Contractor will provide designated LATIG representatives with a summary report (electronic format) within 180 days of Contractor receipt of LATIG's itemized colony listing.
- Within the Summary report, Contractor will identify/quantify (where applicable) the following endpoints:
    - Species and number of individuals/species encountered/colony;
    - Number of nests by species/colony;

    - Nest status by species/colony and;
    - Contractor observations which may provide LATIG with insight into current and future avian restoration projects and/or adaptive management strategies.
- Contractor will provide designated LATIG representatives with an individual, georegistered digital mapping product (i.e., photo mosaic) which clearly identify counting subregions for each colony evaluated during photographic counting analyses.

Appendix 2: Bird Quantification (i.e., Dotting) Protocol (RG Ford)

Aerial photographs (Appendix 1) will be analyzed using the same methods used to analyze photographs collected in the study area in 2010-2013 (Ford 2010). Photos from May and June surveys will be evaluated for their representation of peak breeding population size for each species at each colony. For most species, photos from May surveys will represent peak breeding numbers and will be selected for analysis. For some species, especially black skimmer (*Rynchops niger*), photos from June surveys will better represent peak numbers and will be used for analysis. Occasionally, especially for brown pelican (*Pelecanus occidentalis*), royal tern (*Thalasseus maximus*), and Sandwich tern (*Thalasseus sandvicensis*), well-developed colonies will be counted using May photographs, but additional large nesting groups that form after the May survey will be counted from June photographs and summed with May counts for a total number of nests.

All images of each individual colony will be inspected for clarity, location within the colony, and extent of colony coverage. Those best suited for nest counts based on those criteria and collectively comprising all areas photographed will be analyzed using counting software (Image-Pro, Media Cybernetics®). Nests and birds will be marked manually, and the software will automatically tally total counts for each category. Although the primary objective will be to determine number of nests, individual birds and chicks of each species will be counted in each photo.

For brown pelican, nests will be categorized by their stage of development. These categories will include the following:

- Well-built nest (with attending adult, and with or without chicks);
- Poorly-built nest (pre egg-laying);
- Nest with chicks, but without attending adults;
- Abandoned nest (with eggs, but unattended);
- Empty nest (early-season unattended without eggs or chicks); and
- Brood (dependent chicks away from an obvious nest and not attended by an adult).

Together, these categories will provide numbers of pelican nests and breeding pairs at each colony based usually on a single aerial photographic survey, even though egg-laying dates may span a period of months. For other species, all nests and territories will be marked more generally as “sites”. The detailed nest categories that will be used for brown pelicans are inappropriate for other species because of their small size (terns and gulls), scrape-nesting habits (terns and skimmers), or partial concealment by vegetation (waders and gulls).

Using the software, unique symbol-color combinations will be assigned to different nest and bird categories for each species. Where overlapping images are used to analyze portions of a colony, one or more lines will be drawn on the selected image to delineate the area to be counted using that image. Areas outside any such lines will then be counted using different images. This process will continue until the colony is counted completely with available photographs.

Compiling Data

After analyzing an image with the software, a screen capture of the analyzed image will be saved as a jpeg file. The screen capture will show all data, including image number, all symbols that marked nests and birds, total counts for each category, colony name, area number, the initials of the photo analyst, the date the image was analyzed, and any other annotations the photo analyst added. All screen captures will be saved with standardized file names and archived in colony-specific folders. All data from each screen capture will be manually entered into a Microsoft® Access database.

Assessing Colony Conditions

Each analyzed image will be evaluated to characterize conditions at each colony. Factors that will be considered will include the following:

- The stage of the breeding cycle (e.g., early-, mid-, or late-incubation, early chick-rearing, etc.) for each species;
- Habitat occupancy (numerical and geographic extent to which each species occupied the habitat);
- Reproductive performance (e.g., pattern of abandonment, if any, chick production, etc.), and

Information specific to a particular image will be entered into a notes field in the main data table in the Access database. Information concerning the colony as a whole will be entered in a separate data table in the same database.

Appendix C: Monitoring and Adaptive Management Plan for Deepwater Horizon NRDA Project: Shoreline Protection at Jean Lafitte National Historical Park and Preserve

Monitoring and Adaptive Management Plan for *Deepwater Horizon* NRDA Project: Shoreline Protection at Jean Lafitte National Historical Park and Preserve

Prepared by: Jean Lafitte National Historical Park and Preserve

Draft Version Date: 2/4/2020

1.0 Introduction

Jean Lafitte National Historical Park and Preserve (the park) developed this monitoring and adaptive management plan (MAM plan) for the Shoreline Protection at Jean Lafitte National Historical Park and Preserve Restoration Project (the Project), which represents one of six projects selected by the Deepwater Horizon (DWH) Louisiana Trustee Implementation Group (LA TIG) from within the broader *Final Restoration Plan #1: Restoration of Wetlands, Coastal, and Nearshore Habitats; Habitat Projects on Federally Managed Lands; and Birds* (RP) in January 2017. The purpose of this MAM plan is to identify monitoring activities that will be conducted to evaluate and document restoration effectiveness, including performance criteria for determining restoration success or need for interim corrective action (15 Code of Federal Regulations [CFR] 990.55(b)(1)(vii)). Where applicable, the MAM plan identifies key sources of uncertainty and incorporates monitoring data and decision points that address these uncertainties. It also establishes a decision-making process for adjusting the plan where needed.

MAM plans have three primary purposes:

1. Identify and document how restoration managers will measure and track progress towards achieving restoration goals and objectives.
2. Increase the likelihood of successful implementation through identification, before a project begins, of potential corrective actions that could be undertaken if a project does not proceed as expected.
3. In a systematic way, capture lessons learned or new information acquired that can be incorporated into future project selection, design, and implementation.

This MAM plan is a living document and may be updated as needed to reflect changing conditions and/or new information. For example, the plan may need to be revised if the Project design changes, if initial data analysis indicates that the sampling design requires adjustment, or if any uncertainties are resolved or new uncertainties are identified during Project implementation and monitoring. Any future revisions to this document will be made publicly available through the Restoration Portal (https://www.diver.orr.noaa.gov/web/guest/home) and accessible through the DWH Natural Resource Damage Assessment (NRDA) Trustees website (http://www.restoration.noaa.gov/dwh/storymap/).

1.1 Project Overview

The Project is located in Louisiana along the shoreline of the Barataria Preserve unit of Jean Lafitte National Historical Park and Preserve (Figure 1). The Project is being implemented as restoration for the *Deepwater Horizon* oil spill NRDA, consistent with the Final Programmatic Damage Assessment and Restoration Plan and Programmatic Environmental Impact Statement (PDARP/PEIS). In responding to the oil spill, the decision to release fresh water from the Davis Pond Freshwater Diversion structure into Lake Cataouatche resulted in the loss of submerged aquatic vegetation (SAV). A total of 50 acres of SAV were assessed to be lost in the nearshore waters of Barataria Preserve between the fall of 2010 and fall of 2012. The SAV community in the injured area has not recovered since the original injury occurred, despite the presence of adjacent SAV beds that are reproducing via seeds and vegetative spreading and are not dispersal limited. Contiguous SAV beds reduced erosion on the adjacent marsh shoreline and decreased the resuspension of sediments in the water column by stabilizing the benthic substrate and reducing wave action and current velocity. The reduced coverage of these SAV beds has likely created a positive feedback loop where reduced SAV cover has facilitated increased wave energy and current velocity while destabilizing sediments, resulting in increased sediment suspension and erosion to the nearshore environment, making recruitment by new plants impossible. Monitoring by US Geological Survey (USGS) and others suggests that factors such as water depth, salinity, turbidity, and nutrient

levels are all favorable for SAV growth. National Park Service (NPS) and USGS staff conclude, however, that the habitat conditions within affected parts of Lake Cataouatche and Lake Salvador have shifted to a new state characterized by much lower cover in the SAV community that is unlikely to reestablish on its own because of continued exposure to wave energy and current velocity and their impacts on SAV habitat conditions, including sediment disturbance, turbidity, and water quality attributes.

Figure 1. Area Map of Barataria Preserve, Lake Cataouatche, and Lake Salvador

Restoration activities will involve constructing a wave attenuation structure (i.e., rock breakwater) to protect habitat and create favorable conditions for the restoration of at least a net 50 acres of SAV (Figure 2). By reducing wave energy, the structure is expected to reduce sediment disturbance and turbidity behind the structure creating conditions suitable for SAV recovery. The structure will be designed such that current velocities between the structure and the shoreline will be within an acceptable range for SAV recruitment. Fish gaps will be incorporated into the design to allow fish passage through the structure, as well as boating access behind the structure.

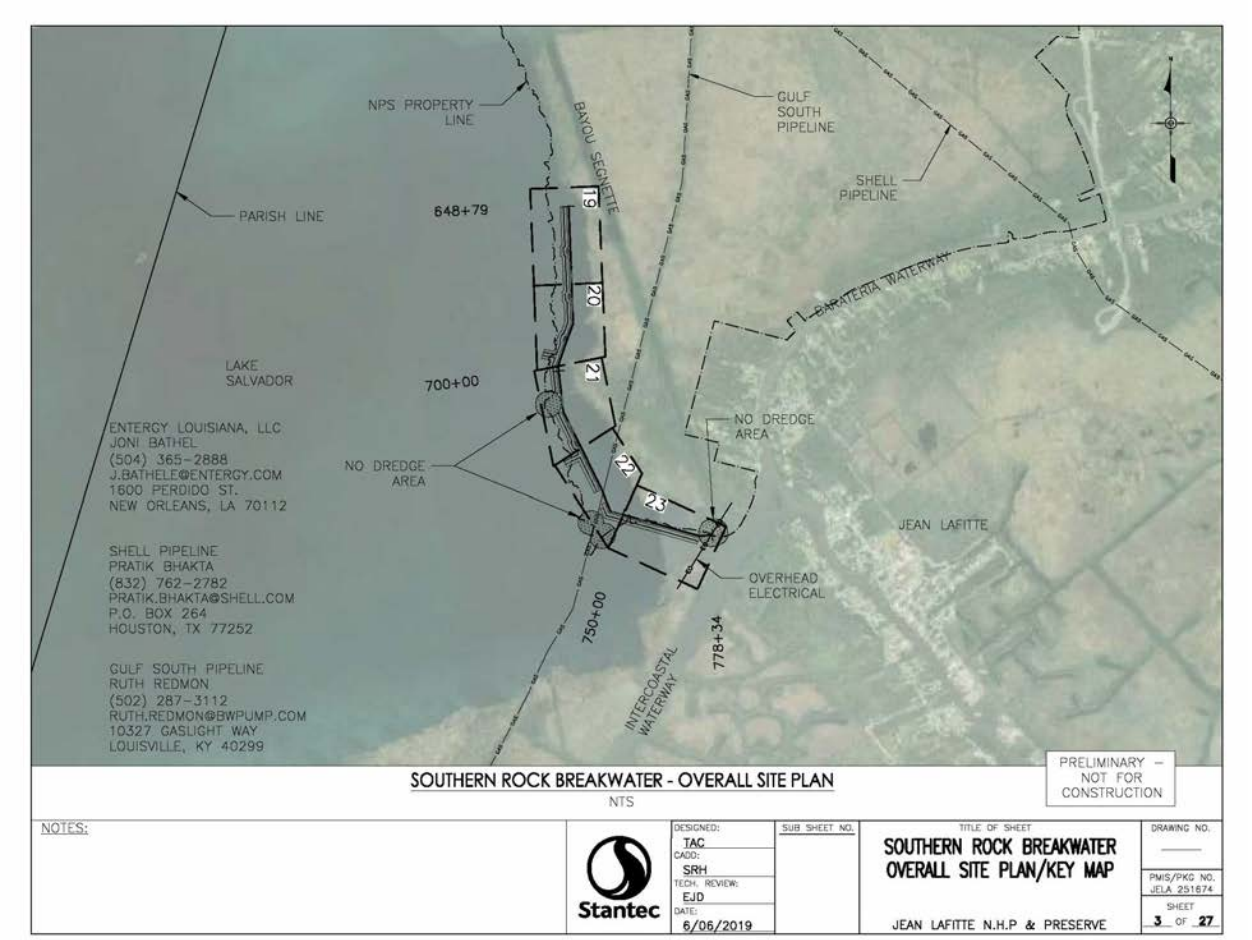

Figure 2. Project Layout

The Project is being implemented as restoration for the DWH oil spill NRDA, consistent with the DWH PDARP/PEIS and the *Deepwater Horizon Oil Spill Natural Resource Damage Assessment Strategic Framework for Habitat Projects on Federally Managed Lands* (the Framework).

- Programmatic Goal: Replenish and Protect Living Coastal and Marine Resources
- Restoration Type: Habitat Projects on Federally Managed Lands
- Restoration Approach: Restore and Enhance SAV
- Restoration Technique: Protect and enhance SAV through wave attenuation structures
- Trustee Implementation Group: LA TIG
- Restoration Plan: LA TIG Restoration Plan #1 Phase II-Wetlands, Coastal and Nearshore Habitats, Habitat Projects on Federally Managed Lands, and Birds

The implementing Trustee is the Department of the Interior (DOI), with NPS as the implementing agency on its behalf.

1.2 Restoration Type Goals and Project Restoration Objectives

The Project's primary goal is to restore at least a net 50 acres of SAV in Barataria Bay by constructing a wave attenuation structure to protect habitat and create favorable conditions for SAV recruitment. In doing so, the Trustees envision the Project will replenish and protect living coastal and marine resources (SAV communities) that were injured as a result of the DWH oil spill.

Goals for the Habitat Projects on Federally Managed Lands Restoration Type relevant to this Project, as identified in the PDARP, are:

- Restore federally managed habitats that were affected by the oil spill and response actions through an integrated portfolio of restoration approaches across a variety of habitats.
- Restore for injuries to federally managed lands by targeting restoration on federal lands where the injuries occurred, while considering approaches that provide resiliency and sustainability.
- Ensure consistency with land management plans for each designated federal land and its purpose by identifying actions that account for the ecological needs of these habitats.

The Project's restoration objectives are:

- **Primary objectives:**
  - *Objective #1:* Restore a net 50 acres of SAV in Barataria Preserve within the legislated boundary of Jean Lafitte National Historical Park and Preserve
    - Parameter #1: SAV percent cover
  - *Objective #2:* Ensure proper installation and functionality of the wave attenuation structure for a life span of at least 20 years
    - Parameter #2: Structural integrity and function of constructed features
    - Parameter #3: Wave height, period, and direction
    - Parameter #4: Longshore current velocity
    - Parameter #5: Shoreline position
  - *Objective #3:* Reduce wave energy and current velocity to create habitat parameters suitable for SAV to reestablish
    - Parameter #3: Wave height, period, and direction
    - Parameter #4: Longshore current velocity
    - Parameter #6: Floating Aquatic Vegetation (FAV) percent cover
    - Parameter #7: Substrate type
    - Parameter #8: Water quality
    - Parameter #9: Water depth

- **Secondary objectives:**
  - *Objective #4:* Protect the Barataria Preserve shoreline to reduce shoreline erosion
    - Parameter #3: Wave height, period, and direction
    - Parameter #4: Longshore current velocity
    - Parameter #5: Shoreline position

Performance criteria will be used to determine restoration success or the need for corrective action in accordance with 15 CFR 990.55(b)(1)(vii)). Specific, measurable performance criteria are defined for monitoring parameters associated with each of the restoration objectives in Section 5.0.

1.3 Conceptual Setting

A conceptual model forms the basis of this monitoring plan and includes a summary of the Project activities, the expected product or output of those activities, and the desired Project outcome.

Table 1. Conceptual Model

Activity	Output	Short-term outcome	Long-term outcome
Complete construction of wave attenuation structure (i.e., rock breakwater).	Wave attenuation structure is installed and functions as designed to facilitate SAV recovery.	Wave energy is reduced to create habitat parameters suitable for SAV to reestablish.	• A net 50 acres of SAV is restored. • The Barataria Preserve shoreline is protected against erosion compared to existing conditions.

1.3.1 Potential Sources of Uncertainty

The LA TIG aims to propose and select projects that are feasible and have a high probability of success. In some instances, projects may have restoration techniques or project components that are more innovative, which may result in a higher degree of uncertainty. Sources of uncertainty, the degree of uncertainty, and the level of uncertainty associated with projects will vary. Potential uncertainties are defined as those that may affect the ability to achieve project restoration objective(s). Monitoring can be used to inform these uncertainties and inform the selection of appropriate corrective actions if a project is not meeting its performance criteria. Table 2 presents the key uncertainties for this Project.

Table 2. Key Uncertainties

Key Uncertainty	Description of How the Uncertainty Could Impact Project Success and or Decision Making
Hydrologic conditions (e.g., wave energy, current velocity) with wave attenuation structure in place	High-velocity longshore currents or wave energy could degrade conditions for colonization and sustainability of SAV by removing or destabilizing substrates behind the wave attenuation structure.
Water quality conditions (e.g., turbidity, salinity, temperature, nutrients, dissolved oxygen [DO], and contaminants) with wave attenuation structure in place	The primary water quality conditions driving SAV presence or absence include turbidity (which affects light availability) and salinity (Bornette and Puijalon 2011, Kemp et al. 2004). Excessive turbidity or algal blooms, if they become trapped behind the structure, could reduce light penetration into the water column, inhibiting photosynthesis. Short-term fluctuations in salinity could negatively impact mature SAV during summer months or affect germination/colonization during the winter. Other water parameters that are likely to affect SAV recovery include temperature, DO concentration, and nutrient (nitrogen and phosphorus) availability. In addition to its direct physiological effects on SAV propagule viability,

Key Uncertainty	Description of How the Uncertainty Could Impact Project Success and or Decision Making
	growth rates and mortality, water temperature influences the capacity for oxygen to remain in solution. Nutrient loading from upstream sources including urban and agricultural runoff could degrade conditions for SAV growth, including by competition from other species such as phytoplankton or filamentous algae. Increased microbial respiration resulting from algal decay following a bloom could temporarily reduce DO concentration, leading to hypoxic or anoxic conditions which could reduce SAV growth or lead to SAV mortality. The presence of contaminants such as oil, herbicides, or other industrial or household chemicals could limit growth and reproduction or result in mortality of SAV via a broad variety of direct effects on SAV physiology and indirect effects on other biota that, in turn, influence water quality conditions and habitat availability.
Relative sea level rise (i.e., local subsidence combined with eustatic sea level rise)	Relative sea level rise (rSLR) is determined by local subsidence rates combined with eustatic (global) sea level rise (SLR). Greater than anticipated rates of regional subsidence, or increased project area subsidence due to the mass of the structure itself, would cause the wave attenuation structure to settle and be overtopped by waves produced by less than a 20-year storm, thus causing the structure to not fully function as originally designed. This impact would be exacerbated by eustatic SLR. The local subsidence rate and projected rate of eustatic SLR have been incorporated into project design; however, there is uncertainty around the stability of this estimate into the future, and both subsidence and eustatic SLR rates could exceed those currently accounted for in the project design.
Presence of floating aquatic vegetation (FAV)	FAV cover behind the wave attenuation structure could shade SAV habitats, thereby inhibiting SAV photosynthesis and preventing SAV from colonizing newly established suitable habitat. Similarly, increases in FAV cover after SAV establishment could reduce SAV cover.
Frequency/intensity of tropical storms	Physical disturbance due to frequent or intense storm events could threaten the integrity of the wave attenuation structure, uproot or otherwise damage SAV, or alter habitat conditions (substrate and water quality attributes).
Vegetation stress due to recreational boating	Outboard marine engines could damage plants or disturb sediments if boats enter shallow SAV habitats.
Contractor completing Project on time	Contractor's inability to complete Project within designated timeframe would delay resource restoration and require allocation of additional resources for Project completion.

2.0 Project Monitoring

The MAM plan was developed to evaluate project performance, key uncertainties, and potential corrective actions, if needed over the 20-year life of the plan. For each identified monitoring parameter, information is provided on its intended purpose (e.g., monitor progress toward meeting one or more of the restoration objectives, regulatory compliance, or support adaptive management of the project), monitoring methods, timing and frequency, duration, sample size, and sites. These parameters will be monitored at the restoration project site and may also be monitored at appropriate reference and/or control sites to demonstrate how the restoration project is trending toward the performance criteria and to inform needed for corrective actions (if applicable) (see Section *5.0,* Project-Level Decisions Performance Criteria and Potential Corrective Actions).

Objective #1: Restore a net 50 acres of SAV in Barataria Preserve within the legislated boundary of Jean Lafitte National Historical Park and Preserve

Parameter #1: SAV percent cover

a) Purpose: The purpose of monitoring SAV percent cover is to track progress toward the objective of restoring a net 50 acres of SAV and to inform post-construction adaptive management.
b) Method: SAV percent cover will be estimated using both *in situ* field observations (e.g., DeMarco et al. 2018, DeMarco 2018) and assessment of remotely sensed (e.g., Landsat) datasets covering the project's full spatial extent. If, or once, strong relationships between these two observation approaches are established for this project area, *in situ* observations may be reduced.
c) Timing, Frequency, and Duration: *In situ* field sampling will be conducted biannually in June and October to capture growing season maximum and end-of-season SAV cover. Landsat datasets for these biologically relevant dates also will be acquired and analyzed, enabling 1) assessment of correspondence of *in situ* sampling with SAV response across the project's full spatial extent and 2) quantification of SAV cover at the full project scale. Landsat (or other remotely sensed data providing similar observations) data will be collected and analyzed at monthly intervals; analysis of these additional data will enable assessment of changes occurring between focal *in situ* sampling dates. Additionally, *in situ* sampling should be implemented shortly following any strong storm disturbance in the project area. *In situ* observations will begin with baseline assessment prior to construction of the wave attenuation structure and continue until achievement of Objective #1 is stable (40% SAV cover or greater) for 3 out of 5 years, or until project stakeholders decide that this sampling frequency can be diminished and replaced by evaluation of remotely sensed datasets. Remotely sensed data should be acquired at monthly intervals for the project's full spatial and temporal extents, enabling renewed analysis that could inform adaptive management over the project lifespan. Pre-construction "baseline" observations will enable comparison of pre-project conditions (here, SAV cover) with change associated with project implementation.
d) Sample Size: The *in-situ* field observation sample size will be guided by expert understanding (see literature referenced in [b]) and by a rigorous statistical evaluation (e.g., power analyses, scaling of *in situ* area observed to full project extent) of baseline *in situ* observations. Remotely sensed observations shall cover the full project extent at the finest spatial resolution available and any areas used as a local reference (see [e] below).
e) Sites: The *in-situ* field observation spatial distribution across the project area will be guided by expert understanding (see literature referenced in [b]) and by a rigorous statistical

evaluation (e.g., power analyses, scaling of *in situ* area observed to full project extent) of baseline *in situ* observations. To capture change in SAV cover unrelated to project implementation, SAV observations (*in situ* and remotely sensed) will be implemented both in the project area and in similar habitat nearby, but not included in, the project area.

Objective #2: Ensure proper installation and functionality of the wave attenuation structure for a life span of at least 20 years

Parameter #2: Structural integrity and function of constructed features

a) Purpose: The purpose of this monitoring parameter is to track progress toward the restoration objective of ensuring proper installation and functionality of the wave attenuation structure and to inform corrective actions, if needed.
b) Method: Structural integrity will be assessed visually by boat, inspecting for damage or structural weaknesses. Subsidence of the structure will be measured using rod and standpipe readings from settling plates installed along the length of the breakwater. Function will be assessed based on data from monitoring parameters #3, #4, and #5.
c) Timing, Frequency, and Duration: The structure will be visually inspected, and subsidence will be measured at 1 year after the completion of construction, at 5-year intervals after the completion of construction (years 5, 10, 15, 20), and following major storm events.
d) Sample Size: A total of 21 visual samples and subsidence surveys will be taken over the life of the plan.
e) Sites: The structure will be visually inspected along its entire length. Therefore, the entire area of the breakwater will be considered one site.

Parameter #3: Wave height, period, and direction

a) Purpose: The purpose of this monitoring parameter is to track progress toward the restoration objectives of reducing wave energy to create habitat parameters suitable for SAV to reestablish and protecting the Barataria Preserve Shoreline against erosion.
b) Method: Wave height, period, and direction will be measured using an Acoustic Doppler Current Profiler (ADCP) or similar instrument.
c) Timing, Frequency, and Duration: Instruments will be deployed twice annually for approximately 30 days at a time. Sampling will initially be conducted in June and October to coincide with SAV sampling. However, timing, frequency, and duration of sampling will be adjusted as needed based on data analyses. Sampling will continue for the life of the plan.
d) Sample Size: One instrument will be placed at each site.
e) Sites: A minimum of two sites will be selected within the project area. At least one site will be located outside the breakwater for reference. Exact number of sites will be determined from power analyses.

Parameter #4: Longshore current velocity

a) Purpose: The purpose of this monitoring parameter is to track progress toward the restoration objectives of reducing current velocity to create habitat parameters suitable for SAV to reestablish and protecting the Barataria Preserve Shoreline against erosion.
b) Method: Longshore current velocity will be measured using an ADCP or similar instrument.
c) Timing, Frequency, and Duration: Timing, frequency, and duration of sampling will be the same as described under Parameter #3. Sampling will continue for the life of the plan.
d) Sample Size: One instrument will be placed at each site.

e) Sites: Two to three sites will be selected within the action area. Exact number of sites will be determined from power analyses.

Parameter #5: Shoreline position

a) Purpose: The purpose of this monitoring parameter is to allow for documentation of shoreline change over time, including in response to particular disturbance events. Monitoring of shoreline position, with reference to initial shoreline position and to the constructed wave attenuation structure would also provide the total protected aquatic surface area which would be an estimate of the amount of SAV habitat being protected.
b) Method: Shoreline position will be monitored using high-resolution aerial imagery or by measuring shoreline locations along established transects. Background rate of shoreline erosion will be used as a baseline for comparison.
c) Timing, Frequency, and Duration: Shoreline position will be assessed prior to construction, immediately following completion of construction, and in years 5, 10, 15, and 20, and after major storm events when appropriate.
d) Sample Size: There will be a minimum of six sampling events over the life of the plan.
e) Sites: For the purposes of monitoring shoreline position, the entire action area will be considered one site.

Objective #3*:* Reduce wave energy and current velocity to create habitat parameters suitable for SAV to reestablish

Parameters #3 and #4, as described above

Parameter #6: FAV percent cover

a) Purpose: The purpose of this parameter is to identify effects of FAV shading (identified as a key uncertainty) that could limit restoration success and to inform adaptive management.
b) Method: FAV percent cover will be estimated using the field methods described by DeMarco (2018). FAV cover will be classified as none (0), marginal (1-10%), light (10-25%), moderate (25-50%), heavy (50-75%), or extensive (>75%). FAV may also be monitored using Landsat-based remotely sensed data, if feasible.
c) Timing, Frequency, and Duration: Sampling will be conducted concurrently with SAV percent cover sampling, as described under Parameter #1. Sampling will continue until Objective #1 is stable (40% SAV cover or greater) for 3 out of 5 years.
d) Sample Size: Approximately three replicates will be taken at each site. Exact number of replicates will be determined from power analyses.
e) Sites: A minimum of 10 sites will be selected within the target SAV recovery area. Exact number of sites will be determined from power analyses.

Parameter #7: Substrate type

a) Purpose: The purpose of this parameter is to identify the suitability of substrates in the project area for SAV recovery, especially following major storm events, and to inform adaptive management.
b) Method: Substrate type will be characterized visually using general classifications (e.g., mud, sand, shell). Substrate depth will be measured by collecting sediment cores (to a depth of 30 centimeters [cm]) or grab samples. Pre-construction sediment boring data will serve as a baseline for comparison.

c) Timing, Frequency, and Duration: Sampling will be conducted prior to construction of the wave attenuation structure (baseline), in years 1, 2, and 3 after construction, after major storm events, and once in year 20 or upon achievement of Objective #1. Pre-construction "baseline" observations will enable comparison of pre-project substrate conditions with changes associated with project implementation.
d) Sample Size: Approximately three replicates will be taken at each site. Exact number of replicates will be determined from power analyses.
e) Sites: A minimum of 10 sites will be selected within the target SAV recovery area. Two to three reference sites will be selected for comparison. Reference sites will be in nearby areas that currently support SAV and have habitat features similar to the project area. Exact number of sites will be determined from power analyses.

Parameter #8: Water quality (turbidity, salinity, temperature, DO, and chlorophyll)

a) Purpose: The purpose of this parameter is to monitor water quality, identified as a key uncertainty for restoration success, and to inform adaptive management.
b) Method: Continuous monitoring data (salinity, temperature, DO, and chlorophyll) will be collected using data loggers. Turbidity data will be collected using data loggers, or Landsat-based remotely sensed data, if feasible. Continuous salinity and temperature data for the general area are also available from Louisiana's Coastwide Reference Monitoring System (CRMS), which has several monitoring stations in Barataria Bay. CRMS data could be used as a reference for comparison.
c) Timing, Frequency, and Duration: Data will be collected continuously for the life of the plan.
d) Sample Size: Sample size will depend on the number of sites selected and will be determined from power analyses.
e) Sites: A minimum of 10 sites will be selected within the target SAV recovery area, with at least one site located near a fish gap. Two to three reference sites will be selected outside the target SAV recovery area for comparison. Exact number of sites will be determined from power analyses.

Parameter #9: Water depth

a) Purpose: The purpose of this parameter is to ensure that water depth in the project area remains suitable for SAV colonization after project implementation, to monitor rSLR, identified as a key uncertainty for restoration success, and to inform adaptive management.
b) Method: Water level data will be collected using continuous data loggers suspended at precisely-measured depths in wells. Baseline surveys will be completed in each well top, and a benchmark rod will be established at every site. Re-survey measurements of these benchmark rods could occur simultaneously with re-surveys of the benchmark rods and settling plates established on the structure (as described under parameter #2). Subsequent surveys will be used to measure subsidence or accretion in the project area based on changes in elevation. These measurements will be combined to obtain a measurement of rSLR. The park is currently using this methodology to monitor water level dynamics and subsidence throughout the Barataria Preserve. The monitoring proposed in this MAM plan would build on existing monitoring efforts and would leverage those data.
c) Timing, Frequency, and Duration: Water level data will be collected continuously for the life of the plan. Elevation will be measured at each well top prior to construction of the wave attenuation structure (baseline), and in years 5, 10, 15, and 20.

d) Sample Size: Sample size will depend on the number of sites selected. Site selection will be informed by coastal topography, geophysical attributes of sediments, and variation in structure-to-shore distance.
e) Sites: Monitoring sites would be selected from existing monitoring sites in Barataria Preserve based on the criteria listed above. The park currently has 42 monitoring wells located throughout the Barataria Preserve and plans to add 12 additional wells, 5 of which will be located in waterways.

Objective #4: Protect the Barataria Preserve shoreline to reduce shoreline erosion

Parameters #3, #4, and #5, as described above

3.0 Adaptive Management

Monitoring information collected at the project level will inform adaptive management (a form of structured decision-making applied to the management of natural resources in the face of uncertainty of that individual project) (Pastorok et al. 1997, Williams 2011). Within the LA TIG, an adaptive management framework has been developed that identifies and characterizes the four main phases and is illustrated within a representative management cycle (see Figure 3).

1. Goal-Setting Phase: Problem is identified or defined, and project goals and objectives are established based on multiple sources, including lessons learned, data and associated synthesis, and applied research from previous projects and from the knowledge base as a whole.

2. Development and Execution Phase: Project advances through select steps, including model development or refinement, identification and prioritization of uncertainties, plan formulation, engineering, design, and project construction.

3. Monitoring and Performance Phase: Project operations, maintenance, and monitoring plans are developed, and project assessment and evaluation criteria are identified.

4. Adaptive Management Coordination Phase: Encompasses steps for recommending and approving project revisions so that revisions can achieve one or both of the following:
    - Result in alterations and redesign of project elements or changes to project operation
    - Provide input to either the understanding of the overall problem statements or the refinement of attainable or realistic goals and objectives for future projects

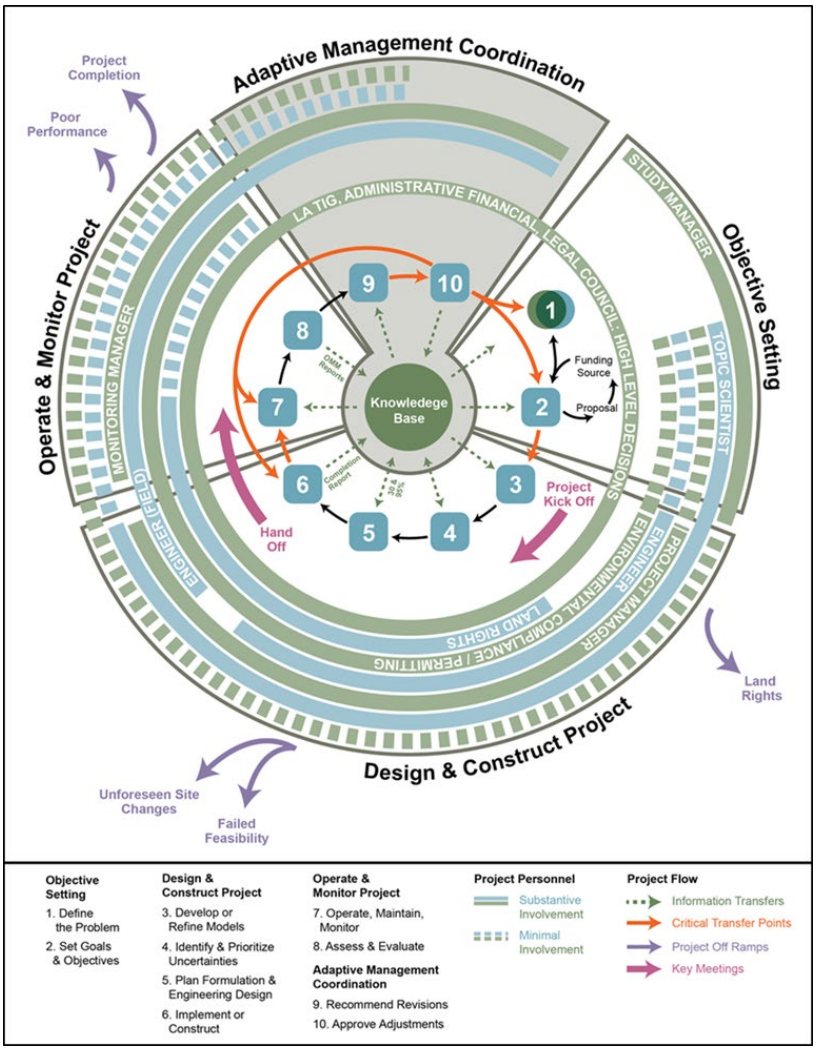

Figure 3. LA TIG Adaptive Management Cycle (Source: The Water Institute of the Gulf 2019)

Given the spatial and temporal scale of the Project, its novel restoration approach, and associated uncertainties (see Section 1.3.1, Potential Sources of Uncertainty), it is likely that some degree of adaptive management will be necessary to ensure project success. If the Project is not meeting its performance criteria, the LA TIG, in collaboration with the park, will consider implementing corrective actions to enhance project performance (see Section 5.0, Project-Level Decisions: Performance Criteria and Potential Corrective Actions).

4.0 Evaluation

Monitoring data must be evaluated to assess the performance of the project in meeting its restoration objectives, resolving uncertainties to increase understanding, and determine whether corrective actions are needed.

As part of the larger decision-making context beyond the project scale, monitoring data from the individual projects would be compiled and assessed at the Restoration Type and LA TIG level, and the results would be used to update the knowledge base to inform decisions such as future LA TIG project prioritization and selection, implementation techniques, and identification of critical uncertainties. The analysis results would be used to answer the following questions:

- Were the project restoration objectives achieved? If not, is there a reason why they were not met?
- Did the restoration project produce unanticipated effects?
- Were there unanticipated events unrelated to the restoration project that potentially affected the monitoring results (e.g., major storm events)?
- Were any of the uncertainties identified prior to project implementation resolved?
- Were any new uncertainties identified?

Proposed analysis methods for monitoring parameters are described below under each project objective and will be updated as necessary:

Objective #1: Restore a net 50 acres of SAV in Barataria Preserve within the legislated boundary of Jean Lafitte National Historical Park and Preserve

Analysis: SAV percent cover data will be analyzed using appropriate statistical methods to compare SAV cover before and after project implementation and throughout the life of the project to track progress toward the objective of restoring a net 50 acres of SAV. Monitoring data for other parameters associated with this objective (i.e., FAV percent cover, substrate type, and water quality) will be analyzed to determine their contribution to SAV recovery and to better understand how key uncertainties may affect project success. Monitoring parameters will be analyzed using general linear model (GLM) or similar analysis of variance (ANOVA) tests, combined with appropriate ad-hoc tests to determine significance.

Objective #2: Ensure proper installation and functionality of the wave attenuation structure for a life span of at least 20 years

Analysis: Structural integrity will be evaluated qualitatively based on visual inspection. Therefore, no statistical analyses will be performed. Function will be evaluated based on performance criteria associated with Objective #1 and monitoring data for other parameters associated with this objective (i.e., subsidence; wave height, period, and direction; longshore current velocity; shoreline position). If necessary, monitoring data will be analyzed before and after project implementation and through the life of the project, and will be compared with reference sites outside the structure, where appropriate, to assess function. Monitoring data will be analyzed using T-test, ANOVA, or other appropriate statistical tests. Analysis of these parameters will also allow the park and the LA TIG to better understand how key uncertainties (e.g., rSLR) may affect project success.

Objective #3: Reduce wave energy and current velocity to create habitat parameters suitable for SAV to reestablish

Analysis: Monitoring data for parameters associated with this objective (i.e., water quality; wave height, period, and direction; longshore current velocity) will be analyzed before and after project implementation and through the life of the project and will be compared with reference sites outside the structure, where appropriate. Monitoring data will be analyzed using T-test, ANOVA, or other appropriate statistical tests. Monitoring data may also be compared with literature values or data from reference sites to determine if parameters are within an acceptable range for SAV recovery.

Objective #4: Protect the Barataria Preserve shoreline to reduce shoreline erosion

Analysis: Monitoring data for parameters associated with this objective (i.e., wave height, period, and direction; longshore current velocity; shoreline position) will be analyzed as described under objective #2.

5.0 Project-Level Decisions: Performance Criteria and Potential Corrective Actions

In this section, the park describes how updated knowledge gained from the evaluation of monitoring data will be used at the project-level to determine whether the Project is considered successful or whether corrective actions are needed. A project may not be achieving its intended objectives because of previously identified key uncertainties, unanticipated consequences, previously unknown conditions, or unanticipated environmental drivers. The decision to implement (or not implement) corrective actions is one type of decision within the larger adaptive management decision-making framework.

Learning through monitoring allows for informed corrective actions to be made to the project to achieve desired outcomes. Table 3 identifies performance criteria performance monitoring parameters and potential corrective actions that could be taken if the performance criteria are not met, as defined in NRDA regulations (15 CFR 990.55(b)(1)(vii)). This table should not be considered exhaustive; rather, it includes a list of potential actions for each parameter to be considered if the Project is not performing as expected once implemented. Other corrective actions may be identified post-implementation, as appropriate. The decision of whether a corrective action should be implemented for a project should holistically consider the overall outcomes of the restoration project (i.e., looking at the combined evaluation of multiple performance criteria) to understand why project performance deviates from the predicted or anticipated outcome. Corrective action(s) may not be taken in all cases based on such considerations, and corrective actions would only be considered to address Project performance toward primary restoration objectives (see Section 1.2, Restoration Type Goals and Project Restoration Objectives). The knowledge gained from this process could also inform future restoration decisions, such as selection, design, and implementation of future similar projects.

SAV can be affected by many environmental factors and in many cases specific tolerance thresholds are poorly defined or unknown. This is further complicated by complex interactions among variables and varying response to stressors among SAV species. Therefore, not all monitoring parameters identified in Table 3 have associated performance criteria (e.g., substrate type; and water quality). However, monitoring these parameters will provide valuable insight regarding the contributions of key uncertainties to Project success or failure based on performance objectives and inform adaptive management and identify potential corrective actions in the future.

Table 3. Performance Criteria and Potential Corrective Actions to Meet Project Objectives

Monitoring Parameter	Final Performance Criteria used to determine Project Success	Interim Performance Criteria	Potential corrective actions or mid-course corrections*
SAV percent cover	At year 20, SAV coverage is equal to or greater than 50 acres[3]	At year 3 post-construction, SAV cover is equal to or greater than 25 acres; 35 acres at year 5; and 50 acres at year 10 and beyond	Monitor for nutrients to determine if they are affecting SAV Plant SAV
Structural integrity and function of constructed features	At year 20, the elevation of the breakwater crest is >1 foot lower than the anticipated design elevation (based on settlement curve analyses) since completion of construction (development of geotechnical settlement curves is ongoing)	At years 5, 10, and 15 post-construction, the elevation of the breakwater crest is >1 foot lower than the anticipated design elevation for that time period since completion of construction	Add rock to raise the elevation of the crest of the breakwater to the appropriate height
Wave height, period, and direction	At year 20, wave height landward of the breakwater is < wave height seaward of the breakwater	At year 1 and each post-construction sampling interval, wave height landward of the breakwater is < wave height seaward of the breakwater	Corrective actions would only be considered if performance criteria for SAV cover and/or structural integrity and function are not met and would be the same are described above
Longshore current velocity	At year 20, current velocity is <180 cm s^{-1} and bottom shear stress is <1.0 Pa landward of the breakwater	At year 1 and each post-construction sampling interval, current velocity is <180 cm s^{-1} and bottom shear stress is <1.0 Pa	Install submerged "baffles" (e.g., Atlantic ReefMaker©) perpendicular to and behind the breakwater to reduce current velocity
Shoreline position	At year 20, the rate of shoreline retreat is < the pre-construction rate[4]	At years 5, 10, and 15 post-construction, shoreline retreat does not exceed the amount anticipated based on pre-construction rate	No corrective actions are proposed
FAV percent cover	To be determined	No performance criteria	Remove FAV using mechanical methods; corrective actions would only be considered if performance criteria for SAV cover are not met
Substrate type	No performance criteria	No performance criteria	No corrective actions are proposed

[3] Based on DeMarco (2018), approximately 40% SAV coverage measured on an annual basis constitutes successful restoration (i.e., if restoring 1 acre of habitat, achieving 40% SAV coverage within that acre would constitute successful SAV restoration).

[4] Shoreline retreat rate would consider multiple physical and environmental factors as well as shoreline retreat rates at adjacent or nearby protected and un-protected stretches of shoreline.

Water quality (turbidity, salinity, temperature, DO, chlorophyll)	No performance criteria	No performance criteria	If turbidity levels seemed to be impairing SAV establishment, additional gaps would be considered to improve flushing
Water depth	No performance criteria	No performance criteria	No corrective actions are proposed

**The table provides the triggers for helping determine whether adjustments to the project are needed based on the performance criteria; potential corrective actions for any unknown or unanticipated conditions that arise would need to be determined.*

cm s^{-1} = centimeter per second

Pa = Pascal

6.0 Monitoring Schedule

The Project's monitoring schedule (Table 4) is separated by monitoring parameter. Baseline monitoring will occur before project execution. Monitoring will resume when the Project has been fully executed (constructed), although this timeframe may vary for different parameters. Performance monitoring will occur in the years following initial project execution (Years 1-20). While some parameters may be monitored continuously, seasonally, or annually, others will be monitored with less frequency. Additional discussion of monitoring timing, duration, and frequency for each monitoring parameter is provided in Section 2.0, Project Monitoring.

Table 4. Monitoring Schedule

Monitoring Parameters	Baseline Monitoring	Post-construction Monitoring (Year 0)	Performance Monitoring (PM) Year 1	PM Year 2	PM Year 3	PM Year 5	PM Year 10	PM Year 15	PM Year 20	PM Years 1-20 (annually)	PM after major storm events
SAV percent cover	X	X								X (until stable for 3 out of 5 years; see section 2, parameter #1)	
Structural integrity and function of constructed features			X			X	X	X	X		X
Wave height, period, and direction	X	X								X	
Longshore current velocity	X	X								X	
Shoreline position	X	X				X	X	X	X		
FAV percent cover	X	X								X (until SAV percent cover is stable for 3 out of 5 years)	
Substrate type	X	X	X	X	X				X		X
Water quality (turbidity, salinity, temperature, DO, chlorophyll)	X	X								X	
Water depth	X					X	X	X	X		

7.0 Data Management

7.1 Data Description

To the extent practicable, all environmental and biological data generated during monitoring activities will be documented using standardized field datasheets. Field data may also be collected using digital collection media such as tablets or mobile apps. If standardized datasheets are unavailable or not readily amendable to record project-specific data, then project-specific datasheets or other appropriate media will be developed prior to conducting any project monitoring activities. Original hardcopy datasheets, notebooks, photographs, and electronic files will be retained by the implementing Trustee.

Relevant Project data that are handwritten on hardcopy datasheets or notebooks will be transcribed (entered) into standard digital format. All field datasheets and notebook entries will be scanned to PDF files. Electronic data files should be named with the date on which the file was created and include a ReadMe file that describes when the file was created and by whom, and any explanatory notes on the file contents. If a data file is revised, a new copy should be made and the original preserved.

All data will have properly documented Federal Geographic Data Committee/International Organization for Standardizations (FGDC/ISO) metadata, a data dictionary (defines codes and fields used in the dataset), and/or a Readme file as appropriate (e.g., how data was collected, quality assurance/quality control [QA/QC] procedures, other information about data such as meaning, relationships to other data, origin, usage, and format – can reference different documents).

7.2 Data Review and Clearance

All monitoring data will undergo QA/QC review following the protocols and process outlined in Section 3.0 of the MAM Manual Version 1.0. Any transcription errors identified during QA/QC review will be corrected as appropriate before data used for any analyses or distributed outside the implementing agency. The implementing Trustee will verify and validate monitoring data and information and will ensure that all data are entered or converted into agreed upon/commonly used digital format and labeled with metadata following FGDC/ISO standards to the extent practicable and in accordance with implementing Trustee agency requirements.

After QA/QC review is complete and all identified errors are addressed, data will be considered cleared. The implementing Trustee will give the other LA TIG members time to review the data before making such information publicly available (as described below). Before submitting the monitoring data and information package, LA TIG members shall confirm with one another that the package is approved for submission.

7.3 Data Storage and Accessibility

Once data have been cleared, they will be submitted to the Restoration Portal. Trustees will provide DWH NRDA MAM data and information to the Restoration Portal as soon as possible and no more than 1 year from when data are collected.

7.4 Data Sharing

Data will be made publicly available, in accordance with the Federal Open Data Policy (Section 10.6.6 of the Trustee Council's Standard Operating Procedures (SOP; DWH NRDA Trustees 2016), through the Data Integration Visualization Exploration and Reporting (DIVER) Explorer Interface within 1 year of when the data collection occurred.

8.0 Reporting

Annual MAM reports will be developed in accordance with Appendix D in the MAM Manual, describing results of project monitoring and evaluation. A final MAM report for the Project will be developed prior to project closeout. All MAM reports will be made publicly available via DIVER.

9.0 Roles and Responsibilities

The LA TIG is responsible for addressing MAM objectives that pertain to its restoration activities and for communicating information to the Trustee Council or Cross-TIG MAM work group. DOI is the implementing Trustee and, in collaboration with NPS, the implementing agency, will ensure the project is completed. The LA TIG, in conjunction with the implementing Trustee will ultimately determine whether the Project is considered successful or whether corrective actions are needed. The implementing Trustees' roles include:

- Ensuring all permitting and regulatory compliance requirements are met prior to project implementation
- Ensuring successful completion of the project
- Ensuring data collection and reporting requirements are completed in a timely manner
- Providing project progress information to the LA TIG
- Revising and updating the project MAM plan as needed

10.0 Monitoring and Adaptive Management Budget

The overall budget for the project monitoring and adaptive management is $1,045,893 and includes monitoring for all parameters described in Section 2.0 of this MAM plan, funds for potential corrective actions, and oversight costs for the 20-year life of the plan.

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12.0 MAM Plan Revision History

Old Version #	Revision Date	Changes Made	Reason for Change	New Version #

Appendix D: Past, Present, and Reasonably Foreseeable Future Actions

Table 1. Past, Present, and Reasonably Foreseeable Future Actions in the Rabbit Island Project Area Cumulative Impact Analysis

Projects	Project Description	Resources with Potential Cumulative Impacts
Oyster Lake Marsh Creation and Nourishment	The project aims to create approximately 475 acres of saline marsh in recently formed shallow open water and nourish approximately 185 acres of saline marsh. Sediment would be mined from an offshore disposal area and placed in multiple disposal areas to create approximately 660 acres of saline marsh.	<u>Short-term, adverse impacts to:</u> Geology and substrates Hydrology and water quality Habitats Wildlife species Marine and estuarine fauna, EFH, and managed fish species Protected species <u>Long-term, adverse impacts:</u> No applicable impacts identified <u>Long-term, positive impacts to:</u> Geology and substrates Hydrology and water quality Habitats Wildlife species Marine and estuarine fauna, EFH, and managed fish species Protected species Tourism and recreational use Land and marine management Aesthetics and visual resources Public health and safety, including flood and shoreline protection
No Name Bayou Marsh Creation and Nourishment	Marshes in the southwest portion of the Cameron Creole Watershed have converted to open water due to subsidence and saltwater intrusion from the Calcasieu Ship Channel. In addition, hurricanes previously breached the levee, scouring the marsh and increasing salinities. This project would create and nourish approximately 533 acres of open water and saline marsh using sediment mined from a nearby USACE confined disposal facility. Approximately 5,000 linear feet of the levee borrow channel would be cleaned out and 10,000 linear feet of tidal creeks and two 2.5-acre ponds constructed to help facilitate hydrologic flow of water into and out of the project area. In addition, 251 acres of vegetation would be planted in the newly created areas.	
Oyster Bayou Marsh Restoration	Create and nourish approximately 605 acres of saline marsh in a shallow open water area that was created by hurricane scour. The source of dredge material will be from an offshore borrow area. The features also include constructing approximately 17,500 linear feet of earthen terraces north of the marsh creation area to provide protection from wind-generated erosion to the newly created brackish marsh.	
Cameron-Creole Watershed Grand	The project aims to restore and nourish hurricane-scoured marsh in the Cameron Prairie National Wildlife Refuge and adjacent brackish marshes of the Calcasieu Lake estuary. Approximately 3 million cubic yards of material	

Bayou Marsh Creation	would be dredged from a borrow site proposed in Calcasieu Lake and placed into two marsh creation areas north of Grand Bayou to restore 609 acres and nourish approximately 7 acres of brackish marsh. The borrow site would be designed to avoid and minimize impacts to oysters and other sensitive aquatic habitat. Tidal creeks would be constructed prior to placement of dredge material, and retention levees would be gapped to support estuarine fisheries' access and achieve a functional marsh. The project would result in approximately 534 net acres of brackish marsh over the 20-year project life.	
Cameron-Creole Freshwater Introduction	The freshwater introduction project would restore the function, value, and sustainability to approximately 22,510 acres of marsh and open water by improving hydrologic conditions via freshwater input and increasing organic productivity.	
Sabine Marsh Creation Cycles 6 and 7	Planned future project designed to create 916 acres of intertidal marsh and protect 77 acres of emergent marsh behind in the Sabine National Wildlife Refuge through beneficial use of material dredged from the Calcasieu Ship Channel.	
Calcasieu Ship Channel Salinity Control Measures	Planned future project consists of the construction of multiple features along or near the Calcasieu Ship Channel to manage salinity introduction into adjacent water bodies through the channel and reduce the rate of wetland loss in the surrounding wetlands. Measures would control salinity spikes and would be constructed in a manner that would allow for the continued functioning of the Calcasieu Ship Channel and the Port of Lake Charles.	<u>Short-term, adverse impacts to:</u> Geology and substrates Hydrology and water quality Habitats Wildlife species Marine and estuarine fauna, EFH, and managed fish species Protected species <u>Long-term, adverse impacts:</u> No applicable impacts identified
Cameron Parish Shoreline Stabilization Project	This proposed project consists of the installation of up to 6 miles of shoreline protection at Rutherford, Little Florida and Long Beaches on the Gulf shoreline of Cameron Parish	<u>Long-term, positive impacts to:</u> Geology and substrates Hydrology and water quality Habitats

		Wildlife species Marine and estuarine fauna, EFH, and managed fish species Protected species Land and marine management Aesthetics and visual resources Public health and safety, including flood and shoreline protection
East Mud Lake Marsh Management	The project created a hydrologic regime conducive to restoration, protection, and enhancement of the Mud Lake area by using various types of water control structures and vegetative plantings. Structural components included culverts with flap gates, two variable crest weirs, three earthen plugs, overflow bank, and repair of existing levee.	<u>Short-term, adverse impacts:</u> Not applicable because the project is already constructed <u>Long-term, adverse impacts:</u> No applicable impacts identified <u>Long-term, positive impacts to:</u> Geology and substrates Hydrology and water quality Habitats Wildlife species Marine and estuarine fauna, EFH, and managed fish species Protected species Tourism and recreational use Land and marine management Aesthetics and visual resources Public health and safety, including flood and shoreline protection
Sweet Lake/Willow Lake Hydrologic Restoration	The project reestablished the shoreline between Sweet Lake and the Gulf Intracoastal Waterway to reduce lake turbidity and tidal exchange and halt erosion and trap sediments needed to rebuild marsh along the northern and northwestern shorelines of Sweet Lake.	
Highway 384 Hydrologic Restoration	The project restored the natural hydrology of the project area and eliminated undesirably high salinities and severe water fluctuations, tremendously reducing the potential for future marsh losses.	
Replace Sabine Refuge Water Control Structures at Headquarters Canal, West Cove Canal, and Hog Island Gully	Water control structures at Hog Island Gully, West Cove, and Headquarters Canals were inadequate in that they did not provide enough discharge potential to discharge excess water and could not be operated to effectively preclude saltwater intrusion. The project replaced the existing structures with ones that have substantially greater discharge potential and greater management flexibility.	
Cameron Meadows Marsh Creation and Terracing	The project aims to restore approximately 400 acres of coastal marsh habitat and reduce the fetch by constructing approximately 12,150 linear feet of earthen terraces. Sediment will be hydraulically dredged from the Gulf of Mexico and pumped via pipeline to create approximately 380 acres of marsh. Approximately 180 acres will be planted. Approximately 12,150	

	linear feet of earthen terraces will be constructed to reduce fetch and wind-generated wave erosion.	
Kelso Bayou Marsh Creation	The project aims to restore and protect approximately 319 acres of critically important marsh and the numerous functions provided by those areas. The proposed project will restore a portion of the historical meandering channel of Kelso Bayou and provide direct protection to Louisiana State Highway 27, the region's only northward hurricane evacuation route. Project features include creating/nourishing 319 acres of marsh, 3,200 linear feet of shoreline protection, and rock armor at the mouth of Kelso Bayou to prevent additional tidal scour.	
Holly Beach Sand Management	The project protects approximately 8,000 acres of existing, low energy intermediate and brackish marsh wetlands north of the forested ridge and created and protected roughly 300 acres of beach dune and coastal chenier habitat from erosion and degradation.	
Sabine Refuge Marsh Creation, Cycle 1	The project was intended to strategically create marsh in large, open water areas to block wind-induced saltwater introduction and freshwater loss. Over time, it would increase nourishment in adjacent marshes while reducing open water fetch and erosion of marsh fringe.	
Sabine Refuge Marsh Creation, Cycle 2	The Sabine Refuge Marsh Creation Cycle 2 project consisted of approximately 3.54 miles of 29-inch inside diameter permanent pipeline. The purpose of the project was to provide a permanent dredged material pipeline to be used for additional cycles of marsh creation on the Sabine National Wildlife Refuge and surrounding areas in conjunction with USACE maintenance dredging of the Calcasieu River Ship Channel.	
Sabine Refuge Marsh Creation, Cycle 3	The project consisted of constructing five marsh creation sites within the Sabine National Wildlife Refuge using material dredged out of the Calcasieu River Ship Channel.	
Sabine Refuge Marsh Creation, Cycles 4 and 5	Cycles 4 and 5 consisted of the creation of 230 and 232 acres, respectively, of brackish marsh platform using material dredged from the Calcasieu River Ship Channel. Approximately 2 million cubic yards of material was placed within each of two marsh creation areas. The dredged material was contained by earthen dikes and low-level earthen overflow weirs that when constructed assist in the dewatering of the marsh creation disposal area. This also assists in the creation of fringe marsh through the overflow.	

Road Maintenance	Past and potential future projects may include periodic road maintenance and road improvements on Louisiana State Highway 27 around Calcasieu Lake.	<u>Short-term, adverse impacts to:</u> Geology and substrates Hydrology and water quality Habitats Wildlife species <u>Long-term, adverse impacts:</u> No applicable impacts identified <u>Long-term, positive impacts to:</u> Infrastructure Land and marine management Tourism and recreational use Aesthetics and visual resources Public health and safety, including flood and shoreline protection
Recreational Improvements	Potential future improvements may include additional recreational improvements to the Queen Bess site such as additional shuttle service, picnic areas, restrooms, and bird-watching structures.	Short-term, adverse impacts to: Geology and substrates Habitats Wildlife species Protected species <u>Long-term, adverse impacts to:</u> Habitats Wildlife species Protected species <u>Long-term, positive impacts to:</u> Infrastructure Land and marine management Tourism and recreational use Aesthetics and visual resources

Table 2. Past, Present, and Reasonably Foreseeable Future Actions in the Jean Lafitte Project Area Cumulative Impact Analysis

Projects	Project Description	Resources with Potential Cumulative Impacts
Northeast Turtle Bay Marsh Creation and Critical Area Shoreline Protection	The project would create approximately 377 acres and nourish approximately 300 acres of marsh using sediment dredged from Turtle Bay. Approximately 2,870-ft. of critical shoreline would be protected, and two channel liners would be installed to prevent further enlargement of two primary water exchange points.	<u>Short-term, adverse impacts to:</u> Geology and substrates Hydrology and water quality Habitats Wildlife species Marine and estuarine fauna, EFH, and managed fish species Protected species <u>Long-term, adverse impacts:</u> No applicable impacts identified <u>Long-term, positive impacts to:</u> Geology and substrates Hydrology and water quality Habitats Wildlife species Marine and estuarine fauna, EFH, and managed fish species Protected species Tourism and recreational use Land and marine management Aesthetics and visual resources Public health and safety, including flood and shoreline protection
Caminada Headland Back Barrier Marsh Creation Increment 2	The goals of this project are to create and/or nourish 543 acres of emergent back barrier marsh by pumping sediment from an offshore borrow site and to create a platform upon which the beach and dune can migrate, reducing the likelihood of breaching, increasing the retention of over washed sediment, improving the longevity of the barrier shoreline, and protecting wetlands and infrastructure to the north and west.	
East Leeville Marsh Creation and Nourishment	The project goal is to create approximately 358 acres and nourish 124 acres of saline marsh east of Leeville. After consideration of three potential alternatives, features and an alignment were selected to establish an arc of wetlands along the north side of Southwestern Canal, Lake Jesse, and the west side of South Lake.	
Barataria Bay Rim Marsh Creation and Nourishment	The proposed project would create approximately 251 acres and nourish approximately 266 acres of marsh using sediment dredged from Barataria Bay. The majority of the dredged material would be fully contained. For creation of approximately 15 acres of marsh and nourishment of 34 acres in the eastern portion of the project, the dredged material would be semi-contained.	
Bayou Dupont Sediment Delivery – Marsh Creation and Terracing	The primary goal of this project is to create and nourish approximately 144 acres of emergent intermediate marsh using sediment from the Mississippi River and constructing 9,679 linear feet of terraces. The proposed project includes dredging sediment from the Mississippi River for marsh creation by pumping the sediment via pipeline into an area of open water and broken marsh.	
Northwest Turtle Bay Marsh Creation	The primary goal is to recreate marsh habitat in the open water areas and nourish existing marsh within the project area. The specific goal of the project is to create approximately 700 acres of marsh with dredged	

	material from Turtle Bay or Little Lake. The total project area is 798 acres, but the entire area will not be filled with dredged material.
Cheniere Ronquille Barrier Island Restoration	Restoration would expand the shoreline structural integrity and associated protection by tying into two recently constructed projects to the east, and it would address one of the remaining reaches of the Barataria/Plaquemines shoreline. The design includes fill for a beach and dune, 20 years of advanced maintenance fill, and fill for marsh creation/nourishment. The location of the type and amount of sediment needed to construct this project has been identified under the East Grand Terre Project that is presently under construction. Approximately 127 acres of beach/dune fill would be constructed, and approximately 259 acres of marsh creation/nourishment would be constructed.
Grand Liard Marsh and Ridge Restoration	The project restored both structural and habitat functions of Grand Liard Bayou and flanking marshes. The project created and nourished 450 acres of marsh and restored 15,484 linear feet of ridge on the east bank of Bayou Grand Liard.
West Pointe a la Hache Marsh Creation	This project will recreate marsh habitat in the area just west of the Jefferson Lake Canal by harvesting sediment from the Mississippi River and pumping it via pipeline to the proposed site. The goals of this project include converting approximately 250 acres of open water habitat to intermediate marsh, nourishing approximately 102 acres of existing intermediate marsh with dredged material, and maintaining 203 acres of created/nourished marsh over the 20-year project life.
Bayou Dupont Ridge Creation and Marsh Restoration	Project goals included creating and nourishing approximately 390 acres of marsh through sediment pipeline delivery from the Mississippi River and creating over 2 miles of ridge (10.5 acres of ridge habitat) along a portion of the southwestern shoreline of Bayou Dupont.
Lake Hermitage Marsh Creation	The original project features included dredging in the Mississippi River and pumping sediments via pipeline to create 549 acres of marsh. Additionally, 6,300-ft. of shoreline restoration using river material and 7,300 linear feet of terraces were included.
Riverine Sand Mining/Scofield Island Restoration	Project strategies include the construction of 429 acres of dune area, including the dune itself, dune foreslope and backslope (above-tide, sloping elevations in front of and behind the dune), and marsh platform

	(areas behind the dune backslope where marsh will be created). Of that acreage, approximately 278 acres would settle to intertidal back barrier marsh. A double row of sand fencing will be installed along the 12,700-ft. length of dune.
South Shore of the Pen Shoreline Protection and Marsh Creation	For shoreline protection, approximately 11,750-ft. of foreshore rock dike will be constructed along the south shore of The Pen and Bayou Dupont. Two existing bayous will remain open, and a site-specific opening to The Pen will be incorporated at the eastern marsh creation site. Dedicated dredging will be used to create approximately 175 acres of marsh and nourish an additional 132 acres of marsh within the triangular area bounded by the south shore of The Pen.
Mississippi River Sediment Delivery System – Bayou Dupont	The proposed project included dredging sediment from the Mississippi River for marsh creation and pumping it via pipeline into an area of open water and broken marsh west of the Plaquemines Parish flood protection levee. The material was spread over the project area. Newly constructed low containment dikes were necessary only along a limited portion of the project area.
Mississippi River Reintroduction into Bayou Lafourche	Project features include a receiving intake structure at the point of diversion in the Mississippi River, a pump/siphon system with a combined discharge capacity of 1,000 cubic feet per second (cfs), a discharge settling pond/sediment basin in Bayou Lafourche at Donaldsonville, modification of weir structures, bank stabilization along Bayou Lafourche, monitoring stations, and dredging of Bayou Lafourche.
Delta Building Diversion at Myrtle Grove	The project would involve installation of gated box culverts on the west bank of the Mississippi River in the vicinity of Myrtle Grove; dedicated dredging from the Mississippi River to create marsh in the vicinity of Bayou Dupont, the BBWW, and the Wilkinson Canal; or a combination of these actions. Supporting features might include a conveyance channel with parallel mainline flood control levees and an outflow channel with guide levees.
Barataria Basin Landbridge Shoreline Protection Project Phase 4	The project's main objective is to reduce or eliminate shoreline erosion along 31,500-ft. of shoreline. To reach this goal, a rock revetment was constructed, incorporating six openings to allow the exchange of water

	and organisms. The project will be maintained for the full 20-year project life, with the effects lasting beyond.
Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake	The project's goals were to prevent erosion along roughly 4 miles of Little Lake shoreline, create 488 acres of intertidal wetlands along the Little Lake shoreline, nourish and maintain 532 acres of intermediate marsh, and reduce land loss rates by 50 percent over the 20-year life of the project.
Barataria Barrier Island Complex Project: Pelican Island and Pass La Mer to Chaland Pass	The project's primary goals were to prevent breaching of the barrier shoreline by increasing its width and average height and to protect and create dune, swale, and intertidal marsh habitats. The Chaland Headland project restored and created about 230 acres of dune, beach, and berm and 254 acres of intertidal saline marsh. Nearly 3.4 million cubic yards of sand and silt mined from an offshore borrow area in the Gulf of Mexico were placed to construct the dune and marsh features. The Pelican Island project restored about 190 acres of dune, beach, and berm and 396 acres of intertidal saline marsh. Over 2.6 million cubic yards of sand and silt were mined from two offshore borrow areas.
Barataria Basin Landbridge Shoreline Protection, Phases 1 and 2	Approximately 35,000-ft. of shoreline protection will be implemented. Approximately 6,200-ft. is a traditional foreshore rock dike. The remainder of the shoreline protection will consist of concrete panel structures.
West Pointe a la Hache Outfall Management	In 1991, the West Pointe a la Hache siphon was constructed to draw water from the Mississippi River into nearby marshes. The siphon has a maximum capacity of approximately 2,700 cfs through eight 72-inch-diameter tubes. The objective of the siphon is to restore the marshes to a fresher state by reintroducing fresh water, sediment, and nutrients to the area.
Lake Salvador Shore Protection Demonstration	Phase 1 of the project tested four types of shoreline protection structures along a section of the northern lakeshore to determine their effectiveness in reducing shoreline erosion. To the south, Phase 2 constructed a 9,000-ft. rock shoreline stabilization structure along a section of the western lakeshore to protect the shoreline and adjacent marsh from wave-induced erosion.

Jonathan Davis Wetland Protection	This hydrologic restoration project contains structural measures that were designed to improve hydrologic conditions and provide shoreline protection along the southern project boundary. A series of water control structures reduce rapid water exchange and tidal energies, and the shoreline protection provides a stable buffer for the interior marsh from the wave action along Bayou Perot and Bayou Rigolettes.	
Gulf Intracoastal Waterway to Clovelly Hydrologic Restoration	The project features include three rock weirs and four canal plugs. There is also a plug with a flap-gated culvert and one with a variable crest weir. In addition, there is a weir with a barge bay in the Clovelly Canal, 5,000-ft. of shoreline reestablishment along project area canals, and 6,000-ft. of lake rim reestablishment at Bay L'Ours.	
Barataria Bay Waterway Wetland Restoration	The initial project design was to use maintenance-dredged sediments to create marsh in shallow water areas adjacent to the BBWW. However, oyster leases in or adjacent to the proposed marsh creation sites prohibited the use of all sites. As an alternative, in cooperation with the O&M of the channel, dredged material was used to enlarge Queen Bess Island. An additional 9 acres of vegetated wetland were created adjacent to the state-funded Queen Bess project (BA-05b) by constructing a rock dike and filling the containment area with dredged material from the BBWW. A breach was built on the north side of the rock dike to allow effluent to be routed from the containment area through the BA-05b project area and the original Queen Bess Island.	
Caminada Headlands Back Barrier Marsh Creation Project	Planned future project designed to create 300 acres of back barrier intertidal marsh and nourish 130 acres of emergent marsh behind 3.5 miles of Caminada Beach.	<u>Short-term, adverse impacts to:</u> Geology and substrates Hydrology and water quality Habitats Wildlife species Marine and estuarine fauna, EFH, and managed fish species Protected species <u>Long-term, adverse impacts:</u> No applicable impacts identified <u>Long-term, positive impacts to:</u>

		Geology and substrates Hydrology and water quality Habitats Wildlife species Marine and estuarine fauna, EFH, and managed fish species Protected species Land and marine management Aesthetics and visual resources Public health and safety, including flood and shoreline protection
Bayou Grande Chenier Marsh and Ridge Restoration	The goals of the Bayou Grande Chenier Marsh and Ridge Restoration Project (BA-173) are to restore marsh habitat adjacent to the eastern shoreline of Bayou Grande Chenier, reestablish the corresponding section of the bayou's forested ridge habitat along this shoreline, and create terraces to restore marsh in open water habitat. Specific objectives are to restore 302 acres of brackish marsh habitat, construct the marsh platform to an elevation that supports healthy marsh, reestablish 10,625 linear feet of the historic Bayou Grande Chenier Ridge to an elevation that supports healthy woody vegetation, establish the ridge with diverse native woody species, and construct 12,000 linear feet of terraces to an elevation that will support healthy marsh.	<u>Short-term, adverse impacts:</u> Not applicable because the project is already constructed <u>Long-term, adverse impacts:</u> No applicable impacts identified <u>Long-term, positive impacts to:</u> Geology and substrates Hydrology and water quality Habitats Wildlife species Marine and estuarine fauna, EFH, and managed fish species Protected species Tourism and recreational use Land and marine management Aesthetics and visual resources Public health and safety, including flood and shoreline protection
Pass Chaland to Grand Bayou Pass Barrier Shoreline Restoration	The project's objectives were to prevent the breaching of the Bay Joe Wise shoreline by increasing barrier shoreline width, increasing the emergent marsh area by some 226 acres to maintain the barrier shoreline, and creating emergent marsh suitable for tidal aquatic habitats.	
Barataria Bay Waterway West Side Shoreline Protection	The project is located in Jefferson Parish, Louisiana, on the west bank of the Dupre Cut portion of the BBWW, north of the Lafitte gas and oil field and south of the subsided land reclamation effort known as The Pen. The project encompasses 1,789 acres of brackish marsh and open-water habitat on the west bank of the BBWW.	
East/West Grand Terre Restoration	The barrier shoreline of western Grand Terre Island will be restored by constructing 40 acres of dune.	

Caminada Headland Beach and Dune Restoration	Recently constructed projects to restore and maintain the headland through creation of dunes and beach habitat.	
Road Maintenance Recreational Improvements	Past and potential future projects may include periodic road maintenance and road improvements in and around Jean Lafitte Louisiana.	<u>Short-term, adverse impacts to:</u> Geology and substrates Hydrology and water quality Habitats Wildlife species <u>Long-term, adverse impacts:</u> No applicable impacts identified <u>Long-term, positive impacts to:</u> Infrastructure Land and marine management Tourism and recreational use Aesthetics and visual resources Public health and safety, including flood and shoreline protection
	Potential future improvements may include additional recreational improvements to the Jean Lafitte National Historical Park and Preserve such as additional shuttle service, picnic areas, restrooms, and bird-watching structures.	

Appendix E: Finding of No Significant Impact

Louisiana Trustee Implementation Group Final Phase 2 Restoration Plan/Environmental Assessment #1.3: Rabbit Island Restoration and Shoreline Protection at Jean Lafitte National Historical Park and Preserve

Introduction

The Louisiana Trustee Implementation Group Final Phase 2 Restoration Plan/Environmental Assessment #1.3: Rabbit Island Restoration and Shoreline Protection at Jean Lafitte National Historical Park and Preserve (Phase 2 RP/EA #1.3) fulfills requirements under the Oil Pollution Act (OPA) and the implementing regulations of the National Environmental Policy Act (NEPA). The Phase 2 RP/EA #1.3 was prepared by the Louisiana Trustee Implementation Group (LA TIG) to partially address injuries caused by the *Deepwater Horizon* (DWH) oil spill to natural resources and services in the Louisiana Restoration Area using natural resource damages procedures as set forth in the DWH post-settlement Consent Decree.

In accordance with OPA, and as set forth in the Consent Decree and described in the DWH Trustees' 2016 *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan/Programmatic Environmental Impact Statement* (PDARP/PEIS),[5] the LA TIG includes five Louisiana state Trustee agencies and the four federal DWH Trustees: Louisiana Coastal Protection and Restoration Authority (CPRA), Louisiana Department of Natural Resources (LDNR), Louisiana Department of Environmental Quality (LDEQ), Louisiana Oil Spill Coordinator's Office (LOSCO), Louisiana Department of Wildlife and Fisheries (LDWF), U.S. Department of the Interior (DOI), National Oceanic and Atmospheric Administration (NOAA), U.S. Environmental Protection Agency (EPA), and U.S. Department of Agriculture (USDA).[6]

The PDARP/PEIS is a programmatic document developed by the DWH Trustees to guide and direct the DWH oil spill restoration effort. The PDARP/PEIS was prepared in accordance with OPA, NEPA, Council on Environmental Quality (CEQ) NEPA regulations, and the NEPA regulations, procedures, and guidance applicable to the DWH federal Trustees. The Phase 2 RP/EA #1.3 tiers from the PDARP/PEIS. The PDARP/PEIS includes a portfolio of restoration types that addresses the diverse suite of injuries that occurred at both regional and local scales. Of five overarching goals set forth in the PDARP/PEIS, the Phase 2 RP/EA #1.3 addresses the goal to "restore and conserve habitat." Within that goal, the RP/EA focuses on the "birds" and "habitat projects on federally managed lands" restoration types.

Lead and Cooperating Agencies, Adoption of NEPA Analysis by Cooperating Agencies

The LA TIG designated DOI as the lead agency responsible for NEPA analysis for the Phase 2 RP/EA #1.3. Each of the other state and federal co-Trustees participates as a cooperating agency pursuant to NEPA (40 CFR 1508.5) and the *Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the Deepwater Horizon (DWH) Oil Spill* (SOP) (DWH Trustees 2016). Each federal Trustee on the LA TIG must make its own independent evaluation of the NEPA analysis in support of its decision-making responsibilities. In accordance with 40 CFR 1506.3(a) and the SOP, each of the federal Trustees has reviewed the Phase 2 RP/EA #1.3, and finds that it meets the standards set forth in its own NEPA implementing procedures, and accordingly adopts the NEPA analysis.

Public Participation

In 2016, the Rabbit Island and Jean Lafitte projects were proposed for engineering and design (E&D) in a restoration plan entitled *Louisiana Trustee Implementation Group Draft Restoration Plan #1: Restoration of Wetlands, Coastal, and Nearshore Habitats; Habitat Projects on Federally Managed Lands; and Birds*

[5] The final PDARP/PEIS, Record of Decision and information on the Consent Decree can be found at http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan/.

[6] Chapter 7 of the PDARP/PEIS describes a distributed governance structure that assigns a TIG for each of the eight Restoration Areas (restoration in each of the five Gulf states, Open Ocean, Regionwide, and Unknown Conditions and Adaptive Management). The Trustees believe that restoration can be carried out most efficiently by directly vesting restoration decision-making to those Trustees who have the strongest collective trust interests in natural resources and their services within each Restoration Area.

(Phase 1 RP). After a 30-day public comment period, during which the LA TIG hosted a public meeting, the Rabbit Island and Jean Lafitte projects were approved for funding to undergo E&D.

On June 22, 2018 the LA TIG posted a Notice of Intent on the NOAA Gulf Spill Restoration website (https://www.gulfspillrestoration.noaa.gov/), informing the public that they were beginning to draft a phase 2 restoration plan evaluating the Rabbit Island and Jean Lafitte projects under different design scenarios. Following public notice in the Federal Register on November 13, 2019, the draft Phase 2 RP/EA #1.3 was made available to the public until December 20, 2019. On December 2, 2019, the LA TIG hosted a public webinar to facilitate the public review and comment process. The LA TIG accepted public comments during the webinar, as well as through email, web-based comment submissions, and U.S. mail. All comments were reviewed and considered prior to finalizing; public comments and LA TIG responses are found in Section 7 of the Phase 2 RP/EA #1.3.

Proposed Action and Alternatives

The Phase 2 RP/EA #1.3 evaluates in detail two design alternatives and a no action alternative for the Rabbit Island project and two design alternatives and a no action alternative for the Jean Lafitte project. The LA TIG applied each of the OPA evaluation standards (15 CFR § 990.54) to the alternatives to affirm consistency with initial OPA evaluation completed in the Phase 1 RP. Implementation of the two preferred alternatives is the LA TIG's "proposed action". Details on the scope of the alternatives are found in Sections 3.1 (Rabbit Island) and 3.2 (Jean Lafitte) of the Phase 2 RP/EA #1.3.

Rabbit Island Project

Design Alternative 2A (Preferred) – This alternative restores 87.8 acres of the island's original 200-acre footprint for bird habitat by raising the elevation of Rabbit Island using dredged fill material from the Calcasieu Ship Channel as the borrow source area (approximately 40 acres). Alternative 2A utilizes Access Route B for construction equipment access and sediment pipeline conveyance. Route B extends approximately 8,900-ft. from Rabbit Island through Joe's Cut, near mile 5 of the Calcasieu Ship Channel to the delineated borrow area.

Design Alternative 2 – Alternative 2 has a larger footprint for Cell 3 that extends to the southeast of the island and an elevation of 3-ft. compared to a 1-ft. elevation for Alternative 2A. The fill area for Alternative 2 includes a total of 137.5 acres compared to a total fill area template of 87.8 acres for Alternative 2A. The borrow area is also the Calcasieu Ship Channel. The access route is the same as Alternative 2A, Access Route B.

Jean Lafitte Project

Design Alternative 4C (Preferred) – This alternative implements a nearly continuous rock breakwater, with rock elbows protecting fish gaps along the eastern shorelines of Lake Cataouche, Lake Salvador, and Bayou Bardeaux in the Jean Lafitte National Historical Park and Preserve. Implementation is proposed in two increments, the northern and the southern portions of the project area. In the Phase 2 RP/EA #1.3, the LA TIG proposes at this time to implement only the southern portion. A "floatation channel" would be dredged parallel to the proposed breakwater alignment to accommodate the draft of necessary equipment and material barges. The proposed floatation channel would be 80-ft. wide and 4-ft. below the existing surface bottom to accommodate typical equipment and material barges. Material excavated

to create the floatation channel would be stockpiled on the western side of the breakwater and re-used post-construction to backfill the channel.

Design Alternative 4A – Alternative 4A implements continuous shoreline protection in the exact same footprint as Alternative 4C; however, it would utilize other manufactured construction materials such as Ecobale© or Reefmaker©. Construction methods would be entirely water-based but a floatation channel may not be required for these alternative construction methods because wave attenuator material is lighter than limestone riprap. This alternative would require treated timber piles to be driven at the project site. If it became necessary, a similar access route to 4C would be used for Alternative 4A.

Natural Recovery/No Action Alternative – Under this alternative, the Rabbit Island and Jean Lafitte projects would not be implemented. Conditions would continue to deteriorate unless other actions were taken. Pursuant to OPA NRDA regulations and NEPA, Natural Recovery/No Action was analyzed programmatically (PDARP/PEIS, Section 5.3.2) and was found to not meet the purpose and need for implementing alternatives that address lost natural resources and their services and is not considered as a viable alternative in subsequent tiered RP/EAs. Pursuant to OPA, Natural Recovery was discarded from further consideration in subsequent RP/EAs. Pursuant to NEPA, the No Action Alternative is included in the Phase 2 RP/EA #1.3 as a benchmark with which to "compare the magnitude of environmental effects of the action alternatives" (Forty Questions, CEQ 1981).

Through OPA evaluation (Phase 2 RP/EA #1.3, Section 2.3), the LA TIG determines if implementation of the preferred design alternatives, Rabbit Island project alternative 2A and Jean Lafitte project alternative 4C, best meet the purpose and need for partial restoration over the non-preferred alternatives. The findings from the NEPA analysis informing the LA TIG's OPA determination are summarized below. Pursuant to the Consent Decree, implementation would be funded from the "birds" and "habitat projects on federally managed lands" restoration type allocations at a total estimated cost of approximately $36,888,556.

NEPA Analysis Summary of Findings

The reasonable range of design alternatives is analyzed to determine environmental effects that could result from project implementation (Phase 2 RP/EA #1.3, Section 4). The NEPA analysis is summarized below for both Rabbit Island and Jean Lafitte project design alternatives. Environmental effects greater than no effect all fall within the range of short-term minor to long-term moderate as defined in Section 4 of RP/EA #1.3, and are not determined significant considering the context and intensity of the projects' scopes and effects on the resources. The environmental effects of each project's design alternatives are similar in most cases and none are found to cause effects outside the short-term minor to long-term moderate range. To avoid redundant information, only environmental effects that differ notably between design alternatives for each project are described in more detail below.

- For Rabbit Island, the Proposed Action would result in minor, short-and long-term adverse impacts on terrestrial substrates, such as localized soil disturbances or compaction which may result from use of heavy equipment during site preparation and construction. Construction activities would result in localized disturbances to aquatic substrates that would constitute short-term, minor, adverse impacts. For Rabbit Island, short term, minor to moderate adverse impacts to subaqueous substrates in the excavation sites would occur, which would be expected to gradually fill in through time. The placement of large quantities of substrates across the island constitutes a long-term, moderate, adverse impact to the island's substrates; however, Alternative 2A is expected to have minimal impact on the island's overall footprint. Alternative 2

covers a larger area and would have a greater impact but would still fall within the moderate range. The establishment of construction BMPs would help to minimize impacts of construction, access areas, and site preparation on substrates. BMPs could include the implementation of erosion controls, development of and adherence to a stormwater management plan, and consistent construction monitoring. Avoiding fill placement before or during severe weather would minimize erosion during construction. Revegetation would help stabilize soils and reduce long term soil loss due to erosion. Therefore, this revegetation would have a long-term, beneficial impact on substrates. Overall, short- and long-term, minor to moderate, adverse impacts and long-term, beneficial effects on substrates are expected. For Jean Laffite, construction of a floatation channel would affect vegetation, benthic substrates, and organisms within the construction zone; however, the overall impact is expected to be minor. To protect existing soils including SAV and surrounding wetlands, BMPs would be used to control turbidity during dredging and backfilling.

- The Proposed Action includes the use of equipment and vehicles which burn fossil fuels. This would be short-term and would result in minor effects on regional air quality.
- Implementing the Proposed Action would result in short-term, minor adverse noise impacts that are limited to construction activities.
- Implementing the Proposed Action would result in short- and long-term, minor to moderate adverse effects on hydrology and water quality. For Rabbit Island, increased bird populations and their waste, use of barges, and fill material placement would cause adverse impacts. Short-term, minor, adverse impacts to water quality on and near Rabbit Island are expected during implementation of restoration and construction activities. Localized erosion and sediment transport are expected during fill material placement. The use of barges, other vehicles, and equipment during implementation and monitoring could result in short-term, minor, adverse impacts to water quality due to potential fuel leaks or vehicle fluid leaks. Appropriate measures, such as provisions for proper disposal and storage of materials and wastes, would also be taken to avoid accidental spillage of fuels or other chemicals and to control runoff into adjacent water bodies. Construction BMPs, in addition to other avoidance and mitigation measures as required by state and federal regulatory agencies, would minimize water quality and hydrology impacts. Silt fencing or training dikes would be used to limit runoff. BMPs such as limiting idling time either by shutting equipment off when not in use or reducing the idling time, stockpiling material, an erosion and sedimentation control plan, and maintaining spill prevention measures would minimize impacts to water quality and hydrology. National Pollutant Discharge Elimination System (NPDES) guidelines for Phase 2 construction activities would be followed during construction, and a site-specific Stormwater Pollution Prevention Plan (SWPPP) would be developed. State permits would be obtained as necessary, including Section 401 Water Quality Certification and Section 402 NPDES permits. For Rabbit Island, USACE permitting authorizing activities pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act was issued on August 26, 2019. For Jean Lafitte, coordination and permitting with the USACE is ongoing and would be completed prior to construction. Overall, at Jean Lafitte, the Proposed Action would result in short-term, minor effects and long-term beneficial effects on hydrology and water quality resulting from the establishment and propagation of SAV and its ability to remove suspended sediments and nutrients from the water column.
- The Proposed Action supports the goals outlined in their respective parish's CZM Programs and would result in long-term, beneficial impacts to land and marine management due to its aim of restoring ridge and/or marsh habitats.
- The Proposed Action would have short-term minor to moderate adverse impacts to habitats and wildlife in the Rabbit Island project vicinity during project construction, including installation of

pipeline and dredging, and is anticipated to benefit habitats over the long term. Short-term, moderate adverse impacts to birds inhabiting the project areas and to brood-rearing habitat on Rabbit Island would occur during construction. During construction, birds inhabiting the project areas would be temporarily displaced, and would need to find other areas to forage and loaf. Suitable habitats are available nearby.

- The Proposed Action would result in short-term, moderate impacts to marine and estuarine aquatic fauna, crustaceans, mollusks, and other aquatic organisms within the project vicinities. At Rabbit Island there would be short-term, moderate adverse impacts to a portion (81.48) acres of EFH within the island footprint due to the filling and conversion of some tidal ponds and creeks on the east side of the island to create non-tidal marsh habitat. For Jean Lafitte Alternative 4A, impacts to marine and estuarine fauna, EFH, and managed fish species would be similar to those under the preferred Alternative 4C; however greater short-term impacts would occur for Alternative 4A due to required pile driving activities.
- The Proposed Action would result in short-term to long-term, minor adverse effects to biodiversity and ecosystem functioning. Implementation of the Proposed Action would cause short-term to long-term minor adverse impacts to biological resources. Habitats, marine fauna, and protected species would be impacted by possible disturbances derived from construction activities. Resources would recover quickly and only a small fraction of any local population would be adversely affected. Overall, long-term effects would be beneficial.
- Marine mammals could be adversely affected by the Rabbit Island project. During dredging activities, monitoring will be conducted for marine mammals on either side of the barge, and measures taken to avoid them if they are present. Implementation of USACE Standard Manatee Conditions will avoid and minimize impacts to manatees if present. BMPs to minimize temporary water quality impacts that could affect any sea turtles or marine mammals that could be present will be implemented. Piping plover, red knot and other species protected under the Endangered Species Act are not expected in the project areas due to lack of foraging habitat.
- The Proposed Action would not create a disproportionately high and adverse effect on minority or low-income populations as the project areas are not in populated areas.
- The Proposed Action may result in short-term, minor, adverse impacts to tourism and recreation use if construction activities were to discourage visitors. However, the impacts would be temporary and would increase bird populations and wildlife viewing opportunities.
- The Proposed Action would result in minor, short-term adverse impacts to aesthetics and visual resources during construction but would ultimately enhance the natural aesthetics and visual resources of the areas.
- The Proposed Action would not have adverse impacts on public health and safety. Safety measures to protect workers during construction are required and enhance public health and safety through the restoration and protection of shorelines.
- The Proposed Action is not expected to affect known cultural resources for the Rabbit Island project. Data indicate no sensitive features to be known on Rabbit Island. Areas identified to have potential cultural resources in the borrow area (anomalies seen from employment of magnetometer, sidescan sonar, and sub-bottom profiler technology) will be buffered thus avoiding impacts to those areas. Cultural resources in the Jean Lafitte project area will be protected through avoidance by design and by minimizing the rate of shoreline erosion that is occurring there now. Section 106 consultation is ongoing and would be completed prior to implementation of the proposed project, and the project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural resources.

- The Proposed Action would not result in adverse impacts to marine transportation because the proposed projects would not unreasonably interfere with or create obstructions to navigation on the surrounding waterways.
- In combination with other actions, the Proposed Action would not contribute significantly to adverse cumulative impacts to air quality, geology and substrates; hydrology and water quality; habitats; wildlife species; protected species; marine and estuarine fauna, marine mammals, EFH, and managed fish species; land and marine management; cultural resources, socioeconomics and public health and safety. The Proposed Action would create long-term cumulative benefits to most of these resources.
- The Proposed Action neither establish a precedent for future LA TIG actions with significant effects nor represent a decision in principle about a future consideration. Future LA TIG actions will be determined through separate, independent planning processes.
- The Proposed Action is not expected to threaten or violate federal, state, or local laws, or requirements imposed for environmental protection. The Proposed Action is intended to restore habitats and compliance with all applicable federal, state, and local laws is ensured. Details are provided below.
- The Proposed Action is not expected to result in the introduction or spread of nonindigenous species. Use of BMPs and adherence to permit conditions will minimize the chances for introduction or spread of nonindigenous species.
- The Proposed Action has no highly uncertain, unique, or unknown risks. The described methods for restoration of coastal island habitats and protection of shorelines have been used successfully for decades in coastal Louisiana to protect coastal resources.
- The Proposed Action will be implemented in compliance with all applicable federal laws and regulations. A summary of the federal regulatory compliance review and approvals as of signature on this document are provided below. Any environmental reviews and consultations not yet completed will be finalized prior to the initiation of the relevant project activities.

Agency Coordination and Consultation Summary

The LA TIG has completed environmental compliance technical assistance and reviews with the applicable state and federal agencies. NOAA, on behalf of the LA TIG, has requested ESA consultation from NMFS for the Rabbit Island project. This request is seeking concurrence with the determination of a *not likely to adversely affect* determination for sea turtles associated with the Rabbit Island project. DOI, on behalf of the LA TIG, requested ESA consultation with USFWS. On January 21, 2020, USFWS concurred with the determination of a *not likely to adversely affect* determination for West Indian manatees associated with the Rabbit Island project. USFWS has concurred with the ESA determination for the Jean Lafitte project.

EFH consultation with NMFS is complete for the Rabbit Island and Jean Lafitte projects. NOAA has reviewed the Proposed Action for compliance with the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) and the Marine Mammal Protection Act (MMPA) and had informational discussions with the National Marine Fisheries Service Southeast Regional Office. NOAA determined, under the MSFCMA, that the projects would have no substantial adverse effect to essential fish habitat. No further coordination under the MMPA is required.

Pursuant to the Coastal Zone Management Act, on behalf of the LA TIG federal Trustees, consistency determinations were submitted for state review. Louisiana concurred with the determination of consistency with the enforceable policies of their respective Coastal Area Management Programs for

the Proposed Action. Additional consistency review may be required pursuant to federal regulations (see 15 C.F.R. Part 930) prior to project implementation.

Work in waters of the U.S., including wetlands, has been coordinated with the U.S. Army Corps of Engineers (USACE) pursuant to the Clean Water Act Section 404 and Rivers and Harbors Act Section 10 (CWA/RHA) for the Rabbit Island project. Coordination with the USACE and final authorization pursuant to CWA/RHA will be completed prior to construction for the Jean Lafitte project.

Section 106 consultation is ongoing and would be completed prior to implementation of the projects, and the projects would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural resources. If any cultural resources are found during implementation, work would cease, the proper agencies notified, and additional review under Section 106 would be conducted if necessary.

The LA TIG will ensure compliance reviews and/or approvals under all applicable state and local laws and other applicable federal laws and regulations are complete before implementation. Implementing Trustees are required to implement alternative-specific mitigation measures, including BMPs, that are identified in this Phase 2 RP/EA #1.3 and in the completed consultations/permits and biological evaluation forms. Implementing Trustees will provide oversight to ensure no unanticipated effects to listed species and habitats occur, including ensuring that BMPs are implemented and continue to function as intended.

If any further need to coordinate and consult with other regulatory authorities would arise, the additional coordination or consultation requirements would be addressed prior to project implementation. The status of federal regulatory permits/approvals will be maintained online (http://www.gulfspillrestoration.noaa.gov/environmental-compliance/) and updated as regulatory compliance information changes. The LA TIG federal Trustees' Finding of No Significant Impact for these projects is issued subject to the completion of all outstanding compliance reviews under applicable federal laws. If during final design the proposed action changes or information is brought to light as a result of completing such reviews that is potentially relevant to the environmental assessment supporting this Finding of No Significant Impact, that assessment would be updated or supplemented as required by NEPA and a new determination made by the LA TIG federal Trustees as to whether the proposed action is likely to significantly affect the quality of the human environment.

Determination

In view of the findings presented in this document and the analysis contained in the supporting Phase 2 RP/EA #1.3, the LA TIG federal Trustees determine that the proposed action will not significantly impact the quality of the human environment. Accordingly, preparation of an environmental impact statement for this action is not necessary.

For the U.S. Department of the Interior

Date: 2/14/2020

Signature: Debora L McClain

Debora L. McClain
Acting Assistant Regional Director, Gulf Restoration

For the National Oceanic and Atmospheric Administration

Date: _____

Signature: DOLEY.CHRISTOPHER.D.1365844042 Digitally signed by DOLEY.CHRISTOPHER.D.1365844042 Date: 2020.02.14 18:10:06 -05'00'

Christopher D. Doley
Principal Representative, National Oceanic and Atmospheric Administration
Trustee Official for the Louisiana Trustee Implementation Group

Date: _____

Signature: PENN.TONY.MARTIN.1365863640 Digitally signed by PENN.TONY.MARTIN.1365863640 Date: 2020.02.13 10:26:42 -05'00'

Tony Penn
Chief, Assessment and Restoration Division
Trustee Official for the Louisiana Trustee Implementation Group

For the U.S. Department of Agriculture

Date: 2/14/2020

Signature: Homer L Wilkes

Homer L. Wilkes
Principal Representative, U.S. Department of Agriculture
Trustee Official for the Louisiana Trustee Implementation Group

For the U.S. Environmental Protection Agency

Date: 2/11/2020

Signature:

Mary Kay Lynch
Alternate to Principal Representative, U.S. Environmental Protection Agency